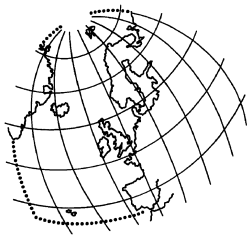
Biodiversity Series

EcoQO Handbook

Handbook for the application of Ecological Quality Objectives in the North Sea

First Edition - 2007



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The Convention for the Protection of the Marine Environment of the North-East Atlantic (the "OSPAR Convention") was opened for signature at the Ministerial Meeting of the former Oslo and Paris Commissions in Paris on 22 September 1992. The Convention entered into force on 25 March 1998. It has been ratified by Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, Netherlands, Norway, Portugal, Sweden, Switzerland and the United Kingdom and approved by the European Community and Spain.

La Convention pour la protection du milieu marin de l'Atlantique du Nord-Est, dite Convention OSPAR, a été ouverte à la signature à la réunion ministérielle des anciennes Commissions d'Oslo et de Paris, à Paris le 22 septembre 1992. La Convention est entrée en vigueur le 25 mars 1998. La Convention a été ratifiée par l'Allemagne, la Belgique, le Danemark, la Finlande, la France, l'Irlande, l'Islande, le Luxembourg, la Norvège, les Pays-Bas, le Portugal, le Royaume-Uni de Grande Bretagne et d'Irlande du Nord, la Suède et la Suisse et approuvée par la Communauté européenne et l'Espagne.

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Executive Summary

Ecological Quality Objectives (EcoQOs) have been developed as tools to help OSPAR fulfil its commitment to apply the ecosystem approach to the management of human activities that may affect the marine environment. Within the concept of a "healthy and sustainable marine ecosystem" for present and future generations, EcoQOs are intended to provide a set of clear environmental indicators stating aspirations for a healthy North Sea as part of the ecosystem approach. An introduction to the EcoQO system is given in the document Ecological Quality Objectives – Working towards a healthy North Sea (OSPAR publication 2007/318). Section B gives guidance on the implementation of those EcoQOs being applied in the North Sea. Section C gives guidance on the development of new or less advanced EcoQOs

This EcoQO handbook is intended to provide a basis for the implementation of Ecological Quality Objectives (EcoQOs) in the North Sea during the period 2007-2010 as set out in the OSPAR agreement on the application of the EcoQO system. Section B gives guidance on the implementation of those EcoQOs being applied in the North Sea. The EcoQOs covered concern commercial fish species, marine mammals, seabirds, benthic communities and eutrophication and their interactions with human activities. For each EcoQO details are given on the overall aims, the methodology, quality assurance, costs of application, reporting requirements and the method of application by the lead country. On the basis of the application of EcoQOs in the North Sea, OSPAR will prepare evaluations of the results of the EcoQO system in 2008 and 2009.

Further EcoQOs are being developed by OSPAR with the aim of developing a comprehensive and coherent set of EcoQOs for the North Sea. Guidance on the steps to be taken for the development of new EcoQOs is given in section C of this handbook.

The Handbook is intended to be updated periodically and following initial publication will need to be updated to take into account the results of these evaluations. The edition number indicates which update of the handbook the reader is using.

Récapitulatif

Les Objectifs de qualité écologique (EcoQO) sont des outils qui ont été développés pour permettre à OSPAR de remplir son engagement d'appliquer une approche écosystémique à la gestion des activités de l'homme qui risquent d'affecter le milieu marin. Les EcoQO ont pour objectif de constituer une série d'indicateurs environnementaux clairs qui déclarent les aspirations pour une mer du Nord saine faisant partie de l'approche écosystémique, dans le cadre du concept d'un «écosystème marin sain et durable» pour les générations actuelles et futures. Le document «Objectifs de qualité écologique – travailler dans le sens d'une mer du Nord saine (publication OSPAR 2007/318) présente le système d'EcoQO. La section B donne des orientations sur la mise en œuvre des EcoQO qui sont appliqués dans la mer du Nord. La section C donne des orientations sur le développement de nouveaux EcoQO ou d'EcoQO moins perfectionnés.

Le présent manuel d'EcoQO a pour intention de constituer une base pour la mise en oeuvre des EcoQO dans la mer du Nord entre 2007 et 2010 tel qu'il est défini dans l'accord OSPAR sur l'application du système d'EcoQO. La section B donne des orientations sur la mise en œuvre des EcoQO qui sont appliqués dans la mer du Nord. Les EcoQO couverts concernent les espèces halieutiques commerciales, les mammifères marins, les oiseaux de mer, les communautés benthiques et l'eutrophisation ainsi que leurs interactions avec les activités de l'homme. Pour chaque EcoQO des détails sont fournis sur l'objectif général, la méthodologie, l'assurance de qualité, le coût de l'application, les exigences de notification et la méthode d'application par le pays pilote. OSPAR préparera des évaluations des résultats du système d'EcoQO en 2008 et 2009, à partir de l'application des EcoQO dans la mer du Nord.

OSPAR est en train de développer des EcoQO supplémentaires dans le but de mettre en place une série exhaustive et cohérente d'EcoQO pour la mer du Nord. La section C du présent manuel donne des orientations sur les mesures à prendre pour développer de nouveaux EcoQO.

Il est prévu d'actualiser périodiquement le manuel. Celui-ci devra être actualisé après sa publication initiale afin de tenir compte des résultats de ces évaluations. Le numéro de l'édition indique quelle version actualisée est utilisée par le lecteur.

A. Introduction and Background

1. Introduction

1.1 This EcoQO handbook is intended to provide a basis for the implementation of Ecological Quality Objectives (EcoQOs) in the North Sea during the period 2006-2009 as set out in the OSPAR agreement on the application of the EcoQO system (OSPAR agreement 2006/4). This implementation follows up the outcome of the Report on the North Sea Pilot Project on EcoQOs published by OSPAR in 2006 (OSPAR Publication 2006/239).

1.2 The EcoQOs currently being applied in the North Sea under OSPAR agreement 2006/4 are as follows:

1.1 Spawning stock biomass of commercial fish species (*lead* Norway, under BDC);

2.1a Harbour seal population trends (*lead* UK, under BDC);

2.1b Grey seal population trend (*lead* UK, under BDC);

2.2 Bycatch of harbour porpoise (*lead* UK, under BDC);

3.1 Proportion of oiled common guillemots amongst those found dead or dying on beaches (*lead* Netherlands, under BDC);

5.1 Imposex in dog whelks (*Nucella lapillus*) (*lead* Belgium & Portugal, under HSC);

9.1 Eutrophication Status of the North Sea

9.1.1 Winter nutrient (DIN and DIP) concentrations (lead Netherlands & Norway, under EUC);

9.1.2 Phytoplankton chlorophyll a (lead Netherlands & Norway, under EUC);

9.1.3 Phytoplankton indicator species for eutrophication (lead Netherlands & Norway, under EUC);

9.1.4 Oxygen (lead Netherlands & Norway, under EUC);

9.1.5 Kills in zoobenthos in relation to eutrophication (lead Netherlands & Norway, under EUC

1.3 Section B of this handbook provides guidance on the implementation of each of the EcoQOs listed above. The guidance is intended to assist Contracting Parties to support the work of Lead Parties in assembling the data on each EcoQOs and producing evaluations of each advanced EcoQO as the basis for:

a. a first evaluation of the results of the application of the EcoQO system in 2008, which will lead to;

b. an improved evaluation of the results of the EcoQO system in 2009, as a contribution to the QSR 2010.

1.4 The evaluations of individual EcoQOs (or, as the case may be the overview of the integrated suite of eutrophication EcoQOs) will aim to cover, as far as possible, the following issues:

a. whether the EcoQO is met, and if not, why not;

b. (potential) consequences of failing to meet the EcoQO. The consequences of failing to meet an EcoQO will vary case by case and will depend on whether the EcoQO is a target, limit or indicator. Consequences may be viewed from an ecological perspective, or the perspective of the Contracting Parties attempting to manage human activities in such a way to meet the EcoQO. If an EcoQO is not met, a study should be initiated to examine the reasons why and, on the basis of this, to determine future action. (see paragraphs 14 – 17 of OSPAR agreement 2006-4);

c. suitability of present monitoring and reporting;

d. developments in harmonization of monitoring and reporting schemes;

e. costs of present monitoring and reporting;

f. extra costs of harmonizing the monitoring;

g. performance of the EcoQO in terms of the ICES criteria for good EcoQOs and with regard to the Ecosystem Approach to management (both within OSPAR and the proposed EC Marine Strategy Directive (MSD));

h. the specific linkages with the MSD and how the EcoQO might be used in relation to the MSD initial assessment, drawing up programmes and measures and elaborating GES

i. gaps in knowledge, present conditions that hamper the implementation process and ways and means to overcome these problems;

j. effectiveness of communication, i.e. amount of support and knowledge on this EcoQO among stakeholders, and

k. whether the status of the EcoQO should be target, limit or indicator,

l. if needed, a proposal for modification and improvement of the EcoQO, including consideration on whether the EcoQOs set originally in 1999 would require revision in the light of the timing for GES under the MSD and are consistent with other regional agreements and legislation

m. proposals for possible milestones up to the achievement of the objective

n. potential applicability of the EcoQO in other OSPAR regions than the North Sea

1.5 These evaluations of individual EcoQOs in 2008 are to be prepared on the basis summarised in Table 1.

1.6 The Intersessional Correspondence Group on EcoQOs will prepare, on the basis of the individual evaluations, an overview of the implementation of the advanced EcoQOs for consideration by BDC in the spring of 2008.

1.7 OSPAR 2008 will consider what further work is needed in the 2008/2009 cycle of meetings to improve the evaluations as an input to the QSR 2010.

1.8 Further EcoQOs are being developed by OSPAR, particularly for the remaining ecological quality objectives, with the aim of developing a comprehensive and coherent set of EcoQOs for the North Sea. Guidance on the steps to be taken for the development of new EcoQOs is given in section C of this handbook.

1.9 The handbook will be updated from time to time both to adjust the existing guidance, in the light of experience with its use, and to include guidance on any of the EcoQOs that are currently under developments which are added to the above set. For this reason there are gaps at some sections of this version of the handbook where text will be developed in due course. The current edition number and date indicates which update of the handbook the reader is using.

Table 1. Timetable for evaluation of individual EcoQOs

EcoQO	Body to prepare draft evaluation for review by BDC, ASMO and OSPAR	Sources for the draft evaluation	Target date for the preparation of the draft evaluation
1.1 Spawning stock biomass of commercial fish species	MASH on the basis of a proposal from the lead country (Norway)	ICES Advice on Fisheries Management for recent years	Proposal from the lead country by the deadline for MASH in the autumn of 2007
2.1(a) and (b) Harbour and grey seal population trends in the North Sea	MASH on the basis of a proposal from the lead country (United Kingdom)	Monitoring data submitted in 2006 and/or 2007 by relevant North Sea States to the lead country	Proposal from the lead country by the deadline for MASH in the autumn of 2007
2.2 Bycatch of harbour porpoise	MASH on the basis of a proposal from the lead country (United Kingdom)	Data to be obtained by lead country from ASCOBANS, from reporting under EC Regulation 812/2004, and similar data provided to lead country by Norway	Proposal from the lead country by the deadline for MASH in the autumn of 2007
3.1 Proportion of oiled common guillemots amongst those found dead or dying on beaches	MASH on the basis of a proposal from the lead country (Netherlands)	Monitoring data submitted in 2006/2007 by relevant North Sea States to the lead country	Proposal from the lead country by the deadline for MASH in the autumn of 2007

EcoQO	Body to prepare draft evaluation for review by BDC, ASMO and OSPAR	Sources for the draft evaluation	Target date for the preparation of the draft evaluation
5.1 Imposex in dog whelks *(Nucella lapillus)*	MON Working Group to produce an assessment and on the basis of this the lead countries (Belgium and Portugal) to produce a draft on remaining aspects listed in §11	Monitoring data provided to the ICES database under CEMP	MON Working Group (December 2007 or January 2008) and thereafter the deadline for BDC 2008
9. Integrated suite of eutrophication EcoQOs	Eutrophication Committee (EUC) on basis of the results of the Common Procedure produced by the North Sea States and on proposals for an overview from the lead countries (Netherlands and Norway)	Results of the Common Procedure from North Sea States, based on monitoring data provided to the ICES database under CEMP, and further national data	EUC in December 2007 or January 2008

2. Overview of the EcoQO system and glossary of key terms

2.1 The EcoQO system is a tool to help OSPAR fulfil its commitment to apply the ecosystem approach to the management of human activities that may affect the marine environment. The underlying concept is that of a "healthy and sustainable marine ecosystem". As the third recital to the OSPAR Convention says, the aim is to manage "human activities in such a way that the marine ecosystem will continue to sustain the legitimate uses of the sea and will continue to meet the needs of present and future generations"

2.2 In the context of the ecosystem approach, marine ecological quality is an expression of the structure and functioning of a marine ecosystem, taking into account its biological community and its natural physiography, geography and climate, as well as physical and chemical conditions, including those resulting from human activities. Ecosystems can be defined at a range of scales. In this context, the relevant ecosystem needs to be specified at a scale which relates to sensible management units.

2.3 The system of EcoQOs operates at two complementary levels:

a. reaching a judgement on the overall ecological quality of the marine environment;

b. considering the separate aspects of the marine environment, in order to derive policy conclusions on those aspects.

2.4 The basic requirements for the system of EcoQOs are agreements on:

a. the aspects of the marine environment that must be considered in forming a judgement on the overall ecological quality of that environment;

b. the way in which to structure the process of reaching both judgements on overall ecological quality and policy conclusions on the separate aspects;

c. the tasks that OSPAR must carry out to implement the system of EcoQOs.

2.5 In following this process, and to avoid confusion, it is essential to be careful in the use of the different terms.

2.6 **Ecological Quality (EcoQ)** can best be defined as "*An overall expression of the structure and function of the marine ecosystem taking into account the biological community and natural physiographic, geographic and climatic factors as well as physical and chemical conditions including those resulting from human activities*."

2.7 Within this overall concept, **Ecological Quality Issues** are the fields in which it is appropriate to attempt to measure aspects of the general ecological quality of the marine ecosystem under consideration. For the North Sea pilot project, these have been selected as:

1. Commercial fish species;
2. Threatened and declining species;
3. Sea mammals;
4. Seabirds;
5. Fish communities;
6. Benthic communities;
7. Plankton communities;
8. Habitats;
9. Nutrient budgets and production; and
10. Oxygen consumption.

2.8 Under each of these issues, the **Ecological Quality Elements** are the individual aspects of ecological quality on which it is appropriate to focus. The number of elements selected under each of the issues will vary.

2.9 An **Ecological Quality Objective (EcoQO):** is the desired level of an ecological quality. Such a level may be set in relation to a reference level.

2.10 The "**reference level**" is the level where the anthropogenic influence on the ecological system is minimal. Terms such as "reference conditions" or "background conditions" are also used interchangeably with "reference level". In the context of eutrophication, the reference level is referred to as "background concentration" or "background level". In this use, "background concentration" is defined, in general, as salinity-related and/or specific to a particular area, and which has been derived from data relating to a particular (usually offshore) area or from historic data.

2.11 There will be a one-to-one relationship between ecological quality elements and ecological quality objectives. The desired level of ecological quality will be set in relation to a metric which can be objectively verified. EcoQOs can take the form of targets (values where there is a commitment to attain them), limits (values where there is a commitment to avoid breaching them) or indicators (values which simply show what is happening). In this report each EcoQO is provisionally classified as a target, a limit or an indicator.

2.13 For the purpose of eutrophication, the desired levels of ecological quality (the EcoQOs) are referred to as "**assessment levels**". They are based on levels of increased concentrations and trends as well as on shifts, changes or occurrence to take account of natural variability and to allow some eutrophication (or 'slight disturbance' in the terminology for the Water Framework Directive). Parameters which are found to be at levels above the appropriate assessment levels are referred to as "**elevated levels**".

2.14 An overview of the EcoQO system is given in Table 2.

Table 2. Overview table of the revised EcoQO system for the North Sea

Ecological quality issues, related ecological quality elements and corresponding ecological quality objectives (EcoQOs), following the adoption by OSPAR 2005 of the Report on the North Sea Pilot Project on EcoQOs. EcoQOs that are currently under development are shown in plain italic text

Ecological quality Issue	**Ecological quality element and related *ecological quality objective* (EcoQO*)***
1. Commercial fish species	1.1 **Spawning stock biomass of commercial fish species in the North Sea** (former a) *Above precautionary reference points[1] for commercial fish species where those have been agreed by the competent authority for fisheries management*
2. Marine mammals	2.1 **Seal population trends in the North Sea** (former c) *a. Harbour seal population size: 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 sub-units of the North Sea. These sub-units are: Shetland; Orkney; North and East Scotland; South-East Scotland; the Greater Wash/Scroby Sands; the Netherlands Delta area; the Wadden Sea; Heligoland; Limfjord; the Kattegat, the Skagerrak and the Oslofjord; the west coast of Norway south of 62°N.* *b. Grey seal pup production: 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), and in breeding sites, within any of nine sub-units of the North Sea. These sub-units are: Orkney; Fast Castle/Isle of May; the Farne Islands; Donna Nook; the French North Sea and Channel coasts; the Netherlands coast; the Schleswig-Holstein Wadden Sea; Heligoland; Kjørholmane (Rogaland).* 2.2 **By-catch of harbour porpoises** (former e) *Annual by-catch levels should be reduced to below 1.7% of the best population estimate*

[1] In this context 'reference points' are those for spawning stock biomass, also taking into account fishing mortality, where these have been agreed by the competent authority for fisheries management.

Ecological quality Issue	Ecological quality element and related *ecological quality objective* (EcoQO*)*
3. Seabirds	3.1 **Proportion of oiled common guillemots among those found dead or dying on beaches** (former f) *The proportion of such birds should be 10% or less of the total found dead or dying, in all areas of the North Sea* 3.2 **Mercury concentrations in seabird eggs** (former g) *The average concentrations of mercury in the fresh mass of ten eggs from separate clutches of common tern (Sterna hirundo) and Eurasian oystercatcher (Haematopus ostralegus) breeding adjacent to the estuaries of the Rivers Elbe, Weser, Ems, Rhine/Scheldt, Thames, Humber, Tees, and Forth, 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 in south-western Norway and in the Moray Firth* 3.3 **Organohalogen concentrations in seabird eggs** (former h) *For each site, the average concentrations in fresh mass of the eggs of 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 and of HCH. Sampling should be of ten eggs of each species from separate clutches of birds breeding adjacent to the estuaries of the Rivers Elbe, Weser, Ems, Rhine/Scheldt, Thames, Humber, Tees, and Forth, and in similar (but not industrial) habitats in south-western Norway and in the Moray Firth* 3.4 **Plastic particles in stomachs of seabirds** (former i) *There should be less than 2% of northern fulmars (Fulmarus glacialis) having ten or more plastic particles in the stomach in samples of 50–100 beach-washed fulmars found in winter (November to April) from each of fifteen areas of the North Sea over a period of at least five years* 3.5 **Local sand eel availability to black-legged kittiwakes** (former j) *Breeding success of the black-legged kittiwake (Rissa tridactyla) should exceed (as a three-year running mean) 0.6 chicks per nest per year in each of the following coastal segments: Shetland, north Scotland, east Scotland, and east England* 3.6 **Seabird population trends as an index of seabird community health** (former k)
4. Fish communities	4.1 **Changes in the proportion of large fish and hence the average weight and average maximum length of the fish community** (former l)
5. Benthic communities	5.1 **Imposex in dog whelks (*Nucella lapillus*) or other selected gastropods** (former n) *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 (EAC) for TBT – that is, < 2.0, as measured by the Vas deferens Sequence Index, Where Nucella does not occur naturally, or where it has become extinct, the red whelk (Neptunea antiqua), the whelk (Buccinum undatum) or the netted dog whelk (Nassarius reticulatus) should be used, with exposure criteria on the same index of <2.0, <0.3 and <0.3, respectively.* 5.2 **Density of sensitive (e.g., fragile) species** 9.1.5 **Kills in zoobenthos in relation to eutrophication** (former m) This EcoQO is part of the integrated subset of EcoQOs for eutrophication under issue 9. 9.1.6 Changes in zoobenthos in relation to eutrophication This EcoQO is part of the integrated subset of EcoQOs for eutrophication under issue 9.

Ecological quality Issue	Ecological quality element and related *ecological quality objective* (EcoQO*)*
6. Plankton communities	9.1.2 **Phytoplankton chlorophyll *a*** (former q) This EcoQO is part of the integrated subset of EcoQOs for eutrophication under issue 9. 9.1.3 **Phytoplankton indicator species for eutrophication** (former r) This EcoQO is part of the integrated subset of EcoQOs for eutrophication under issue 9.
7. Threatened and/or declining species	7.1 **Presence and extent of threatened and/or declining species in the North Sea, as shown on the Initial OSPAR List** (former b)
8. Threatened and/or declining Habitats	8.1 **Restore and/or maintain the quality and extent of threatened and/or declining habitats in the North Sea, as shown on the Initial OSPAR List** (former s)
9. Eutrophication	9.1 **Eutrophication status of the North Sea** Overarching EcoQO-eutro: *All parts of the North Sea should have by 2010 the status of non-problem areas with regard to eutrophication, as assessed under the OSPAR Common Procedure for the Identification of the Eutrophication Status of the OSPAR Maritime Area (which consists of the (one-off) Screening Procedure and the (iterative) Comprehensive Procedure)* Supporting EcoQOs-eutro: 9.1.1 **Winter nutrient (DIN and DIP) concentrations** (former t) *Winter DIN and DIP (that is, concentrations of dissolved inorganic nitrogen and dissolved inorganic phosphate) should remain below a justified salinit**y-related and/or area-specific % deviation from background not exceeding 50%.*** 9.1.2 **Phytoplankton chlorophyll a** (former q) *Maximum and mean chlorophyll a concentrations during the growing season should remain below a justified area-specific % deviation from background not exceeding 50%.* 9.1.3 **Phytoplankton indicator species for eutrophication** (former r) *Area-specific phytoplankton eutrophication indicator species should remain below respective nuisance and/or toxic elevated levels (and there should be no increase in the average duration of blooms* 9.1.4 **Oxygen** (former u) *Oxygen concentration, decreased as an indirect effect of nutrient enrichment, should remain above area-specific oxygen assessment levels, ranging from 4 – 6 mg oxygen per litre* 9.1.5 **Kills in zoobenthos in relation to eutrophication** (former m) *There should be no kills in benthic animal species as a result of oxygen deficiency and/or toxic phytoplankton species* 9.1.6 **Changes in zoobenthos in relation to eutrophication**

B. Implementation arrangements for EcoQOs being applied in the North Sea

Ecological Quality Issue 1: Commercial Fish Species

EcoQ 1.1 **Spawning stock biomass of commercial fish species in the North Sea**

EcoQO 1.1 **Above precautionary reference points[2] for commercial fish species where those have been agreed by the competent authority for fisheries management**

Overall aims

1. Commercial fish species are important components in marine ecosystems. Several species have large populations in the North Sea (e.g. herring and mackerel) and they have major roles in the structuring and functioning of the North Sea ecosystem. North Sea fisheries have a major impact on the North Sea ecosystem, directly on the targeted fish stocks and indirectly through trophic (e.g. predator-prey) interactions.

2. The EcoQO on spawning stock biomass of commercial fish species in the North Sea is currently being applied as a limit/indicator. More information on the development of this EcoQO is presented in the OSPAR background document (OSPAR publication 242)

Methodology

3. 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. The data sources used in the assessments are information from scientific surveys and data collected on catch statistics. Agencies and scientific institutes in the various North Sea countries carry out the data collection and scientists from these countries contribute data and expertise into stock-assessment working groups (WGs) in ICES. The assessments done by the ICES expert group form the basis for the advice from the ICES Advisory Committee on Fisheries Management (ACFM) to fisheries managers on quotas and other aspects of fisheries. As information is already collected and data is harmonised there is no need for new procedures for harmonisation.

[2] In this context 'reference points' are those for spawning stock biomass, also taking into account fishing mortality, where these have been agreed by the competent authority for fisheries management.

4. In agreeing precautionary reference points, the fisheries managers use the system of precautionary reference points for spawning stock biomass (SSB, B_{pa}) and fishing mortality (F_{pa}) as a response to the uncertainty which inevitably surrounds determinations of SSB and F. The system is designed to ensure that there is a high probability of keeping away from the limit reference points for these two factors (B_{lim} and F_{lim}), taking into account the degree of uncertainty of determinations of SSB and F. The limit reference points B_{lim} and F_{lim} have ideally to be designed, on the basis of the fish stock dynamics, as those below which there is a high probability that the stock will collapse. ICES has also in some cases set the limit reference points associated with the lowest observed spawning stock size, to prevent the stock from coming into an area with unknown stock dynamics.

5. The ICES system is generally based on assessments carried out in year y on the basis of historical series of data up to year *y-1*. These assessments yield estimates for SSB at the beginning (or at spawning time) of year y and estimates of F for year *y-1*. Advice is given for management measures to be adopted for year *y+1* on the basis of catch and SSB forecasts made under different scenarios for years y and *y+1*. In this context, the following procedure should be used:

a. the EcoQO should be taken, as agreed in the Bergen Declaration, as "SSB above precautionary reference points (B_{pa}) for commercial species where these have been agreed by the competent authority for fisheries management".

b. on the basis of ICES work, OSPAR should compile SSB values for commercial species having populations, at least partially, in the North Sea. The assessment of the ecological status of the North Sea in year y will then be obtained by comparing the current estimates of SSB with the agreed B_{pa};

c. on the same basis, OSPAR should also compile F values for the same stocks, not for the purpose of assessing the current ecological status (year y), but in order to compare this with the agreed values of F_{pa} and warn fisheries management authorities that, if fishing mortality is kept at that level, then there is likely to be a risk that the SSB will fall below B_{pa} under average conditions of recruitment (it is possible that the catch forecasts indicate no immediate risk of SSB falling below B_{pa}, but the warning is a useful indication of misperformance of the fishery).

6. At present, the fisheries managers with competence for North Sea stocks have agreed values for B_{pa} for a number of stocks. For some joint stocks, such as cod, haddock, whiting saithe, plaice, herring and mackerel, these have been adopted jointly by Norway and the EU in the context of their consultations on mutual fishing possibilities. The EU has also adopted a B_{pa} for the northern stock of hake, which occurs partially in the North Sea.

Quality assurance

7. Evaluation of whether this is EcoQO is met or not are based upon the ICES fisheries advisory system. The ICES fisheries assessment working groups have established handbooks and manuals for the quality assurance of the fisheries advisory process and are working towards the implementation of ICES quality programme for the fisheries advice with the aim of:

a. improving documentation of the advisory process - following data from the points being delivered to ICES through analysis and conclusion as advice;

b. improving fisheries data through assisting the EU Data Collection Programme with planning sampling and setting standards;

c. improving the quality of the advice through strengthening the secretariat function to provide support for the advisory groups – this will improve consistency and secure organisational memory.

Resource requirements (staff time and technical ability, equipment, running costs);

8. As this is covered as part of the regular activities of the fisheries management system for the North Sea, information has not been collected on the costs.

9. At the 1997 Intermediate Ministerial Meeting on the Integration of Fisheries and Environmental Issues there was agreement to develop assessments and forecasts for further species of fish in the North Sea and also to develop target reference points for the major commercial populations (Statement of Conclusions, Annex). The former has developed and implemented by ICES, while the latter will require more resources for research and development.

Reporting requirements for Contracting Parties

10. There are no additional reporting requirements for Contracting Parties as this EcoQO can be reported on by the lead party on the basis of the work of the existing work of ICES Advisory Committee on Fishery Management.

Method of Evaluation by the lead party

11. In reporting on this EcoQO, OSPAR will state the proportion of fish stocks for which the operational objective is met, while spelling out the fish stocks for which the objective is not met (so that the environmental, social and economic implications of these failures can be assessed). There are 26 of these fish stocks. On this basis, the EcoQO would be reported as "x out of 26 commercial fish stocks are assessed to meet the EcoQO criteria on spawning stock. Those which fail to do so are…."

Consequences of not meeting the EcoQO;

12. OSPAR has no competence to adopt programmes and measures on questions related to the management of fisheries. Application of the proposed EcoQO for commercial fish species must therefore be regarded as the responsibility of the competent fisheries management authorities. This is significant as it contributes to the further integration of fisheries and environmental protection, conservation and management measures, as called for in the Statement of Conclusions from the Intermediate Ministerial Meeting on the Integration of Fisheries and Environmental Issues in Bergen in March 1997. The competent fisheries management authorities for the North Sea are the European Commission and Norway.

Link with the proposed MSD

13. [to be developed as part of the 2008 evaluation of the results of the EcoQO system]

Ecological Quality Issue 2: Marine Mammals

EcoQ 2.1 Seal population trends in the North Sea

EcoQO 2.1A ***Harbour seal population size*: 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 sub-units of the North Sea. These sub-units are: Shetland; Orkney; North and East Scotland; South-East Scotland; the Greater Wash/Scroby Sands; the Netherlands Delta area; the Wadden Sea; Heligoland; Limfjord; the Kattegat, the Skagerrak and the Oslofjord; the west coast of Norway south of 62°N.**

Overall aims

1. As with others, this EcoQO is designed as an indicator to alert that all is not necessarily well with an important part of the North Sea's mammal fauna. If the EcoQO is not met, then it is unlikely that immediate management action would be taken, instead it is intended that this event should trigger research into the causes of this change. If the cause is found to be related to a human activity, then suitable management measures might then be taken. The trajectory of harbour seal (*Phoca vitulina*) populations has been such that the EcoQO would have triggered research at least twice in recent decades – on two occasions the changes were caused by an epizootic of phocine distemper virus.

2. The EcoQO trigger level is to an extent arbitrary – it is based on inspection of past performance of harbour seal populations, and not on modelling of populations. This was not considered necessary as the EcoQO is an alerting EcoQO rather than one based on a strict target for the seal population. Such modelling might be necessary should the EcoQO be triggered.

Methodology

3. Table 2.1.1 outlines current and known monitoring of harbour seal populations in the North Sea. There are a variety of methods in use, with some variation even within a method – for example some aerial surveys use counts from infra-red photographs while others use visual counts. In general methods have evolved to suit local conditions and so long as reasonable standardisation is followed and variance and bias is consistent between sequential surveys of the same sub-unit then such differences do not matter.

Table 2.1.1. Current and known plans for monitoring of harbour seals by Contracting Parties in the North Sea.

Country	Sub-unit	Current monitoring	Monitoring method	Further needs
United Kingdom	Shetland	Population monitoring during moult	Aerial survey on approximate 5 yearly schedule	None
United Kingdom	Orkney	Population monitoring during moult	Aerial survey on approximate 5 yearly schedule	None
United Kingdom	North and East Scotland	Population monitoring during moult	Aerial survey on less than 5 yearly schedule	None
United Kingdom	South-East Scotland	Population monitoring during moult	Aerial survey on less than 5 yearly schedule	None
United Kingdom	Greater Wash/ Scroby Sands	Population monitoring during moult	Aerial survey on less than 5 yearly schedule	None
France	Baie du Mont Saint Michel	Pup and population monitoring	Aerial surveys 18/year. + 15 census (boat and land)	None
France	Baie de Somme	Pup and population monitoring	Land census each 10 days (January-June). Each day from June to September	None

France	Baie des Veys	Pup and population monitoring	Land and aerial surveys (1/week)	None
Netherlands	Delta	No information provided	No information provided	No information provided
Netherlands/ Germany/ Denmark	Wadden Sea	Population monitoring during moult	Aerial survey annually	None
Germany	Heligoland	No regular programme		Probably none
Denmark	Limfjord	No information provided	No information provided	No information provided
Denmark/ Sweden	Kattegat/Skagerrak	Population monitoring during moult	Aerial survey annually	None
Norway	Skagerrak and Oslo Fjord	No information provided	Aerial survey (frequency?)	No information provided
Norway	West coast, south of 62^{o}N	No information provided	Aerial survey (frequency?)	No information provided

Quality assurance

4. [text to be developed on the basis of submissions by Contracting Parties]

Resource requirements (staff time and technical ability, equipment, running costs);

5. The UK undertakes surveillance of harbour seal numbers for internal reasons not associated with the EcoQO. The costs of the aerial surveillance amount to approximately £100,000 spread over a 5 year period, with staff an overhead costs, shared with grey seal monitoring, adding approximately another £160,000.

6. No figures have been provided by other Contracting Parties.

Reporting requirements for Contracting Parties

7. The lead for this EcoQO requires the following key data for reporting purposes.

   a. Number of harbour seals hauled out in sub-unit, or national part of sub-unit of the North Sea

   b. Period over which count was made;

   c. Any further notes to be taken account of when assessing against EcoQO.

8. It is likely the correspondence and clarification of results will be necessary between the Lead Country and Contracting Parties.

Method of Evaluation by the lead party

9. [text needs to be developed]

Consequences of not meeting the EcoQO (target, limit, indicator);

10. In the case that the EcoQQ is not met (i.e a decline in population size of ≥10%) research should be triggered into the causes of the change. [text on this will be further developed as part of the 2008 evaluation]

Link with the proposed MSD

11. [text to be developed as part of the 2008 evaluation of the results of the EcoQO system]

EcoQO 2.1B ***Grey seal pup production*: 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), and in breeding sites, within any of nine sub-units of the North Sea. These sub-units are: Orkney; Fast Castle/Isle of May; the Farne Islands; Donna Nook; the French North Sea and Channel coasts; the Netherlands coast; the Schleswig-Holstein Wadden Sea; Heligoland; Kjørholmane (Rogaland).**

Overall aims

1. As with others, this EcoQO is designed as an indicator to alert that all is not necessarily well with an important part of the North Sea's mammal fauna. If the EcoQO is not met, then it is not recommended that immediate management action be taken, instead it is intended that this event should trigger research into the causes of this change. If the cause is found to be related to a human activity, then suitable management measures might then be taken.

2. The EcoQO trigger level is to an extent arbitrary – it is based on inspection of past performance of seal populations, and not on modelling of populations or the effects of such a reduction in pup production. This was not considered necessary as the EcoQO is an alerting EcoQO rather than one based on a strict target for the seal population. Such modelling might be necessary should the EcoQO be triggered, in order to understand possible population consequences of any changes in pup production.

Methodology

3. Table 2.1.2 outlines current and known monitoring of populations of grey seals (*Halichoerus grypus*) in the North Sea. There are a variety of methods in use, with some variation even within a method – for example some aerial surveys use counts from infra-red photographs while others use visual counts. In general methods have evolved to suit local conditions and so long as reasonable standardisation is followed and variance and bias is consistent between sequential surveys of the same sub-unit then such differences do not matter.

Table 2.1.2. Current and known plans for monitoring of grey seals by Contracting Parties in the North Sea.

Country	Sub-unit	Current monitoring	Monitoring method	Further needs
United Kingdom	Orkney	Pup production monitoring	Annual	None
United Kingdom	Fast Castle and Isle of May	Pup production monitoring	Annual	None
United Kingdom	Farne Islands	Pup production monitoring	Annual	None
United Kingdom	Donna Nook	Pup production monitoring	Annual	None
France	Archipelago of Molene	Pup and population monitoring	Regular (monthly) census and Photo identification	None
France	Archipelago of Sept Iles	Pup and population monitoring	Regular (monthly) census	None
France	North sea and Channel coasts	No information provided	No information provided	No information provided
Netherlands	Coast	No information provided	No information provided	No information provided
Germany	Schleswig-Holstein Wadden Sea	Pup production monitoring	Annual	None
Germany	Heligoland	Pup production monitoring	Annual	None
Norway	Kjørholmane (Rogaland)	No information provided	No information provided	No information provided

Quality assurance

4. [text needs to be developed on the basis of submissions by Contracting Parties]

Resource requirements (staff time and technical ability, equipment, running costs)

5. The UK undertakes annual surveillance of grey seal pup production for internal reasons not associated with the EcoQO. The costs of the aerial surveillance amount to approximately £80,000 per year, with staff an overhead costs, shared with harbour seal monitoring, adding approximately another £160,000.

6. No figures have been provided by other Contracting Parties.

Reporting requirements for Contracting Parties

7. The lead country for this EcoQO requires the following key data for reporting purposes.

   a. Number of grey seals estimated in sub-unit, or national part of sub-unit of the North Sea;

   b. Period over which count was made;

   c. Count method and method of processing results of counts;

   d. Any further notes to be taken account of when assessing against EcoQO.

8. It is likely the correspondence and clarification of results will be necessary between the Lead Country and Contracting Parties.

Method of Evaluation by lead party

9. [text to be developed]

Consequences of not meeting the EcoQO (target, limit, indicator)

10. In the case that the EcoQQ is not met (i.e a decline in pup production of ≥10%) research should be triggered into the causes of the change. [text on this will be further developed as part of the 2008 evaluation]

Link with the proposed MSD

11. [text to be developed as part of the 2008 evaluation of the results of the EcoQO system]

EcoQ 2.2 By-catch of harbour porpoise

EcoQO 2.2 Annual by-catch levels should be reduced to below 1.7% of the best population estimate

Overall aims

1. The objective derives from considerable analysis by the International Whaling Commission (IWC) and the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas (ASCOBANS). OSPAR has agreed to apply this EcoQO as a limit. Bycatch of harbour porpoises (*Phocoena phocoena*) at levels above this are considered to be unacceptable by ASCOBANS as there would not then be a high enough probability of allowing harbour porpoise populations to reach 80% of carrying capacity in the long term. This figure has been considered by both ICES and other advisory structures to the European Commission (responsible for fisheries management issues in all of the North Sea except Norwegian waters). Advice from these sources was consistent with the ASCOBANS evaluation. Although not stated explicitly, this target underlies Regulation (EC) No 812/2004 agreed by EU Fisheries Council in April 2004. This regulation includes requirements for monitoring bycatch as well as taking measures to reduce bycatch in certain fisheries.

2. Those Contracting Parties which are Member States of the European Union are required under the Habitats Directive (92/43/EC) to introduce a system to monitor the incidental capture and killing of all cetaceans. In light of the results of this monitoring, Member States are required to undertake further research or conservation measures to ensure that the incidental capture and killing does not have a significant negative impact on the species concerned. Member States also have a duty to ensure that any measures taken under the Directive are designed to maintain or restore, at a favourable conservation status, all cetaceans. These obligations do not apply to Norway.

3. Despite these statutory obligations (most in existence since 1992), knowledge of harbour porpoise bycatch in the North Sea is incomplete. There have been a number of recent reviews of bycatch in European waters, principal among these are:

a. ICES, 2002. Report of the working group on marine mammal population dynamics and habitats. ICES CM 2002/ACE:02;

b. CEC, 2002. Incidental catches of small cetaceans. Report of the meeting of the subgroup on fisheries and the environment (SGFEN) of the Scientific, Technical and Economic Committee (STECF). SEC (2002) 376. Commission of the European Communities, Brussels;

c. CEC, 2002. Incidental catches of small cetaceans. Report of the meeting of the subgroup on fisheries and the environment (SGFEN) of the Scientific, Technical and Economic Committee (STECF). SEC (2002) 1134. Commission of the European Communities, Brussels;

d. Kaschner, K. 2003 Review of small cetacean bycatch in the ASCOBANS area and adjacent waters – current status and suggested future actions. ASCOBANS MoP4/Doc. 21.

4. Rather than repeat these, a current summary is presented below, but these sources should be consulted if further detail is required. See also Section 6 of the report of the 2003 ICES Advisory Committee on Ecosystems and the Background Document on this EcoQO (OSPAR Publication 2005/244).

Methodology

5. In order to assess the impact of bycatch on a population, two main figures are needed: numbers being bycaught and an abundance estimate for the population that the bycatch is coming from.

6. Bycatch can only reliably be estimated using a properly designed monitoring scheme that is independent of the fisheries being checked. Although several types of fisheries may occasionally catch harbour porpoises, those that pose the greatest risk to harbour porpoise populations are thought to be bottom-set gill-nets. Such fisheries are relatively common throughout the shallower parts of the North Sea. Prior to 2005, bycatch estimates have been made in most relevant UK, Danish and Swedish fisheries in the North Sea, but not in any French, Belgian, Dutch, German or Norwegian fisheries. Given the range of the harbour porpoise and the scale of relevant fisheries in the North Sea, further information from relevant French, Belgian, Dutch, German or Norwegian fisheries is essential to assess whether or not this EcoQO is being met. There is no additional cost of meeting the monitoring needs of this EcoQO above those needed for the EU Habitats Directive and Fisheries Regulation requirements.

7. Surveys in order to provide up-to-date abundance estimates for North Sea harbour porpoises were made in 2005 in the SCANS II project, funded by the European Commission and EU Member States. A subsidiary problem is that we do not know the structure of the North Sea harbour porpoise population – we

know that animals from the western Channel are different from those in the North Sea, and that there is a difference between animals in the northern and southern North Sea and the Kattegat. There are no sharp lines between these groups, and further research is needed if we are to understand the impact of bycatch on different parts of the North Sea harbour porpoise population. Despite this problem, it should be possible to estimate the proportion of the harbour porpoise population that are bycaught in parts of the North Sea if sufficient bycatch observation is undertaken. Population modelling is underway to address these issues also under the SCANS II project.

8. Table 2.2.1 outlines current and known plans for monitoring of harbour porpoise bycatch in the North Sea. It appears that despite statutory requirements for monitoring, not all Contracting Parties are undertaking or planning observation programmes. In some cases where such programmes are planned, they appear to be undertaking the minimum necessary to meet the EU fishery regulation.

Table 2.2.1. Current and known plans for monitoring of harbour porpoise bycatch by Contracting Parties in the North Sea.

Country	Current monitoring	Monitoring method	Needs
Norway	Scheme under development	On-board and shore-based observations	Implementation
Sweden	Scheme prepared and funding available for 1 year	On-board observer scheme	Implementation
Denmark	Scheme under development with limited funds for implementation in Skagerrak only	On-board observer scheme	Implement in Skagerrak; devise and implement scheme in North Sea
Germany	Insufficiently covered: experimental monitoring in force for static gillnet fishery; no monitoring for pelagic trawl fishery	On-board observer scheme	Devise and implement scheme in relevant fisheries
Netherlands	None, though bycatch known to occur	-	Devise and implement scheme in relevant fisheries
Belgium	None, though bycatch known to occur	-	Devise and implement scheme in relevant fisheries
France	A programme to meet the needs of EC Regulation 812/2004 has been devised and will be implanted in 2006	-On-board observer scheme. Pilot programme	Implement planned scheme and determine if meets the needs of Habitats Directive (92/43/EC)
UK	Full scheme implemented from March 2005; in 2006 sampling in gillnetters in the English Channel, netters using pingers and smaller (<15m) netters and drift netters in the North Sea and English Channel will be undertaken.	On-board observer scheme	None

9. Numerous studies have shown that the only reliable source of information on the scale of bycatch is through the use of independent observers. Schemes that rely on self-reporting by fishers are difficult or impossible to audit (in order to verify figures) and frequently under-report bycatch. On larger vessels, observers are usually accommodated onboard; while various techniques may be applied to smaller vessels – there may be logistic problems accommodating observers and the amount of net per vessel (and therefore the number of bycatches per trip) will be lower. The observation of the largest vessels in the “small boat” fleets and of onshore observers have both been used. The use of dedicated porpoise bycatch observers is likely to be necessary in many but not all gillnet fisheries. This is because each haul needs to be observed as the net comes aboard to ensure that any porpoises falling from the net as it breaks the surface are counted. If these animals are not detected then the total mortality will be underestimated. Some schemes have attempted to use observers employed on other duties, but this carries the risk that observers will become overworked and not efficient at either duty. Each fishery needs to be evaluated to determine what tasks can be combined without undue loss of efficiency.

10. The proportion of the fishing effort observed depends on the precision of results required and the nature of the occurrence of bycatch. Higher precision requires higher observation effort – but a law of diminishing returns applies. The nature of bycatch can vary between a ‘constant’ background bycatch rate

and an episodic and patchy 'many animals in few hauls/ many hauls with no bycatch' situation. The latter scenario generally requires a higher proportion of the fishery to be observed that the former, if the same level of precision is required. A relatively low sampling effort may suffice if sampling is stratified correctly for each fishery; this may mean adaptation of the observer effort as results are built up. The level of coverage should normally be tuned so that the CV of the total kill estimate is roughly equal to the CV of the total population estimate, as this will optimise the accuracy of the estimated kill to population size ratio.

11. The most efficient way to sample a fishing fleet may not become clear for a number of years, but it is certainly possible to make educated guesses about levels of coverage and stratification at the start of an observer programme. Tuning the programme thereafter becomes an ongoing process. Programmes should therefore be planned to continue over several years if full benefits are to be derived. The continuation of an observer programme over several years also has the advantage of producing longer-term average catch rates which may be more appropriate for longer-lived species such as porpoises. Individual Contracting Parties will need to examine each of their fisheries and adapt the proportion of fishing effort observed to take account of this.

12. Observer schemes usually monitor only a proportion of a fleet's activities. The number of observed bycaught animals then need to be scaled up to estimate the catch of the whole fleet. This might appear to be a simple mathematical calculation but more often than not, estimating the total effort of a fleet is problematic. There are two major issues of concern, the first is what measure of effort is to be used, which depends on what is available and the second is the accuracy of effort statistics.

13. It is usual for gillnet observer schemes to try to collect bycatch data in terms of the numbers of animals taken per km of net set. Often it is possible to improve this by collecting numbers per km of net and per hour of soak time. It is very unusual, however for any fishery statistical service to have reliable effort data in terms of km.net.hours. Extrapolating from the sample to the whole fleet therefore needs to rely on cruder indices of effort.

14. Typically units of effort which might be available from fishery inspectorates or statistical services are the numbers of days spent at sea, or days spent fishing, or the number of trips. These statistics therefore become candidates for collection by the observer scheme. In practice, however, it seems that such statistics are less than reliable and that other measures have to be adopted. There are a number of possibilities ranging from tonnes of fish landed to days at sea. All of these statistics have their biases and carry the risk of various types of misreporting. In any extrapolation exercise it is clearly important to have a clear understanding of any possible shortcomings of the effort collection scheme. Effort statistics can often under-estimate total fleet effort and this can be a significant source of bias in estimating the total kill. This is a problem that all Contracting Parties will need to address in order to ensure that there is no large scale under-reporting of effort. If such under-reporting is suspected then alternative measures of effort will need to be found and employed.

15. A full review of the requirements for observer schemes for recording cetacean bycatch is available: Northridge, S.P. 1996. A review of marine mammal bycatch observer schemes with recommendations for best practice. *JNCC Report*, No. 219.

Quality assurance arrangements

16. [text to be developed]

Resource requirements (staff time and technical ability, equipment, running costs)

17. As noted above, bycatch observation is a statutory requirement for EU Member States. The marginal extra cost for the Contracting Parties is therefore minimal. Notwithstanding this, estimates have been made for the costs of observation schemes.

18. In the UK and Ireland, a study in the early 1990s had a total budget of around £20,000 and resulted in data collection during 328 days at sea (about 1% of the total effort in these fisheries). This amounts to just £61 per day at sea (or roughly €100). This was only possible by recruiting volunteer observers for the English observer scheme, by subsidising the Irish part of the survey by the use of funds for work on fish discards in the same fishery and by having the data management and analysis done without cost too. A more extensive discard monitoring scheme run by the SERAD Marine Laboratory in Aberdeen was costed at that time at around £520 (€785) per observer day at sea. This was the full economic cost of the scheme and includes staff wages, data handling, transport, analysis and management costs. Inflation of costs will have increased these figures, in some cases to possibly double this level. This range of figures might be used to provide an indication of the scale of expected expenses for any fishery if there is some idea of the total numbers of days at sea which need to be sampled.

Reporting requirements for Contracting Parties

19. A statutory timetable has been established for reporting under Regulation (EC) No 812/2004. The first report from EU Member States was due in June 2006. This is no similar timetable for reporting observations made in fulfilment of the Habitats Directive, or by Norway. It is suggested that reporting in fulfilment of this EcoQO should not add to the effort of reporting to the European Commission, thus a copy of these reports, sent to the lead country (UK) should suffice. It is not known at present how the European Commission will analyse reports to them, but it is suggested that the lead country will report briefly on progress annually to BDC. For observation schemes undertaken by Norway or by EU Member States in addition to Regulation 812/2004, the lead country would prefer to receive reports by November each year.

20. Key data for inclusion in any report are:

a. estimated number of harbour porpoises killed per fishery;

b. the geographic extent of the fishery (perhaps by ICES sub-area and rectangle)

c. the number of observed porpoises bycaught;

d. the proportion of the fishery observed;

e. any indication of temporal (e.g. monthly or diurnal) variance in bycatch (results indicate that there often is some temporal variance);

f. the use (and, if known, the effectiveness) of any mitigation tool (e.g. pingers) in the fishery.

21. It is likely the correspondence and clarification of results will be necessary between the Lead Country and Contracting Parties.

Method of Evaluation by lead party

22. [text to be developed]

Consequences of not meeting the EcoQO (target, limit, indicator);

23. [text to be developed as part of the 2008 evaluation of the results of the EcoQO system]

Link with the proposed MSD

24. [to be developed as part of the 2008 evaluation of the results of the EcoQO system]

Ecological Quality Issue 3: Seabirds

EcoQ 3.1 Proportion of oiled common guillemots among those found dead or dying on beaches

EcoQO 3.1 The average proportion of oiled common guillemots in all winter months (November to April) should be 10% or less of the total found dead or dying in each of 15 areas of the North Sea over a period of at least 5 years.

Overall aims

1. As a result of (chronic) marine oil pollution, many thousands of seabirds wash ashore on the beach every year. The Oiled-Guillemot EcoQO provides a description of the proportion of oiled Common Guillemots *Uria aalge* among those found dead on beaches within the OSPAR area. It is therefore being applied as an indicator. Systematic beached bird surveys (BBS) provide insight in species composition and oil rates (% of birds oiled of all birds found dead) and have been conducted since the early 1960s to study temporal and spatial trends in oil-related mortality in most countries bordering the North Sea. Spatial patterns in Common Guillemot oil rates reflect different levels of chronic marine oil pollution around the North Sea, whereas temporal trends in oil rates are indicative for changes in these levels over time.

2. Common Guillemots have been selected because they are highly vulnerable to oil pollution, and are sufficiently abundant and widespread that sample sizes (number of corpses checked) each winter and in all participating countries should be large enough for statistical analysis. Oil rates are species- and area-specific, but also vary seasonally and can even be age-specific (annual natural mortality of juvenile Guillemots is proportionally higher than in adults). The use of scavenged or otherwise incomplete corpses ('remains') found on beaches may bias the results. For reasons of consistency, participants are therefore asked to systematically search for Guillemots between November and April, to identify the birds they find, to check the corpses for missing parts, to age the birds according to standardised ageing techniques, and to carefully check for oil in the feathers.

3. The Oiled-Guillemot EcoQO is not only meant to monitor current patterns in oil rates, but also to check if set targets are actually reached. In the most polluted parts of the North Sea, currently over 50% of the Guillemots found on beaches are oiled. Even although this means a considerable improvement in comparison with the 1960s, 1970s and even 1980s, such levels are considered unacceptable. Law enforcement, perhaps in combination with new measures to minimise chronic oil pollution at sea, should lead to further reductions.

4. This chapter provides a practical manual of the "Oiled-Guillemot–EcoQO" for regional or national co-ordinators. Annual reports will be compiled based on material submitted by participants working in 15 subregions around the North Sea. National or regional co-ordinators will collect these data through volunteer networks (just as in BBS schemes currently operating), by providing adequate instructions to these volunteers (field manuals), they will be responsible for ensuring that surveys take place, for receiving, checking and summarising data, and for sending their data by June each year to the International Co-ordinator for inclusion in an annual report.

5. For background information on this EcoQO the earlier background document on the Oiled Guillemot EcoQO should be consulted (Camphuysen 2004; OSPAR publication 2005/252). Annex 1 of the background document (Camphuysen 2004) was a provisional manual for volunteer participants, to enable them to identify and age Common Guillemots as well as to instruct how them how presence of oil on stranded Guillemots should be stated. An enlarged and improved version of this manual is included in this chapter. Volunteers working beaches will have to be provided with clear and short instructions that can be deduced from this manual, in the language that is most appropriate for them. No attempt has been made to include a field manual in this report, but any material required to compose such a document is available on request from the Lead Party.

Methodology

What to do on the beach? *[collecting base data]*

6. The necessary data can be derived from standard beached bird surveys, although field workers may need special instructions so that they know how to handle Guillemots for the Oiled Guillemot EcoQO. Fieldworkers should go out especially to search for stranded birds and enlarge the sample of checked, beached Common Guillemots. Basic questions for the fieldworkers to address are:

- What species? Common Guillemot or not
- What age? Juvenile, adult or unknown

- What remains? Complete corpse suitable for checking oil or just remains
- Is there any oil in the feathers? Presence absence indication, or a more precise quantification

7. Fieldworkers should record the location they worked, the distance searched (km), the date, their name and contact address, the conditions of the survey, and the numbers of birds found as in an ordinary beached bird survey, basically according to local or national guidelines. For Common Guillemots the above questions should be asked and the answers logged.

Identification and ageing

8. It is assumed that fieldworkers are capable of identifying a Common Guillemot and separate these from any other auks. To age the bird, fieldworkers should be instructed to check the pattern of the tips of the greater underwing coverts: clear white tips = first year birds, grey tips = older birds (termed 'adult' for convenience). In case of doubt (e.g. silvery tips in summer plumage individuals), don't record the age but log the individual as "age unknown".

Visible inspection of white tips on the greater wing coverts in a stranded Common Guillemot (clearly present in the illustrated case, indicating that this is a juvenile bird). Photograph C.J. Camphuysen.

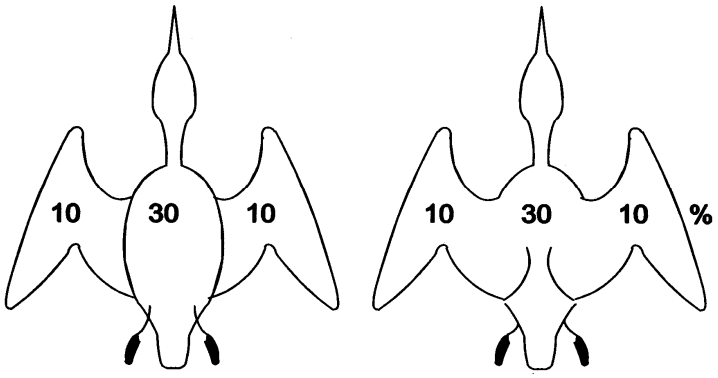
Check if the corpse is intact

9. Fieldworkers should have clear instructions as what to classify as a complete corpse (entirely intact, or just basically scavenged with all major parts are available for inspection) or as 'just remains' (e.g. wings with sternum, or badly damaged corpse where substantial parts are missing). It is generally a matter of common sense to judge what corpses are sufficiently intact to be part of the main pool: complete, aged carcasses of Common Guillemots.

Corpses need be complete for a valid inspection. Scavengers may have entered the corpse or even have torn it apart (left), but the corpse may still be considered "complete". Only when vital parts are missing (right) should the corpse be considered "incomplete" (in the illustrated case: feet, some skeleton remains, sternum and wings, head and neck torn inside out by scavenging gulls at sea). Photographs C.J. Camphuysen

Checking for oil

10. All parts of the body should be checked for oil. Note that small amounts may be present around the tail, on the flanks or on the wings on otherwise, superficially clean carcasses. Blood stains, certainly in partly scavenged specimens, should not be confused with mineral oil contamination. For the EcoQO it is essential to know if a bird is oiled or not (need-to-know data). The *amount* of oil present on a corpse of a bird is interesting information, but not essential (nice-to-know data). Follow these guidelines, when possible, if information on the amount of oil is to be obtained:



Each side of the body is regarded as 30%, each wing area as 10% (Σ 100%). Don't overdo the scores, but simplify scores as follows by rounding:

- 1% - a few specks of oil
- 5% - small oiled area
- 10% - moderate oiled area
- 25% - about one quarter oiled
- 50% - about half of corpse oiled
- 75% - nearly all of the corpse oiled
- 100% - completely covered with oil

Record the presence of oil (yes, no or unknown) and if there is any oil, do indicate the percentage covered of the corpse according to the following scheme:

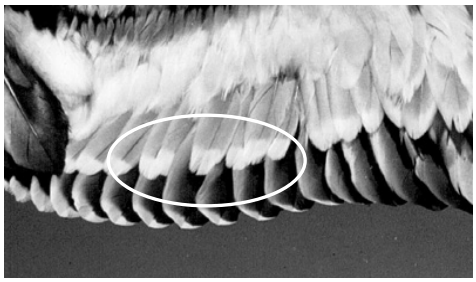
Type of oil

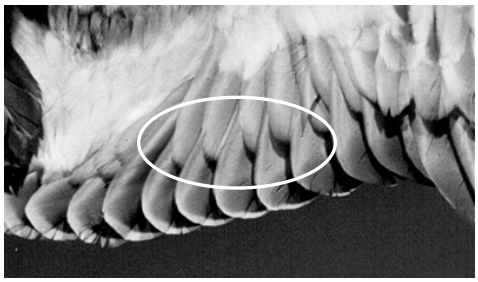
11. When the Oiled-Guillemot EcoQO is fully established, the type of oil needs be established from a representative sample of birds. This document does not provide the guidelines for this because the possibilities to fund this part of the monitoring programme have not been identified. Sampling oil is easy and can be done by well-instructed volunteers during their walks on beaches, the chemical analysis of oil samples is specialist work that need be done in high quality and experienced laboratories. Sampling and analysis techniques have been proposed by Camphuysen & Dahlmann (1995).

12. Without the collection of samples, the identification of oil types is impossible, for different oil types cannot be separated by eye (Timm & Dahlmann 1991; Dahlmann *et al.* 1994). In fact, to say whether a substance is 'mineral oil' or any other lipophilic substance disrupting a bird's plumage is not always possible. Therefore, in the absence of a sampling programme, all substances damaging bird plumages will be included in the census and notes made by observers and regional or national co-ordinators that may shed light on the type of pollution encountered are welcomed.

Checklist

13. In short, the following data need be collected
    - Site, distance, date, observer
    - Subregion
    - Species, age (check greater underwing coverts for white tips):
        - o White tips present (i.e. juvenile)





    - White tips absent (i.e. 'adult')
- Completeness of corpses (more or less intact / just remains)
- Oiling

14. It will be hard to age birds that are completely covered with oil and sometimes the ageing will be "forgotten" by field workers. To avoid losing material, and because recent oil rates will have to be compared with data collected in historical times when ageing was not common practice, the record form will accommodate such incomplete records, so that every Guillemot found can be listed. It is advisable, however, to keep pointing at the ageing characteristics that need be used, as a reminder, and as a guarantee that the highest quality data is collected.

Quality assurance arrangements

15. [text to be developed]

Resource requirements (staff time and technical ability, equipment, running costs)

16. An important assumption for the budget presented below is that budgeted costs include *only* costs necessary for the successful completion of the project: an international collation of data. Such (annual) costs include: overall international co-ordination and an annual report (lead country only, estimated at *c.* € 13 250,= per annum) and national expenses on top of the costs required to run a BBS and to organise the participating volunteers (estimated at € 1500,= per annum for participating countries). The actual costs of a national BBS varies per country and these are not budgeted here, for these are seen as a national responsibility of countries represented at the North Sea Ministers Conference; those that signed the Bergen Declaration(1)

17. Extra costs are involved when the monitoring programme will include systematic oil sampling and the analysis of these samples as a study of the sources of oil. Costs would than include materials for sampling, the distribution of sampling tools and the central collection of the samples(2). A central laboratory is the most cost-effective solution for this task. Budgeted costs are based on estimates by the Bundesamt für Seeschiffart und Hydrographie in Hamburg (Germany). It should be highlighted that the Oiled Guillemot EcoQO could start even if a choice regarding the need for chemical analysis of oil samples is postponed.

Co-ordination, lead country	**Days**	**Rate (€)**	**Subtotal**	**Remarks**
*Project co-ordination (work time)	10	750	7500	p.a.
*Production annual report	5	750	3750	p.a.
*Mailing, printing report, expendables		1000	1000	p.a.
*Travel		1000	1000	p.a.
Subtotal			13250	p.a.
National co-ordination				UK, N, DK, FRG, NL, B, F
*Running BBS			p.m.	National responsibility; costs depend on present state of volunteer network and travel expenses
*EcoQO participation	2	750	1500	p.a. per country, as a compensation for work needed to implement the EcoQO on a national level: data preparation and steering of volunteers to follow the protocols exactly
Chemical analysis of oil and other substances				
*technician	full time		40000	BSH, Hamburg
*supervision of work and reporting	5		3750	BSH, Hamburg
			43750	

Reporting requirements for Contracting Parties

18. An example data sheet for count results is below although the exact procedures are at the discretion of the regional or national data coordinator.

Oiled Guillemot EcoQO record sheet				
Subregion:	#	Date (dd/mm/yy):	- - 20	
Site:				
Contributor:				
Contact address:				
Quality of count:	poor / moderate / good		Total effort *km*:	km
Complete birds (May be scavenged corpses, but all major feather parts available for inspection)	Adults 	Juveniles 	Not aged	Totals
Oiled *n*				
Unoiled *n*				
Total *n*				
Oil rate	%	%	%	%
Remains	Adults	Juveniles	Not aged	Totals
Oiled *n*				
Unoiled *n*				
Total *n*				
All birds *n*				Σ
Densities *n/km*	/km	/km	/km	/km

Optional datasheet for Oiled-Guillemot EcoQO counts. Most cells ask for concrete data, the bottom rows are meant to sum up all Guillemots recorded (no matter what condition and age, including the individuals where oiling was uncertain). The 'Quality of count" box is a subjective indicator of the conditions of a survey and whether or not densities found are probably reliable of seriously biased as a result of poor conditions.

Avoid double counts

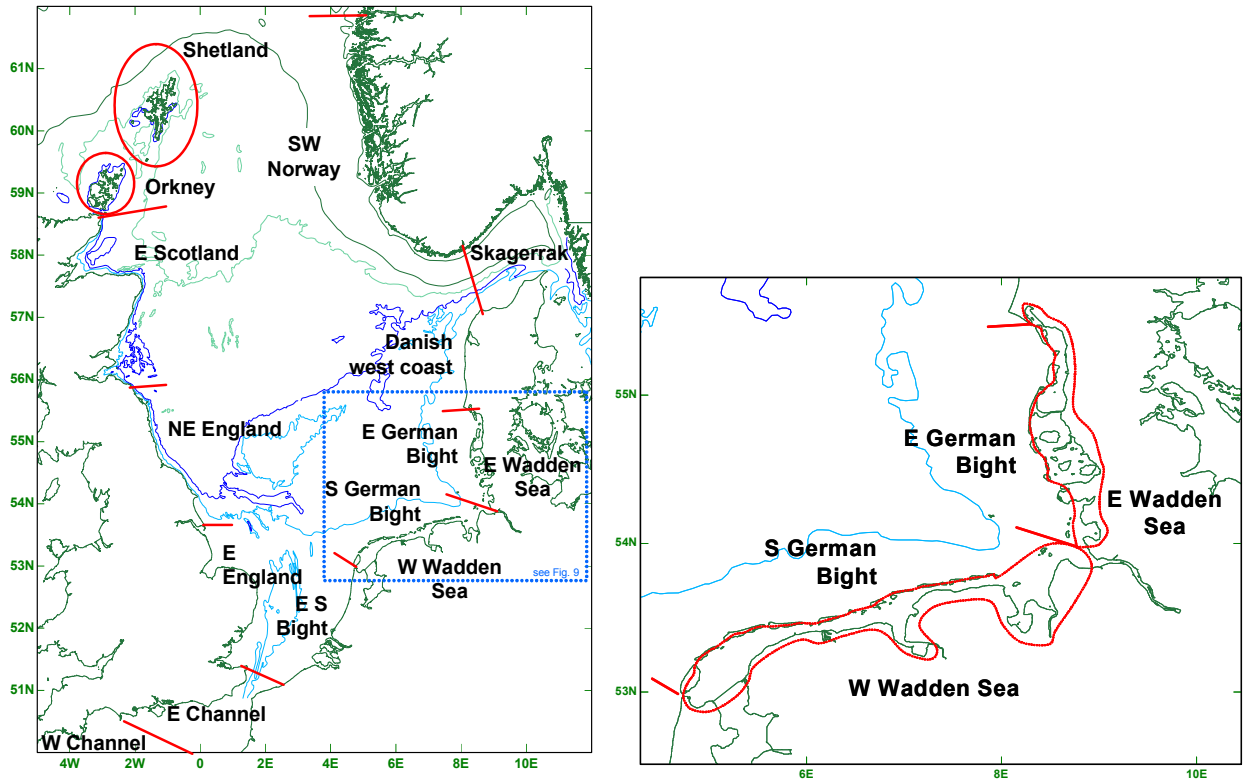
19. Stranded corpses should be recorded only once. Different BBS schemes have different means of avoiding double counts. Some have instructed participants to remove the corpses, others have given instructions to mark them as 'being recorded' by clipping the primaries. It is important that clear instructions are given to field workers as how to avoid double counts in this programme.

What subregions do we use?

20. Data should be submitted for the 15 subregions described below. Note that some subregions cross regional or even national borders, so that data submitted by one Contracting Party may *contribute* to the outcome of a given subregion rather than provide all the available material. Data that has been collected in more than one subregion should not be combined and even very small datasets are useful, as these may contribute to the bigger overall picture..

Fifteen subregions for the Oiled Guillemot EcoQO.

1	Shetland	Shetland Islands	UK
2a	Orkney	Orkney Islands	UK
2b	North Scotland	north coast of Scotland	UK
3	East Scotland	Duncansby Head to Berwick on Tweed	UK
4	Northeast England	Berwick on Tweed to Spurn Head	UK
5	East England	Spurn Head to North Foreland	UK
6	Eastern Channel	line between North Forland and Belgian French border to line between Cherbourg - Portland	UK, B. F
7	Western Channel	line between Cherbourg and Portland to Land's End to Ouessant	UK, F
8	Eastern Southern Bight	mainland coast Belgian/French border to Texel	B, NL
9	Southern German Bight	North Sea coast Frisian Islands Texel to Elbe	NL, FRG
10	Western Wadden Sea	mainland and Wadden Sea coast Frisian Islands Texel to Elbe	NL, FRG
11	Eastern Wadden Sea	mainland coast and Wadden Sea coast Elbe to Esbjerg	FRG, DK
12	Eastern German Bight	North Sea coast Wadden Sea Islands Elbe to Fanø	FRG, DK
13	Danish west coast	mainland coast Esbjerg – Hanstholm	DK
14	Skagerrak	east of line between Hanstholm - Kristiansund, north of a line from Skagen - Gothenburg	N, DK, S
15	SW Norway	Kristiansund to Stadt	N



Fifteen subregions for the Oiled Guillemot EcoQO. The inset (Wadden Sea area) is enlarged in the right-hand figure. The Orkney Islands (encircled in the left hand map) includes the Scottish north coast, to the west of Duncansby Head.

How to collate the data regionally or nationally?

21. Because subregions may cross regional or even national borders, the easiest way of contributing to the joint database that will be constructed for the Oiled Guillemot EcoQO is by labelling each survey result with a date/subregion tag. Not every participant may be able to achieve full coverage (monthly samples of most of their study area between November to April). Therefore, the smallest unit stored into the joint database will be subregion/month data rather than subregion/winter data.

22. National and regional co-ordinators are requested to collate the data in a single table format, in excel or any other database or spreadsheet software, using the following fields:

Tabulated results by regional or national co-ordinators for the Oiled Guillemot EcoQO. The headers are in bold, options are provided for each field. A database contribution for a given subregion in a given month may end up in a 27 line record (three options for age x three options for state of corpse x three options for oiling), and where fields Subreg-Km are copied down for each line of data.

Subreg	**Ctry**	**Year**	**Month**	**Km**	**Contrib**	**Age**	**State**	**Oiling**	**Number**
[1-15]	[Abbrev.]	[Value]	[1-12]	[value]	[Abbrev.]	Adult	Complete	Oiled	[Value]
						Juv	Remains	Unoiled	
						Unknown	Unknown	Unknown	

Example of tabulated results, reporting survey results in subregion 8 (i.e. mainland coast Belgian/French border to Texel), in the Dutch part of the subregion (NL), in March 2006, by Royal NIOZ, covering 25 km which resulted into a sample of 14 Common Guillemots, 10 of which were complete corpses that could be aged.

Subreg	Ctry	Year	Month	Km	Contrib	Age	State	Oiling	Number
8	NL	2006	3	25	NIOZ	Adult	Complete	Oiled	6
8	NL	2006	3	25	NIOZ	Adult	Complete	Unoiled	4
8	NL	2006	3	25	NIOZ	Juvenile	Remains	Unknown	2
8	NL	2006	3	25	NIOZ	Unknown	Remains	Oiled	2

23. Contributed data should be exported as excel files and sent to the international co-ordinator by e-mail.

What data are expected for the annual report?

24. Regional or national co-ordinators are requested to check, analyse and organise the data collected and to forward the material in the fixed tabulated format shown earlier. Densities of Guillemots encountered around the North Sea (all Guillemots found dead) are also taken into account, but mostly in accurate oil rates of birds that could be aged and that are classified as 'complete' corpses.

25. All data should be accompanied by a short description of the circumstances that characterise the period/area in which the material was collected. Shipping accidents or oil-incidents are known to affect the oil rates in different ways. Regional and national co-ordinators are therefore requested to keep a log on special events. Key issues to report are: were there any remarkable spills, influxes of birds, unusual weather, or major shipping accidents of Guillemots that may have biased the results one way or the other. The report should be a short text, with clear references to particular datasets, so that the reports can be linked to particular data in the relational database.

26. An accompanying text should make clear if some material is considered to be of low-quality and explain the reasons, with clear reference to the data produced.

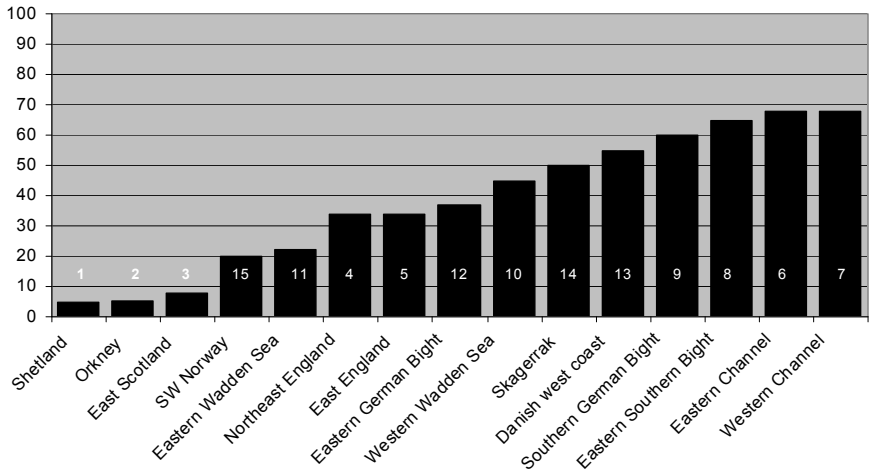
Timing

27. The data should be collected between November and April, summaries of results should be forwarded to the international co-ordinator *before* June of each year of monitoring, so that an Annual Report can be drafted in July and published in August, well before the next season's start.

Method of Evaluation by the lead party

Contents of the annual report

28. The annual report will provide the international overview of trends in oil rates by listing updates from each of the 15 subregions (spatial patterns), and while comparing these with historical material to evaluate the temporal trends. The expected situation, based on collected material (Camphuysen 2004), educated guesswork, and combination of the two age categories of Guillemots in the absence of the concrete data of age composition, is a pattern as shown here:



Expectation of current oil rates of Common Guillemots around the North Sea in 15 pre-defined subregions based on recent data (Camphuysen 2004), and guesses (subregions 14 and 15). Oil rates below 10% are expected in three out of 15 areas. Numbers refer to subregion numbers (Table 1).

29. The material in the annual report will be organised such that changes over time and shifting spatial patterns are most visible. This could be achieved by mapping data, and/or by the use of graphs or tables.

30. This update will however require an explanatory text, compiled from the reports submitted with the data from regional or national co-ordinators, indicating *why* certain values are particularly low or rather high and whether or not full coverage and adequate samples sizes have been achieved in each subregion.

Consequences of not meeting the EcoQO (target, limit, indicator)

31. [text to be developed as part of the 2008 evaluation of the results of the EcoQO system]

Link with the proposed MSD

32. [text to be developed as part of the 2008 evaluation of the results of the EcoQO system]

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Camphuysen C.J. 2002. Oil rates in Common Guillemots. CSR Report, Project INTERNAT*NZM-DNZ, OSPAR Biodiversity Committee, BDC 03/2/4, Annex 1, 22pp.

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Camphuysen C.J. & Dahlmann G. 1995. Guidelines on standard methodology for the use of (oiled) beached birds as indicators of marine pollution. Ad Hoc working group on Monitoring, Oslo and Paris Convention for the Prevention of Marine Pollution. MON 95/7, Agenda item 7, 13-17 November 1995, Copenhagen.

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Ecological Quality Issue 5: Benthic Communities

EcoQ 5.1 Imposex in dog whelks (*Nucella lapillus*) or other selected gastropods

EcoQO 5.1 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 (EAC) for TBT – that is, < 2.0, as measured by the Vas deferens Sequence Index, Where Nucella does not occur naturally, or where it has become extinct, the red whelk (*Neptunea antiqua*), the whelk (*Buccinum undatum*) or the netted dog whelk (*Nassarius reticulatus*) should be used, with exposure criteria on the same index of <2.0, <0.3 and <0.3, respectively.

Overall aims

1. The justification for this EcoQO is that the female dogwhelk (*Nucella lapillus*) is particularly sensitive to tributyl tin (TBT), which has been extensively used as an anti-fouling treatment on ships. TBT is linked to the incidence of imposex in dogwhelk. Imposex is the condition where female individuals develop non-functional male characteristics, eventually leading to sterilisation and a serious population decline. This phenomenon is fully developed at ambient TBT concentrations of 1-2 ng l^{-1}, and females are fully sterilized at concentrations above 5 ng l^{-1}. A standard method exists for measuring imposex: the Vas Deferens Sequence Index (VDSI). Besides the dog whelk, other gastropods such as red whelk (*Neptunea antiqua*), common whelk (*Buccinum undatum*), netted dog whelk (*Nassarius reticulatus*) and periwinkle (*Littorina littorea*) proved to be vulnerable to the effects of TBT. Besides for *N. lapillus*, the VDSI can be used as a measure for specific biological effects of TBT on *N. reticulatus* and *N. antiqua*. For specific effects on *L. littorea* and *B. undatum* other measures are used for classifying the specific biological effects of TBT: respectively Intersex State Index (ISI or intersex) and Penis Classification Index (PCI). Intersex is expressed at higher concentrations of TBT (10 ng l^{-1}).

2. Periwinkle, whelk, red whelk and netted dog whelk may be used as an alternative biomonitor for TBT pollution to cover areas where dog whelk does not occur naturally, or where it has become extinct.

3. A detailed background document on this the EcoQO was published by OSPAR in 2005 (OSPAR Commission, 2005a; OSPAR publication number 2005/247.). The EcoQO is being applied in the North Sea as an indicator.

Methodology

Monitoring guidelines and methods

4. Organotins in sediments and TBT specific effects have become mandatory determinants of the OSPAR Co-ordinated Environmental Monitoring Programme (CEMP) from 2003 onwards (OSPAR Agreement 2006/1).

5. Guidance for monitoring is provided in Technical annex 3 (TBT-specific biological effects monitoring) of the JAMP Guidelines for contaminant-specific biological effects monitoring (OSPAR Agreement 2003/10). This technical annex describes the sampling strategy, the choice of sampling locations, the methods to be used, the temporal trend monitoring, the field sampling and sampling equipment, the storage of samples and the determination of imposex or intersex in *B. undatum, N. antiqua, L. littorea, N. reticulatus and N. lapillus*.

6. There is, for the moment, no need for a further elaboration of the monitoring guidelines and methods for the work of OSPAR on the EcoQO imposex in dogwhelks. However, Contracting Parties to OSPAR only carrying out monitoring of TBT specific biological effects on one gastropod species could be encouraged to extend this monitoring to other relevant species living in their waters (such as *B. undatum* or *N. reticulatus*), given the different habitats the relevant species occur in. Given the relatively low sensitivity of *L. litorea* to TBT, a national or regional monitoring system only using this species should, if possible, be extended to other species.

7. The monitoring frequency (and subsequent reporting) should be harmonised between Parties to every two years, so that a more complete assessment could be carried out in the future on a more regular interval and on data which are intercomparable throughout the area concerned.

Quality Assurance

8. Laboratories collecting data on TBT-specific effect under the CEMP should participate in the “Quality Assurance of Information for Marine Environment Monitoring in Europe” (QUASIMEME) laboratory performance scheme. QUASIMEME is a platform for exchange of laboratory performance studies and test material to support improvement of data quality by laboratories, and for verification of the performance of all

participating laboratories. QUASIMEME covers all the matrix-determinant combinations of the CEMP. New determinants are added to QUASIMEME upon demand. OSPAR is represented in the advisory board of QUASIMEME, and CEMP data of Contracting Parties have to go through QUASIMEME QA testing before being forwarded directly by QUASIMEME to ICES (as CEMP data centre) with a QA statement. SIME annually reviews developments in QUASIMEME.

Resource Requirements

9. Given that the monitoring of TBT specific effects has become mandatory under the CEMP since 2003, there should be no additional cost for implementing the monitoring required for this EcoQO. Assessments under the current CEMP should allow determination whether the EcoQO is met or not. However, if the monitoring frequency is increased, if the current monitoring is extended to include other relevant species occurring at different locations (e.g. inshore – offshore) and/or if sample sizes and the number of sites sampled are increased, then costs will rise accordingly.

Reporting requirements for Contracting Parties

10. The required data for the biological effects measurements, including the supporting parameters, have been described in technical annex 3 (TBT-specific biological effects monitoring) of the JAMP guidelines for contaminant-specific biological effects monitoring (OSPAR Agreement, 2003-10). Data monitored under the CEMP should be reported to the ICES environmental databases in accordance with the latest ICES reporting formats by 1 August in the year following monitoring.

Method for Evaluation of the data

11. As monitoring of TBT specific biological effects is already a mandatory component of the CEMP, it should be possible to determine whether or not the objective is met from assessments of the existing monitoring.

12. Assessments of the data collected under the CEMP are assessed by the OSPAR Working Group on Monitoring (MON). A preliminary, incomplete interim presentation of monitoring activities, covering 3 countries (UK, Norway, Denmark) was included as part of the *2005 assessment of data collected under the CEMP* (OSPAR Publication XX). Monitoring data were presented according to the OSPAR assessment classes. A preliminary spatial and temporal assessment of monitoring results was made for *N. lapillus* (UK, N), *L. littorea* (UK), *N. antiqua* (DK) and *B. undatum* (DK). MON are currently preparing annual assessments of CEMP data. Assessments of imposex data will be included as part of this series.

Assessment criteria for organotin specific biological effects in gastropods

13. Monitoring data has little importance if one cannot interpret, or assess, their significance to man or to the environment. Therefore a set of criteria or a reference scale is needed to describe the significance of the data. Assessment criteria were derived for the VDSI in *Nucella lapillus*, representing the most sensitive species known. Considering the absence of populations of *N. lapillus* in some coastal areas, other species should be used for monitoring the effects of TBT. The criteria for *Nucella* were presented alongside equivalent VDSI/ISI values for other gastropods *(N. reticulatus, B. undatum, N antiqua* and *L. littorea*). The effects of TBT on different species were compared using sympatric populations in the field. The proposed criteria enable the consideration of the likely effects on *N. lapillus* based on effects in other species and allow the adoption of a consistent approach over the whole OSPAR region. Six assessment classes were defined for the various gastropods considered. These provisional assessment criteria for TBT were adopted by OSPAR in 2004 (OSPAR Agreement 2004/15). An overview of the assessment classes is given in the Table 5.1. The Environmental Assessment Criteria (EAC) are concentrations above which there is concern that negative effects might be observed in marine organisms.

Table 5.1. Assessment classes for N. lapillus and other selected gastropods

Assessment class	***N. lapillus***	***L. littorea***	***N. reticulatus***	***B. undatum***	***N. antiqua***
Criterion	**VDSI**	**ISI**	**VDSI**	**PCI**	**VDSI**
A Level of imposex is close to zero	<0.3	<0.3	<0.3	<0.3	<0.3
B Level of imposex (~30-~100% of the females have imposex) indicates exposure to TBT concentrations below the EAC derived for TBT	0.3 - <2.0	<0.3	<0.3	<0.3	0.3 - <2.0
C Level of imposex indicates exposure to TBT concentrations higher than the EAC derived for TBT	2.0 - <4.0	<0.3 - <0.7	0.3 <4.0	0.3 - 4.0	2.0 - 4.0
D Reproductive capacity in the gastropod populations is affected as a result of the presence of sterile females, but some reproductively capable females remain	4.0 – 5.0	0.7 - <2.0	May occur beyond 4.0	May occur beyond 4.0	May occur beyond 4.0
E Populations are unable to reproduce. The majority, if not all females within the population have been sterilised	5.0 – 6.0	>2.0			
F Populations are absent/expired	-				

Consequences of not meeting the EcoQO (target, limit, indicator)

14. [text to be developed as part of the 2008 evaluation of the results of the EcoQO system]

Link with the proposed MSD

15. [text to be developed as part of the 2008 evaluation of the results of the EcoQO system]

Ecological Quality Issue 9 Eutrophication

Overall aims

1. The use of the integrated set of five eutrophication Ecological Quality Objectives (EcoQOs) is identical to the application of the Comprehensive Procedure, both in procedure and frequency of application, and they can be seen as part of the target-oriented approach of the Eutrophication Strategy. Their implementation is through the second application of the Comprehensive Procedure to produce the integrated report on eutrophication status to OSPAR 2008.

2. The ecological quality issue 9 – Eutrophication – comprises one overarching EcoQO and an integrated set of five sub-EcoQOs for eutrophication. The five sub-EcoQOs and their relation to the assessment parameters of the Common Procedure are presented in Table 9.1.

Table 9.1. Overview of the overarching ecological quality objective for eutrophication and its integrated set of EcoQOs, in relation to the assessment parameters of the Common Procedure

EcoQ eutrophication element	EcoQOs for eutrophication	Common Procedure assessment parameter and related elevated levels
9.1 Eutrophication status of the North Sea	Overarching EcoQO: All parts of the North Sea should have by 2010 the status of non-problem areas with regard to eutrophication, as assessed under the OSPAR Common Procedure for the Identification of the Eutrophication Status of the OSPAR Maritime Area (which consists of the (one-off) Screening Procedure and the (iterative) Comprehensive Procedure).	
9.1.1 Winter nutrient concentrations	Winter concentrations of dissolved inorganic nitrogen (DIN) and dissolved inorganic phosphate (DIP) should remain below a justified salinity-related and/or area-specific % deviation from background not exceeding 50%.	Category I: Degree of nutrient enrichment:: Nutrient concentrations (area-specific): • Elevated level(s) of winter DIN and/or DIP
9.1.2 Phytoplankton chlorophyll *a*	Maximum and mean chlorophyll a concentrations during the growing season should remain below a justified area-specific % deviation from background not exceeding 50%.	Category II: Direct effects of nutrient enrichment: Chlorophyll a concentration (area-specific): • Elevated maximum and mean level
9.1.3 Phytoplankton indicator species for eutrophication	Area-specific phytoplankton eutrophication indicator species should remain below respective nuisance and/or toxic elevated levels (and there should be no increase in the average duration of blooms)	Category II: Direct effects of nutrient enrichment: phytoplankton indicator species (area-specific): • Elevated levels of nuisance/toxic phytoplankton indicator species (and increased duration of blooms)
9.1.4 Oxygen	Oxygen concentration, decreased as an indirect effect of nutrient enrichment, should remain above area-specific oxygen assessment levels, ranging from 4 – 6 mg oxygen per litre	Category III: Indirect effects of nutrient enrichment: Oxygen deficiency: • Decreased levels (< 2 mg/l: acute toxicity; 2 - 6 mg/l: deficiency) and lowered % oxygen saturation
9.1.5 Kills in zoobenthos in relation to eutrophication	There should be no kills in benthic animal species as a result of oxygen deficiency and/or toxic phytoplankton species	Category III: Indirect effects of nutrient enrichment on zoobenthos and fish: • Kills (in relation to oxygen deficiency and/or toxic algae)

Detailed Methodology

3. The OSPAR Eutrophication Monitoring Programme (*OSPAR agreement 2005-4; see table 9.2*) and the related JAMP Monitoring guidelines provide adequate monitoring data (including supporting environmental information) for eutrophication issues. Coherent monitoring, in accordance with the OSPAR Joint Assessment and Monitoring Programme (JAMP) and the JAMP guidelines should be maintained.

4. The OSPAR Eutrophication Monitoring Programme is an integral part of the OSPAR Eutrophication Strategy. It provides the basis for enabling Contracting Parties to assess and classify the eutrophication status of their maritime waters under the "Comprehensive Procedure" of the Common Procedure for the Identification of the Eutrophication Status of the OSPAR Maritime Area ("Common Procedure", reference number: 2005-3).

5. The Eutrophication Monitoring Programme forms part of the OSPAR Coordinated Environmental Monitoring Programme (the CEMP – *OSPAR agreement 2007-1*). Contracting Parties shall report the monitoring results for the parameters listed in the annexed tables in accordance with the arrangements for the CEMP agreed and updated periodically by OSPAR. ICES is currently the OSPAR data centre for marine environmental monitoring data, and according to the agreements of OSPAR, Contracting Parties are obliged to report their monitoring data to ICES by 1 August in the year following the year of monitoring using the agreed formats and should resolve any data processing issues with the ICES data centre.

6. The parameters on nutrient enrichment and on direct and indirect eutrophication effects, and general guidance of sampling frequency is shown in the overview of the OSPAR Eutrophication Monitoring Programme in Table 9.2.

Actions needed to achieve harmonised monitoring

7. There is need to supplement the Eutrophication Monitoring Programme with guidance on frequency and spatial coverage. This will be delivered as JAMP Product ET-1 on Guidance on the frequency and spatial resolution of monitoring for nutrients and eutrophication effects. The product has been delayed and is not expected to be ready until 2007.

Quality Assurance

8. Data for the national assessments will have been collected under the Eutrophication Monitoring Programme. Details of the quality assurance procedures applied are set out in the relevant JAMP guidelines compiled under the CEMP monitoring manual. For any other data taken into account in the Common Procedure, Contracting Parties are required to include information on QA procedures followed in their national assessment reports and should follow guidance, prepared by EUC specifically for the application of the Common Procedure in 2007, on the information that Contracting Parties need to include in their reports.

Resource Requirements

9. The report of the North Sea Pilot Project on EcoQOs conclude in chapter 7 that the monitoring requirements for all the eutrophication EcoQOs are covered by the Eutrophication Monitoring Programme already required for the OSPAR Comprehensive Procedure and the EC Water Framework, Nitrates and Urban Waste Water Directives. Additional assessment work is likely to be very small.

Reporting Requirements for Contracting Parties

10. The reporting format as in Annex 5 of the Common Procedure should be used.

11. The timetable for monitoring and reporting is guided by the requirements of the JAMP towards the 2008 assessment of the eutrophication status (EA-6) and the 2009 evaluation of the results of the EcoQO system (BA-2) as a contribution to the QSR 2010 (AA-2).

Method for Evaluation of the data

12. The evaluation of the EcoQOs-eutro will be carried out in conjunction with the work on the second application of the OSPAR Common Procedure. Contracting Parties will submit national reports on the application of the common Procedure during 2007. These will include national reports on the implementation of the EcoQOs-eutro. On the basis of these reports EUC will prepare an evaluation of the results of the EcoQOs eutro.

Consequences of not meeting the EcoQO (target, limit, indicator);

14. [to be developed as part of the 2008 evaluation of the results of the EcoQO system]

Link with the proposed MSD

15. [to be developed as part of the 2008 evaluation of the results of the EcoQO system]

Table 9.2. The OSPAR Eutrophication Monitoring Programme (OSPAR agreement 2005-4) minimum requirements

1. Nutrient enrichment[1]

	Non-problem areas	Potential problem areas	Problem areas
NH_4-N[2,4] (µmol l^{-1})	+	+	+
NO_2-N[2,4] (µmol l^{-1})	+	+	+
NO_3-N[2,4] (µmol l^{-1})	+	+	+
PO_4-P[3,4] µmol l^{-1})	+	+	+
SiO_4-Si[4] (µmol l^{-1})	-	+	+
Salinity	+	+	+
Temperature	+	+	+
Frequency[5]	About every three years during winter	Annually during winter when algal growth is at a minimum and during monitoring of direct and indirect effects	

\+ Action required
\- Action discretionary
1 All parameters should be monitored in conjunction with area-specific ecosystem features.
2 Winter dissolved inorganic nitrogen (DIN) is the sum of NH_4-N, NO_2-N and NO_3-N.
3 Winter dissolved inorganic phosphate (DIP)
4 Monitoring of winter DIN, DIP and Si should be in conjunction with salinity measurements (see Common Procedure, §§ 4.25 and 4.28).
5 Monitoring should include sufficient samples to confirm that the maximum winter nutrient concentration has been determined.

2. Direct and indirect eutrophication effects[1]

	Non-problem areas	Potential problem areas	Problem areas
Phytoplankton chlorophyll *a* (µg l^{-1})	-	+	+
Phytoplankton indicator species (cells l^{-1}; species composition)	-	+ species composition: (genera and nuisance/potentially toxic species)	• + species composition: (genera and nuisance/potentially toxic species) + TOC and POC[2]
Macrophytes, including macroalgae and angiosperms[3]	-	+ biomass	+ biomass + species composition, coverage, and reduced depth distribution
O_2 concentration (mg l^{-1}; including % O_2 saturation)	-	+	+
(zoo) Benthic communities	-	+ biomass and species composition (if time series already exist)	+ biomass, species composition and eutrophication indicator species
Frequency[4]	-	annually during the algal growing season	

\+ Action required
\- Action discretionary
1 All parameters should be monitored in conjunction with area-specific ecosystem features.
2 TOC: Total Organic Carbon; POC: Particulate Organic Carbon.
3 In shallow areas, primarily in estuaries and coastal waters.
4 With adequate frequency and area coverage

C. Guidance on developing EcoQOs

Planning

1. When a contracting Party agrees to act as lead country for the development of an EcoQO (or EcoQOs) for one of the less advanced EcoQ elements or issues, they should inform the OSPAR Secretariat of the planned timescale for the development work so that appropriate entries can be made in the OSPAR work programmes when they are next revised.

Information collection and analysis

2. An initial information collection stage should include the collection of existing information on, among other things, the monitoring of the ecological quality element, current and historic levels of the EcoQ element in the North Sea, reference levels, sensitivity to human activities and potential sensitivity to management actions. The lead country, at an early stage, should contact other Contracting Parties and observer organisations to obtain information they may have on the EcoQ element concerned.

Proposal of an objective

3. On the basis of the information collected, an objective (EcoQO) should be proposed as the "desired level of an ecological quality" for the EcoQ element. Such a level may be set in relation to a reference level. The definition of an EcoQO should take into account the conceptual description of the EcoQO system in Chapter 3 of the Report on the North Sea Pilot Project on EcoQOs (OSPAR Publication: 2006/239)

Preparation of a Background Document

4. At the same time, a Background Document should be prepared. The purpose of a Background Document is to set out a justification for the EcoQO and its definition and an analysis of the applicability of the EcoQO. Background Documents should be prepared with a view to publication. They should therefore be reader-friendly, well-structured and concise, and the language used should be clear and unambiguous. Background Documents should contain the following information:

1. EcoQO Issue;
2. EcoQO Element;
3. EcoQO Objective;
4. Justification for the development of the EcoQO;
5. Technical evaluation considering the following elements:
    a. ICES criteria for a good EcoQO:
        (i) Relatively easy to understand by non-scientists and those who will decide on their use
        (ii) Sensitive to a manageable human activity
        (iii) Relatively tightly linked in time to that activity
        (iv) Easily and accurately measured, with a low error rate
        (v) Responsive primarily to a human activity, with low responsiveness to other causes of change
        (vi) Measurable over a large proportion of the area to which the EcoQ metric is to apply
        (vii) Based on an existing body or time-series of data to allow a realistic setting of objectives
    b. Ecological relevance/basis for the metric
    c. Current and historic levels (including geographical areas)
    d. Reference level

e. Limit point

f. Time frames

g. Advice on EcoQO options (scenarios)

h. Monitoring methods and reporting requirements

i. Management measures required to achieve the EcoQO

6. Applicability of the EcoQO in each of the OSPAR Regions

7. Further considerations (including costs);

8. Conclusions;

9. References.

Quality Assurance

24. The lead country should make proposals during the planning phase for peer review of EcoQOs and background documents by relevant specialists. Where the peer review is proposed to be by ICES, this will need to be included in the OSPAR ICES work programme.

Acceptance of the Background Document and setting the EcoQO

25. Proposals for EcoQOs and supporting Background Documents should be presented for initial discussion at the relevant BDC working group (MASH or EIHA), with the aim of them being submitted to BDC later in that cycle of meetings for recommendations to the OSPAR Commission meeting at the end of that cycle of meetings for:

a. adoption of the EcoQO;

b. publication of the Background Document.

Follow-up to adoption

26. When an additional EcoQO has been adopted, the lead country should then make proposals for the entry in section B of the EcoQO Handbook on the basis for its implementation, covering the points mentioned each of the sections covered by the current guidance. The aim of these proposals is to establish compatible monitoring methods and consistent reporting by all relevant North Sea States. Where appropriate, such proposals can accompany the proposals for the EcoQO and the Background Document.