Biodiversity Series

North Sea Pilot Project on Ecological Quality Objectives

Background Document on the Ecological Quality Objective on Oiled Guillemots

OSPAR Commission
2005

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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NORTH SEA PILOT PROJECT ON ECOLOGICAL QUALITY OBJECTIVES

BACKGROUND DOCUMENT ON ECOLOGICAL QUALITY OBJECTIVE ON OILED GUILLEMOTS

ISSUE 4. SEABIRDS
ECOQO ELEMENT (F)

PROPORTION OF OILED COMMON GUILLEMOTS AMONG THOSE FOUND DEAD OR DYING ON BEACHES

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Report to Biodiversity Committee (BDC) 2005 and the OSPAR Convention for the Protection of the Marine Environment of the North-east Atlantic 2005

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FINAL VERSION

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Abstract

This report was commissioned by the North Sea Directorate, Ministry of Transport, Public Works and Water Management. CSR Report 2004-012 (Revised edition) as input to the review of the advanced EcoQOs under the North Sea Pilot Project.

This report provides a history of international conventions to prevent oil pollution of the seas and how the EcoQO became established within the framework of a Special Area status of NW European Waters under MARPOL Annex 1. In the next part, research techniques and modifications to existing beached bird survey monitoring schemes are highlighted. Subregions for international data analysis are proposed. The report subsequently reviews recent existing data on oil rates in Common Guillemots in the North Sea and the preparedness of different countries to participate in the oiled-Guillemot EcoQO. The sources of (chronic) oil pollution are briefly outlined and measures to further reduce pollution levels are discussed. A budget for the Oiled Guillemot Eco-QO is attached, but without reservations for a study of types of pollutants (sampling oiled substances from seabirds). A (field) manual is provided as an annex to this document. In spring 2004, ICES WGSE suggested that the EcoQO should be reformulated as:

The average proportion of oiled common guillemots 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. Sampling should occur in all winter months (November to April) of each year.

Summary

- This document provides background information on the **"oiled-Guillemot–EcoQO"**, including an overview the International Convention for the Prevention of Pollution from Ships and recent amendments meant to reduce the scale and impact of chronic oil pollution worldwide (MARPOL 1973/78), and agreements of the North Sea Ministers to monitor spatial and temporal trends in oil pollution on a North Sea scale through their Ecological Quality Objectives (Bergen Declaration, March 2002).
- Oil pollution of the seas was recognized as a problem in the first half of the 20th century and various countries introduced national regulations to control discharges of oil within their territorial waters. MARPOL Annex I (Prevention of pollution by oil) entered into force 2 October 1983. Under the 1997 amendment, adopted 23 Sep 1997, North West European waters were designated a "special area" status under Regulation 10 of Annex 1. The concept of "Special Areas" meant that some area were considered to be so vulnerable to pollution by oil that oil discharges within them were completely prohibited, with minor and well-defined exceptions.
- In a set of Ecological Quality Objectives for the North Sea, the Proportion of oiled Common Guillemots among those found dead or dying on beaches is listed Under Issue 4 (Seabirds), EcoQO element (f). The EcoQO, as agreed by the 5th North Sea Conference, was defined as: *The proportion of such birds should be 10 % or less of the total found dead or dying, in all areas of the North Sea.*
- Although national boundaries may be the most practical subdivision of the North Sea in terms of financing and logistics, a further subdivision is required to describe spatial differences in oil rates all over the North Sea. A set of 15 subregions is proposed here:

1	Shetland		UK
2	Orkney	Orkney and 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 to 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 to Kristiansund, north of a line from Skagen to Gothenburg	N, DK, S
15	SW Norway	Kristiansund to Stadt	N

- WGSE and ACE recommended in 2003 (ICES 2003a, b) that trends might be most easily reported as five-year running mean percentages oiled. In line with this, ICES (2003a) advised that a period of at least 5 years in which an average of 10% or less oiled common guillemots has been recorded should occur before the conclusion that the objective has been reached could be justified statistically. WGSE therefore suggests that the EcoQO be reformulated as:

The average proportion of oiled common guillemots 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. Sampling should occur in all winter months (November to April) of each year.

- A comparison of available data indicate overall declines in oil rates on a North Sea scale, but also that the oil rates in Common Guillemots in only three out of 15 subregions for which data are currently available are at the "required" level of 10% or less. In six areas were oil rates calculated over a five-year period still >5x higher than the Oiled-Guillemot-Quality Objective. Recent data in some of the most polluted areas suggest that initial declines in oil rates have slowed down or even came to a halt.
- To the issue of further reductions in levels of chronic oil pollution, and while the Special Area status in theory should suffice, it is clear that additional measures are required to make sure that mariners obey the regulations and discharge no oil or oily waters within the North Sea. Stronger enforcement and further education of cadets are key-issues.
- Budgeted costs include only expenses that are necessary for the successful completion of the project: an international combination of data and these are on top of national expenses needed to run a beached bird survey with volunteer input (i.e. national responsibility of countries represented at the North Sea Ministers Conference; those that signed the Bergen Declaration). Budgeted costs amount to €13250 p.a. for international co-ordination, and €10500 (€1500 per participating country) p.a. for extra national expenses.
  National expenses (running a beached bird survey in any of the 15 subregions) cannot be calculated, because both the organisation structure and the personnel involved will be different in each of the OSPAR member states.

1. Introduction

This document provides background information on the **"oiled-Guillemot–EcoQO"**, including an overview the International Convention for the Prevention of Pollution from Ships and recent amendments meant to reduce the scale and impact of chronic oil pollution worldwide (MARPOL 1973/78), and agreements of the North Sea Ministers to monitor spatial and temporal trends in oil pollution on a North Sea scale through their Ecological Quality Objectives (Bergen Declaration, March 2002). The oiled-Guillemot-EcoQO is described. An overview is provided of recent results of beached bird surveys (BBS) in North Sea countries, including spatial patterns in oil rates of Common Guillemots found dead. Measures needed to achieve the oiled-Guillemot-EcoQO (in short: less than 10% of birds found dead should be oiled, anywhere in the North Sea) are evaluated in the light of recent BBS results. Sources of chronic oil pollution are discussed based on recent findings in Britain, Belgium, The Netherlands and Germany. The state of the art with respect to beached bird surveys is evaluated in terms of (1) present activities, (2) preparedness to participate in future, (3) current levels and future prospects regarding national funding, and (4) further costs of the establishment of an international monitoring scheme. Annex 1 of the present document is a manual needed for volunteer participants to identify, age, and assess the presence of oil on stranded Guillemots, to enhance the standardisation of information collected in future.

2. Short history

2.1 International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)[1]

Oil pollution of the seas was recognized as a problem in the first half of the 20th century and various countries introduced national regulations to control discharges of oil within their territorial waters. In 1954, the United Kingdom organised a conference on oil pollution which resulted in the adoption of the *International Convention for the Prevention of Pollution of the Sea by Oil* (**OILPOL**), 1954. The depository and secretariat functions in relation to the Convention were transferred from the United Kingdom Government to International Maritime Organisation (**IMO**). The 1954 Convention, which was amended in 1962, 1969 and 1971, primarily addressed pollution resulting from routine tanker operations and from the discharge of oily wastes from machinery spaces, regarded as the major causes of *chronic oil pollution*. The 1954 OILPOL Convention, which entered into force on 26 July 1958, attempted to tackle the problem of pollution of the seas by oil in two main ways:

a. it established "prohibited zones" extending at least 50 miles from the nearest land in which the discharge of oil or of mixtures containing more than 100 parts of oil per million was forbidden;

b. it required Contracting Parties to take all appropriate steps to promote the provision of facilities for the reception of oily water and residues.

In 1962, IMO adopted amendments to the Convention, which extended its application to ships of a lower tonnage and also extended the "prohibited zones". Amendments adopted in 1969 contained regulations to further restrict operational discharge of oil from oil tankers and from machinery spaces of all ships. Although the 1954 OILPOL Convention went some way in dealing with oil pollution, growth in oil trade and developments in industrial practices were beginning to make it clear that further action, was required. Nonetheless, pollution control was at the time still a minor concern for IMO, and indeed the world was only beginning to wake up to the environmental consequences of an increasingly industrialised society.

In 1967, the tanker **Torrey Canyon** ran aground while entering the English Channel and spilled her entire cargo of 120,000 tons of crude oil into the sea. This resulted in the biggest oil pollution incident ever recorded up to that time and the incident raised questions about measures then in place to prevent oil pollution from ships and also exposed deficiencies in the existing system for providing compensation following accidents at sea. First, IMO called an extraordinary session of its Council, which drew up a plan of action on technical and legal aspects of the Torrey Canyon incident. Then, the IMO assembly decided in 1969 to convene an international conference in 1973 to prepare a suitable international agreement for placing restraints on the contamination of the sea, land and air by ships. In the meantime, in 1971, IMO adopted further amendments to OILPOL 1954 to afford additional protection to the Great Barrier Reef of Australia and also to limit the size of tanks on oil tankers, thereby minimizing the amount of oil that could escape in the event of a collision or stranding.

Finally, an international Conference in 1973 adopted the **International Convention for the Prevention of Pollution from Ships**. While it was recognized that accidental pollution was spectacular, the Conference considered that operational pollution (chronic oil pollution) was still the bigger threat. As a result, the 1973 Convention incorporated much of OILPOL 1954 and its amendments into **Annex I**, covering oil. In February 1978, in response to a spate of tanker accidents in 1976-1977, IMO held a Conference on Tanker Safety and Pollution Prevention. The conference adopted measures affecting tanker design and operation, which were incorporated into the Protocol of 1978 relating to the 1973 International Convention for the Prevention of Pollution from Ships (**1978 MARPOL Protocol**), adopted on 17 February 1978. More importantly in terms of achieving the entry into force of MARPOL, the 1978 MARPOL Protocol allowed States to become Party to the Convention by implementing Annex I (oil). As the 1973 Convention had not yet entered into force, the 1978 MARPOL Protocol absorbed the parent Convention. The combined instrument - the International Convention for the Prevention of Marine Pollution from Ships, 1973 as modified by the Protocol of 1978 relating thereto (**MARPOL 73/78**) - finally entered into force on 2 October 1983 for Annexes I (oil) and II (chemicals).

2.2 MARPOL (73/78); Annex I Regulations for the Prevention of Pollution by Oil

MARPOL Annex I (Prevention of pollution by oil) entered into force 2 October 1983. The 1973 Convention maintained the oil discharge criteria prescribed in the 1969 amendments to the 1954 Oil Pollution Convention, without substantial changes: Operational discharges of oil from tankers are allowed only when all of the following conditions are met:

a. The total quantity of oil which a tanker may discharge in any ballast voyage whilst under way must not exceed 1/15,000 of the total cargo carrying capacity of the vessel;

b. The rate at which oil may be discharged must not exceed 60 litres per mile travelled by the ship;

c. No discharge of any oil whatsoever must be made from the cargo spaces of a tanker within 50 miles of the nearest land;

d. An oil record book is required, in which is recorded the movement of cargo oil and its residues from loading to discharging on a tank-to-tank basis.

In addition, in the 1973 Convention, the maximum quantity of oil to be legally discharged on a ballast voyage of new oil tankers was reduced from 1/15,000 of the cargo capacity to 1/30,000 of the amount of cargo carried. As with the 1969 OILPOL amendments, the 1973 Convention recognized the *"load on top"* (LOT) system, which had been developed by the oil industry in the 1960s. All oil-carrying ships are required to be capable of operating the method of retaining oily wastes on board through the "load on top" system or for discharge to shore reception facilities. A new and important feature of the 1973 Convention was the concept of "**Special Areas**" which are considered to be so vulnerable to pollution by oil that oil discharges within them have been

completely prohibited, with minor and well-defined exceptions. The 1973 Convention identified the **Mediterranean Sea**, the **Black Sea**, and the **Baltic Sea**, the **Red Sea** and **the Gulf**s area as special areas. New oil tankers (i.e. those for which the building contract was placed after 31 December 1975) of 70,000 tons deadweight and above, must be fitted with segregated ballast tanks large enough to provide adequate operating draught without the need to carry ballast water in cargo oil tanks. Secondly, new oil tankers are required to meet certain subdivision and damage stability requirements so that, in any loading conditions, they can survive after damage by collision or stranding.

The **Protocol of 1978** made a number of changes to Annex I of the parent convention, such as that segregated ballast tanks are required on all new tankers of 20,000 dwt and above and The Protocol also required segregated ballast tanks to be positioned in such a way that they will help protect the cargo tanks in the event of a collision or grounding. Another important innovation concerned crude oil washing, which had been developed by the oil industry in the 1970s and offered major benefits. Under crude oil washing, tanks are washed not with water but with crude oil - the cargo itself. Crude oil washing was accepted as an alternative to segregated ballast tanks on existing tankers and is an additional requirement on new tankers. The 1978 Protocol to MARPOL therefore introduced stricter regulations for the survey and certification of ships. With respect to Annex I of MARPOL (1973/78), the following amendments were adopted:

2.3 1984 amendment; Adoption: 7 September 1984; Entry into force: 7 January 1986

The amendments to Annex I were designed to make implementation easier and more effective. New requirements were designed to prevent oily water being discharged in special areas, and other requirements were strengthened. But in some cases they were eased, provided that various conditions were met: some discharges were now permitted below the waterline, for example, which helps to cut costs by reducing the need for extra piping.

2.4 1987 Amendment; Adoption: December 1987; Entry into force: 1 April 1989

The amendments extended Annex I Special Area status to the Gulf of Aden

2.5 1990 amendment; Adoption: November 1990; Entry into force: 17 March 1992

The amendments extended Special Area Status under Annexes I and V to the Antarctic.

2.6 1991 amendment; Adoption: 4 July 1991; Entry into force: 4 April 1993

The amendment added a new chapter IV to Annex I, requiring ships to carry an oil pollution emergency plan.

2.7 1992 amendment; Adoption: 6 March 1992; Entry into force: 6 July 1993

The amendments to Annex I of the convention that deals with pollution by oil brought in the "double hull" requirements for tankers. New-build tankers are covered by Regulation 13F, while regulation 13G applies to existing crude oil tankers of 20,000 dwt and product carriers of 30,000 dwt and above. Regulation 13G came into effect on 6 July 1995.

The amendment also considerably reduced the amount of oil that can be discharged into the sea from ships (for example, following the cleaning of cargo tanks or from engine room bilges). Originally oil tankers were permitted to discharge oil or oily mixtures at the rate of 60 litres per nautical mile. The amendments reduced this to 30 litres. For non-tankers of 400 grt and above the permitted oil content of the effluent which may be discharged into the sea is cut from 100 parts per million to 15 parts per million.

2.8 1994 amendment; Adoption: 13 November 1994; Entry into force: 3 March 1996

The amendment makes it possible for ships to be inspected when in the ports of other Parties to the Convention to ensure that crews are able to carry out essential shipboard procedures relating to marine pollution prevention. Extending port State control to operational requirements is seen as an important way of improving the efficiency with which international safety and anti-pollution treaties are implemented.

2.9 1997 amendment; Adoption: 23 September 1997; Entry into force: 1 February 1999

Regulation 25A to Annex 1 specifies intact stability criteria for double hull tankers. Another amendment made the **North West European waters** a "**special area**" under Regulation 10 of Annex 1. The waters cover the North Sea and its approaches, the Irish Sea and its approaches, the Celtic Sea, the English Channel and its approaches and part of the North East Atlantic immediately to the West of Ireland. In special areas, discharge into the sea of oil or oily mixture from any oil tanker and ship over 400 gt is prohibited. Other special areas

already designated under Annex I of MARPOL include: the Mediterranean Sea, the Baltic Sea, the Red Sea, the Gulf of Aden and the Antarctic.

2.10 North Sea as Special Area and Ecological Quality Objective (EcoQOs) regarding oil pollution

With the adoption of the International Convention for the Prevention of Marine Pollution from Ships, 1973 as modified by the Protocol of 1978 relating thereto (MARPOL 73/78), that entered into force on 2 Oct1983 for Annexes I (oil), and with the adoption of the 1997 amendment where the North Sea and its approaches, the Irish Sea and its approaches, the Celtic Sea, the English Channel and its approaches and part of the North East Atlantic immediately to the West of Ireland were made a *Special Area*, the North Sea was considered to be so vulnerable to pollution by oil that oil discharges within them have been completely prohibited.

The International Conferences on the Protection of the North Sea are political events where the ministers responsible for the protection of the environment meet for a broad and comprehensive assessment of the measures needed to protect the North Sea environment. At the **Bergen Conference** in March 2002[3], the North Sea Ministers adopted a declaration covering a wide range of issues of importance for the Protection of the North Sea, including management, protection of species and habitats, sustainable fisheries, shipping, hazardous substances, eutrophication, offshore activities, radioactive substances, promotion of renewable energy, marine litter, spatial planning and future co-operation. The Ministers recognized the need to manage all human activities that affect the North Sea in a way that conserves biological diversity and ensures sustainable development. The Ministers agreed on many initiatives in order to reduce the environmental impacts from shipping and planned to create a network of investigators and prosecutors in order to improve the cooperation between North Sea States to enforce the internationally agreed rules and standards for the prevention of pollution from ships. They agreed to implement an **ecosystem approach** and on a conceptual framework to guide this approach to management. This includes the use of Ecological Quality Objectives (**EcoQO**) as a tool for setting clear operational environmental objectives and serving as indicators for the ecosystems health. Ministers agreed to use those ecological quality objectives already developed as a pilot project for the North Sea, and invited OSPAR to review progress by 2005.

With respect to MARPOL (1973/78) Annex I, and the current Special Area status of the North Sea, it has been realised that the effectiveness of measures against (chronic) oil pollution, and of any temporal an spatial trends existing and developing in past and current levels of chronic oil pollution can be effectively monitored through beach bird surveys: counts of stranded seabirds on North Sea coasts, coupled with the assessment of oil rates (proportion of birds oiled)[4,5].

In a set of Ecological Quality Objectives for the North Sea, the **Proportion of oiled Common Guillemots among those found dead or dying on beaches** is listed Under Issue 4 (Seabirds), EcoQO element (f). The EcoQO, as agreed by the 5th North Sea Conference[3], was defined as: *The proportion of such birds should be 10 % or less of the total found dead or dying, in all areas of the North Sea.* General activities that needed to be undertaken to implement the EcoQO and to ensure that these developments are properly coordinated and communicated with other stakeholders were listed at a recent meeting of the OSPAR Biodiversity Committee[6]. The Seabird Ecology working group of ICES has been invited to provide current levels, on an appropriate geographical basis, to be used as baseline against which progress can be measured, to reconstruct the historic trajectory of the metric and to determine its historic performance (hit, miss or false alarm) relative to the objective being measured. The possibilities to distinguish between the human impact and that from natural influences needed to be evaluated, as a basis for deciding the relationship to management (BDC 03/2/4, Annex 1)[7,8].

2.11 References

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(6) BDC 2003. OSPAR Convention for the Protection of the Marine Environment of the North-east Atlantic, Annex 4: 2003-2005 Work Programme for the North Sea Pilot Project on Ecological Quality Objectives. Meeting Biodiversity Committee, Dublin, 20-24 January 2003, Dublin.

(7) 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.

(8) Anonymous 2003. Report of the Working Group on Seabird Ecology, ICES Headquarters 7-10 March 2003. Oceanography Committee, ICES CM 2003/C:03, Ref. ACE, D, E and G, International Council for the Exploration of the Sea, Copenhagen, Denmark.

3. Oiled-guillemots-EcoQO

The instrument itself, the **oiled-Guillemots-EcoQO**[1], is fairly simple in principle: stranded Common Guillemots are checked for the presence of oil in their feathers and the result is produced as an area-specific oil rate (%oiled of all birds found). To improve the performance of the metric the following should be considered, however[1]:

3.1 Beached bird surveys

Beached bird surveys have been standardised nationally, with small methodological differences between countries[2,3]. It has been recommended earlier[4,5] (with slight modifications for the specific case of recording Common Guillemots) that to obtain comparable results over large geographical areas the following set-up is required:

- Subregions should be chosen to sample the entire coastline appropriately. Subregion design should be in response to local conditions and will vary between countries, with different strategies in those whose coastline is mainly comprised of long sandy beaches and countries where the coast consists of numerous islands, fjords or long stretches of cliff[2]. A representative fraction of the coast directly bordering the sea should be chosen and remain standardised over the years. The length of coast chosen should produce sufficient beached birds of the most common species to enable the calculation of reliable oil rates (*i.e.* aiming for 10-25 monthly per species/age category).
- Each bird should be identified to species and Guillemots need to be aged by external characteristics (Annex 1).
- The condition and completeness of corpse and the extent of any oil on the feathers should be recorded. To calculate oil rates, only complete corpses should be used, in which all main feather groups are available for a check of the presence of oil.
- If beached birds cannot be removed from the vicinity of the shore area (scavengers may redistribute carcasses thrown above the high tide-line), they should be marked (e.g. by clipping the primaries) to avoid double counting. Marks should be clear and easy to identify even on incomplete corpses.
- For each count, the following information should be recorded: date, place, km surveyed, km of coast with visible oil, characteristics of the oiling, name(s) of observers, mark used to avoid double counts, completeness of survey and problems encountered, other significant pollution of the beach, list of beached birds.
- A computerised database should be established to facilitate prompt analyses and reporting of results.

3.2 Oil rates

From an earlier examination of trends in oil rates and the statistical power of appropriate trend tests it has been concluded that the power (1-*ß*), or the probability that a trend if present will be detected as statistically significant, depends on the size of the trend, the error variance, the number of years (*n*), and the size of the test[6]. Presumably the fraction of oiled birds (the oil rate, *y*) has some s-shaped relation with some index of oil pollution (*x*) and a widely used mathematical representation of such s-shaped curve is the logit function. The analysis of oil rates focuses on this index of oil pollution. Significant linear trends (by least squares estimation) were observed in time series of the observed index *x* for Common Guillemots for several countries, including The Netherlands and the Shetland Islands[6]. Shorter time series for Norway and Denmark did not reveal significant trends. These linear trends cannot continue in infinity and a plateau is likely to be reached when approaching very low levels of oil pollution (for example <5% oiled). Small local spills, widely spaced in time, will lead to relatively marked shifts in oil rates when the overall levels are very low, especially if the sample size is low[3]. A statistical analysis was conducted for observed trends in Dutch material and the variability of the material was examined (*i.e.* the standard deviation of the (yearly) logit-transformed oil rate indices around the

observed linear trend) to come up with a proposal for a time span within which the desired 10% level has to be observed.

Only **complete corpses** should be examined for the presence of oil. Scavengers tear corpses apart and incomplete corpses (often just pairs of wings with a sternum, or breastbone) cannot be used (Fig. 1). Incomplete material needs to be excluded from the analysis.

Fig. 1. *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*

Dead Common Guillemots **should be aged** using external characteristics (Fig. 2), because oil rates are not only species-specific, but also age-specific. Juvenile seabirds with relatively low survival probabilities have a much lower oil rate than adults[7]. In Dutch material for example, where many Common Guillemots have been routinely aged since the early 1980s, oil rates among adults (75.5% overall, *n* = 3387) and among juveniles (47.4%, *n* = 1940) are structurally lower in most years (Fig. 3). Areas with relatively high proportions of adult birds are therefore likely to produce higher oil rates than areas where juveniles predominate. So, one has to assume that age composition is constant between years for a valid year-to-year comparison. Similarly, a geographical comparison may be misleading when age composition is different between areas. Neither a constant age-composition within areas between years, nor between areas within years is likely to occur. Therefore, an indicator of the age composition in stranded Common Guillemots is important. Juvenile Common Guillemots will be separated from "adult" individuals (>1 year old) in the field by a quick inspection of the greater under wing coverts (white tipped in the former, all grey in the latter category[8, Annex1]).

Fig. 2. *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.*

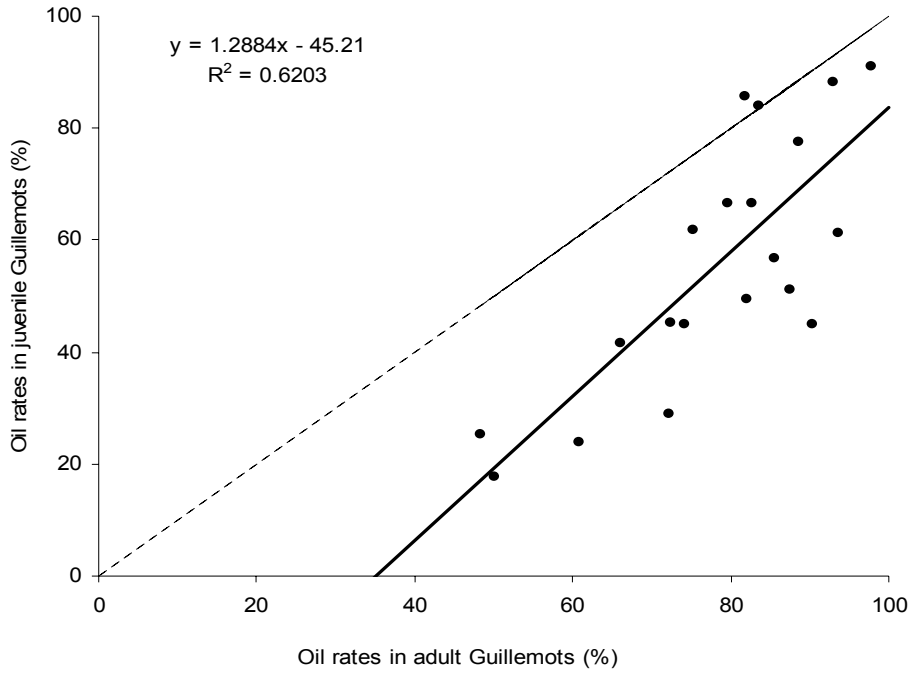

Fig. 3. *Correlation between oil rates in adult and juvenile Guillemots in The Netherlands, winter 1980/81 – winter 2001/02. The dashed line indicates an equal level (oil rates similar), values to the right of the dashed line indicate winters in which adults had a higher oil rate than juveniles.*

Fig. 4 *The amount of oil on corpses found, non-crucial information for the EcoQO, but still informative to evaluate the amounts of oil discharged at sea. Shown are Common Guillemots with a few specks of oil only (top-left), 50% oiled (top right), 75% oiled (bottom-left) and completely covered, 100% oiled (bottom-right). Photographs C.J. Camphuysen (TL, TR, BL) and J.A. van Franeker (BR).*

As a **minimum sample size** for a reliable (annual) oilrate in Common Guillemots, at least 25 juvenile and 25 adult (complete) carcasses of Common Guillemots are required[1,3]. In areas where this is feasible, at least 100 specimens of either category should be examined to further exclude or at least further minimise the risk of failure.

It has been recommended to collect information of the **amount of oil found on corpses** (Fig. 4, although this should be ranked as 'non-crucial info' with regard to the oiled-Guillemot-EcoQO. Although evidence has never been highlighted in published accounts, there have been suggestions that apart from a general decline in oil rates also the percentage of heavily oiled casualties may decline.

Dutch material has shown that some years stand out for having proportionally many 'heavily oiled casualties', but that there is as yet not a consistent trend to be detected (Fig. 5). It has been observed, however, that from Dutch Common Guillemots identified as juveniles, 33.7% were oil-fouled with just a few specks (n = 807), whereas in adults, only a fifth of the oiled birds were only slightly oil-fouled (n = 2440; NZG/NSO unpubl. data).

In some programmes, post-mortal oiling is separated from pre-mortal contamination. Although the difference between the two is clear for experts in most cases, this is still a tricky observation in schemes where numerous volunteers are used. Since these observations are relatively unimportant for the oiled-Guillemots-EcoQO (species-specific oil rates take some degree of post-mortal oiling into account and even corpses should stay clean in sea areas designated as Special Areas under MARPOL), such observations should not be recommended as standard procedure.

3.3 Season

The information on oiled Common Guillemots should be collected **in winter** (November-April). The rationale behind this restriction is:

a. Common Guillemots are most widespread in winter and are common visitors in all northwest European shelf seas.

b. Oil rates differ between summer and winter (as a result of differences in exposure of the birds, temperatures and the breakdown of mineral oils at sea).

Few countries could participate if the surveys were held in summer, simply as a result of the general absence of Common Guillemots in their waters. Common Guillemots are common or abundant breeding birds in the North Sea in Scotland (including Orkney and Shetland) and E England, with rather small breeding populations in S England, Channel Islands, French Channel coast, and in Germany (Helgoland)[9]. In summer, Common Guillemots are localised in their distribution and occur mainly in the vicinity of their colonies[10].

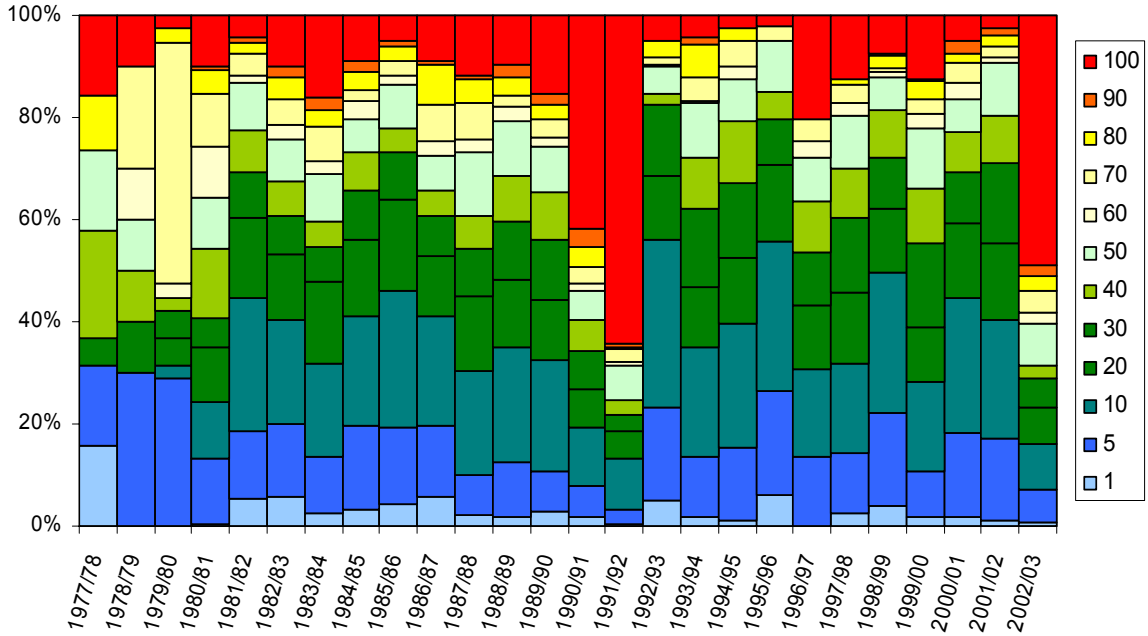

Fig. 5. *The amount of oil found on Guillemot corpses in The Netherlands. This is non-crucial information for the EcoQO, but still informative to evaluate differences between years and areas. Shown are rounded percentages for 14,465 Common Guillemots examined in detail (556 ± 440 p.a.), ranging from corpses with a few specks of oil only (blue) to birds that were completely covered with oil (red). NZG/NSO database, C.J. Camphuysen unpubl. data.*

3.4 Performance of the metric

Oil rates among stranded birds in a well-studied country as The Netherlands have substantially declined during the past 25 years[11]. Although Common Guillemots rank still among the species with the highest values, even in this species the oil rate has almost halved since the beached bird surveys were re-established in a more systematic manner in the late 1970s[11,6]. There are similar signals in other countries around the North Sea, indicating that the pressure of chronic oil pollution is declining. A detailed analysis of material in the Netherlands showed that, in concert with more particular attempts to prevent the coast from becoming oiled (legislation, control, and clean-up operations), oil rates in coastal species have declined more markedly than oil rates in offshore species such as Common Guillemots. An analysis of existing material is required to see if this pattern is consistent all over the North Sea.

In the work plan for Ecological Quality Objectives it is suggested that the historic trajectory of the metrics (misses, and false alarms) should be evaluated, as well as the performance of the metric. In many of the trend analyses of oil rates in Common Guillemots, the material has shown to provide a rather consistent, gradual decline over time with relatively little scatter around the trend line[6,12].

With respect to Common Guillemots, there has not been any clear false alarm in recent years, except when specific oil incidents are referred to. The *Erika* incident in western France and the *Tricolor* incident in The Channel area were events during particularly large numbers of oiled Common Guillemots were obtained during systematic surveys. The 'unreasonably' high oil-rate would never have had the risk to be mis-interpreted as an increase in chronic oil pollution levels, simply because of the media publicity surrounding the event. A false alarm was in fact given in the early 1980s, when a drastic increase in *numbers* of oiled corpses of auks and Black-legged Kittiwakes *Rissa tridactyla* was mistaken for an increase in chronic oil pollution[13]. It turned out that food-driven wrecks of starved birds were responsible for the very large numbers of seabirds washing ashore in these years[14]. A subsequent analysis of the material showed that the *oil rate* had in fact not changed very much in the years where very large numbers of casualties washed ashore. This in fact resulted in the proposal to use the oil rate rather than bird numbers as a rather stable indicator of the risk for birds or corpses of birds to become oil fouled in certain areas[6]. The oil rate as a measure was further studied and evaluated in the mid-1990s, including a power analysis of observed trends[6,15] and was soon adopted by national and international authorities, as well as by the scientific community.

3.5 The ecological quality objective

The ecological quality objective with respect to the proportion of oiled Common Guillemots is seemingly simple and straightforward: *"The proportion of such birds should be 10% or less of the total found dead or dying, in all*

areas of the North Sea". However, given the short-term variability of oil-rates due to all sort of factors such as particular local circumstances, oil incidents and seabird wrecks, it is important to agree on what a level of 10% oiled birds actually is and how this needs to be assessed. Would this be the first time a 10% level was reached? Would this be an *average* or a *maximum* oil rate over a period of several consecutive years?

Camphuysen[6] examined trends in oil rates and the statistical power of appropriate trend tests. The power (1-*ß*) is the probability that a trend, if present, will be detected as statistically significant. It depends on the size of the trend, the error variance, the number of years (*n*), and the size of the test. Presumably the fraction of oiled birds (the oil rate, *y*) has some s-shaped relation with some index of oil pollution (*x*) and a widely used mathematical representation of such s-shaped curve is the logit function. The analysis of oil rates focuses on this index of oil pollution and showed time series were showed of the observed index *x* for Common Guillemots with fitted linear trends (by least squares estimation) for The Netherlands, Denmark, Germany, Norway and Shetland Islands[6]. Significant declines were found in Shetland, Germany and The Netherlands, whereas shorter time series for Norway and Denmark did not reveal significant trends. These linear trends cannot continue in infinity and a plateau is likely to be reached when approaching very low levels of oil pollution (for example <5% oiled). Small local spills, widely spaced in time, will lead to relatively marked shifts in oil rates when the overall levels are very low, especially if the sample size is low (<100 corpses[3]). Therefore, a statistical analysis was conducted for observed trends in Dutch material[1]. This study examined the standard deviation of the (yearly) logit-transformed oil rate indices around the observed linear trend to come up with a proposal for a time span within which the desired 10% level has to be observed.

The Working Group on Seabird Ecology[16] recommended that trends might be most easily reported as five-year running mean percentages oiled. “Linear or other regression suggests that there is a model underlying any trends, while plain plotting of the percentage recorded each year would be relatively noisy due to short-term fluctuations.” Following calculations presented earlier, we would suggest that a five year period of during which 10% or less of the Guillemots reported during dedicated surveys are oiled would be considered a sign that the objective has been reached for that area. In line with this, ICES (2003a) advised that a period of at least 5 years in which an average of 10% or less oiled common guillemots has been recorded should occur before the conclusion that the objective has been reached could be justified statistically. WGSE therefore suggests that the EcoQO be reformulated as[17]:

The average proportion of oiled common guillemots 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. Sampling should occur in all winter months (November to April) of each year.

3.6 Information required (summary)

A ‘grand total’ percentage of oiled birds would not be appropriate as this may be biased by disproportionately-sized samples in some areas. In addition, knowledge of the location of high (or low) proportions of oiled birds may help to better target any management or mitigation measures. Based on historical precedent, and therefore practicality, a set of 15 coastal sections of the North Sea has been suggested (Figs. 7-8). Equally, previous advice has suggested that monthly samples be taken in each section for the winter months between November and April in each year. Any lower sampling rates carry the risk that external factors could severely bias the result and that variance around the mean oiling rate would be higher than ideal.

The collected information consists of (1) a national component and (2) an international task. The work can be summarised as follows:

(1) National count data (volunteers), organised by National co-ordinators:

Per site/beach (data transfer to co-ordinator on monthly basis)
- Date, km surveyed, observers, description oil on beach, remarks
- Number of complete adult or juvenile Guillemots found (oiled, unoiled)
- Number of complete unaged Guillemots found (oiled, unoiled)
- Number of incomplete Guillemots found (oiled, unoiled)

Per subregion (data transfer to International co-ordinator on annual basis)
- Winter (max Oct-Apr), monthly summary, total km surveyed, remarks
- Total number of complete adult or juvenile Guillemots found (oiled, unoiled)
- Total number of complete unaged Guillemots found (oiled, unoiled)
- Total number of incomplete Guillemots found (oiled, unoiled)
- Description of unusual events (oil spills, wrecks, other events)

(2) Meta data (International co-ordinator):

Per country, per subregion
- Winter (max Oct-Apr), monthly summary, total km surveyed, remarks
- Total number of complete adult or juvenile Guillemots found (oiled, unoiled)
- Total number of complete unaged Guillemots found (oiled, unoiled)

Total number of incomplete Guillemots found (oiled, unoiled)
Description of unusual events (oil spills, wrecks, other events) in international context
→ Annual report to OSPAR

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4. Present activities and preparedness

Beached bird survey schemes in the North Sea area became established in the early 1960s[1] and have been carried out in many European countries[2]. During the 1970s and early 1980s the number of European countries in which there were organized beached bird surveys gradually increased and the Royal Society for the Protection of Birds (RSPB) in Britain began to co-ordinate results internationally from 1972 onwards (International Beached Bird Survey; IBBS)[3]. When the national scheme in Britain was suspended in 1986, the Danish Ornithological Society[4] took on this role. In 1991, the RSPB largely resumed its activities and this

organisation has participated in the IBBS since. Beached bird surveys started in the early 1960s in Belgium[5] and The Netherlands[6], slightly later in Germany[7] and Denmark[8], and have been organised ever since, at least as a contribution to the IBBS, except in 1973/74 (The Netherlands) and 1979/80 (Belgium). Long-running schemes have been maintained also in Orkney (RSPB)[9] and Shetland (Shetland Oil Terminal Environmental Advisory Group, SOTEAG)[10], areas where oil rates are considerably lower. Beached bird surveys have been organised in Norway, Sweden and France, but infrequent or irregular and maintaining contact with organisers has proven to be difficult.

In the 1990s, beached bird survey schemes operated on a more or less regular basis in 13 European countries (Table 1), varying considerably in temporal and geographic coverage. Many surveys were organised independent of the IBBS, but most countries would provide data for the IBBS on request and on a voluntary basis. As soon as a national budget fails, or when national interests are low, participation is often halted. The high level of chronic oiling in the southern North Sea and it's approaches, and the frequency with which oiled seabirds occur on beaches has probably helped maintain the interest and commitment of participating volunteers in most of these long-running schemes. Volunteer commitment is essential in order to maintain a cost-effective monitoring tool and it has only been the costs for supervision and co-ordination; perhaps some travel expenses that have been claimed in any country. It should be possible, however, to interest local or national NGOs to participate in a future joint project related to the oiled-Guillemot-EcoQO (see: Budget).

Table 1. Beached bird surveys in Europe. Incidental reports (X) and the occurrence of systematic beached bird surveys (BB) are indicated per decade[1 (updated)].

	1910s	1920s	1930s	1940s	1950s	1960s	1970s	1980s	1990s	2000s
Belgium					BB	BB	BB	BB	BB	BB
Britain	X	X	X	X	X	BB	BB	BB	BB	BB
Denmark			X	X	X	BB	BB	BB	BB	BB
Estonia	X					X			BB	?
Finland				X	X	X	X	X	?	?
France						BB	BB	BB	BB	X
Germany					BB	BB	BB	BB	BB	BB
Iceland									?	?
Ireland						X	X	X	?	?
Latvia								BB	BB	?
Lithuania									BB	?
Netherlands	X	X	X	BB	BB	BB	BB	BB	BB	BB
Norway						X	X	BB	BB	X
Poland					X	X	BB	BB	BB	?
Portugal								BB	BB	X
Spain							X	BB	BB	X
Sweden					X		X	X		X
Russia				X	X			?	?	?

For the oiled-Guillemot-EcoQO, existing beached bird surveys need very little, if any, modification. Participants are asked to search for Common Guillemots, or rather to select guillemots during routine surveys, to separate complete corpses from incomplete ones (see Annex 1), to age them using external characteristics, and to report the amount of oil (if any) on the feathers. A simple field guide and short training of volunteers will be sufficient to obtain reliable data. Sampling should be continued through the winter (Oct-Apr or Nov-Mar at least) to avoid short-term weather effects and to increase the likelihood that a sufficient sample of corpses can be used to calculate the oil rate.

Since for the oiled-Guillemot-EcoQO, existing beached bird surveys need very little modification, there would be very little extra costs where external (national) funding is available,. It should be highlighted here that another EcoQO, *Plastic particles in stomachs of seabirds* [11], requires the same baseline data and effort and would therefore benefit at the same time. It is clear, however, that national funding is far from secure in most participating countries. Today, the activities around the North Sea could be summarised as follows:

United Kingdom	Shetlands	Co-ordinator Martin Heubeck, SOTEAG, Sumburgh Head, Shetland Islands, long-running BBS scheme, does deploy methodology proposed for oiled-guillemot-EcoQO including ageing of Common Guillemots and coverage of entire winter period. Ready to participate.
United Kingdom	Orkneys	Co-ordinator RSPB, Orkney Islands (Eric Meek), long-running BBS scheme, coverage of entire winter period. Ready to participate.

United Kingdom	North Sea coasts	Co-ordinator RSPB, Sandy, Bedfordshire (Sabine Schmitt), long-running participation in IBBS scheme, by annual counts in February covering vast distances of coast. Coverage of entire winter period possible. Prepared to participate.
France	Channel coasts	No contact established
Belgium	North Sea coasts	Co-ordination Instituut voor Natuurbehoud, Brussels (Eric Stienen), long running BBS scheme. Oiled Guillemot EcoQO protocol fully implemented since at least the late 1990s; surveys cover entire winter period. Historical surveys mainly February counts (IBBS participation)
The Netherlands	North Sea coasts	Co-ordination Kees Camphuysen (Nederlandse Zeevogelgroep). Long running BBS scheme (1977 to present). Oiled Guillemot EcoQO protocol fully implemented since early 1980s; surveys cover entire winter period. Historical surveys are mainly February counts (IBBS participation). Financial support for co-ordination since mid-1990s (Ministry of Transport, Public Works and Water Management) resulted in strengthening and continuation of monitoring scheme.
The Netherlands	Wadden Sea	Co-ordination Kees Camphuysen (Nederlandse Zeevogelgroep). Long running BBS scheme (1977 to present). Oiled Guillemot EcoQO protocol fully implemented since early 1980s; surveys cover entire winter period. Historical surveys are mainly February counts (IBBS participation). Financial support for co-ordination since mid-1990s (Ministry of Transport, Public Works and Water Management) resulted in strengthening and continuation of monitoring scheme. Continuation of national funding required.
Germany	Niedersachsen	Co-ordinated by Nds. Landesbetrieb für Wasserwirtschaft u. Küstenschutz (NLWK), contact Martin-Schulze Diekhoff (no response; no contact established) The Counts on Neuwerk are carried out by the Verein Jordsand. Surveys are financially supported by regional authorities (county, city of Hamburg). Oiled Guillemot EcoQO protocol not fully implemented (ageing auks to be incorporated), but surveys cover entire winter period. Historical surveys are mainly February counts (IBBS participation)
Germany	Schleswig-Holstein	Nationalparkamt Schleswig-Holstein (David Fleet). Long-running BBS scheme, participating in Trilateral monitoring programme Wadden Sea. The Nationalparkamt is potentially interested in participating in the EcoQO oiled Guillemots. The State of Schleswig-Holstein presently finances the surveys of oiled birds on the S.-H. coast and the handling, treatment and analysis of data (part of my job at the NP-office). Oiled Guillemot EcoQO protocol not fully implemented (the systematic ageing of auks should be introduced), but surveys cover entire winter period. Historical surveys are mainly February counts (IBBS participation)
Denmark		Co-ordination Dansk Ornitologisk Forening (Henrik Skov). Long running scheme of mid-winter surveys (mainly February and March), with more variable effort in recent years. Prepared to adopt oiled-Guillemot-EcoQO protocol and prepared to participate, but this will depend on the availability of national funding of co-ordinator.
Sweden	Skagerrak coast	Sotenäs Produktionsskola (Per Joel Andersson) Currently involved in systematic beach cleaning project and EC project studying plastic ingestion in stranded Northern Fulmars. Te coastline of the Sotenäs Municipality roughly corresponds to the 60 km of coast required for oiled-Guillemot-EcoQO. The organisation to conduct surveys is available. Costs for the annual beach cleaning activity are *c.* €50,000. A minor governmental subsidy of €7000 p.a. is now available for beach cleaning; beached bird surveys will require additional funding.
Norway	North Sea coast	No contact established, but contacts through the EC project marine litter suggest that there is potential for participation in Southern Norway (Kare Olav Olsen, Lista Peninsula).

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5. Recent results of beached bird surveys

With the North Sea enforced as a Special Area under Annex I of MARPOL since 1999, oil rates in seabirds washing ashore in all North Sea countries are expected to decline. Most beached bird surveys are designed as monitoring programmes, using internationally harmonised standard methods so that differences in the proportion of oiled beached birds and beaches can be easily compared between countries, seasons and years[1,2].

There is considerable regional and temporal variation in oil rates (the proportion of dead birds found oiled on beaches). However, oil rates are clearly species specific and indicative of the differing risk of birds to become oiled in certain sea areas[1,3]. Several studies have ranked different seabird species in an oil vulnerability index according to their behaviour, population size, range and dependence on the marine environment[4,5,6,7], and species with a high anticipated vulnerability to oil pollution typically had a higher oil rate among beached birds than those of lower anticipated oil vulnerability[2]. Oil rates are consistently higher for species that spend a lot of time on the sea surface in highly polluted areas, such as divers, seaduck and auks, than for more aerial seabirds such as shearwaters, skuas and terns. Oil rates tend to be higher in areas with intensive shipping than in oceanic environments where shipping traffic is less dense.

The Common Guillemot is a winter visitor in most parts of the North Sea that breeds mainly in the NW (NE England, Scotland, Orkney and Shetland). As a winter visitor, the Common Guillemot should be ranked as an offshore species, illustrating the risk to become contaminated with oil away from the coast. The oil rates of the Common Guillemot are generally rather high, mainly due to exposure and behaviour at sea. Spatial differences in winter oil rates of Guillemots have been used to illustrate the effect of differences in shipping intensity around the North Sea[8,9]. High oil rates are typical for the Channel area, Southern Bight and Skagerrak region (close to major shipping lanes where numerous illegal discharges occur), whereas comparatively low oil rates are found in the north and northwest and on Atlantic coasts.

Table 2 and Fig. 6 illustrate the present situation in most countries around the North Sea. Oil rates were provided for 17 regions around the North Sea (presented only if at least 25 complete corpses were examined; exact status of oldest data (<1980) not always clear). The results show that the situation has improved since previous international overviews were published[8,9,16], while they confirm that the areas closest to the major shipping lanes (Channel (UK), Belgium and The Netherlands, Helgoland (FRG), West Denmark) do still produce comparatively high oil rates. Areas where longer series of data are available show consistent declines in oil rates, with few exceptions. It should be realised that these data could not be 'polished' (e.g. corrected for age-composition and the occurrence of unusual events such as wrecks and oil accidents) and it has not been attempted to explain all outliers in the material. For the overview image, where a 5-year mean oil rate has been presented, the most recent data have been omitted, however, because the *Tricolor* oil spill elevated the oil rates in at least 3 countries (no French data available, but oil rates should be elevated here as well).

The results in Table 2 indicate overall declines on a North Sea scale, but also that the oil rates in Common Guillemots are at the “required” level of 10% or less in only three out of 15 subregions for which data are currently available. Recent data in some of the most polluted areas suggest that initial declines in oil rates have slowed down or even came to a halt[18] and in six areas were oil rates calculated over a five-year period still >5x higher than the Oiled-Guillemot-Quality Objective:

1997-2002	**<10% oiled**	**10-50% oiled**	**>50% oiled**
	Shetland	SE Britain	S Britain
	Orkney	Netherlands W Sea	Belgium
	NE Britain	Germany Nieders	Netherlands mainland
		Germany Schl-H	Netherlands Wadden Isles
		Germany W Sea	Germany, Helgoland
		Denmark I	Denmark II

Oiled Common Guillemot (JA van Franeker)

Table 2. *Common Guillemot oil rates (% oiled) in the North Sea and 5-year mean over 1997/98-2001/02 (i.e. excluding the Tricolor incident). Oil rates were calculated if >25 casualties were found.* Data (1) SOTEAG, Martin Heubeck[10], (2-5) RSPB Orkney Islands, Eric Meek[11], (6) Instituut voor Natuurbehoud, Eric Stienen[12], (7-9) Nederlandse Zeevogelgroep, Kees Camphuysen[13], (10-14) Landesamt für den Nationalpark Schleswig-Holsteiniches Wattenmeer, Nds. Landesbetrieb für Wasserwirtschaft u. Küstenschutz (NLWK) and Verein Jordsand, David Fleet[14], (15-17) Dansk Ornitologisk Forening, Henrik Skov[15]

	Shetland	Orkney	UK NE	UK SE	UK S	Belgium	NL mainl	NL WIsle	NL Wsea	FRG hel ns	FRG nds	FRG nds ns	FRG sh	FRG ws	DK - I	DK-II	DK-IV
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1963/64						100.0											
1964/65						100.0											
1965/66							100.0	100.0									
1966/67						98.2											
1967/68							100.0	96.8									
1968/69						100.0	100.0	100.0									
1969/70							99.2	100.0									
1970/71							100.0										
1971/72							100.0										
1972/73							51.6										
1973/74																	
1974/75							100.0										
1975/76		9.1															
1976/77		29.2					97.4										
1977/78		50.0					96.3										
1978/79		71.0					83.9	91.3									
1979/80		67.0					94.1	85.9									
1980/81		16.9		87.7			90.4	95.8	92.2								
1981/82		11.2					87.1	95.5	92.2								
1982/83		5.8	12.6	22.0	70.8		87.6	95.6	91.9								
1983/84		7.5	35.9	41.7	56.4		87.5	95.2	78.3								78.7
1984/85		10.7	26.9	10.8			77.2	89.5	87.2	86.6			43.3				75.8
1985/86		3.5	44.9	35.6	65.5	75.0	78.5	90.6	80.5	89.3	77.8		47.7				78.0
1986/87		12.9					89.8	96.1		92.0							90.1
1987/88		4.5	27.5				96.1	93.0	79.1	81.0			39.1				77.5
1988/89		2.1					73.5	85.2	49.6	73.7			39.4				78.4
1989/90		6.8	37.5			88.8	79.6	76.6	73.5	62.4	59.3		30.9				66.2
		4.1	26.2	49.2	71.0		83.9	85.5	42.9	58.1			21.7				74.8

1990/91																
1991/92		7.2			85.3	67.5	88.9	92.2		67.1	73.3		40.8			85.2
1992/93	64.3	10.9	12.0	13.2	73.6	28.5	43.2	28.7	43.4			47.8	43.4	21.4		31.1
1993/94	5.3	1.5	1.1	12.0	65.5	38.5	60.9	56.4	53.3			46.0	78.4	57.5		54.2
1994/95	275	2.7	10.0	29.4	81.6	53.5	69.2	75.8	71.1	85.3		65.5	72.0	35.7		71.3
1995/96	29.5	3.9	9.9	58.0	49.4	70.5	58.6	62.7				48.8				
1996/97	20.2	2.5	11.2	61.2	77.1	73.5	84.2	77.5		63.3		61.0	79.6		87.8	
1997/98	18.3	3.7	4.7	20.5	59.8	54.0	71.5	65.1				55.4	34.5		47.8	60.5
1998/99	8.3	3.4	17.9	18.4	67.0	48.1	43.0	50.5	24.1	41.4		25.4	24.8	26.0	32.3	45.9
1999/00	15.7	2.9	10.1	40.0	77.1	70.4	78.8	77.0	60.4	78.9		53.5	33.3	16.7		59.8
2000/01	3.2	16.5	8.4	18.6	70.9	51.4	48.6	64.0	42.9	54.8		43.1		14.3		
2001/02	3.1	2.7	2.6	31.0	84.4	62.2	65.4	53.4	52.6			36.5	33.3	30.8	33.3	
2002/03	3.4	1.7	4.5	75.8	49.7	75.0	95.7	59.9	46.1			29.3	36.4			
2003/04																
1997-02	9.7	6.7	8.7	25.7	71.8	57.2	61.4	62.0	45.0	58.4		42.8	31.5	21.9	37.8	55.4

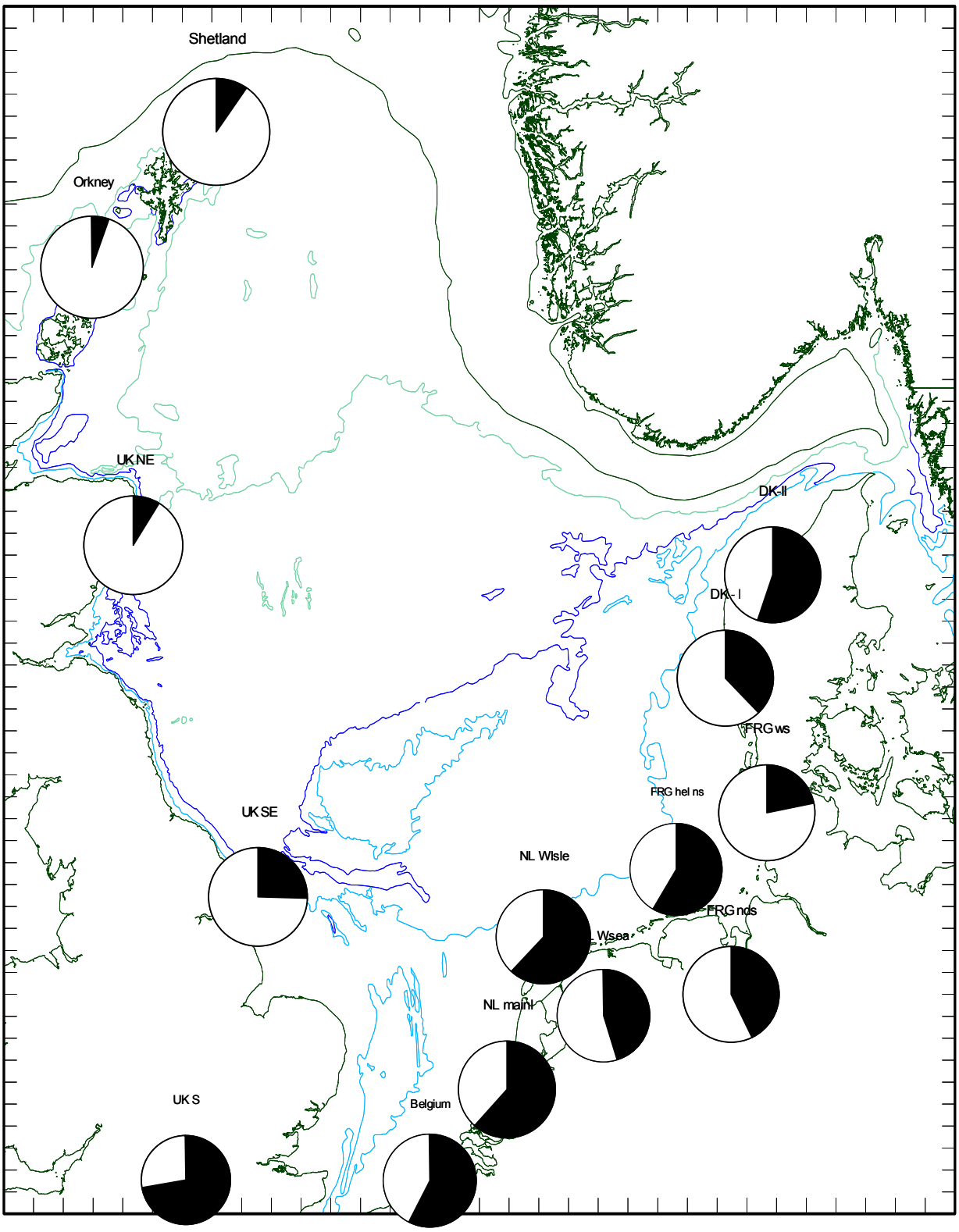

Fig. 6. *Mean oiled rate (% oiled) in Common Guillemots in the North Sea over 1997/98-2001/02 (i.e. excluding the Tricolor incident).* Data (1) SOTEAG, Martin Heubeck[10], (2-5) RSPB Eric Meek and Sabine Schmidt[11], (6) Instituut voor Natuurbehoud, Eric Stienen[12], (7-9) Nederlandse Zeevogelgroep, Kees Camphuysen[13], (10-14) Landesamt für den Nationalpark Schleswig-Holsteiniches Wattenmeer, Nds. Landesbetrieb für Wasserwirtschaft u. Küstenschutz (NLWK) and Verein Jordsand, David Fleet[14], (15-17) Dansk Ornitologisk Forening, Henrik Skov[15]

5.1 Winter index versus mid-winter survey

British material, with the exception of Shetland data, was based on mid-winter surveys only (February counts, contribution to the IBBS)[8,16]. In the oiled-Guillemot-EcoQO protocol, as was argued in earlier studies[1,2,3,17], a winter index is used based on surveys covering all winter, to eliminate the effects of peculiar weather conditions caused by a concentration of observations in on two week period. For Shetland, for example, where monthly surveys have been conducted, oil rates in February and oil rates for the entire winter period, resembled each other in three out of eight of the most recent seasons (Fig. 7). Compared to the gradual and highly significant decline in logit-transformed oil rates in Shetland measured through a winter index, the February material (often due to small sample size) produced substantial scatter. Similarly, from Dutch material, where the overall mean appeared not to be too different between February counts and all-winter material, the standard deviation (indicating the variability from year-to-year in either series) was substantially greater in data collected in February (Table 3).

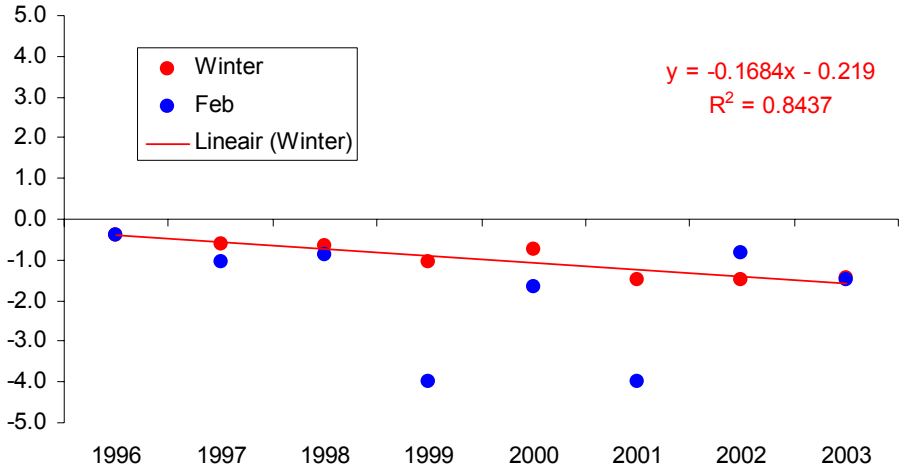

Fig. 7. *Logit-transformed mean oiled rate (% oiled) in Common Guillemots in Shetland measured over a complete winter season (red symbols, and trend line) versus oil rates in Common Guillemots measured in February only (blue symbols) 1995/96-2002/03.* Data (1) SOTEAG, Martin Heubeck[10].

Table 3. *Logit-transformed oil rates in Common Guillemots found along the North Sea coast in The Netherlands over 1989/90-2001/02 (i.e. excluding the Tricolor incident). Oil rates were calculated if >25 casualties were found.* Data Nederlandse Zeevogelgroep, Kees Camphuysen[13].

Season	All winter	February
1990	0.56	0.78
1991	0.72	0.48
1992	0.96	1.62
1993	-0.16	-0.27
1994	0.15	-0.05
1995	0.38	0.24
1996	0.17	0.34
1997	0.65	0.40
1998	0.35	0.08
1999	-0.09	-0.35
2000	0.55	0.53
2001	0.15	0.24
2002	0.16	0.27
Mean	0.35	0.33
SD	0.31	0.48

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(10) Unpublished data Shetland Oil Terminal Environmental Advisory Group, Sumburgh Head, Shetland Islands (UK), courtesy Martin Heubeck

(11) Unpublished data Royal Society for the Protection of Birds, Orkney Islands (UK), courtesy Eric Meek

(12) Unpublished data Instituut voor Natuurbehoud, Brussels (B), courtesy Eric Stienen

(13) Unpublished Nederlandse Zeevogelgroep, Texel (NL), courtesy Kees Camphuysen,

(14) Unpublished data Landesamt für den Nationalpark Schleswig-Holsteiniches Wattenmeer, Tönning (FRG); Nds. Landesbetrieb für Wasserwirtschaft u. Küstenschutz, Norden (FRG); and Verein Jordsand, Ahrensburg (FRG), courtesy David Fleet

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6. Geographical differentiation and proposed study AREAS

Although national boundaries may be the most practical subdivision of the North Sea in terms of financing and logistics, a further subdivision is required to describe spatial differences in oil rates all over the North Sea. The ICES working group on Seabird Ecology[1], proposed a set of 13 subregions: (1) Shetland, UK; (2) Orkney Orkney and north coast of Scotland, UK; (3) Moray Firth Duncansby Head–Rattray Head, UK; (4) East Scotland Rattray Head to Berwick on Tweed, UK; (5) Northeast England Berwick on Tweed to Spurn Head, UK; (6) East England Spurn Head to North Foreland, UK; (7) Eastern Channel line between North Forland and Belgian French border to line between Cherbourg to Portland, UK, B & F; (8) Western Channel line between Cherbourg and Portland to Land's End to Ouessant, UK & F; (9) Eastern Southern Bight Belgian/French border to Texel, B & NL; (10) Southern German Bight Texel to Elbe, NL & FRG; (11) Eastern German Bight Elbe to Hanstholm, FRG & DK; (12) Skagerrak east of line between Hanstholm to Kristiansund, north of a line from Skagen to Gothenburg, N, DK & S; (13) SW Norway Kristiansund to Stadt, N. This regionalisation is based on earlier analyses of differences in oil rates of Common Guillemots around the North Sea[2,3] and low oil rates, close to or even below the 10% target, are foreseen for subregions 1, 2, and 13, at least in the near future.

There are several reasons *not* to follow this proposal, however, and to come forward with a different one. One reason is that the UK subdivision is not in accordance with the present day situation and that it is not clear why for example Moray Firth should be separated from East Scotland (with the risk of reducing sample sizes to unacceptable levels). Secondly, while a combination of data of Dutch Wadden Sea islands and the West Frisian islands of Niedersachsen, as well as a combination of islands in Schleswig-Holstein en Denmark seems logic, there are good reasons to separate the Wadden Sea area from the North Sea coast (see for example the use of beached bird surveys in the Trilateral Wadden Sea monitoring programme[4]). A slightly different proposition, using 15 different subregions combining the different needs for data collection and analysis and building on historical subdivisions, is therefore put forward in the present document (Fig. 7-8):

1	Shetland		UK
2	Orkney	Orkney and 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 Foreland and Belgian/French border to line from Cherbourg to Portland	UK, F
7	Western Channel	line between Cherbourg and Portland to line from Lizard to Ouessant	UK, F
8	Eastern Southern Bight	French border Belgian coast 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 to Kristiansund, north of a line from Skagen to Gothenburg	N, DK, S
15	SW Norway	Kristiansund to Stadt	N

With the centralised collection of data on count-level (individual counts) rather than grouped, any more convenient subdivision could be deployed in future.

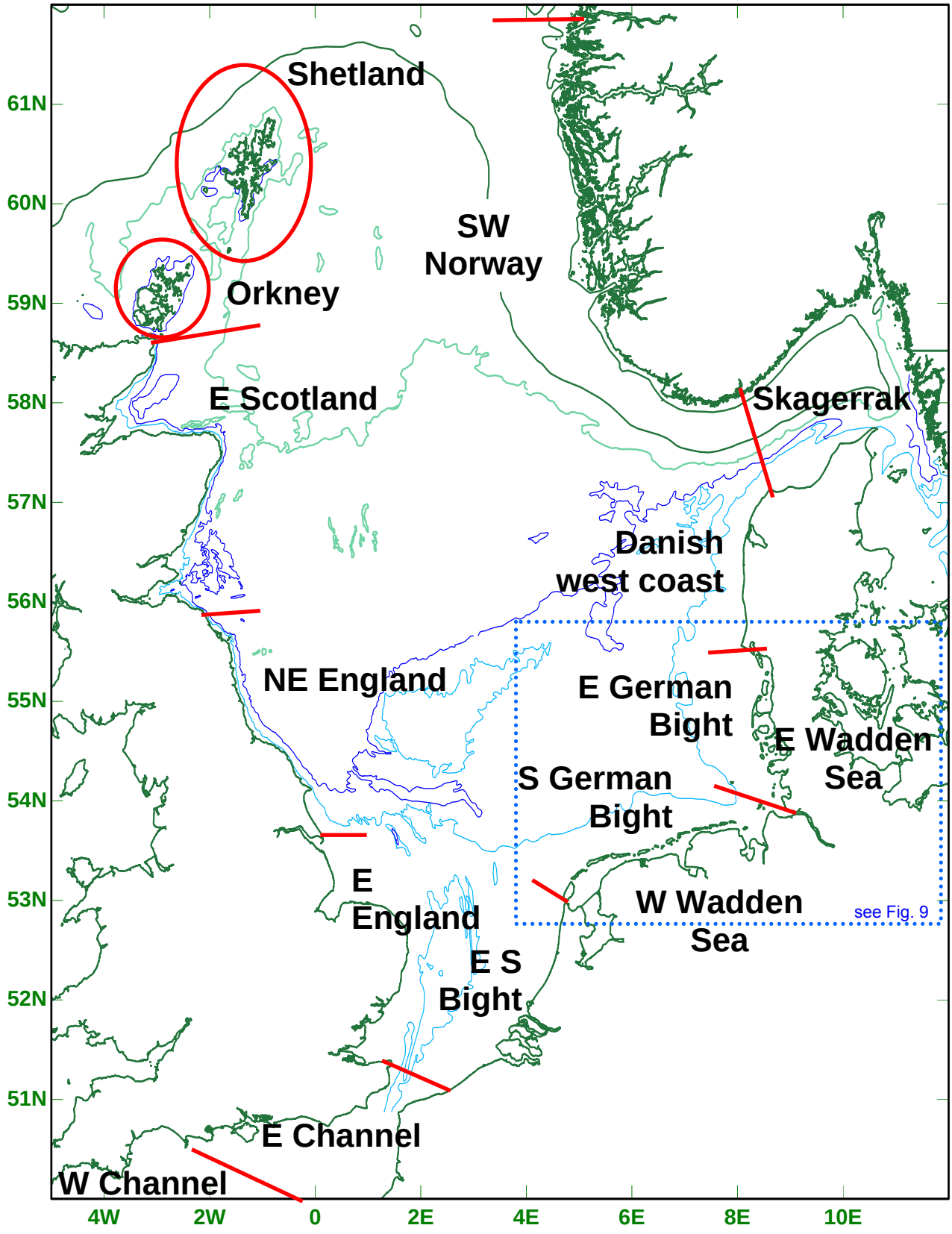

Fig. 7. *Regionalisation of data collected for oiled-Guillemot-EcoQO (see text for explanation, see Fig. 8 for details German Bight and Wadden Sea area); see Table on page 19 for exact borders.*

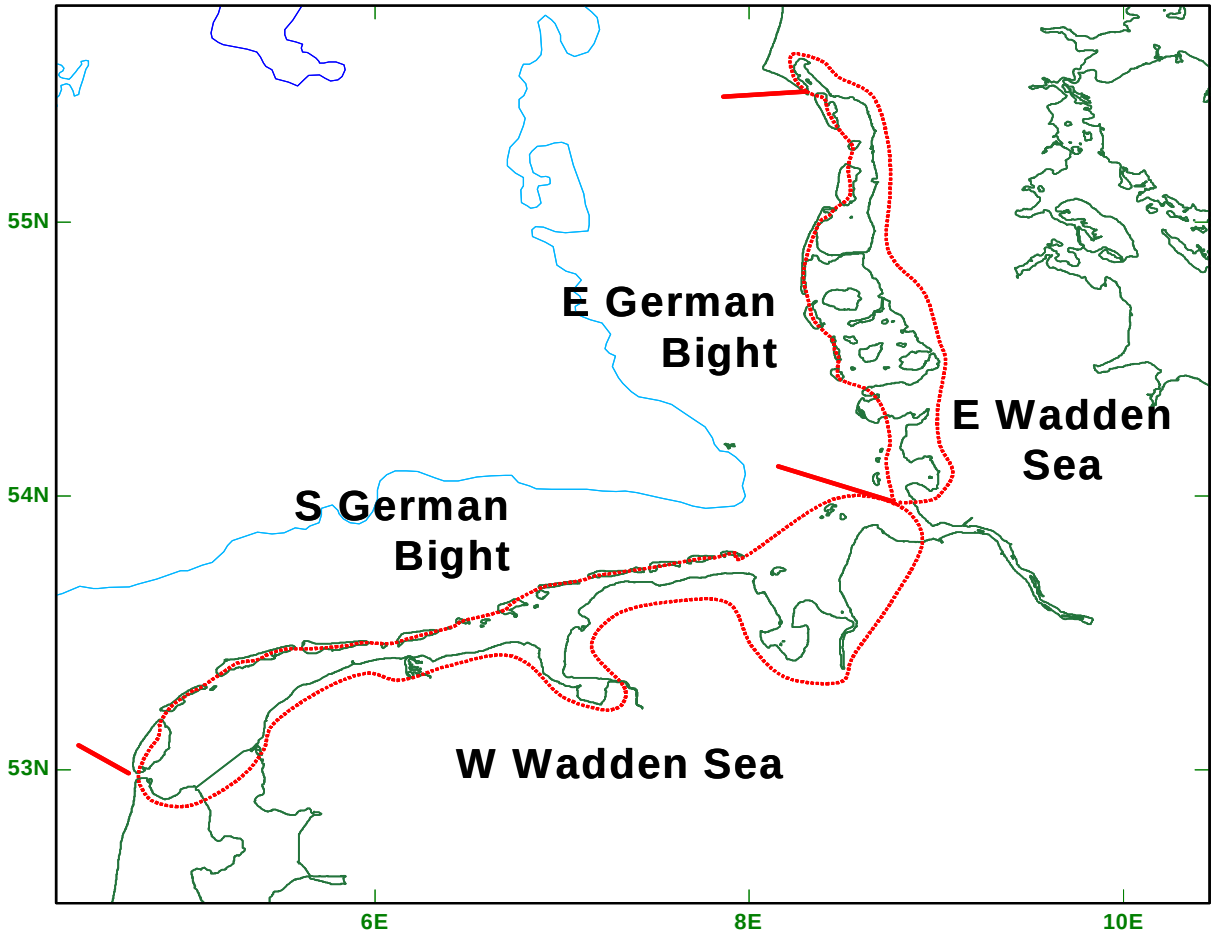

Fig. 8. *Regionalisation of data collected for oiled-Guillemot-EcoQO in the German Bight and international Wadden Sea (Denmark, Germany and The Netherlands; see Fig. 9 for North Sea scale).*

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7. Sources of chronic oil pollution

The sources of chronic oil pollution are diverse, and estimates of total quantities dumped or released in the marine environment vary widely[1]. Several recent reports indicated declines in chronic oil pollutions and these conclusions were based on direct observations (aerial surveys), as well as beached bird surveys (trends in oil rates)[2]. Chronic oil pollution should refer to mineral oil only, but in fact, numerous lipohilic substances are involved, including mineral oil, while few studies were capable of discriminating between types. While incidents with non-mineral oils are know to occur[3], and while adverse effects are well known[4], we insufficient knowledge about the scale and eventual trends in the levels of non-mineral oil pollutants in the marine environment[5]. With regard to mineral oil pollution within the North Sea area, there is good evidence that ordinary ships' fuel oils, deliberately discharged with bilge waters, are the main source of oil pollution[6] and reported results of aerial surveys show a clear clustering of recorded slicks around the major shipping lanes in the south and in the south-east[7]. The clustering of oil slicks around the busiest areas in terms of marine shipping is clearly reflected in oil rates found on beach-washed corpses (Fig. 6), both in the past and in recent years, and it would suggest that the main source of pollution remained the same over time. It should be stressed, however, that there is fairly little concrete information about the sources of pollution in recent years.

7.1 References

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8. How to reduce chronic oil pollution – a discussion

With the North West European waters being made a Special Area under regulation 10 of MARPOL Annex I (1997 amendment, adopted 23 September 1997)[1], a lot has been achieved. However, just making an area a 'Special Area' is rather pointless if this is not enforced by (National) law and if this law is not adequately implemented. There has been no shortage of recommendations for solving ship-source oil pollution over the years. Unfortunately the problem is still plaguing our waters. To a captain or ship's operator, the chances of being caught are low, the fine can be considered a business cost and is usually covered by insurance. Near-zero discharge within the North Sea has not (yet) been achieved, as can be clearly seen from BBS results gathered since the adoption of the amendment (Table 2, Fig. 6).. While the Special Area status in theory should suffice, it is clear that additional measures are required to make sure that mariners obey the regulations and, to put it very simple, discharge no oil or oily waters (<15 ppm) within this area. In Newfoundland (Canada), where chronic oiling is an increasing threat to marine wildlife, the following actions have been proposed[2] and it will be clear that many of these would help in Western Europe:
Actions in 3 fields

1. Prevention:
   a. Mandatory on-board transponders and oil fingerprinting of all vessels in North Sea waters would facilitate surveillance, enforcement and the prevention of pollution.
   b. Implement directive 2000/59/EC, including 100% indirect financing of waste collection
   c. Strict waste accounting. Shippers must account for all produced waste oil or face illegal dumping charges. Falsification of records should result in fraud charges.
   d. Implement a ship accreditation system. This system would be for shippers who promote and adopt best environmental practices and have clean environmental records.
   e. Protect and monitor sensitive areas. The Canadian government should seek an International Maritime Organisation (IMO) designation of Particularly Sensitive Sea Areas (PSSA) for offshore areas where seabirds are most vulnerable.
2. Control and enforcement
   a. Increase co-operation between EU-countries
   b. Information exchange
   c. Increase frequency of joined exercises
   d. Direct communication during major incidences

e. Stronger legal deterrence. Imposed fines, including minimum fines, must be increased to clearly reflect the full extent of the crimes under both shipping and environmental laws.
f. Improved surveillance and evidence-gathering technologies. Satellite and aircraft surveillance need to be enhanced to better detect oil dumping. Increase persuance of enforcement: bring all polluters to court

3. Oil recovery / clearing

Fingerprinting is an issue of debate, and mineral oil should not be made more toxic than it is by adding metal traces for example. Facts are, however, that illegal spills are still numerous, that few vessels are caught and prosecuted, that hardly any fines are cashed, so that it will remain profitable to misbehave at sea. Hence, stronger legal deterrence and improved surveillance and evidence-gathering technologies are important aspects. At the same time, seafarer should be accommodated by excellent harbour reception facilities where the delivery of waste oils and other wastes should have a minimum cost. Once it has been made economically profitable to behave properly, while misbehaviour becomes a cost, there is little doubt that illegal discharges will decline rapidly.

As a more specific step to try and reduce oil rates in seabirds (and to protect sensitive areas), it should be recommended to identify, monitor and protect sensitive areas at sea. Spatial patterns and seasonal trends in vulnerable concentrations of seabirds in the North Sea and west of Britain have been identified and published[3]. Despite this knowledge, there has been little evidence that this information is used to better plan clean-up operations in case of oil incidents (e.g. *Tricolor* incident), in the decision process to either immediately combat illegal spills at sea or leave them to disperse naturally (and slower), or in the planning of aerial surveillances for oil at sea. A stronger emphasis on the most vulnerable areas would probably help to reduce the oil problem.

A third step is education. A recent and obligatory course that Dutch cadets follow at the Royal Netherlands Institute for Sea Research (now Texel Academy) during their training at least in the short term significantly raised the interest of the to-become mariners for marine environmental issues. Being confronted with the damage done through illustrated lectures and practical activities stimulated lengthy discussions as demonstrably increased knowledge. Such trainings can be used to underline that even a very small amount of discharged oil does immediate damage and that it isn't so much the amount of oil spilled but the time and location where the oil is released to cause significant mortality among seabirds and other marine wildlife. It may at least be hoped, that the information provided will be remembered, such that an illegal discharge is recognised as a criminal act by the offender himself.

At present an effective enforcement regime for ships at sea does not exist. Aerial surveillance has severe limitations (hugely costly to regularly over-fly all areas and ineffective at night and in wind speeds above force 5) and while satellite surveillance may solve some of these problems in the long-term, at present once a ship leaves port it can dump its waste oil with little chance of being caught. Until this changes, efforts to reduce illegal discharges should target activities in port. Specifically vessels should be inspected to ensure they have on board the waste oil commensurate with the cargo and voyage they have just undertaken and they should be forced to discharge all waste before their next journey, The next port-of call can be notified (especially when a vessel attracts suspicion) to check the vessel on arrival. A vessel that leaves with no waste oil on board and knows that it will be checked at its next port of call is less likely to dump waste illegally. This assumes of course that the legal arrangements are such that evidence gathered in this way can be used to bring successful prosecutions. The North Sea Network of Prosecutors is a useful development in this regard. In the absence of forced use of reception facilities it is of course vitally important that reception facilities are readily available and free at the point of use. Unfortunately the PRF Directive failed to ensure this, requiring only a 30% no-special-fee element.

A technical fix for oil and cargo residues (but not garbage) would be the connection of transponders to the ship's oily water separators and other cargo pumping equipment. This would allow coastal State monitoring of the operations of vessels in their waters. Current proposals for the fitting of transponders to ships do not go this far, although there is no technical obstacle.

8.1 References

(1) IMO 1973/78. International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78); Annex I Regulations for the Prevention of Pollution by Oil. International Maritime Organisation, London, http://www.imo.org/home.asp.

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(4) Camphuysen C.J. 1999-2003. Lozingen van olie, chemicaliën en plastics in zee en de gevolgen voor zeevogels en zeezoogdieren: MARPOL Annex I en V anders belicht. College en prakticum Cursus Mariene Milieukunde voor de Zeescheepvaart (HBO), Nederlands Instituut voor Onderzoek der Zee, Texel; Camphuysen C.J. 1999-2003. Marine Pollution Monitoring. Seabirds as indicators of chronic oil pollution. Oral presentation College en prakticum Cursus Mariene Milieukunde voor de Zeescheepvaart (HBO), Nederlands Instituut voor Onderzoek der Zee, Texel.

9. Budget for the international monitoring plan - OILED-GUILLEMOT-EcoQO

An important assumption for the budget presented below is that budgeted costs include only the costs that are necessary for the successful completion of the project: an international combination of data. The costs are on top of national expenses needed to run a beached bird survey with volunteer input (i.e. national responsibility of countries represented at the North Sea Ministers Conference; those that signed the Bergen Declaration)[1].

Main (annual) costs include: overall international co-ordination and an annual report (lead country only, estimated at € 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 is not budgeted here, for this is seen as a national responsibility. It should be stressed that most countries have well established schemes, albeit in different conditions of governmental or NGO funding, so that expensive start-up costs are not expected. When an oil sampling programme is attached, the costs would include materials for sampling, distribution sampling tools and central collection of the samples[2].

Analysis 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. A central laboratory is the most cost-effective solution for this task[2], and as a centre with sufficient expertise, BSH in Hamburg was chosen as an option for the budget below. 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.

1. Overall co-ordination, lead country	**Subtotal**	**Remarks**
Total	13250	p.a.
2. 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	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
3. Chemical analysis of oil and other substances		
*technician	40000	BSH, Hamburg
***supervision of work and reporting	3750	BSH, Hamburg
	43750	

9.1 References

(1) Anonymous 2002. Bergen Declaration. Ministerial declaration Fifth International Conference on the Protection of the North Sea, 20-21 March 2002, Bergen, Norway.

(2) 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.

ANNEX 1

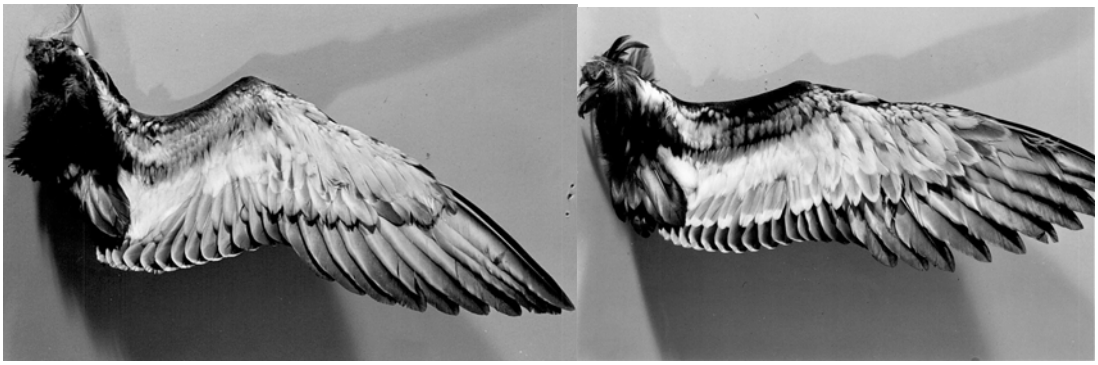
FIELD MANUAL GUILLEMOT – OIL – ECOQO

Uria aalge – Common Guillemot – Guillemot de Troïl – Lomvie – Lomvi – Sillgrissla - Trottellumme - Zeekoet

For each Common Guillemot found dead, the following should be recorded: (1) Date and place, finder (2) Species and age (3) Condition of corpse (4) Presence of oil on the feathers	

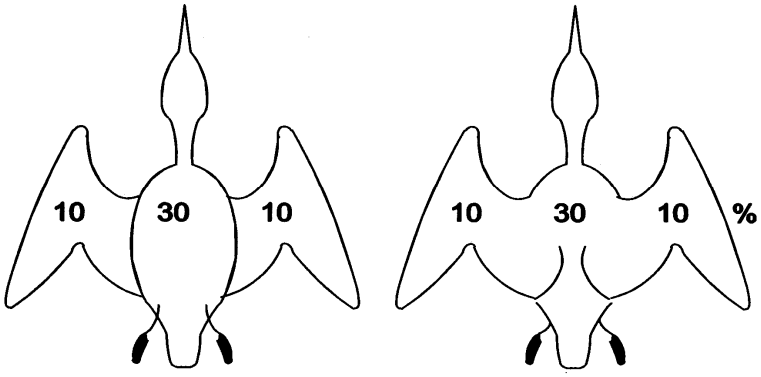
(1) Date and place: Record date and location information as required in the beached bird survey scheme (locations are usually identified as grid reference, lat-long information, name of the beach, or identified transect numbers). Include name of observer and contact address.

(2) Any Common Guillemots found dead should be aged according to the under wing characteristics (white tips on greater under wing coverts). Record birds with no white tips (> 1 year old, "adults") and with white tips (1 year old; "juveniles") separately. In case of doubt (dirty wings or silvery fringes on feathers), do *not* record the age of the bird. Do note that the autumn period may pose difficulties as a result of wing moult. Make sure the scored feathers are indeed greater under-wing coverts (moult is simultaneous, so the entire set may be missing or growing).



Guillemot wings without (left) and with (right) white tips on greater under wing coverts. It is important to inspect the greater secondary coverts (arm of the wing), not the primary coverts (hand of the wing).

(3) Judge each corpse in terms of completeness: are al important parts of the body available for inspection? The bird may be torn apart, but could still be complete. Exclude "wings and breastbone" from the sample (record separately), but do include birds that have been partly scavenged where all or most breast, flank, and belly feathers are still available for inspection.



(4) 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:

Where each side of the body is regarded as 30%, and each wing area as 10% (Σ 100%). Do simplify the result and try to rank each corpse as:

- 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

Oiled - GUILLEMOT - EcoQO RECORD SHEET

COUNTRY □ **N** □ **S** □ **DK** □ **FRG** □ **NL** □ **B** □ **F** □ **UK**

EcoQO SUBREGION

□ Shetland	□ SW Norway	□ Skagerrak
□ E Scotland	□ Orkney	□ Danish west coast
□ NE England	□ S German Bight	□ E German Bight
□ E England	□ E Southern Bight	□ W Wadden Sea
□ W Channel	□ E Channel	□ E Wadden Sea

DATE ……-……-……

SITE ……

KM surveyed ……km

OBSERVER ……

ADDRESS FOR CONTACT ……

TELEPHONE **(Country)……..(city)…….(person)……**

E-MAIL ……@.....

OIL VISIBLE ON BEACHES?

NOTES: ……

[Crucial survey data in top-left box] ……

Guillemots found dead		**Oiling:**		**1%**	**5%**	**10%**	**25%**	**50%**	**75%**	**100%**
State of corpse	Age	**Unoiled**	**Oiled**	specks	slight	moderate	quarter	half	largely	compl
Complete corpses	white tips									
	no white tips									
	unknown									
Complete	**Totals**									
Wing & BBs	white tips									
	no white tips									
	unknown									
Incomplete	**Totals**									