Monitoring and assessment of the proportion of oiled Common Guillemots from beached bird surveys in The Netherlands: update winter 2013/14

C.J. Camphuysen

Zeekoet - *Uria aalge* 2014-01-04 Vlieland - Nieuwe Eendenkooi © Edwin Schuller

Zeekoet - *Uria aalge* 2014-01-04 Brouwersdam © Jeroen Riemens

Zeekoet - *Uria aalge* 2013-12-26 Vlieland © Carl Zuhorn

Zeekoet - *Uria aalge* (adult winterkleed) 2013-12-17 Texel - Veerhaven © Daan Liefhebber

Report commissioned by the Ministry of Infrastructure and the Environment (I&M), RWS Water, Traffic and Living Environment (RWS-WVL) *and* DG Mobility and Transport (DGB)

Royal Netherlands Institute for Sea Research, Texel

Front cover:

Selection of photo's of stranded Common Guillemots from www.waarneming.nl for the period 1 Nov 2013-30 April 2014. The guillemots depicted on the left are oiled, the ones on the right are unoiled.

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Citation:

Camphuysen C.J. (2014). Monitoring and assessment of the proportion of oiled Common Guillemots from beached bird surveys in The Netherlands: update winter 2013/14. NIOZ Internal Report, June 2014. Royal Netherlands Institute for Sea Research, Texel.

Monitoring and assessment of the proportion of oiled Common Guillemots from beached bird surveys in The Netherlands: annual update winter 2013/14

Annual report for the OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic, Meeting the Environment Impacts of Human Activities Committee (EIHA)

Summary

This is the annual update for OSPAR of the beached bird survey (BBS) results in The Netherlands (winter 2013/14). The Dutch BBS provides data for OSPAR area's 8, 9 and 10, but data from Belgian and German colleagues will have to be merged to arrive at the final values for these areas. For the Dutch North Sea region, significant declines in oil rates were reported over a long study period (1977/78-2013/14) as well as (seemingly accelerating) over the last 15 years.

In winter 2013/14, densities of pelagic seabirds washing ashore were very low, despite the very high numbers of auks off the mainland coast in autumn and winter. Some oil incidents (mystery spills, no source known, deduced from stranded seabirds) were recorded at Texel and Vlieland, affecting mostly Common Guillemots, but numbers stranded remained low. As in other years, drowning events were recorded and a sample of about 40 seabirds from a single catch (notably Red-throated Divers and Common Guillemots) were collected for autopsies.

The (Dutch) national oil rate of Common Guillemots in winter 2013/14 amounted to 22.7% (n= 110), which is identical with the five-year running mean over 2009/10-2013/14 (mean ± SD 22.6 ± 11.2%). The Dutch contribution to OSPAR area 8 (mainland coast) arrived at 0% (n= 32), OSPAR area 9 (Wadden Sea islands) at 44.2% (n= 52), and OSPAR area 10 (Wadden Sea area at 7.7% (n= 26). For five other selected offshore species, only two oiled carcasses were reported. But the sample size was usually too small for a meaningful assessment of the oil rate. Only for Herring Gulls *Larus argentatus* sufficient material (i.e. at least 25 intact corpses) was recorded (4% oiled, n= 25).

The latest results (the last decade in particular) suggest an acceleration of the decline in oil rates in Common Guillemots in Dutch waters. Following the long-term dataset (1977/78-present, **Figs. 1-2**), a projection of the national oil rate for Common Guillemots for 2020 would arrive at *c.* 28% (logit -0.41). When using a shorter, more recent data set, in which this perceived steeper decline would be more prominent (1990/91-present), a projection for 2020 would arrive at *c.* 20% (logit -0.61).

Monitoring en vaststelling van het percentage met olie besmeurde Zeekoeten door middel van systematische strandtellingen in Nederland; jaarlijkse rapportage, winter 2013/14

Jaarverslag voor de OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic, Meeting the Environment Impacts of Human Activities Committee (EIHA)

Samenvatting

Dit is de jaarlijkse weergave voor OSPAR van de resultaten van systematische strandtellingen langs de Nederlandse kust, met een verslag over het seizoen 2013/14. Middels deze tellingen verzorgt Nederland haar bijdragen voor de OSPAR deelgebieden 8, 9, en 10. Om een compleet beeld te krijgen voor deze deelgebieden zullen Belgische en Duitse gegevens moeten worden toegevoegd en gecombineerd. In deze rapportage worden de Nederlandse gegevens besproken en voor de Nederlandse Noordzeekust kon de lange termijn afname in oliebevuilingspercentages (1977/78-2013/14) bij de Zeekoeten worden bevestigd. Over de laatste 15 jaren lijkt deze afname zelfs te versnellen.

In de winter van 2013/14 spoelden erg weinig vogels aan, ondanks dat er enorme aantallen alkachtigen voor de kust van het vasteland overwinterden (www.trektellen.nl). Bij enkele kleine olie-incidenten (mysterieuze, vermoedelijk operationele lozingen, geen oorzaak bekend, afgeleid van de gestrande vogels), gerapporteerd van Texel en Vlieland, werden vooral Zeekoeten getroffen, maar de aantallen bleven klein. Net als in de voorgaande jaren werden massale verdrinkingen geconstateerd in vistuig. Een monster van 40 dieren uit één enkele visvangst (vooral Roodkeelduikers en Zeekoeten) werd verzameld voor een inwendige inspectie (autopsie).

Het (Nederlandse) nationale oliebevuilingspercentage van de Zeekoet in de winter van 2013/14 bedroeg 22.7% (n= 110), hetgeen identiek is aan het vijfjaarlijks lopend gemiddelde over 2009/10-2013/14 (gemiddeld ± SD 22.6 ± 11.2%). De Nederlandse bijdrage aan OSPAR gebied 8 (kust vasteland) bedroeg 0% (n= 32), OSPAR gebied 9 (Waddeneilanden) 44.2% (n= 52), en OSPAR gebied 10 (Waddengebied) 7.7% (n= 26). Bij vijf andere geselecteerde zeevogelsoorten werden slechts 2 met olie besmeurde individuen gevonden. Voor de meeste soorten was de steekproef (door het geringe aantal strandingen) te klein om een betekenisvol percentage te berekenen, maar de indruk van een geringe mate van chronische olievervuiling werd hiermee bevestigd. Alleen van de Zilvermeeuw *Larus argentatus* werden juist voldoende complete lijken gevonden (ten minste 25) om een bevuilingspercentage uit te rekenen (4% met olie, n= 25).

De oliebevuilingspercentages lijken de afgelopen Jaren (vooral de afgelopen 10 jaren) steeds sneller af te nemen. Uitgaande van de lange-termijn gegevens voor de Zeekoet (1977/78-tegenwoordig) en de lineaire regressie berekend over de logit-oliebevuilingspercentages in **Fig. 2**, zou het bevuilingspercentage in 2020 uitkomen op ±28% (logit -0.41). Een kortere serie gegevens, bijvoorbeeld over de afgelopen 25 jaren (1990/91-tegenwoordig), zou leiden tot een verwachting voor 2020 van ±20% (logit -0.61).

Introduction

Oil pollution of the seas was recognised 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 (Mörzer Bruijns & Brouwer 1959, Dunnet 1982, 1987). 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. What is currently known as "MARPOL 73/78" Annex I (oil; following the adoption in 1973, and a modification of the protocol in 1978; IMO 1973/78), entered into force on 2 Oct 1983. With the adoption of a further amendment in 1997, the North Sea and its approaches (the Irish Sea, the Celtic Sea, the English Channel 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 North Sea Ministers subsequently agreed to monitor spatial and temporal trends in oil pollution on a North Sea scale through their Ecological Quality Objectives (EcoQOs; Bergen Declaration, March 2002, Anon. 2002, 2012, 2014).

It was proposed that the effectiveness of measures against (chronic) oil pollution, and of any temporal and spatial trends existing and developing in past and current levels of chronic oil pollution could be effectively monitored through beached bird surveys: counts of stranded seabirds on North Sea coasts, coupled with the assessment of oil rates (proportion of birds oiled; Furness & Camphuysen 1997, Camphuysen & Heubeck 2001). Species-specific oil rates were assumed to reflect the risk for various species of marine birds to become oiled at sea. Indeed, high oil rates are characteristic for seabirds that are particularly common in areas with frequent oil spills; lower oil rates were found in birds wintering away from the busiest shipping lanes (Furness & Camphuysen 1997, Camphuysen 2010). Common Guillemots, abundant and widespread seabirds in NW European waters, were particularly useful in this context. By monitoring the occurrence of oil on carcasses of guillemots washing ashore around Europe, spatial and temporal trends in chronic oil pollution could be derived over large geographical scales.

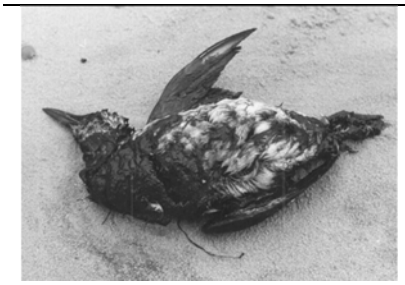
The information need for the monitoring and assessment of oil fouling of seabirds, in particular the Common Guilemot, was first established in the OSPAR organization in the form of an OSPAR Ecological Quality Objective (EcoQO). The Marine Strategy Framework Directive demands in the Commission Decision of 2010, Chapter 8.2, Effects of contaminants, an indicator for oil pollution (EU 2010). In the legal Dutch Kader Richtlijn Marien document, page 78 Vervuilende stoffen (Anon, 2012)., the Oiled Guillemot EcoQO indicator is explicitly implemented. In the EcoQOs for the North Sea, "the Proportion of oiled Common Guillemots among those found dead or dying on beaches" was subsequently listed Under Issue 4 (Seabirds), EcoQO element (f). The "Oiled Guillemot 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"* (Anon. 2002). In spring 2004, ICES WGSE suggested that

the "Oiled Guillemot 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. This was later refined to target mean proportions of 20% in 2020 and 10% in 2030 over periods of at least 5 years (Anon. 2012).

The present document is the annual update for The Netherlands for winter 2013/14. All data collected since winter 1997/78 are incorporated in this report. Oil-rates (% oiled) of Common Guillemots are provided for the Dutch North Sea coast as a whole (monitoring an area of 299 km in length), and for the Dutch contributions to OSPAR areas 8 (238 km), 9 (61 km), and 10 (299 km; see Methods). Raw data are provided in Appendices and an analysis of recent trends is provided in the Results section of this report.

A recent study in The Netherlands (Camphuysen 2010) showed that declines in oil rates were more pronounced in coastal birds than in offshore species (such as Common Guillemots), and these trends were consistent with tendencies to police nearshore waters more effectively than offshore waters. Therefore, while the emphasis of this project is on Common Guillemots, similar data are provided on five other species: two further offshore seabirds (the Black-legged Kittiwake *Rissa tridactyla* and the Razorbill *Alca torda*) and three inshore or more coastal species (Herring Gull *Larus argentatus*, Common Eider *Somateria mollissima*, and Common Scoter *Melanitta nigra*). All six species are illustrated below:

Selected offshore seabirds



Common Guillemot
Uria aalge

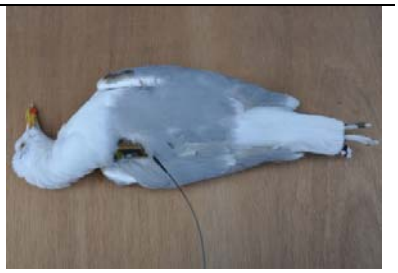
Razorbill
Alca torda

Black-legged Kittiwake
Rissa tridactyla

Selected nearshore or coastal seabirds

Common Eider
Somateria mollissima

Common Scoter
Melanitta nigra



Herring Gull
Larus argentatus

Methods

There are several techniques to evaluate spatial and temporal trends in chronic oil pollution. In case of the "Oiled Guillemot EcoQO", however, the significance of chronic oil pollution in particular sea areas is assessed by means of beached bird surveys, in which stranded dead or dying seabirds (notably Common Guillemots) are checked for the presence or absence of mineral oil in their feathers (Camphuysen & Heubeck 2001). Surveys are conducted in winter (Nov-Apr), when the effects of chronic oil pollution are most pronounced and when (illegal) discharges at sea under cover of darkness (*i.e.* at night) are frequent (Vollaard 2013). Stranded seabirds are identified, aged if possible, and the carcass is examined for the presence of oil in the feathers. Other evident causes of death are recorded simultaneously and in case of mass strandings, a special investigation is organised in order to try and explain the event. The "Oiled Guillemot EcoQO" uses ratios (the proportion of birds oiled from the total number of birds found) rather than absolute numbers of birds washing ashore.

In order to evaluate trends in oil rates as described in earlier proposals (Camphuysen 2002, 2004, OSPAR 2004, Camphuysen 2005ab, OSPAR 2005), all incomplete carcasses were excluded from the analysis of beached bird survey results (the presence or absence of oil in the feathers cannot reliably be studied in incomplete remains of birds). The remainder (nTotal) was split in fractions of unoiled (nUnoiled) and oiled (nOiled) individuals. Only substances that were visually classified as mineral oil were considered here. An acceptable oil rate (nOiled/nTotal*100) is based on at least 25 complete carcasses of stranded seabirds per annum per area (i.e. quality code 01, see Appendices) and is otherwise considered 'unreliable' (quality code 00). Annual winter values (% oiled) are provided in bar graphs, with a running (arithmetic) mean calculated over five-year periods (i.e. the mean of five annual values preceding and including a particular value), superimposed with a line graph to illustrate the most recent trends. Lower quality assessments (00, percentages based on less than 25 complete carcasses) are indicated with a lighter shading. To facilitate a trend analysis by means of linear regression, the oil-rates were logit-transformed in order to obtain normalised data distributions, following recommendations in Camphuysen & Van der Meer 1996 (=LOG((x/100)/(1-(x/100))); see also Camphuysen 1995, 1997). For this part of the analysis, lower quality data (quality code 00) were excluded.

The Dutch beached bird surveys contribute to three OSPAR areas, but additional data are required from neighboring countries in each case:

OSPAR 8 → Eastern Southern Bight mainland coast Belgian/French border to Texel (B, NL)

OSPAR 9 →Southern German Bight North Sea coast Frisian Islands Texel to Elbe (NL, FRG)

OSPAR 10 → Western Wadden Sea mainland and Wadden Sea coast Frisian Islands Texel to Elbe (NL, FRG)

The NZG/NSO beached bird survey monitoring of these areas consists of 93 discrete sections of coast over 598 km (OSPAR area 8, 38 sections, 238km; area 9, 11 sections, 61km; and area 10,

44 sections, 299 km). Half that area consists of coastline bordering the North Sea, the other half borders the western Wadden Sea (*i.e.* more sheltered waters with particularly intense controls of the occurrence of marine pollution). A "national value" of oil rates is provided by lumping all censuses conducted along the North Sea coast (*i.e.* a combination of the Dutch contributions to OSPAR areas 8 and 9).

Observer effort

Since winter 1977/1978, beached bird surveys have been organised by the Dutch Seabird group. Effort peaked in the 1980s, as a result of the enormous numbers of oiled seabirds washing ashore. Over the last 10 years, (arithmetic) mean (± SD) observer effort amounted to 897 ± 309 km per winter. As in 2012/13, effort in 2013/14 was higher, but still relatively low, as a result of very low numbers of birds washing ashore (**Appendix 1**). In this season, no less than 30 counts were received during which not a single bird was found. It is difficult to activate volunteers for beached bird surveys if the rewards (finds) are low. Therefore, data were added from www.waarneming,nl, to compensate for the low observer effort, in order to obtain sufficient data for analysis, and to achieve a wider coverage over the entire Dutch coast. The people reporting their finds in waarneming.nl were all acknowledged and the presence of oil was judged from published photographic material. For Common Guillemots, however, the obtained data from the systematic surveys were in fact sufficient to calculate reliable oil rates, but the waarneming.nl material certainly enhanced the area coverage and the sample size. A further decline in observer effort must be avoided, however. An attempt to recruit new volunteers would possibly help.

I am very grateful to the following observers that have provided information on stranded seabirds in 2013/14: L Anema, W Appels, F Arts, A Balk, C Beeke, N Bekema, S van den Berg-Blok, H de Blauwe, J de Boer, T de Boer, K Boers, R Bom, J Bosch, N Bosch, EWF Brandenburg, J Brandjes, I Bro, F Bruinsma, CJ Camphuysen, MK Camphuysen, P Cools, A Dijksen, V Douwes, M Eerkes, P van Eik, D Eykemans, JA van Franeker, PR van Franeker, W van Gelder, MJ van Gestel-Burman, J Gorissen, P Gorissen, A de Graaf, P Gravestein, A Groenenberg, A Gronert, A Hegeman, C Hoff, J ten Horn, P van Horssen, J Huizinga, K de Jong, L Kelder, A van der Kloet, M Klootwijk, M Knijnsberg, K Kooimans, S Kühn, B Lamers, D Lautenbag, MF Leopold, D Liefhebber, E Marijs, T Näring, R van Ouwerkerk, CJM Philippart, A Piek, S Prins, J Riemens, P Schaft, T Schipper, E Schuller, I Schuller, N Shillcock, E Soldaat, T van Spanje, L Swiers, J Tamminga, T Vandaudenard, D Veenendaal, L Verboom, R van der Vliet, B Voogt, M Zomer, C Zuhorn en J van Zwol.

Results

Birds found dead – Overall densities in winter 2013/14 were the lowest on record over the past 4 decades (**Fig. 1**). The severe storms that occurred washed away material rather than that new corpses washed ashore and the extremely mild winter made even rather weak waterbirds and seabirds survive.

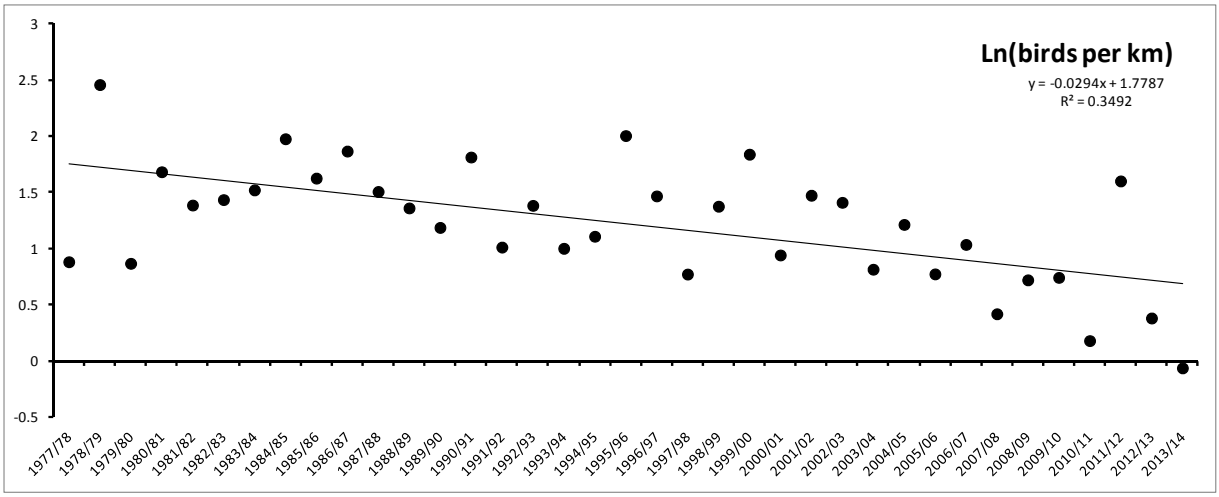


Fig. 1. *Long-term trends in densities of birds (n per km of beach surveyed on a ln scale; all species combined in all surveyed subregions) washing ashore in The Netherlands ranged from a maximum of 11.7 birds km^{-1} in the severe of winter 1978/79 to a minimum of 0.94 birds km^{-1} in winter 2013/14 → an all time low number!*

In all 522 carcasses representing 39 species of birds, four species of mammals, a squid and a shark were recorded during these most recent censuses (**Appendix 2**). In the top-10, most of the species featuring in the present report are represented:

Top 10 most numerous species	***Scientific name***	**Dutch name**	**Total**	**Rank**
Common Eider	*Somateria mollissima*	Eidereend	127	1
Common Guillemot	*Uria aalge*	Zeekoet	127	2
Herring Gull	*Larus argentatus*	Zilvermeeuw	45	3
Black-legged Kittiwake	*Rissa tridactyla*	Drieteenmeeuw	21	4
Razorbill	*Alca torda*	Alk	21	5
Eurasian Oystercatcher	*Haematopus ostralegus*	Scholekster	17	6
Harbour Porpoise	*Phocoena phocoena*	Bruinvis	15	7
Common Shelduck	*Tadorna tadorna*	Bergeend	14	8
Mew Gull	*Larus canus*	Stormmeeuw	14	9
Black Scoter	*Melanitta nigra*	Zwarte Zeeëend	15	10

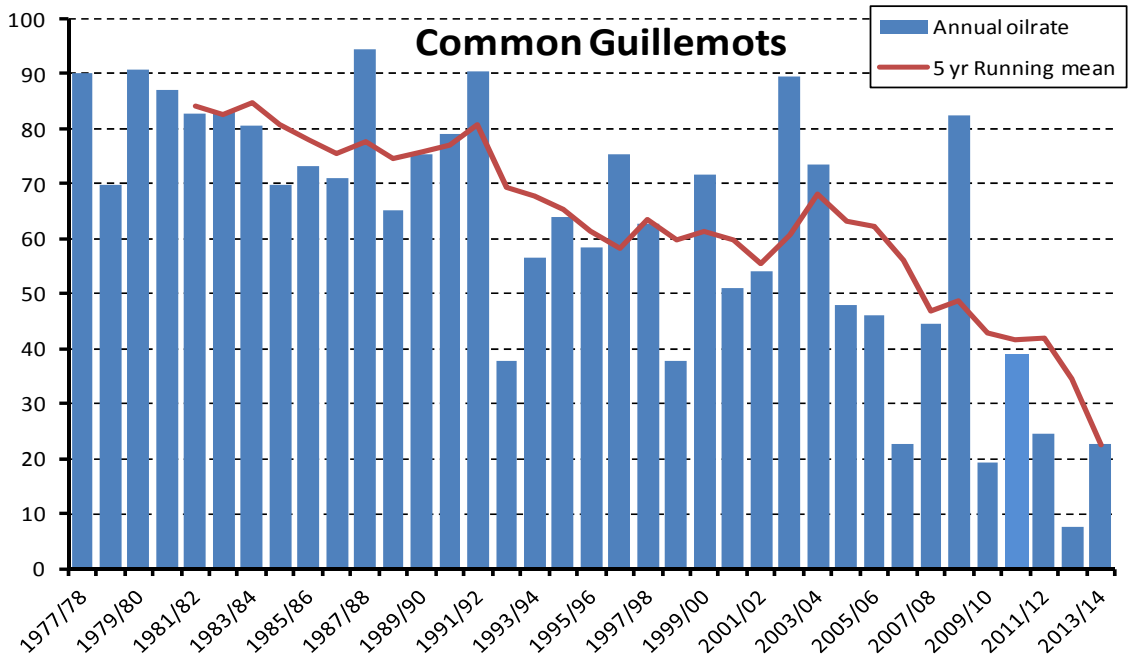


Fig. 2. *Annual oil rates in Common Guillemots (n >25 complete carcasses) in The Netherlands (OSPAR areas 8, 9 and 10) and 5yr running arithmetic mean oil rates since 1977/78. See Fig. 3 for the overall trend in oil rates.* ***Note: to conduct a trend analysis, these values were logit-transformed in Fig. 3.***

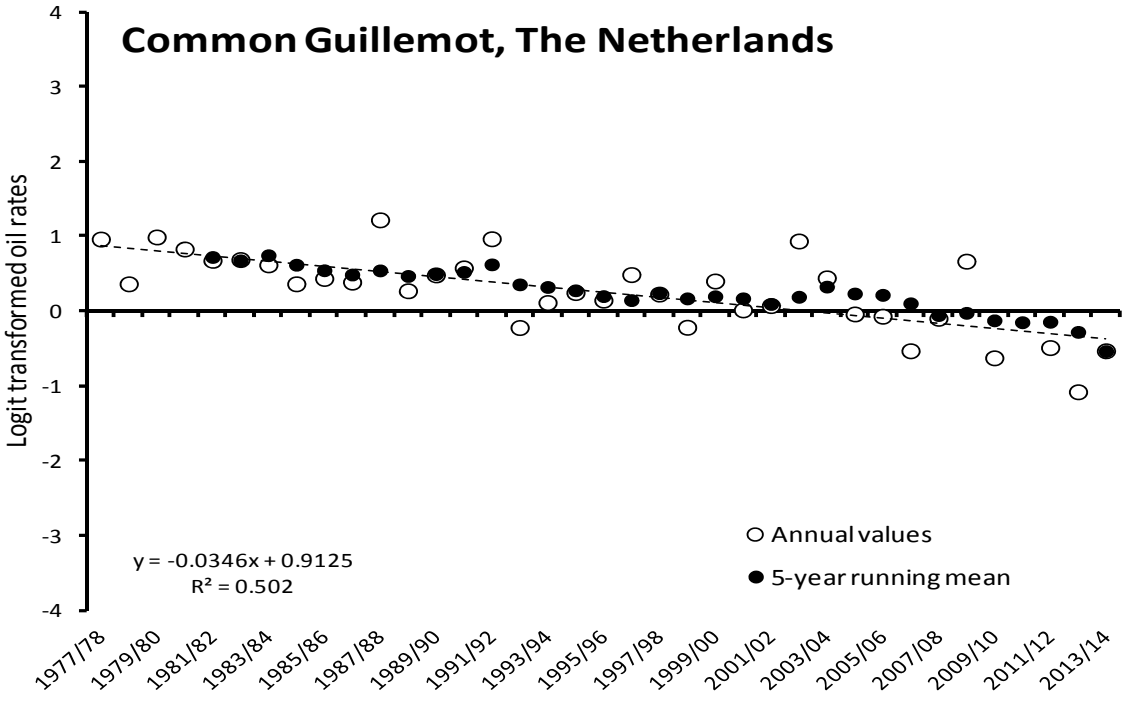


Fig. 3. *Logit-transformed annual oil rates in Common Guillemots (n >25 complete carcasses) in The Netherlands (OSPAR areas 8, 9 and 10) and 5-year running (arithmetic) mean oil rates since the late 1970s. A linear regression was calculated over the annual values since the late 1970s (dashed line; P< 0.001). Linear trend logit-transformed annual values 1997/98-2012/13, P<0.05 (Table 1). For 2013/14, the five-year running mean equalled the value for that season.*

Oil rates in Common Guillemots - The annual oil rate in Common Guillemots along the North Sea coast declined steadily, and significantly since the late 1970s (**Fig. 2**). Along the North Sea coast of The Netherlands as a whole, in line with numerous earlier reports, a significant decline in oil rates could be demonstrated (**Fig. 3**). In winter 2013/14 the national oil rate arrived at a slightly higher proportion 22.7% (n= 110) rather than the exceptionally low value over 2012/13 (8%; n= 54), mainly as a result of some casualties reported on Texel and Vlieland. Since winter 2008/9 oil rates of <25% along the North Sea coast have now been observed four times. The five-year running (arithmetic) mean arrived at an all time low of 22.6 ± 11.2% (**Appendix 2**). Declining oil rates were found in all three OSPAR regions covered by Dutch surveys (**Figs 4-6**).

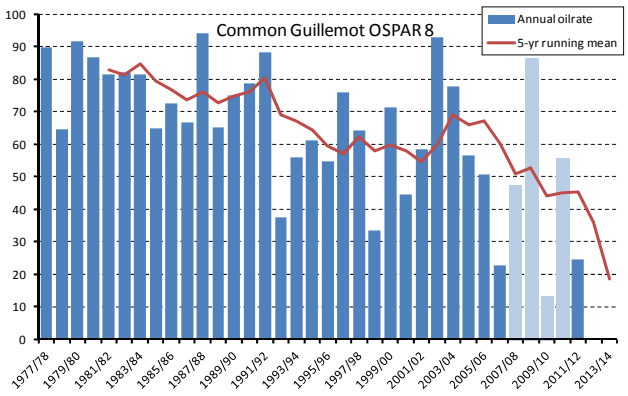


Fig. 4. *Annual oil rates in Common Guillemots (n >25 complete carcasses) in OSPAR area 8 (***Eastern Southern Bight mainland coast** *Dutch contribution only) and 5-year running (arithmetic) mean oil rates since the late 1970s. The quality of the assessments over 2007/08-2010/11 (but not 2012/13-13/14!) is low due to low sample size. No oiled birds in 2012/13 and 2013/14.*

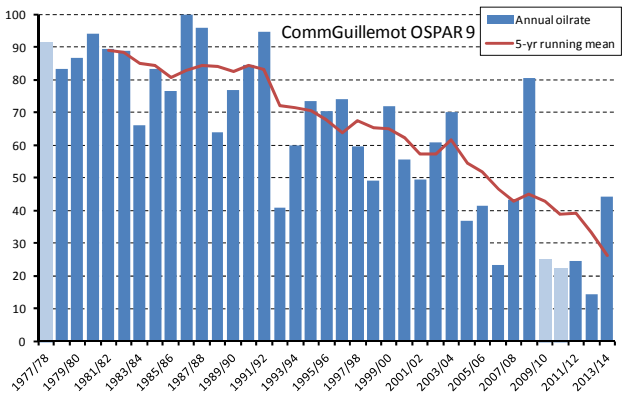


Fig. 5. *Annual oil rates in Common Guillemots (n >25 complete carcasses) in OSPAR area 9 (***Southern German Bight** *Dutch contribution only) and 5-year running (arithmetic) mean oil rates since the late 1970s. The quality of the assessment over 2009/10-2010/11 is low due to low sample size.*

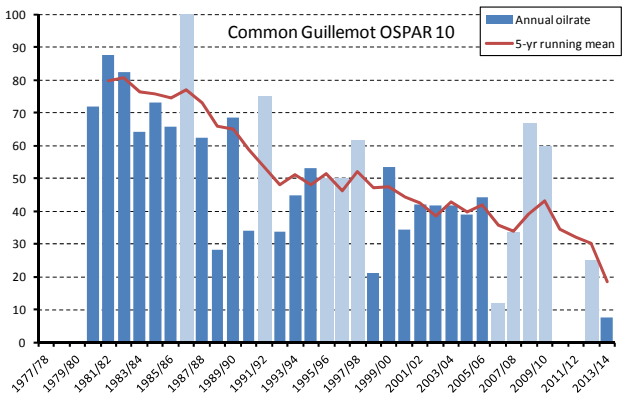


Fig. 6. *Annual oil rates in Common Guillemots (n >25 complete carcasses) in OSPAR area 10 (***Western Wadden Sea** *Dutch contribution only) and 5-year running (arithmetic) mean oil rates since the late 1970s. The quality of the assessments over many years (but not 2013/14) is low due to low sample size.*

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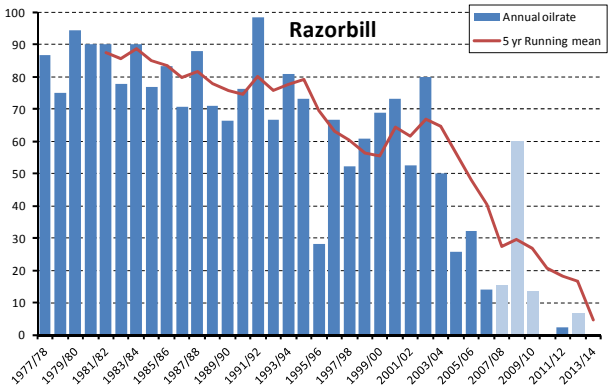

Fig. 7. *Annual oil rates in Razorbills (n >25 complete carcasses) in The Netherlands and 5-year running (arithmetic) mean oil rates since the late 1970s. See Appendix 7 for the quality of values. Sample size in 2013/14 (0% oiled, n= 19) was too low for an accurate estimate of oil rates.*

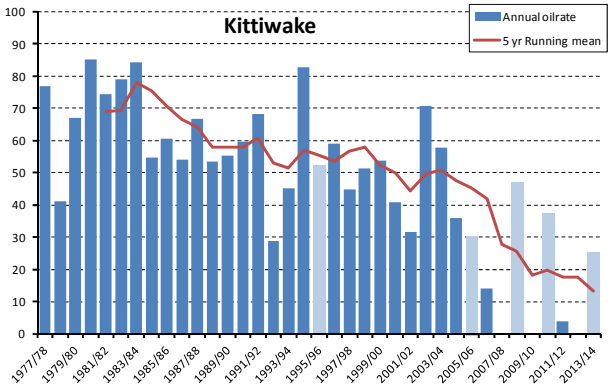

Fig. 8. *Annual oil rates in Black-legged Kittiwakes (n >25 complete carcasses) in The Netherlands and 5-year running (arithmetic) mean oil rates since the late 1970s. See Appendix 8 for the quality of values.*

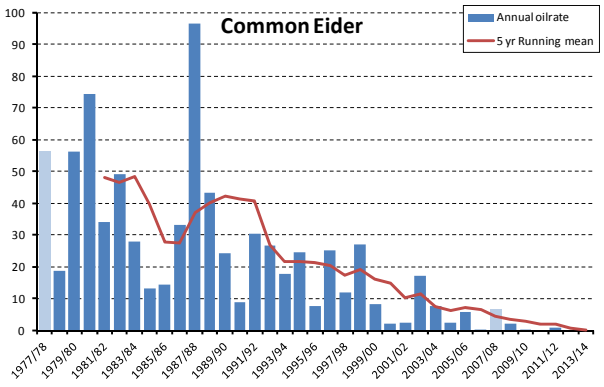

Fig. 9. *Annual oil rates in Common Eiders (n >25 complete carcasses) in The Netherlands and 5-year running (arithmetic) mean oil rates since the late 1970s. See Appendix 9 for the quality of values.*

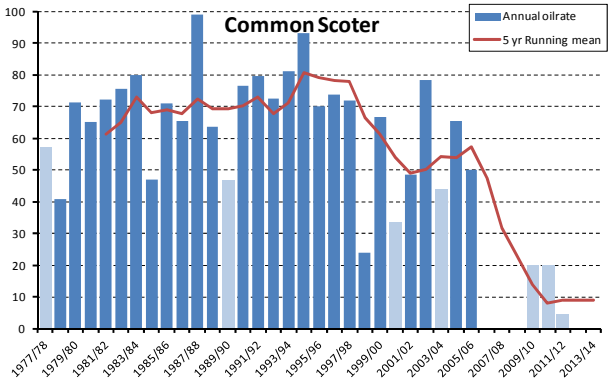

Fig. 10. *Annual oil rates in Common Scoters (n >25 complete carcasses) in The Netherlands and 5-year running (arithmetic) mean oil rates since the late 1970s. See Appendix 10 for the quality of values.*

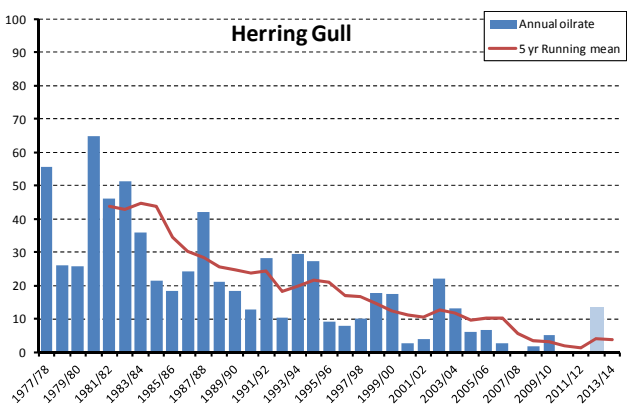

Fig. 11. *Annual oil rates in Herring Gulls (n >25 complete carcasses) in The Netherlands and 5-year running (arithmetic) mean oil rates since the late 1970s. See Appendix 11 for the quality of values.*

Oil rates in other offshore seabirds - The other offshore seabirds are characterised by similar trends (**Figs 7-8**), but the numbers washing ashore are more variable as a result of food-related or storm-driven mass-mortalities and associated wrecks. The most recent wrecks occurred in winter 2011/12, resulting in reliable but also spectacularly low oil rates. It is this kind of mortality events that oil rates are artificially lowered and should be treated with caution.

Oil rates in nearshore seabirds - The long-term trends of the coastal species Common Eiders (**Fig. 9**) and Herring Gulls (**Fig. 11**) are similar or declines are even steeper. Oiled carcasses are currently rather rare, even along the North Sea coast, indicating an even more pronounced decline in oil rates than in offshore seabirds. Remarkably, the oil rates of the more gregarious Common Scoters (**Fig. 10**) did not decline, until rather recently. The decline coincided with a marked decline in overall numbers washing ashore, and seawatchers confirmed that Common Scoters today are scarce in comparison with the 1970s-90s (Camphuysen & Van Dijk 1983, Platteeuw *et al.* 1994, www.trektellen.nl).

Table 1. *Recent trends based on logit transformed oil rates over winters 1997/98 - 2013/14 for Common Guillemots (Uria), Black-legged Kittiwakes (Rissa), Razorbills (Alca), Herring Gulls (Larus), Common Scoters (Melan), and Common Eiders (Somat), for the Dutch North Sea coast as a whole (Nat) and for OSPAR areas 8 and 9 (Dutch contributions only). The significance of the trends is indicated below (P>0.05 is considered non-significant).*

	***Uria* Nat**	***Uria* area 8**	***Uria* area 9**	***Rissa* Nat**	***Alca* Nat**	***Larus* Nat**	***Melan* Nat**	***Somat* Nat**
a=	0.47	0.38	0.30	0.34	0.70	-0.43	0.01	-0.43
b=	-0.06	-0.05	-0.04	-0.09	-0.13	-0.13	0.01	-0.19
r^2=	0.34	0.14	0.33	0.60	0.72	0.35	0.01	0.38
rms	0.19	0.24	0.10	0.10	0.12	0.81	0.14	1.20
se b=	0.02	0.04	0.02	0.03	0.03	0.05	0.05	0.07
t=	-2.67	-1.14	-2.75	-3.68	-4.85	-2.46	0.26	-2.58
n=	16	10	17	11	11	13	9	13
	P<0.05	P>0.05	P<0.01	P<0.01	P<0.01	P<0.01	P>0.05	P<0.05

Recent trends - The long-term trends are evident declines in oil rates in all species, perhaps with the exception of Common Scoters in which the results were more ambiguous. Recent trends

in each of these species, calculated over logit-transformed oil rates for the Netherlands North Sea coast as a whole (Dutch contributions to OSPAR 8 and 9 combined), are provided in **Table 1**. Significant results were again all consistent declines in oil rates.

Discussion and conclusion

In winter 2013/14, very few seabirds washed ashore and oil rates were generally extremely low (**Fig. 1**). A national value for the Common Guillemot (North Sea coast only, Dutch contributions to OSPAR areas 8 and 9 combined) arrived at a rather higher value than in the previous season, apparently as a result of some illegal spills off the Wadden Sea islands (mystery spills, no source known, deduced from stranded seabirds, recorded at Texel and Vlieland, affecting mostly Common Guillemots).

The 5-year running (arithmetic) mean oil rate in Common Guillemots arrived at 22.6 ± 11.2% (**Fig. 2**). The latest results (last decade) suggest an acceleration of the decline in oil rates. Following the long-term dataset (1977/78-present, **Figs. 1-2**), a projection for 2020 would arrive at a national oil rate for Common Guillemots of *c.* 28% (logit -0.41). When using a shorter, more recent data set, in which this perceived steeper decline would be more prominent (1990/91-present), however, a projection for 2020 would arrive at *c.* 20% (logit -0.61).

Oil rates were very low in all other birds studied during beached bird surveys in this season. Only two oiled carcasses were reported: a single Black-legged Kittiwake *Rissa tridactyla* and a Herring Gull *Larus argentatus.* The high numbers of divers (Gaviidae), scoters (*Melanitta*) and even the thousands of Common Guillemots wintering off the mainland coast in winter 2013/14 (see below) did not suffer from oil pollution in any noticeable extend. As in other years, drowning events were recorded and a sample of about 40 seabirds from a single catch (notably Red-throated Divers and Common Guillemots) were collected for autopsies.

Severe storms in autumn 2013 and in winter 2013/14 led to unprecedented seabird wrecks in the UK, in the Bay of Biscay and off the coast of NW Spain and Portugal, affecting mainly Atlantic Puffins *Fratercula arctica* www.bto.org/news-events/press-releases/british-puffins-caught-biscay-storms, but also other auks and for example Black-legged Kittiwakes. This period was also characterised by prolonged periods of westerly winds in The Netherlands, but seabird densities remained very low, suggesting that wintering numbers of seabirds may have been low. In fact, very high numbers of auks occurred along the mainland coast in Dec 2013-Jan 2014, but few birds washed ashore. The absence of any mass mortalities and wrecks makes the current figures quite reliable estimates of the risk to become contaminated with oil (cf. Camphuysen 1995) and the results strongly suggest that chronic oil pollution is gradually disappearing as an issue in Dutch waters.

Seabird densities in winter 2011/12 were so high that volunteers were easy to stimulate and readily set out (in numbers!) to search for dead birds. In 2012/13 and again in 2013/14, numbers of seabirds were so low, that many of them refrained from searching systematically.

More opportunistic reports from www.waarneming.nl, after screening for double counts and identification errors, were successfully used to enhance the sample size of stranded Common Guillemots. Fox predation and the more and more frequent 'sand suppletions' are issues that hinder regular beached bird surveys in various ways. Foxes scavenge and remove corpses, so that intact material (fit for inspection for oil) rapidly turn into scavenged remains (no longer fit for the assessment of oiling). This problem is well known in many countries, but relatively new for The Netherlands. The data are affected in a sense that fewer corpses are available for inspection, but the oil-rate (i.e. the value of interest) is not expected to be influenced by the removal and more rapid decay of carcasses. Sand suppletions make substantial sectors of coastline (at least temporarily) inaccessible and beach-washed carcasses may be covered under sand. Both factors hinder assessments of total numbers washing ashore (corpse counts), but are not expected to negatively affect the oil rate, the value desired by OSPAR for the oiled-seabird (Guillemot) ECOQo.

The Dutch data collected for OSPAR regions 8 and 9 must be seen as contributions to the data set. An international co-ordinator, or OSPAR itself, will have to combine Dutch, Belgian and German data for these areas in order to arrive at OSPAR area specific oil rates for Common Guillemots in the southeastern North Sea. There is no doubt that similar trends will be revealed as presented in the current document for the Dutch area as a whole.

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Appendix 1 Observer effort

Kilometer surveyed in beached bird surveys in The Netherlands, winter 1977/78-2013/14. The data for the North Sea include surveys along the North Sea coast (combining Dutch contributions to OSPAR areas 8-9; see Methods). Total effort is the sum for all three contributions (OSPAR areas 8-10).

	North Sea	OSPAR 8	OSPAR 9	OSPAR 10	Total effort (8-10)
1977/78	396.5	356.0	40.5	7.0	403.5
1978/79	527.7	473.2	54.5	3.0	530.7
1979/80	644.3	594.7	49.6	3.0	647.3
1980/81	1647.0	1492.9	154.1	302.0	1949.0
1981/82	1322.1	1176.6	145.5	527.5	1849.6
1982/83	2051.0	1846.0	205.0	748.8	2799.8
1983/84	1606.0	1341.5	264.5	565.6	2171.6
1984/85	1266.8	1133.3	133.5	424.0	1690.8
1985/86	1118.5	1023.0	95.5	470.0	1588.5
1986/87	774.5	708.0	66.5	444.0	1218.5
1987/88	947.2	835.2	112.0	509.4	1456.6
1988/89	1029.4	951.4	78.0	432.7	1462.1
1989/90	1185.3	1062.8	122.5	290.5	1475.8
1990/91	1243.3	1190.8	52.5	123.0	1366.3
1991/92	883.2	806.7	76.5	265.5	1148.7
1992/93	733.3	678.3	55.0	375.5	1108.8
1993/94	588.0	522.5	65.5	482.0	1070.0
1994/95	393.2	335.3	57.9	481.3	874.5
1995/96	568.2	482.2	86.0	328.0	896.2
1996/97	435.8	381.8	54.0	352.5	788.3
1997/98	473.5	377.8	95.7	408.0	881.5
1998/99	1036.2	772.0	264.2	698.5	1734.6
1999/00	988.8	646.7	342.1	904.7	1893.5
2000/01	904.1	450.3	453.8	690.2	1594.3
2001/02	986.6	496.9	489.7	935.5	1922.0
2002/03	1177.6	805.3	372.3	599.6	1777.2
2003/04	678.8	370.0	308.9	516.1	1195.0
2004/05	599.6	284.8	314.8	772.0	1371.6
2005/06	528.9	253.4	275.5	582.6	1111.5
2006/07	569.1	300.7	268.4	515.1	1084.1
2007/08	397.9	231.9	166.0	493.9	891.8
2008/09	470.9	238.9	232.0	361.2	832.1
2009/10	361.6	225.1	136.5	229.8	591.4
2010/11	396.7	276.9	119.8	141.0	537.7
2011/12	538.9	301.6	237.3	405.7	944.6
2012/13	265.7	197.0	68.7	147.3	413.0
2013/14	370.7	231.3	139.4	128.2	498.9

Appendix 2 Species found, winter 2013/14

Species	Nederlandse naam	*Scientific name*	Total
No birds found dead		Geen vogels gevonden	30x
Red-throated Diver	Roodkeelduiker	*Gavia stellata*	5
Great Crested Grebe	Fuut	*Podiceps cristatus*	1
Northern Fulmar	Noordse Stormvogel	*Fulmarus glacialis*	4
Northern Gannet	Jan van Gent	*Sula bassana*	9
Great Cormorant	Aalscholver	*Phalacrocorax carbo*	1
European Shag	Kuifaalscholver	*Phalacrocorax aristotelis*	1
Greylag Goose	Grauwe Gans	*Anser anser*	1
Brent Goose	Rotgans	*Branta bernicla*	2
Common Shelduck	Bergeend	*Tadorna tadorna*	14
Eurasian Wigeon	Smient	*Anas penelope*	1
EurasianTeal	Wintertaling	*Anas crecca*	1
Northern Pintail	Pijlstaart	*Anas acuta*	2
Tufted Duck	Kuifeend	*Aythya fuligula*	1
Common Eider	Eidereend	*Somateria mollissima*	127
Black Scoter	Zwarte Zeeëend	*Melanitta nigra*	11
Red-breasted Merganser	Middelste Zaagbek	*Mergus serrator*	1
Common Pheasant	Fazant	*Phasianus colchicus*	4
Eurasian Oystercatcher	Scholekster	*Haematopus ostralegus*	17
Grey Plover	Zilverplevier	*Pluvialis squatarola*	1
Red Knot	Kanoetstrandloper	*Calidris canutus*	2
Dunlin	Bonte Strandloper	*Calidris alpina*	3
unidentified sandpiper	ongedeterm. strandloper	*Calidris spec.*	1
Eurasian Woodcock	Houtsnip	*Scolopax rusticola*	9
Whimbrel	Regenwulp	*Numenius phaeopus*	1
Eurasian Curlew	Wulp	*Numenius arquata*	2
Great Skua	Grote Jager	*Stercorarius skua*	4
Black-headed Gull	Kokmeeuw	*Chroicocephalus ridibundus*	11
Mew Gull	Stormmeeuw	*Larus canus*	14
Lesser Black-backed Gull	Kleine Mantelmeeuw	*Larus fuscus*	6
Herring Gull	Zilvermeeuw	*Larus argentatus*	45
Great Black-backed Gull	Grote Mantelmeeuw	*Larus marinus*	11
Black-legged Kittiwake	Drieteenmeeuw	*Rissa tridactyla*	21
Common Guillemot	Zeekoet	*Uria aalge*	127
Common Guillemot / Razorbill	Alk / Zeekoet	*Alca torda / Uria aalge*	1
Razorbill	Alk	*Alca torda*	21
Atlantic Puffin	Papegaaiduiker	*Fratercula arctica*	1
domestic pigeon	Postduif	*Columba 'domestica'*	2
Common Blackbird	Merel	*Turdus merula*	1
Fieldfare	Kramsvogel	*Turdus pilaris*	2
Eurasian Jackdaw	Kauw	*Corvus monedula*	1
Common Starling	Spreeuw	*Sturnus vulgaris*	5
Harbour Porpoise	Bruinvis	*Phocoena phocoena*	15
Grey Seal	Grijze Zeehond	*Halichoerus grypus*	1
Common Seal	Gewone Zeehond	*Phoca vitulina*	8
Small-spotted Catshark	Hondshaai	*Scyliorhinus canicula*	1
Common Cuttlefish	Zeekat	*Sepia officinalis*	1
Rabbit	Konijn	*Oryctolagus cuniculus*	1

Appendix 3 Common Guillemot *Uria aalge*

Oil rates of Common Guillemots in The Netherlands, winter 1977/78-2013/14. The National survey combines all surveys along the North Sea coast (Dutch contributions to OSPAR 8 and 9).

In all tables: Qual (Quality code) 01 = sufficiently large samples, 00= (too) small samples

National			Oil rates			Logit transformed
Winter	nOiled	nTotal	Annual	Qual	5yr mean	Annual oil rates
1977/78	101	112	90.2	01		0.96
1978/79	118	169	69.8	01		0.36
1979/80	137	151	90.7	01		0.99
1980/81	2978	3419	87.1	01		0.83
1981/82	695	841	82.6	01	84.1	0.68
1982/83	2511	3025	83.0	01	82.7	0.69
1983/84	1490	1849	80.6	01	84.8	0.62
1984/85	963	1379	69.8	01	80.6	0.36
1985/86	734	1003	73.2	01	77.8	0.44
1986/87	117	165	70.9	01	75.5	0.39
1987/88	1278	1355	94.3	01	77.8	1.22
1988/89	971	1491	65.1	01	74.7	0.27
1989/90	1105	1468	75.3	01	75.8	0.48
1990/91	1683	2129	79.1	01	76.9	0.58
1991/92	695	770	90.3	01	80.8	0.97
1992/93	358	952	37.6	01	69.5	-0.22
1993/94	407	720	56.5	01	67.7	0.11
1994/95	228	357	63.9	01	65.5	0.25
1995/96	91	156	58.3	01	61.3	0.15
1996/97	160	212	75.5	01	58.4	0.49
1997/98	275	438	62.8	01	63.4	0.23
1998/99	713	1888	37.8	01	59.6	-0.22
1999/00	745	1040	71.6	01	61.2	0.40
2000/01	141	277	50.9	01	59.7	0.02
2001/02	374	690	54.2	01	55.5	0.07
2002/03	2047	2284	89.6	01	60.8	0.94
2003/04	239	325	73.5	01	68.0	0.44
2004/05	247	517	47.8	01	63.2	-0.04
2005/06	81	176	46.0	01	62.2	-0.07
2006/07	135	593	22.8	01	55.9	-0.53
2007/08	28	63	44.4	01	46.9	-0.10
2008/09	65	79	82.3	01	48.7	0.67
2009/10	9	47	19.1	01	42.9	-0.63
2010/11	7	18	38.9	00	41.5	
2011/12	53	216	24.5	01	41.9	-0.49
2012/13	4	52	7.7	01	34.5	-1.08
2013/14	25	110	22.7	01	22.6	-0.53

Appendix 4 Common Guillemot *Uria aalge* – OSPAR area 8

Oil rates of Common Guillemots in The Netherlands, winter 1977/78-2013/14. Surveys along the North Sea coast of the mainland (Dutch contributions to OSPAR 8).

OSPAR 8			Oil rates			Logit transformed
Winter	nOiled	nTotal	Annual	Qual	5yr mean	Annual oil rates
1977/78	79	88	89.8	01		0.94
1978/79	78	121	64.5	01		0.26
1979/80	111	121	91.7	01		1.05
1980/81	2766	3194	86.6	01		0.81
1981/82	586	719	81.5	01	82.8	0.64
1982/83	2184	2657	82.2	01	81.3	0.66
1983/84	1420	1743	81.5	01	84.7	0.64
1984/85	659	1014	65.0	01	79.4	0.27
1985/86	629	866	72.6	01	76.6	0.42
1986/87	96	144	66.7	01	73.6	0.30
1987/88	1131	1202	94.1	01	76.0	1.20
1988/89	893	1369	65.2	01	72.7	0.27
1989/90	1006	1339	75.1	01	74.8	0.48
1990/91	1562	1986	78.7	01	76.0	0.57
1991/92	464	526	88.2	01	80.3	0.87
1992/93	329	881	37.3	01	68.9	-0.22
1993/94	340	608	55.9	01	67.1	0.10
1994/95	170	278	61.2	01	64.3	0.20
1995/96	65	119	54.6	01	59.5	0.08
1996/97	123	162	75.9	01	57.0	0.50
1997/98	198	309	64.1	01	62.3	0.25
1998/99	456	1365	33.4	01	57.8	-0.30
1999/00	531	743	71.5	01	59.9	0.40
2000/01	52	117	44.4	01	57.9	-0.10
2001/02	213	364	58.5	01	54.4	0.15
2002/03	1911	2060	92.8	01	60.1	1.11
2003/04	118	152	77.6	01	69.0	0.54
2004/05	163	288	56.6	01	66.0	0.12
2005/06	44	87	50.6	01	67.2	0.01
2006/07	101	446	22.6	01	60.0	-0.53
2007/08	9	19	47.4	00	51.0	
2008/09	19	22	86.4	00	52.7	
2009/10	3	23	13.0	00	44.0	
2010/11	5	9	55.6	00	45.0	
2011/12	31	126	24.6	01	45.4	-0.49
2012/13	0	24	0.0	00	35.9	
2013/14	0	32	0.0	01	18.6	(- ∞)

Appendix 5 Common Guillemot *Uria aalge* – OSPAR area 9

Oil rates of Common Guillemots in The Netherlands, winter 1977/78-2013/14. Surveys along the North Sea coast of the Wadden Sea (Frisian) islands (Dutch contributions to OSPAR 9).

OSPAR 9			Oil rates			Logit transformed
Winter	nOiled	nTotal	Annual	Qual	5yr mean	Annual oil rates
1977/78	22	24	91.7	00		
1978/79	40	48	83.3	01		0.70
1979/80	26	30	86.7	01		0.81
1980/81	212	225	94.2	01		1.21
1981/82	109	122	89.3	01	89.0	0.92
1982/83	327	368	88.9	01	88.5	0.90
1983/84	70	106	66.0	01	85.0	0.29
1984/85	304	365	83.3	01	84.4	0.70
1985/86	105	137	76.6	01	80.8	0.52
1986/87	21	21	100.0	00	83.0	
1987/88	147	153	96.1	01	84.4	1.39
1988/89	78	122	63.9	01	84.0	0.25
1989/90	99	129	76.7	01	82.7	0.52
1990/91	121	143	84.6	01	84.3	0.74
1991/92	231	244	94.7	01	83.2	1.25
1992/93	29	71	40.8	01	72.2	-0.16
1993/94	67	112	59.8	01	71.3	0.17
1994/95	58	79	73.4	01	70.7	0.44
1995/96	26	37	70.3	01	67.8	0.37
1996/97	37	50	74.0	01	63.7	0.45
1997/98	77	129	59.7	01	67.4	0.17
1998/99	257	523	49.1	01	65.3	-0.01
1999/00	214	297	72.1	01	65.0	0.41
2000/01	89	160	55.6	01	62.1	0.10
2001/02	161	326	49.4	01	57.2	-0.01
2002/03	136	224	60.7	01	57.4	0.19
2003/04	121	173	69.9	01	61.5	0.37
2004/05	84	229	36.7	01	54.5	-0.24
2005/06	37	89	41.6	01	51.7	-0.15
2006/07	34	147	23.1	01	46.4	-0.52
2007/08	19	44	43.2	01	42.9	-0.12
2008/09	46	57	80.7	01	45.1	0.62
2009/10	6	24	25.0	00	42.7	
2010/11	2	9	22.2	00	38.8	
2011/12	22	90	24.4	01	39.1	-0.49
2012/13	4	28	14.3	01	33.3	-0.78
2013/14	23	52	44.2	01	26.0	-0.10

Appendix 6 Common Guillemot *Uria aalge* – OSPAR area 10

Oil rates of Common Guillemots in The Netherlands, winter 1977/78-2013/14. Surveys within the Wadden Sea (Dutch contributions to OSPAR 10).

OSPAR 10			Oil rates			Logit transformations
Winter	nOiled	nTotal	Annual	Qual	5yr mean	Annual oil rates
1980/81	214	298	71.8	01		0.41
1981/82	106	121	87.6	01		0.85
1982/83	399	485	82.3	01		0.67
1983/84	127	198	64.1	01		0.25
1984/85	41	56	73.2	01	75.8	0.44
1985/86	129	196	65.8	01	74.6	0.28
1986/87	15	18	83.3	00	73.8	
1987/88	65	104	62.5	01	69.8	0.22
1988/89	66	233	28.3	01	62.6	-0.40
1989/90	61	89	68.5	01	61.7	0.34
1990/91	15	44	34.1	01	55.4	-0.29
1991/92	6	8	75.0	00	53.7	
1992/93	50	148	33.8	01	47.9	-0.29
1993/94	56	125	44.8	01	51.2	-0.09
1994/95	59	111	53.2	01	48.2	0.05
1995/96	4	8	50.0	00	51.3	
1996/97	4	8	50.0	00	46.3	
1997/98	13	21	61.9	00	52.0	
1998/99	99	466	21.2	01	47.3	-0.57
1999/00	90	168	53.6	01	47.3	0.06
2000/01	21	61	34.4	01	44.2	-0.28
2001/02	70	166	42.2	01	42.7	-0.14
2002/03	36	86	41.9	01	38.7	-0.14
2003/04	28	67	41.8	01	42.8	-0.14
2004/05	44	113	38.9	01	39.8	-0.20
2005/06	34	77	44.2	01	41.8	-0.10
2006/07	10	84	11.9	01	35.7	-0.87
2007/08	7	21	33.3	00	34.0	
2008/09	6	9	66.7	00	39.0	
2009/10	6	10	60.0	00	43.2	
2010/11		1	0.0	00	34.4	
2011/12		31	0.0	01	32.0	
2012/13	1	4	25.0	00	30.3	
2013/14	2	26	7.7	01	18.5	-1.08

Appendix 7 Razorbill *Alca torda*

Oil rates of Razorbills in The Netherlands, winter 1977/78-2013/14. The National survey combines all surveys along the North Sea coast (Dutch contributions to OSPAR 8 and 9).

National			Oil rates			Logit transformed
Winter	nOiled	nTotal	Annual	Qual	5yr mean	Annual oil rates
1977/78	33	38	86.8	01		
1978/79	36	48	75.0	01		0.48
1979/80	34	36	94.4	01		1.23
1980/81	526	583	90.2	01		0.97
1981/82	92	102	90.2	01	87.3	0.96
1982/83	1214	1558	77.9	01	85.6	0.55
1983/84	528	586	90.1	01	88.6	0.96
1984/85	89	116	76.7	01	85.0	0.52
1985/86	129	155	83.2	01	83.6	0.70
1986/87	17	24	70.8	00	79.8	0.39
1987/88	198	225	88.0	01	81.8	0.87
1988/89	146	206	70.9	01	77.9	0.39
1989/90	532	802	66.3	01	75.9	0.29
1990/91	163	214	76.2	01	74.4	0.50
1991/92	67	68	98.5	01	80.0	1.83
1992/93	44	66	66.7	01	75.7	0.30
1993/94	51	63	81.0	01	77.7	0.63
1994/95	60	82	73.2	01	79.1	0.44
1995/96	47	166	28.3	01	69.5	-0.40
1996/97	26	39	66.7	01	63.2	0.30
1997/98	58	111	52.3	01	60.3	0.04
1998/99	84	138	60.9	01	56.3	0.19
1999/00	255	371	68.7	01	55.4	0.34
2000/01	19	26	73.1	01	64.3	0.43
2001/02	64	122	52.5	01	61.5	0.04
2002/03	788	987	79.8	01	67.0	0.60
2003/04	55	110	50.0	01	64.8	0.00
2004/05	64	249	25.7	01	56.2	-0.46
2005/06	18	56	32.1	01	48.0	-0.32
2006/07	45	323	13.9	01	40.3	-0.79
2007/08		13	15.4	00	27.4	
2008/09	6	10	60.0	00	29.4	
2009/10	2	15	13.3	00	27.0	
2010/11		5	0.0	00	20.5	
2011/12	9	370	2.4	01	18.2	-1.60
2012/13	1	15	6.7	00	16.5	
2013/14	0	19	0.0	00	4.5	

Appendix 8 Black-legged Kittiwakes *Rissa tridactyla*

Oil rates of Black-legged Kittiwakes in The Netherlands, winter 1977/78-2013/14. The National survey combines all surveys along the North Sea coast (Dutch contributions to OSPAR 8 and 9).

National			Oil rates			Logit transformed
Winter	nOiled	nTotal	Annual	Qual	5yr mean	Annual oil rates
1977/78	87	113	77.0	01		0.52
1978/79	35	85	41.2	01		-0.15
1979/80	95	142	66.9	01		0.31
1980/81	1317	1545	85.2	01		0.76
1981/82	140	188	74.5	01	69.0	0.46
1982/83	884	1117	79.1	01	69.4	0.58
1983/84	1603	1902	84.3	01	78.0	0.73
1984/85	151	276	54.7	01	75.6	0.08
1985/86	171	282	60.6	01	70.6	0.19
1986/87	61	113	54.0	01	66.6	0.07
1987/88	102	153	66.7	01	64.1	0.30
1988/89	70	131	53.4	01	57.9	0.06
1989/90	87	157	55.4	01	58.0	0.09
1990/91	90	151	59.6	01	57.8	0.17
1991/92	43	63	68.3	01	60.7	0.33
1992/93	66	228	28.9	01	53.1	-0.39
1993/94	28	62	45.2	01	51.5	-0.08
1994/95	43	52	82.7	01	56.9	0.68
1995/96	12	23	52.2	00	55.4	
1996/97	23	39	59.0	01	53.6	0.16
1997/98	62	138	44.9	01	56.8	-0.09
1998/99	97	189	51.3	01	58.0	0.02
1999/00	129	240	53.8	01	52.2	0.07
2000/01	18	44	40.9	01	50.0	-0.16
2001/02	68	216	31.5	01	44.5	-0.34
2002/03	96	136	70.6	01	49.6	0.38
2003/04	37	64	57.8	01	50.9	0.14
2004/05	33	92	35.9	01	47.3	-0.25
2005/06	7	23	30.4	00	45.2	-0.36
2006/07	10	71	14.1	01	41.8	-0.79
2007/08		11	0.0	00	27.6	
2008/09	8	17	47.1	00	25.5	
2009/10	0	14	0.0	00	18.3	
2010/11		8	37.5	00	19.7	
2011/12	10	257	3.9	01	17.7	-1.39
2012/13	0	26	0.0	00	17.7	
2013/14	1	4	25.0	00	13.3	

Appendix 9 Common Eiders *Somateria mollissima*

Oil rates of Common Eiders in The Netherlands, winter 1977/78-2013/14. The National survey combines all surveys along the North Sea coast (Dutch contributions to OSPAR 8 and 9).

National			Oil rates			Logit transformed
Winter	nOiled	nTotal	Annual	Qual	5yr mean	Annual oil rates
1977/78	13	23	56.5	00		
1978/79	10	54	18.5	01		-0.64
1979/80	18	32	56.3	01		0.11
1980/81	32	43	74.4	01		0.46
1981/82	19	56	33.9	01	47.9	-0.29
1982/83	33	67	49.3	01	46.5	-0.01
1983/84	31	111	27.9	01	48.4	-0.41
1984/85	37	285	13.0	01	39.7	-0.83
1985/86	4	28	14.3	01	27.7	-0.78
1986/87	150	451	33.3	01	27.5	-0.30
1987/88	617	638	96.7	01	37.0	1.47
1988/89	32	74	43.2	01	40.1	-0.12
1989/90	15	62	24.2	01	42.3	-0.50
1990/91	50	568	8.8	01	41.2	-1.02
1991/92	117	384	30.5	01	40.7	-0.36
1992/93	47	177	26.6	01	26.7	-0.44
1993/94	9	51	17.6	01	21.5	-0.67
1994/95	14	57	24.6	01	21.6	-0.49
1995/96	19	252	7.5	01	21.4	-1.09
1996/97	24	95	25.3	01	20.3	-0.47
1997/98	8	68	11.8	01	17.4	-0.88
1998/99	17	63	27.0	01	19.2	-0.43
1999/00	167	2039	8.2	01	15.9	-1.05
2000/01	9	447	2.0	01	14.8	-1.69
2001/02	20	885	2.3	01	10.2	-1.64
2002/03	49	289	17.0	01	11.3	-0.69
2003/04	5	67	7.5	01	7.4	-1.09
2004/05	4	164	2.4	01	6.2	-1.60
2005/06	5	88	5.7	01	7.0	-1.22
2006/07		47	0.0	01	6.5	-∞
2007/08	1	15	6.7	00	4.5	
2008/09	1	53	1.9	01	3.3	-1.72
2009/10		32	0.0	01	2.8	-∞
2010/11	0	16	0.0	00	1.7	
2011/12	1	125	0.8	01	1.9	-2.09
2012/13	0	8	0.0	00	0.5	
2013/14	0	17	0.0	00	0.2	

Appendix 10 Common Scoters *Melanitta nigra*

Oil rates of Common Scoters in The Netherlands, winter 1977/78-2013/14. The National survey combines all surveys along the North Sea coast (Dutch contributions to OSPAR 8 and 9).

National			Oil rates			Logit transformed
Winter	nOiled	nTotal	Annual	Qual	5yr mean	Annual oil rates
1977/78	8	14	57.1	00		0.12
1978/79	144	354	40.7	01		-0.16
1979/80	30	42	71.4	01		0.40
1980/81	28	43	65.1	01		0.27
1981/82	107	148	72.3	01	61.3	0.42
1982/83	114	151	75.5	01	65.0	0.49
1983/84	88	110	80.0	01	72.9	0.60
1984/85	84	179	46.9	01	68.0	-0.05
1985/86	152	214	71.0	01	69.1	0.39
1986/87	99	151	65.6	01	67.8	0.28
1987/88	1557	1573	99.0	01	72.5	1.99
1988/89	51	80	63.8	01	69.3	0.25
1989/90	7	15	46.7	00	69.2	-0.06
1990/91	108	141	76.6	01	70.3	0.51
1991/92	59	74	79.7	01	73.1	0.59
1992/93	63	87	72.4	01	67.8	0.42
1993/94	56	69	81.2	01	71.3	0.63
1994/95	55	59	93.2	01	80.6	1.14
1995/96	96	137	70.1	01	79.3	0.37
1996/97	62	84	73.8	01	78.1	0.45
1997/98	18	25	72.0	01	78.1	0.41
1998/99	41	171	24.0	01	66.6	-0.50
1999/00	42	63	66.7	01	61.3	0.30
2000/01	4	12	33.3	00	54.0	-0.30
2001/02	45	93	48.4	01	48.9	-0.03
2002/03	87	111	78.4	01	50.1	0.56
2003/04	7	16	43.8	00	54.1	-0.11
2004/05	19	29	65.5	01	53.9	0.28
2005/06	9	18	50.0	00	57.2	0.00
2006/07	0	1	0.0	00	47.5	
2007/08	0	1	0.0	00	31.9	
2008/09	0	5	0.0	00	23.1	
2009/10	1	5	20.0	00	14.0	
2010/11	1	5	20.0	00	8.0	
2011/12	1	22	4.5	00	8.9	
2012/13	0	4	0.0	00	8.9	
2013/14	0	7	0.0	00	8.9	

Appendix 11 Herring Gull *Larus argentatus*

Oil rates of Herring Gulls in The Netherlands, winter 1977/78-2013/14. The National survey combines all surveys along the North Sea coast (Dutch contributions to OSPAR 8 and 9).

National			Oil rates			Logit transformed
Winter	nOiled	nTotal	Annual	Qual	5yr mean	Annual oil rates
1977/78	49	88	55.7	01		
1978/79	83	320	25.9	01		-0.46
1979/80	43	168	25.6	01		-0.46
1980/81	278	429	64.8	01		0.27
1981/82	145	315	46.0	01	43.6	-0.07
1982/83	159	310	51.3	01	42.7	0.02
1983/84	203	566	35.9	01	44.7	-0.25
1984/85	77	360	21.4	01	43.9	-0.57
1985/86	46	249	18.5	01	34.6	-0.64
1986/87	46	191	24.1	01	30.2	-0.50
1987/88	56	133	42.1	01	28.4	-0.14
1988/89	45	213	21.1	01	25.4	-0.57
1989/90	51	280	18.2	01	24.8	-0.65
1990/91	26	204	12.7	01	23.7	-0.84
1991/92	33	117	28.2	01	24.5	-0.41
1992/93	13	125	10.4	01	18.1	-0.94
1993/94	32	109	29.4	01	19.8	-0.38
1994/95	24	88	27.3	01	21.6	-0.43
1995/96	10	109	9.2	01	20.9	-1.00
1996/97	8	102	7.8	01	16.8	-1.07
1997/98	11	109	10.1	01	16.7	-0.95
1998/99	25	142	17.6	01	14.4	-0.67
1999/00	24	137	17.5	01	12.4	-0.67
2000/01	3	110	2.7	01	11.2	-1.55
2001/02	5	133	3.8	01	10.3	-1.41
2002/03	24	109	22.0	01	12.7	-0.55
2003/04	7	54	13.0	01	11.8	-0.83
2004/05	4	65	6.2	01	9.5	-1.18
2005/06	2	30	6.7	01	10.3	-1.15
2006/07	1	40	2.5	01	10.1	-1.59
2007/08		21	0.0	00	5.7	
2008/09	1	56	1.8	01	3.4	-1.74
2009/10	1	20	5.0	00	3.2	
2010/11		25	0.0	01	1.9	
2011/12		56	0.0	01	1.4	$-\infty$
2012/13	2	15	13.3	00	4.0	
2013/14	1	25	4.0	01	4.5	-1.38