

What Do Systematic Beached Bird Surveys Tell Us about Oil Pollution in the Southern North Sea?

Results of the Research & Development Project "Identification, quantification and evaluation of the oil input into the North Sea in order to assess the effects of free oil disposal facilities in German North Sea harbors"

Birds are the most obvious victims of marine oil pollution and reliable biological indicators of the level of chronic oil pollution of the seas. In the past, systematic beached bird surveys have delivered useful information on the state, causes and the extent of marine pollution. In 2001 a 3,5 year research and development project to assess the source and level of oil pollution and changes in this level in the southern North Sea region was concluded, which was financed jointly by the German federal government and the federal states bordering the North Sea.

The starting point of the project was the hypothesis that the increase in oil residues disposed of in German harbors during the pilot project "Free reception facilities in German harbors according to MARPOL I" which began in 1988, had led to a decrease in the oil pollution of the southern North Sea in the late 1980s and early 1990s, and to an increase of pollution after the phasing out of the pilot project.

The aim of the project was to detect changes in the level of oil pollution in the German Bight using beached bird surveys (BBSs) and oil analysis and thus to review the effectiveness of measures, such as the free reception facilities project, that were introduced to reduce marine oil pollution levels.

The results of the BBSs and the oil analysis were evaluated using data collected on a number of accompanying aspects. These included the analysis of vessel traffic using the MARION database (including the quantification of pollutants from shipping), data on the amount of oil disposed of in German North Sea harbors, registered oil pollution incidents and factors that can influence the results of BBSs, such as weather conditions and the distribution, phenology and density of the bird species in the German Bight.

Beached Bird Surveys

There is a long tradition of BBSs on the German North Sea coast. The results of these surveys document the level of oil pollution in the southern North Sea over a 17-year period. The data collected during the project complete the data set

collected during two previous projects (1983-1992) (Vauk et al. 1987 & 1989, Averbek et al. 1993) and the five years where the surveys were maintained by NGOs and authorities in the coastal states (Fleet et al. 1995). The analysis of the data and all other aspects showed that only the examination of the entire period 1984 - 2001 and the consideration of all measures introduced to reduce oil pollution can give a clear picture of the efficiency of these measures.

During the project 20,742 dead birds of 124 different species were found on the survey beaches of the German North Sea coast. The BBS database, which was developed during the project, now holds information on about 55,000 individual beached birds registered on hundreds of study areas from Sylt to Borkum.

Oil Analyses

Increases in levels of marine oil pollution were registered after introduction of heavy fuel oil as fuel for shipping in the late 1970s. Previous studies in the 1980s and 1990s showed that heavy fuel oil residues are the main cause of oil pollution in the southern North Sea (e.g. Dahlmann et al. 1994). Over 700 samples of plumage of oiled-beached birds and from oiled beaches were analyzed during the period 1998 - 2001. Again, over 90% of the samples contained heavy fuel oil residues.

Oil Residues in Harbor Facilities

The joint federal and coastal state financed pilot project "Free Reception Facilities in German Harbors" existed between 1988 and 1991. In 1992, Schleswig-Holstein introduced a fee system and Hamburg excluded ballast water, tank washings and cargo residues from free disposal. Since 1994, Hamburg subsidizes the disposal of residues only up to certain levels. At the beginning of the pilot project the amount of oil residues disposed of increased, however, from 1993 onwards the amount decreased, and since 1997 the yearly amount has stabilized. After the changes of the fee system in some states the number of ships using harbor fa-

cilities decreased. However, the amount of oil residues disposed of per ship has increased due to a general increase in the size of the vessels involved.

Results

The index used in this project for assessment of trends in the level of oil pollution is the oil rate, this is the proportion of oiled birds in the total sample of birds found dead on a given stretch of coast. Data from species and years where weather conditions (s.a. extremely cold winter 1995/96), natural/mass mortality (s.a. Guillemots in 1998/99, Eider in 1999/00 and 2000/01) or a local oil incident (e.g. Pallas accident in 1998) were found to influence the oil rates were excluded from calculations of trends. The spatial, temporal and species specific differences and trends found in the oil rates thus represent real differences and trends in the level of oil pollution.

A reduction in the level of oil rates of birds beached on German North Sea coasts that indicated a reduction in the oil pollution of the concerned waters, was already recorded in the early 90s. This general trend has continued up to the present day, however, regional differences in the level of oil pollution and differences in trends in this level are apparent.

During the period 1984/85 - 2000/01 oil rates were generally higher on the island of Helgoland than they were on the islands off the German mainland coast and the mainland coast itself. Birds found on the mainland coast and on the islands off the mainland coast of Schleswig-Holstein have generally higher oil rates than birds found on the beaches of the islands and mainland coast in Lower Saxony.

The high oil rates of pelagic species and the sea ducks reflect high levels of oil pollution in the region of the traffic separation scheme and in waters where prevailing winds and water currents transport oil and oiled birds from this region. In the German Bight prevailing winds and water currents transport oil and oiled birds in an anticlockwise direction eastwards and northwards from the traffic separation scheme along the Schleswig-Holstein coast and cause high levels of pollution there.

Oil rates on German North Sea coasts have generally decreased in the period 1984 - 2001. During the last two winters 1999/00 and 2000/01 the oil rates of most species have decreased even further. The general decrease was greater at the end of the 80s and early 90s than it was in the late 90s. In total, the oil rate of Guillemot decreased from 80% to 40%.

In Schleswig-Holstein a high-low-high-low pattern is superimposed on the general decrease. This pattern is due to high oil rates in the mid 1980s a reduction up to the early 90s, a return to high oil rates of most species in the mid 90s and a renewed drop in oil rates at the end of the 90s and in 2000/01 (Fig. 1).

A significant and continual decrease in the oil rates of almost all species since the 1970s was also recorded in the Netherlands (Camphuysen 1997). The trends in the oil rates recorded from southern North Sea coast of Jutland, Denmark reflect the changes recorded on German North Sea coasts. No trends were measurable, however, on the North Sea coasts of northern Jutland (Skov et al. 1996). The reduction in the oil rates of numerous species during the last two winters was also recorded in the Netherlands and on the distant Shetland Isles.

The results of the BBSs were also compared to the results of aerial surveillance activities. Changes in the oil rates of Guillemots found on German coasts are remarkably similar to changes in the number of oil spills recorded by the Central Recording Office (ZMK) in the area of the Traffic Separation Scheme in the German Bight. However, the extreme winter in 95/96 and the mass mortality of Guillemots in 98/99 caused deviation from this general correlation. In 2000 the number of oil incidents registered by the ZMK rose and the oil rate of the Guillemot dropped.

According to the ship traffic analysis changes in the level of ship traffic and its potential for oil pollution (amount of oil residues produced per unit time or distance) can be detected by trends in the oil rates of beached birds found on coasts adjacent to the shipping routes. Due to the shipping analysis all routes showed increases in the oil pollution potential of shipping using those routes in the period 1992-1999. However, the increases were much higher on routes to and from the Baltic than they were on the route along the coast of Lower Saxony. The increase in the oil pollution potential was greatest in the mid 1990s. The increase in shipping and in its oil pollution potential on routes near to Schleswig-Holstein coasts led to the increase in oil rates recorded for a number of species found on these coasts during that period.

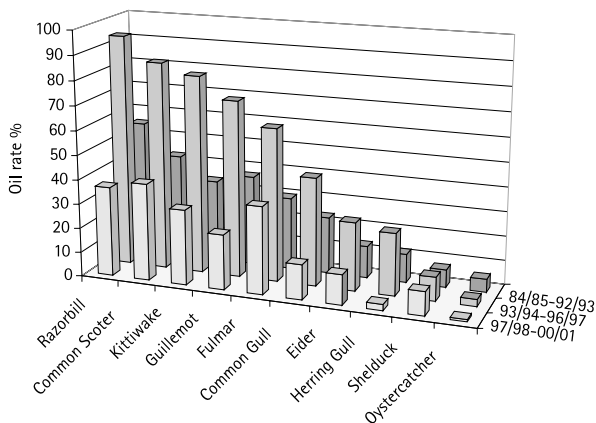


Figure 1: Oil rates on the Schleswig-Holstein coast in three periods 1984/85-1992/93, 1993/94-1996/97 and 1997/98-2000/01.

This trend is not apparent in the results of the BBSs carried out on the coast of Lower Saxony. These regional differences in trends are obvious when the oil rates of Guillemots found on the coasts of Schleswig-Holstein and Lower Saxony are compared (Fig. 2).

Conclusions

After dramatic increases in marine oil pollution due to shipping in the late 1970s, a number of international and European measures were implemented to reduce the input of oil from shipping into the sea in general and especially into the North Sea – amongst others the Port State Control (1982), the MARPOL Annex I (1983), the declaration of the North Sea as Special Area (1999), and national measures such as the free reception facilities project and the strengthening penal provisions in the case of illegal oil discharge. The results of the BBSs and the oil analysis show that ships still cause marine oil pollution in the southern North Sea via illegal discharge of oil residues. The level of this type of pollution has, however, decreased over the last decades.

The systematic BBSs, which began in the 80s, show a continual improvement in the oil pollution situation in the southern North Sea. Regionally different trends are however identifiable. The high levels of oil pollution in the mid 90s in Schleswig-Holstein in comparison to Lower Saxony are related to changes in the level of ship traffic and its potential for oil pollution during that period. The opening up of the eastern states in the 90s apparently led to changes in the intensity of shipping to and from the Baltic.

References

- Averbeck, C., M. Korsch, G. Vauk & J. Wilke (1993): Seevögel als Ölopfer.- Umweltbundesamt, Wasser Forschungsbericht 102 04 414, Norddeutsche Naturschutzakademie, 58 pp.
- Camphuysen, C. J. (1997): Oil pollution and oiled seabirds in the Netherlands, 1969-97: Signals of a cleaner sea. SULA 11/2 (special issue): 43-156
- Camphuysen, C. J. & M. Heubeck (2001): Marine oil pollution and beached bird surveys: the development of a sensitive monitoring instrument. Environment Pollution 112: 443-461.
- Dahlmann G., Timm D., Averbeck C., Camphuysen C., Skov C., Durinck J. (1994): Comparative Investigations on Oiled Seabirds and Oiled Beaches in the Netherlands, Denmark and Germany (1990-1993), Mar. Poll. Bull. 28: 305-310.
- Fleet, D. M., S. Gaus, E. Hartwig, P. Potel & M. Schulze Dieckhoff (1995): Ölopfer in der Deutschen Bucht im Zeitraum 1. Oktober 1992 bis 31. Dezember 1994. - Seevögel 16/4: 87 - 92.
- Skov, H., K. D. Christensen & J. Durinck (1996): Trends in marine oil pollution in Denmark 1984-95, An analysis of beached bird surveys, Miljøstyrelsen Working report No. 75,.

The free disposal facilities project in Germany does not seem to have led exclusively to an improvement in the oil pollution situation in the late 80s early 90s. The additional increase in the oil rates registered on the coasts of Schleswig-Holstein in the mid 90s can be explained by the observed increases in shipping and its pollution potential in that region during that period. However, there is some evidence that in the same time the designation of the North Sea as a Special Area started to lead to a reduction in oil pollution of the southern North Sea.

The reduction in the level of oil pollution measured by oil rates of birds found on German coasts indicate that the measures and regulations taken in the last twenty years including a more intensive surveillance and a better execution of legislation regarding breaches of law, have led to changes in behavior and possibly to a greater environmental awareness of the captains sailing ships through North Sea waters. The oil rates of birds found on German North Sea coasts are, however, still high and the continuation of BBSs within the trilateral monitoring program (TMAP) will tell whether the trends registered during the last two winters will continue and the measures such as the Special Area North Sea and the PSSA Wadden Sea will be effective.

- Vauk, G., G. Dahlmann, E. Hartwig, J. C. Ranger, B. Reineking, E. Schrey & E. Vauk-Henzel (1987): Ölopfererfassung an der deutschen Nordseeküste und Ergebnisse der Ölanalysen sowie Untersuchungen zur Belastung der Deutschen Bucht durch Schiffsmüll. - Umweltbundesamt, Wasser Forschungsbericht 102 04 361, Norddeutsche Naturschutzakademie, 45 pp.
- Vauk, G., E. Hartwig, E. Schrey, E. Vauk-Henzel, & M. Korsch (1989): Seevögelverluste durch Öl und Müll an der deutschen Nordseeküste von August 1983 bis April 1988. - Umweltbundesamt, Wasser Forschungsbericht 102 04 370, 164 pp.
- Further information on cwss.www.de/oelvoegel

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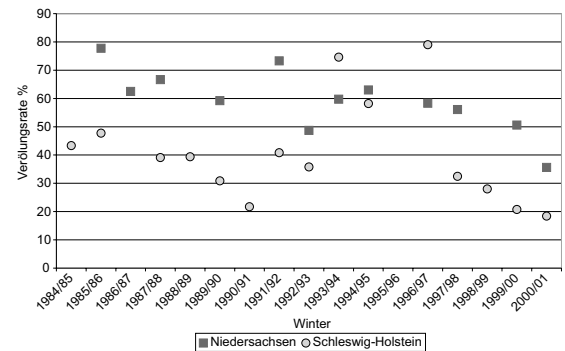


Figure 2:
Oil rates of Guillemot on the coasts of Schleswig-Holstein and Lower Saxony in the period 1984/85 to 2000/01.