

Short report from the EcoQO monitoring of plastic particles in stomachs of fulmars beached on the coast of Southern Norway in 2002-2023 or taken as unintentional bycatch in fisheries 2013-2023

Nina Dehnhard¹, Signe Christensen-Dalsgaard¹, Magdalene Langset¹, Marianne W. Furnes¹, Torill Verpe^{1,2}, Vilde Jonasson Oddvik¹, Ida Ward Myran¹ and Tycho Anker-Nilssen¹

¹ Norwegian Institute for Nature Research (NINA), P.O. Box 5685 Torgarden, NO 7485 Trondheim;

² University of South-Eastern Norway, P.O. Box 4, NO 3199 Borre;

Correspondence: nina.dehnhard@nina.no

Background

In Norway, annual monitoring for the EcoQO on plastic particles in stomachs of beached fulmars was initiated in Lista in Vest-Agder (now Agder) county in winter 2002/03. Since 2010, most of the work has been done in the neighbouring county Rogaland. The fieldwork is conducted by volunteers affiliated to local departments of BirdLife Norway (formerly the Norwegian Ornithological Society) and is administered by the Norwegian Institute for Nature Research (NINA) with financial support from the Norwegian Environment Agency.

In 2022, with additional funding from the Norwegian Environment Agency, NINA initiated monitoring for the EcoQO on plastic particles also in Northern Norway, utilizing fulmars taken as unintentional bycatch in commercial fisheries. Collection of, and dissections of these birds are also financially supported through the Norwegian seabird bycatch project (administered by NINA with financial support from the Norwegian Environment Agency). Through collaboration with the reference fleet of the Marine Research Institute, as well as interested fishermen outside of the reference fleet, fulmars that are unintentionally taken as bycatch are collected and sent to NINA. In 2022, the sampling was restricted to Northern Norway, while in 2023, we also attempted to obtain fulmars taken as bycatch in the North Sea area.

Material and methods

In Southern Norway (OSPAR area II), altogether, 136 beached fulmars have been collected and fully examined for their stomach plastic contents, of which six were found in the winter 2022/23. One fulmar was collected as bycatch in the North Sea in June 2023.

From Northern Norway (OSPAR area I), we examined the plastic contents in 264 fulmars collected as unintentional bycatch in fisheries between 2012 and 2023 (Table 1), of which 109 were collected in 2023. An additional beached bird from Central Norway found in spring 2021 was added to the sample from Northern Norway (Table 1). 36 fulmars were obtained from a fisheries area east of Greenland during 2022 and 2023 (Table 1).

All birds were examined according to internationally standardised procedures (van Franeker 2004). Some of the beached birds from previous years were also dissected by or under the guidance of Jan van Franeker and Susanne Kühn at the laboratory facilities of IMARES/WUR, The Netherlands.

Examination of birds from the North Sea area

Sixty-four (47%) of the 137 birds collected between the winters 2002/03 and 2022/23 in the North Sea area (including one bycatch bird, and 136 beached birds; Table 1) contained > 0.1 g of plastic. As also indicated by the five-year running average for the North Sea area (Figure 1), a numeric increase in the annual proportion of birds exceeding the EcoQO threshold reversed after winter 2013/14. This

trend turned around after the winter 2020/21. The results indicate that the rate of birds exceeding the EcoQO threshold is still much higher than the EcoQO threshold. The overall long-term trend since the start of the monitoring in 2002/03 shows a decrease in the number of birds that exceed the 0.1 g threshold of plastic (Figure 1; linear model, $t_{1,135} = -2.23$, $p = 0.027$). Albeit based on small sample sizes in several years, this trend corresponds to the overall tendency for a decrease in plastic loads observed in other parts of the North Sea (van Franeker et al. 2021).

All Norwegian data of relevance to the fulmar EcoQO for the North Sea area are reported in the attached Excel file (OSPAR-RawData-NOR_FULMAR_byNov2023), which contains individual details for date and place found, the birds' sex and age, and the numbers and masses of plastic particles divided by main categories (industrial plastics and user plastics) and summed.

Table 1. Material collected and examined for the EcoQO on plastic particles in stomachs of Northern fulmars in the different areas.

	Bycatch	Beached	Number of birds exceeding 0.1 g plastic in their stomach
Southern Norway (OSPAR II)			
2002-2022	-	130	61
2022-2023	1	6	3
<i>Total 2002-2023</i>	<i>1</i>	<i>136</i>	<i>64</i>
Northern Norway & Svalbard (OSPAR I)			
2012-2013	71		23
2017	25		7
2021		1	1
2022	59		19
2023	109		23
<i>Total 2012-2023</i>	<i>264</i>	<i>1</i>	<i>73</i>
East of Greenland (OSPAR I)			
2022	17		0
2023	19		5
<i>Total 2022-2023</i>	<i>36</i>		<i>5</i>

Examination of birds from the OSPAR I area

The frequency of birds from Northern Norway that exceeded the 0.1 g EcoQO threshold was 27% (73 of 265 birds), and that of birds from east of Greenland was 14% (5 of 36 birds). Chi-square tests revealed that there was weak evidence for the fulmars taken as bycatch off Northern Norway to exceed the EcoQO threshold more often than those east of Greenland ($\chi^2=3.04$, $df=1$, $p=0.081$). In contrast, there was strong evidence for the birds from Southern Norway to exceed the EcoQO threshold more often than those from Northern Norway and east of Greenland ($\chi^2 \geq 18.79$, $df=1$, $p \leq 0.001$). We have also attached an Excel file with all data for birds from Northern Norway and those from east of Greenland (FulmarsPlastic_OSPAR_NorthernNorway_byNov2023).

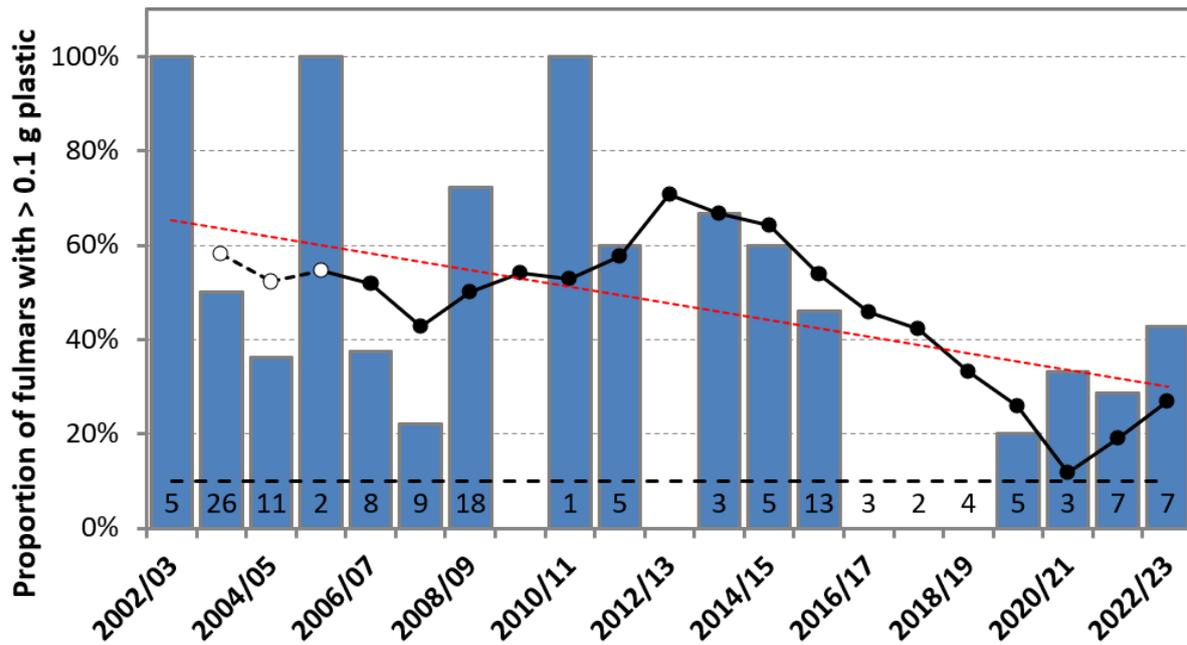


Figure 1. Proportions of fulmars with more than 0.1 g plastic in their stomach, among those found dead on beaches in South Norway in 2002-2023. The EcoQO threshold level (black dashed line) and annual sample sizes are indicated. The black line and scatter plot shows the 5-year running mean centred over the last year in each period. The red dashed line indicates the long-term trend over the entire study period.

References

- van Franeker, J.A. 2004. Save the North Sea Fulmar-Litter-EcoQO Manual part 1: Collection and dissection procedures. **Alterra Report 672**: Wageningen.
- Van Franeker, J.A., Kühn, S., Anker-Nilssen, T., Edwards, E., Gallien, F., Guse, N., Kakkonen, J., Mallory, M., Miles, W., Olsen, K.O., Pedersen, J., Provencher, J., Roos, M., Stienen, E., Turner, D.M. & Van Loon, W.M.G.M. 2021. New tools to evaluate plastic ingestion by northern fulmars applied to North Sea monitoring data 2002-2018. **Marine Pollution Bulletin 166**: 112246. doi: 10.1016/j.marpolbul.2021.112246