

Fulmar population is by now 1700–2000 pairs in this county, with eight colonies, the Gannet numbering more than 500 pairs, still in a single colony at Runde. Both species are still increasing in number. The Cormorant has disappeared as a breeding bird during the last 50 years. In the adjacent district northwards the species has been expanding during the last years and perhaps will recover old breeding sites. The Shag also was decimated after the second world war, but has increased greatly in number since then, the total population of the county being about 6500 pairs. A decline in some colonies during recent years due to overhunting, and heavy predation by the White-tailed Eagle *Haliaeetus albicilla* and the Eagle Owl *Bubo bubo* have been observed. Reproduction was very poor in 1976.

For gulls and terns the period 1970–76 have been characterized by rather poor reproduction and population instability, with fluctuating and moving colonies. The most likely primary cause is food shortage, allied with several secondary factors. The collapse of the Scando-Atlantic herring stock in the sixties may have had a negative effect. So the gulls and terns have been clearly decreasing during recent years, only the Great Black-Backed Gull remaining stable or somewhat increasing. In the Herring Gull the reduced wastes from fisheries by a more rational and concentrated treatment of fish at the factories, and a better utilization of the resources, combined with the closing of more than 75% of the herring-oil factories in the district represent a loss of available food. Nest robbing and disturbing by people, and heavy predation by the Sea-Eagle, the Eagle Owl, the Red Fox and the Mink in the gull and tern colonies have also had a negative influence. During the last decade several small Kittiwake colonies have turned up in the province, but they are not stable with greatly fluctuating reproduction. During the same period studies in the main colony at Runde (100 000 pairs) indicate a decline, and so the small colonies may be more a sign of weakness than a real expansion.

In the Auks the last surveys at Runde by the late Professor Dr E. Brun in 1963 gave 3200 pairs of Razorbills, 7600 pairs of Guillemots and 40 000 pairs of Puffins; by 1970 his figures indicated declining populations of the first two species, perhaps a stable population of the last. Studies in control areas at Runde 1972–76 indicate, however, little or no changes in the populations, some of the Guillemot subcolonies even increasing, though some of them are decreasing, especially those which are exposed to the tourists. The Black Guillemot has decreased greatly during the last 20–30 years, no doubt the main cause is the Mink invasion. The population in the county is by now estimated to be 700–800 pairs.

The total seabird population of Møre & Romsdal is estimated to be more than 210 000 pairs of 15 species, of which four have been increasing in number in recent years, five have been decreasing, while five do not show such a clear decline. In the Puffin the population may be stable. Apparently the surface-feeders, and the species not inclined to move long distances to get food during the breeding season, the gulls and terns, have had problems with reproduction, and hence maintaining their population during the last ten years. The diving species and those which normally fly far away for feeding, the Fulmar, the Pelicaniformes, and the Alcidae, apparently have had a normal reproduction and show no or little tendency to decline. Food and feeding behaviour, disposition to fly long distances to obtain food, and perhaps the ability to use alternative foods in different situations, seem to be responsible for the differences in the population changes of the seabird species discussed here.

Beached bird surveys in Belgium

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In 1962 we started beached bird counts along the Belgian coast, extended in 1965 as an international survey in Holland and northern France. One annual count late in February thus covered up to 550 km and was performed by the Belgian and Dutch Youth Federations for the Study of Nature. Additional partial counts from other dates are also available. Some of our results have already been published: Blankena & Kuyken (1967, *Amoeba* 43: 121–128), Kuyken & Zegers (1968, *Amoeba* 44: 153–158). Earlier work in Holland and Belgium is described by Mörzer-Bruijns (1959, *Levende Nat.* 62: 172–178), Tanis & Mörzer-Bruijns (1962, *Levende Nat.* 65: 133–140) and De Ridder (1961, *Nat. Belg.* 42: 145–156).

Typical seabirds and waterfowl are the most numerous beached birds, as shown in Table 1, which gives the average percentages over the 15 year period. Considerable changes from one year to another mainly depend on mass migratory movements and/or the changing distribution of wintering flocks along the coast. This is illustrated by the exceptional numbers of certain species during annual counts: the most remarkable wreck occurred in 1962 when 92 Fulmars were found (35.5% of the total); other examples are Common Gulls in 1964 (26%), Skylarks *Alauda arvensis* in 1966 (14%) and Dunlin *Calidris alpina* in 1976 (42%). Most of these corpses were not oiled.

Table 2 gives the numbers of birds (both total and oiled) per kilometre during the annual surveys, as well as the percentage of oiled bodies. These figures show significant decreasing trends, expressed by the following linear regressions—the symbols are explained in Table 2:

$$\begin{aligned} y &= 7.8 - 0.45x & (r &= -0.717; P < 0.01) \\ y' &= 6.1 - 0.36x & (r &= -0.645; P < 0.01) \\ z &= 90.2 - 2.7x & (r &= -0.565; P < 0.05). \end{aligned}$$

There is a remarkable drop after 1970, probably reflecting a real decrease of chronic oil pollution in the coastal area. Local differences, however, are often due to larger numbers of birds becoming oiled in the vicinity of oil terminals.

It is clear that meteorological factors largely influence the occurrence of birds on the beach. The ratio of onshore to offshore winds, calculated by omitting winds blowing parallel to the coast (uniformly oriented WSW-ESE) shows significant positive correlations with both the total number of corpses and those oiled ($r = 0.633$ and 0.616 respectively). Bourne & Bibby (1975, *Mar. Pollut. Bull.* 6: 77-80) related the occurrence of oiled birds to cold water temperatures. We calculated the linear regression between the numbers of beached birds and the air temperature (Ostend for a 4 week period before the count date); we found significant negative correlations (total numbers of birds: $r = -0.711$; oiled birds: $r = -0.723$; $P < 0.01$) indicating the importance of cold weather.

TABLE 1
Most frequent oil victims, Belgian coast 1962-77

Species	% of total	% oiled	Family	% of total	% oiled
Common Scoter	20.8	92.8	Gulls and skuas	34.6	67.5
Razorbill	10.5	96.1	Ducks	23.3	90.0
Guillemot	9.6	97.3	Auks	20.4	97.1
Kittiwake	8.3	76.0	Divers and		
Common Gull	7.8	59.8	grebes	7.5	86.8
Black-headed Gull	6.2	62.8			

TABLE 2
Counts of beached birds, Belgian coast 1962-77 (63 km). Number of corpses/km and % oiled

	62*	64	65	Year (x)		68	69	70
				66	67			
Total/km (y)	5.2	6.2	6.9	3.7	4.8	7.9	9.1	4.7
Oiled/km (y')	3.4	4.4	5.8	2.2	4.1	6.6	8.2	4.0
% oiled (z)	66.4	73.5	83.7	60.3	85.6	83.6	90.2	83.6
	71	72	73	Year (x)		76	77	
				74	75			
Total/km (y)	0.9	1.0	2.0	0.8	0.8	1.4	1.0	
Oiled/km (y')	0.6	0.4	1.7	0.4	0.6	0.4	0.2	
% oiled (z)	67.9	41.3	85.2	43.4	73.6	31.1	21.1	

* No 1963 survey due to severe winter.

Totals ($n = 15$): 926 km, 3427 total corpses (3.7/km); 2628 oiled corpses (2.8/km), 76.7%.

For the percentage of oiled birds (see Table 2), the correlation with temperature is not fully significant ($r = -0.508$). This percentage needs to be corrected as typical land birds (e.g. pigeons etc.) are often found oiled. Kuyken & Zegers (*op. cit.*) calculated that about 5-7% of the corpses found on the beach are affected by oil after death. Thus, on average, about 70% of beached birds are oil victims.

From experiments with marked corpses, we learnt that they remain on the beach for about ten days on average, but some may persist for several weeks depending on the size of the bird concerned and the prevailing weather conditions. Tanis & Mörzner-Bruyns (*op. cit.*), however, indicated the average to be ± 25 days. Extrapolations from additional counts produce an estimate of between 40 and 60 birds/km/year or an annual loss of 2500-3600 birds along the Belgian coast. Very little is known about the fraction that these birds represent of the total number of birds killed by oil in the North Sea.