

Oil Spillages Affecting Seabirds in the United Kingdom, 1966-1983

T. J. STOWE AND L. A. UNDERWOOD

Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire, SG19 2DL, UK

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Oil spillages have affected large numbers of seabirds, principally auks, in the United Kingdom waters between 1966 and 1983. The annual scale of mortality has varied widely, although the worst kills are substantially less than some recorded elsewhere in N.W. Europe. Regional variations in the occurrence of mortality incidents are recorded, which in general reflect the distribution at sea of both birds and marine traffic. Oil pollution incidents affecting birds are essentially a winter phenomenon in UK waters and some reasons for this are discussed.

The Royal Commission on Environmental Pollution in its eighth report (1981) considered seabirds as "perhaps the most prominent victims of oil pollution", a view shared by the Royal Society for the Protection of Birds. The RSPB has long been involved in attempting to monitor the extent and effect of damage to birds by oil pollution. Three monitoring schemes are currently in operation. Annual counts of two of the more vulnerable species are made at a selection of their breeding grounds to detect annual and longer term changes (Stowe, 1982a). Observed changes may, of course, be due to factors other than oil pollution. Counts of bird corpses are made on about 2000 km of beach five times each winter (four times since 1982) by teams of Beached Bird Survey volunteers to establish the extent of seabird mortality and the numbers of corpses that are oiled. Finally, these volunteers, assisted by others, are asked to make counts of live and dead oiled birds affected by specific oil pollution incidents and an inventory of incidents is prepared each year. These incidents are the subject of this paper which examines the occurrence of oil-related kills of seabirds in the United Kingdom from the winter 1966-1967, when the infamous *Torrey Canyon* grounded causing gross pollution of beaches and thousands of seabirds in Cornwall (Gill *et al.*, 1967), until the summer of 1983.

The Counts

Public concern has normally led to the swift reporting of oil spillages or oiled birds to the conservation and animal welfare organizations. The network of the Beached Bird Survey, with its local organizers and established teams, greatly facilitated a rapid response to investigate incidents. Furthermore, the volunteers were usually aware of the densities of beached corpses found under more normal conditions. Thus, once a report had been received and evaluated, volunteers were requested to search the appropriate beaches and to record the numbers and species

of live and dead birds found. Corpses were buried or removed from the beach to avoid duplicate counts. Searches were made as frequently as manpower permitted over as wide an area as necessary.

To distinguish between a major incident and mortality resulting from chronic pollution, as measured by the routine beach surveys, an oil pollution incident is here defined as the occurrence of oil which affects a minimum of 50 birds, recorded over a limited time and place. The casualty total for each incident comprised counts of dead and captured, live oiled birds of any species, and also counts of live oiled divers, grebes and auks which were not caught. These free, live birds were included as their chances of recovery were regarded as poor, although slightly oiled auks have been recorded successfully removing small quantities of oil from their plumage (Birkhead *et al.*, 1973). Care was taken to avoid including live birds which may subsequently have been counted dead on beaches. Free-flying oiled birds of other species, notably gulls, were not included in the figures, even though some may have perished through the toxic effects of ingesting oil.

Results are presented annually for the period 1 July-30 June, rather than by calendar year, since most incidents occurred in winter (see below). The main results cover the period from 1971, when the RSPB first appointed a full-time coordinator, to 1983. To set this period in context, annual totals are also given from 1966 to 1967, the winter when the *Torrey Canyon* grounded. Differences in recording effort prevent full inclusion of the early incidents in the results.

Results and Discussion

Frequency and magnitude

The considerable variation between years in the number of birds affected by oil pollution incidents is largely attributed to the occurrence of a few large kills (Tables 1 and 2). The three highest totals were the result of the grounding of the *Torrey Canyon* (1966-1967), a massive wreck of oiled birds in north-east Britain (1969-1970), and in 1978-1979 a combination of the grounding of the *Christos Bitas* and a series of spillages in northern Scotland, coinciding with the first few months' operation of the Sullom Voe oil terminal in Shetland (Heubeck & Richardson, 1980; Richardson *et al.*, 1982). The few incidents between 1966-1967 and 1968-1969 are probably a reflection of the recording effort, although it is improbable that any large kills were overlooked.

TABLE 1

Numbers and size of oil pollution incidents affecting a minimum of 50 birds, and numbers of birds affected in United Kingdom, July 1966–June 1983.

Year	Size of incident (in terms of Nos of birds oiled)					Total No. of incidents	Total birds	% Auks	Species/sp	
	50–99	100–499	500–999	1000–4999	5000–9999					10000 +
1966–67				2	1	3	11 623	66.3	Divers	
1967–68		1		1		2	1668	15.3	Grebes	
1968–69	1	1		1		3	4838	86.3	Fulmar	
1969–70	2	3	1	2		9	18 892	64.9	Gannet	
1970–71		5	2	1		8	3113	86.7	Shag and	
1971–72	3	10				13	2035	61.5	Seaduck	
1972–73	3	7				10	1825	54.7	Other wild	
1973–74	2	7				9	1931	52.7	Waders	
1974–75		6				6	798	57.6	Gulls	
1975–76	1	5	1	1		8	3292	63.7	Auks	
1976–77	1	2	2	1		6	3348	85.5	Guillerm	
1977–78	2	8	1		1	12	8112	75.0	Razorb	
1978–79	1	9	3	3		16	11 847	63.9	Black C	
1979–80	3	5		2		10	6286	72.3	Puffin	
1980–81	1	6		1		8	3204	90.2	Others (in	
1981–82	3	9	2	1		15	4929	82.4		
1982–83	3	2		1		6	1472	83.1		
Total	26	86	12	17	2	1	144	89 213	69.7	Total

Figures for 1982–1983 exclude birds oiled during the massive weather wreck in February when 34 000 birds were found along the east coast (RSPB, unpublished data). Over 2900 of these birds were oiled, but there were no major concentrations which might have been specific incidents. We concluded that, but for the extraordinary numbers of birds in the area at the time, these would have been interpreted as chronic pollution, so we have not included these casualties.

There does not appear to be any overall pattern to the annual occurrence of the number of incidents. In the period 1971–1979 there is similarity between the numbers of birds and the severity of the winter weather. Winters in the early part of the decade were relatively mild, but increasing in severity in the latter half. However, examination of the individual incidents suggests that the similarity is coincidental, the pattern being dominated by a few large incidents in the late seventies (Table 1), whose occurrence shows no relation to winter weather.

The size of a kill is a reflection of the numbers of birds in the area, particularly the proximity of large flocks or colonies, as well as the quantity of oil discharged. The damage caused by small amounts of oil amidst large concentrations of birds is well illustrated by the spillage of about 1 t of fuel oil in the Firth of Forth in February 1978. Oil drifted at night into a roosting flock of Great Crested Grebes *Podiceps cristatus* and concentrations of nocturnal feeding Scaup *Aythya marila* and Pochard *Aythya ferina*, oiling over 800 birds (Campbell *et al.*, 1978).

No attempt has been made to estimate total mortality from the casualty figures (cf. Barrett, 1979). A corpse-drift experiment carried out in France during the *Amoco Cadiz* incident suggested that only about one-third of corpses drifting at sea were eventually recovered on beaches (Hope Jones *et al.*, 1978). Other experiments have given such widely varying recovery rates, e.g. 59% in the Irish Sea (Bibby & Lloyd, 1977) and 0.3% in the North Sea (Bibby, 1981), that proposing a generally applicable figure for

TABLE 2

Oil pollution incidents affecting at least 1000 birds in the United Kingdom, July 1966–June 1983.

Casualties	Date	Place	Source	Reference
2772	Sep. 1966	Kent	<i>Seestern</i>	Harrison & Harrison (1967)
1000	Mar. 1967	Lancashire		Bourne (1969)
7851	Mar. 1967	Cornwall	<i>Torrey Canyon</i>	Bourne <i>et al.</i> (1967)
1368	Feb. 1968	Tayside	<i>Tank Duchess</i>	Greenwood & Keddie (1968)
4407	Apr. 1969	NW England/N Wales	<i>Hamilton Trader</i>	Hope Jones <i>et al.</i> (1970)
1500	Sep. 1969	Ayrshire		Gibson (1970)
12 400	Jan. 1970	NE Britain		Greenwood <i>et al.</i> (1971)
3150	Mar. 1970	Cornwall		Unpublished data
1102	May 1971	Shetland		Bourne & Johnston (1971)
1644	Jan. 1976	Northumberland		Unpublished data
1455	Apr. 1977	Humberside		Cadbury & Richards (1977)
5044	Jan. 1978	Northumberland		Stowe (1979a)
2541	Oct. 1978	S Wales	<i>Christos Bitas</i>	Stowe (1979b)
3704	Dec. 1978	Shetland	<i>Esso Bernicia</i>	Heubeck & Richardson (1980)
1765	Feb. 1979	Shetland		Stowe (1979b)
2990	Dec. 1979	Cornwall		Stowe (1980)
2122	Mar. 1980	Northumberland		Stowe (1980)
1615	Jan. 1981	Norfolk	<i>Ems</i>	Standring & Stowe (1981)
1126	Dec. 1981	Norfolk		Stowe & Underwood (1983)
1001	Mar. 1983	Grampian		Unpublished data

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TABLE 3

Species composition of casualties in 119 oil pollution incidents July 1971-June 1983.

% Auks	Species/species groups	No. of casualties	%
66.3	Divers	347	0.7
15.3	Grebes	445	0.9
86.3	Fulmar	235	0.5
64.9	Gannet	635	1.3
86.7	Shag and Cormorant	1024	2.1
61.5	Seaduck	2628	5.4
54.7	Other wildfowl	742	1.5
52.7	Waders	353	0.7
57.6	Gulls	1453	3.0
63.7	Auks	35 061	71.4
85.5	Guillemot	26 386	
75.0	Razorbill	3480	
63.9	Black Guillemot	743	
72.3	Puffin	398	
90.2	Others (incl. those not identified)	6156	12.5
82.4	Total	49 079	

recovery rates is not appropriate. In these experiments corpses were shown to drift predominantly downwind, so that some incidents may not be detected during periods of strong offshore winds. However, many birds are not killed outright by contamination with oil, and are able to reach shore against offshore winds if the incident occurs near land (Standring & Stowe, 1981). In one incident heavily oiled Pochard were able to fly 7 km before becoming incapacitated (Campbell *et al.*, 1978). Thus, calculation of total number of birds affected using a corpse-drift experiment may over-estimate the size of a kill.

Species composition

Auks were the most numerous group of birds affected (Tables 1 and 3). The amount of time they spend sitting on the sea surface and their distribution in the shipping lanes in winter are presumably responsible. Guillemots *Uria aalge* were more numerous than Razorbills *Alca torda*, to a greater extent than their respective population sizes would suggest, presumably because Razorbills winter outside UK waters to a greater extent than Guillemots. Very few Puffins *Fratercula arctica* were oiled, despite their large populations, perhaps because they winter

further out to sea outside UK waters. Numerically, relatively few other species or species groups were seriously affected. Seaduck (Eider *Somateria mollissima*, Scoters *Melanitta spp*, Long-tailed Duck *Clangula hyemalis*, Scaup, Goldeneye *Bucephala clangula* and Red-breasted Merganser *Mergus serrator*) were the next most frequent casualties. Like auks, they spend much of their time on the sea surface and their propensity to form large flocks increases the risk of large kills in some areas, e.g. Tay estuary (Greenwood & Keddie, 1968), Firth of Forth (Campbell *et al.*, 1978) and Carmarthen Bay (Sutcliffe, 1975).

Totals for several species are particularly influenced by specific incidents, e.g. 67% of the Cormorants *Phalacrocorax carbo* and Shags *P. aristotelis* and 85% of the Black Guillemots *Cephus grylle* were oiled during a single spillage from the *Esso Bernicia* at Sullom Voe oil terminal, Shetland (Heubeck & Richardson, 1980). Fifty-six per cent of grebes were Great Crested, oiled in a spillage in the Firth of Forth (Campbell *et al.*, 1978), and 42% of divers were Great Northern *Gavia immer*, also oiled in the *Esso Bernicia* incident (Heubeck & Richardson, 1980).

Geographical location

North-west Scotland was the only coastline to escape pollution incidents (Fig. 1). The lack of pollution there was probably a genuine phenomenon (certainly in recent years) and not a reflection of fewer observers. In contrast, several areas on the east coast were particularly prone to pollution incidents, e.g. Firth of Forth to Newcastle and north-east Norfolk. These findings are broadly similar to the regional results of the routine Beached Bird Surveys (Stowe, 1982b). The majority of these incidents were the result of discharge of fuel oil, rather than crude oil from tankers (Andrews & Standring, 1979; Stowe, 1982b), and presumably reflect density at sea of both marine traffic and birds.

There has been a recent northerly shift in the occurrence of oil pollution incidents. Along the northern coast of Scotland and in Orkney and Shetland only one incident (1102 birds; Table 1) was reported between July 1966 and January 1976. In the next 7 years, with the opening of major oil terminals in Orkney (1977) and Shetland (1978), there were 13 incidents affecting 8543 birds. Seven of these

TABLE 4

Monthly distribution of numbers of incidents and birds affected. Additional data are presented from the results of Beached Bird Surveys for 1971-1979 (Stowe, 1982b) and for 1970 when monthly surveys were made (Bibby, in Bourne, 1976), and from results of ACOPS surveys of the number of oil spillages 1978-1981.

	No. of incidents 1971-83	No. of casualties 1971-83	Beached Bird Survey		% Beaches oiled 1970	No. of oil spillages 1978-81
			Mean % auks oiled 1971-79	Mean % beaches oiled 1971-79		
Jul.	0	0			14	162
Aug.	2	284			9	144
Sep.	7	1074	34	10	14	174
Oct.	5	3183			17	144
Nov.	8	1916	49	9	18	113
Dec.	18	8887			11	104
Jan.	26	15 849	59	16	41	167
Feb.	22	7084	65	20	35	155
Mar.	16	6171	58	18	30	191
Apr.	7	3365			34	210
May	6	914			26	170
Jun.	2	352			19	191

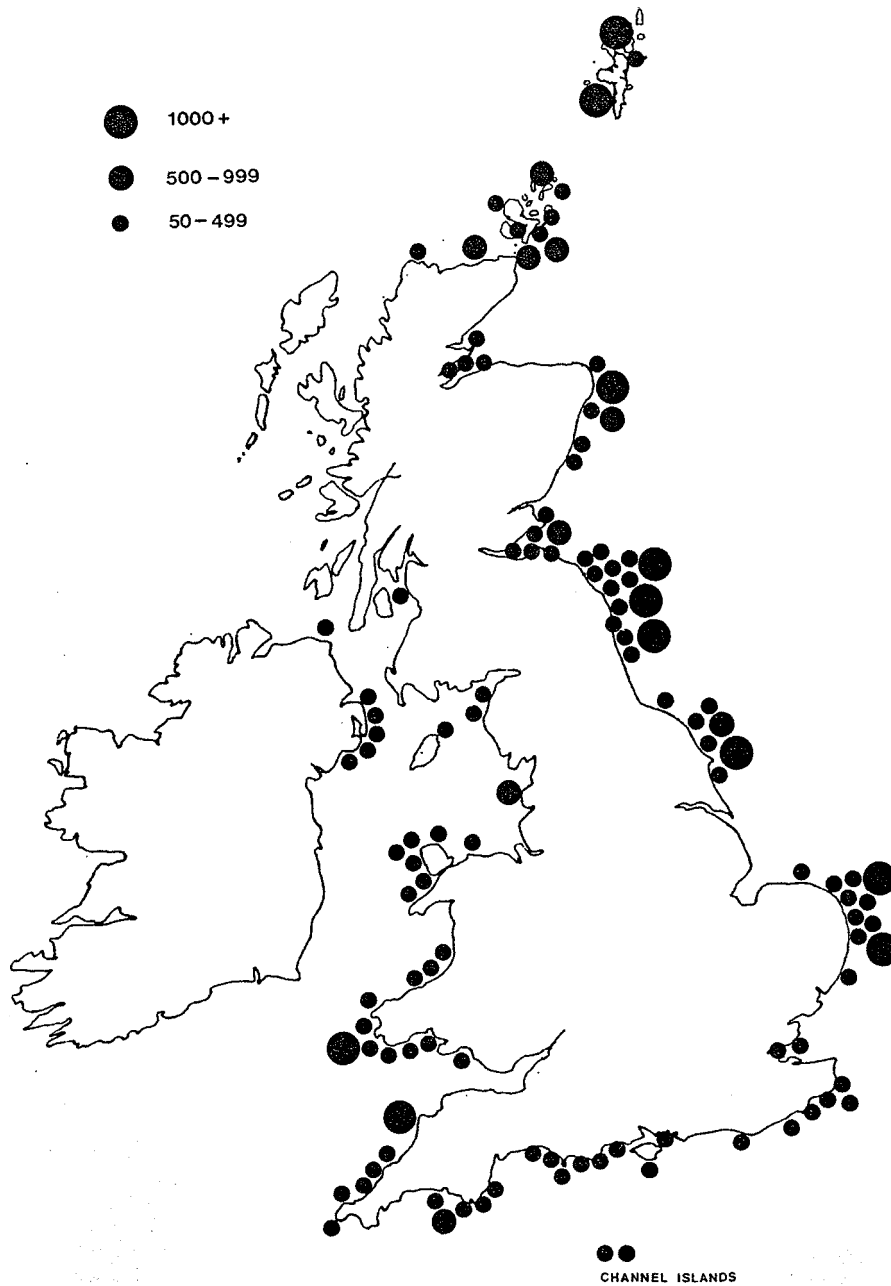


Fig. 1 Oil pollution incidents affecting a minimum of 50 birds, July 1971-June 1983.

incidents involving 7273 birds occurred in the 7 months following the opening of the Sullom Voe terminal, Shetland. The vessels responsible for these pollution incidents were seldom discovered, but after public outcry and the introduction of more stringent prevention measures the frequency of spillages was reduced (Richardson *et al.*, 1982).

It is perhaps surprising, in light of the huge concentrations of seabirds along the cliffs of Caithness, Orkney and Shetland, that more massive kills have not occurred in the area, particularly because of the development on the North Sea oil-fields. The tendency for Guillemots to return to their breeding ledges earlier than was previously observed (Taylor & Reid, 1981) puts the birds at risk at their colonies throughout the critical winter period, when most pollution incidents occur (see below). The concentrations of seaduck in the Moray Firth have also escaped serious pollution.

These are the largest concentrations of seaduck in Britain (Mudge & Allen, 1980) now that numbers on the Firth of Forth have declined following the modification of the sewage treatment (Campbell, in press).

Seasonal occurrence

There was a marked seasonal bias in the occurrence of incidents (Table 4), the majority occurring in the winter months (December-March). No incidents have been recorded in July between 1966 and 1983.

The occurrence of spillages during periods of auk passage can influence the extent of mortality in certain sea areas. During the *Torrey Canyon* disaster in Cornwall in March 1967, nearly 40% of the Guillemots examined were thought to be from northern British populations (Bourne *et al.*, 1967): Some of these birds may have wintered off the Cornish coast but many were returning from further

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south (Mead, 1974). The majority of Puffins killed in Brittany, France, by oil from the *Amoco Cadiz* in March 1978 were returning from their wintering areas to colonies, mainly in southern and western Britain (Hope Jones *et al.*, 1982). Weather conditions during passage may also influence the numbers of birds that become oiled, as at Flamborough Head, N. Yorkshire in April 1977. An oil spillage close to the colony appeared to affect fewer local birds than expected and many of the 1455 casualties were Guillemots from northern colonies, at least some of which had been displaced by a period of strong winds a few days before the incident (Stowe, 1982c).

Why should more incidents occur in winter? The winter distribution of auks, the most numerous casualties, brings the birds southwards into many of the major shipping lanes, putting them at greater risk of contamination, whereas in spring and summer they are at or near their breeding colonies, the majority of which are in the generally less polluted waters of the north and west. Numbers of birds at sea may also be supplemented, particularly in severe weather conditions by birds from Faeroe (Mead, 1974), Norway and Iceland (Mead & Cawthorne, 1983). Although the winter distribution of birds does increase the likelihood of birds becoming oiled, particularly young birds which move further, it does not explain fully the winter occurrence of incidents. Many adult Guillemots return to their breeding grounds as early as October (Taylor & Reid, 1981) where they remain until July, yet the majority of oiling takes place in winter. Also, colonies in or near major shipping lanes, such as the Farne Islands and Flamborough Head, might be expected to lose birds to oil pollution throughout most of the year, and this has not been recorded.

Bourne & Bibby (1975) and Joensen & Hansen (1977) postulated that colder sea temperatures may increase the amount of time that floating oil remains in a state dangerous to marine birds. In warmer seas evaporation of the volatile fractions of the oil would be quicker, ultimately leaving tarballs which are relatively harmless to birds. More information on the behaviour of oil at sea is necessary to determine whether the differences in summer and winter sea temperatures around the United Kingdom are sufficient to account for the observed variation.

Standring & Stowe (1981) suggested that more oil is discharged in winter. Severe weather and rough seas combine to increase the frequency of ballasting operations,

which increases the likelihood of the discharge of oil-contaminated water. Indeed in storm conditions pumping the bilges, which often receive much waste oils, may be carried out as a matter of urgency, and the effects on birds (or the risk of prosecution) may receive little thought. Also, in winter the opportunities to pollute undetected under cover of darkness are greater.

Routine Beached Bird Survey results also suggest that oil pollution is a winter phenomenon, with the highest proportions of both beaches oiled and auks oiled occurring in February (Table 4). Early survey results from monthly counts provide similar evidence (Table 4). We also examined the Enumeration Sheets held by ACOPS to see whether more oil spillages were reported during the winter. During four years, 1978-1981, for which comparable data were available, the highest number of spillages reported to ACOPS occurred in March, April and June; and the lowest in November and December (Table 4). Although ACOPS data do not support the suggestion, we do not consider that they refute it, because of the nature of the information recorded in their survey. For example, many of the spring reports of oil were from local authorities, who were presumably undertaking beach cleaning operations at the start of the holiday season. Offshore platforms reported most spillages in June, presumably because the long daylight hours and reasonable weather conditions make floating oil easier to detect.

Comparison with Europe

In recent years major oil spillages have killed large numbers of seabirds off most European coasts from Galicia, Spain, e.g. 915 birds in 1979 (Anon., 1979) to Varanger fjord in arctic Norway, e.g. 5000 birds in 1979 (Barrett, 1979). Direct comparison of statistics is difficult because the recording methods are different and in general only large-scale incidents are investigated. Nevertheless, it is evident that the scale of some of the incidents, particularly those in the approaches to the Baltic Sea, has far exceeded any oil-related kill in Britain (Table 5).

The majority of the casualties in the major kills were seaduck. As with incidents in Britain, the extent of the casualties is determined by the vast concentrations of birds rather than the size of the spillage. Danish waters alone hold between 1 and 1 1/2 million duck each winter (Joensen, 1974), one of the largest concentrations in Europe (Atkinson-Willes, 1969). In the largest incident, in which

TABLE 5
Selected oil pollution incidents affecting at least 5000 birds in European Waters, excluding UK, July 1966-June 1983.

Casualties	Main species	Date	Place	Reference
10 000	Seaduck	Feb. 1969	Kattegat, Denmark	Joensen (1972)
5000	Seaduck	Dec. 1969	Kattegat, Denmark	Joensen (1972)
12 000	Seaduck	Feb. 1970	Kattegat, Denmark	Joensen (1972)
15 000	Seaduck	Dec. 1970	Kattegat, Denmark	Joensen (1972)
30 000	Seaduck	Mar. 1972	Kattegat, Denmark	Joensen & Hansen (1977)
30 000	Seaduck	Dec. 1972	Waddensea, Denmark	Joensen & Hansen (1977)
5000		Nov. 1978	Kattegat, Sweden	T. Larsson (pers. comm.)
35 100	Seaduck	Jan. 1979	Kattegat, Denmark	Clausager (1979)
6000		Feb. 1979	Latvia/Baltic Sea, Russia/Sweden	Lloyds List (31 Mar. 1979)
5000	Auks	Mar. 1979	Varanger, Norway	Barrett (1979)
45 000	Auks	Jan. 1981	Skaggerak, Norway & Sweden	N. Rov. (pers. comm.)
10 000	Seaduck	Mar. 1981	Helgeland, Norway	RSPB (1981)

45 000 birds are estimated to have died in the Skaggerak, the majority of casualties were auks, e.g. 27 000 Guillemots, 5800 Little Auks *Alle alle* and 4500 Razor-bills (N. Rov, pers. comm.). Oil pollution is a winter phenomenon in Europe as well as Britain. In a review of Danish pollution incidents between 1971 and 1976, Joensen & Hansen (1977) found that pollution affecting birds seldom occurred outside the period October to April, even though large concentrations of ducks occur all year round.

Effects on populations

The effects on the breeding population are difficult to assess. Results of monitoring schemes and a review of Razorbill and Guillemot populations in Britain and Ireland suggest that numbers of both species are increasing (Stowe, 1982a; Wanless *et al.*, 1982; Stowe & Harris, in press). We conclude that, nationally, the effect of the kills, if any, can only have been to retard the rate of increase. However, the effect of the most recent kills, e.g. the Skaggerak incident in 1981, may not yet be detectable, since young birds affected would not have been expected back at the colonies for 2–3 years (Mead & Baillie, 1981). Locally, oil pollution may have reduced population levels. We have only one example in the UK for which there is reasonable evidence—the decline of Black Guillemots *Cephus grylle* in Yell Sound, Shetland, after the spillage at Sullom Voe Oil Terminal in December 1978 (McKay *et al.*, 1981). Nevertheless, the potential to kill enormous numbers of birds remains, particularly in Scottish waters, and the fortunes of seabird populations could change dramatically through even one severe spillage.

We acknowledge the help and dedication of the many hundreds of volunteers who have walked beaches searching for oiled birds over the last sixteen years, and without whom this work could not have been carried out. We are also grateful to the Advisory Committee on Oil Pollution of the Sea for access to the unpublished information and to Shetland Oil Terminal Environmental Advisory Group for permission to cite one of their reports. Prof. G. M. Dunnett and Drs C. J. Bibby and J. Cadbury made helpful comments on the script.

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