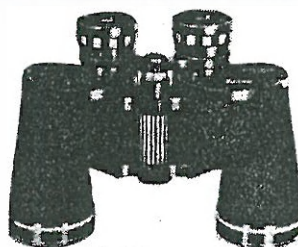




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British Birds

✓ Effect of 'Hamilton Trader' oil on birds in the Irish Sea in May 1969

P. Hope Jones, G. Howells, E. I. S. Rees and J. Wilson

INTRODUCTION

Just before dawn on 30th April 1969 the tanker *Hamilton Trader* was damaged in a collision with a German coaster near the Bar light vessel in Liverpool Bay. About 700 tons of heavy fuel oil were spilled into the sea. This incident provided an opportunity to trace the fate of the oil, and birds which encountered it, as it drifted in the Irish Sea for two weeks before coming ashore in Cumberland. Liaison was maintained between a wide range of institutions and individuals, and this report collates the ornithological information to present a fairly full picture of the course of the incident.

MOVEMENT OF THE OIL

Fig. 1 shows the oil movements in relation to the coastlines of north Wales and north-west England. With light north-west winds during 30th April and 1st May the oil remained in a compact serpentine slick near the Queen's Channel, which leads into the Mersey. On the 2nd the oil started moving towards the north Wales coastal resorts under a north-east wind of 20-25 knots, which, however, then veered south of east a few hours before the main slick would have been driven ashore. With variable winds, the main slick moved to a position ten miles north of the Great Orme on the 3rd and it remained in the same area until the 5th, but a number of smaller slicks seem to have moved closer inshore along the coast after breaking away from the main mass around the banks off the Mersey. The closest these smaller slicks came to the coast was 1½ miles off Rhyl on the 4th. Light winds from the southerly quarter then carried the slicks to the north so that by 7th May the oil was centred 16 miles north of the Great Orme.

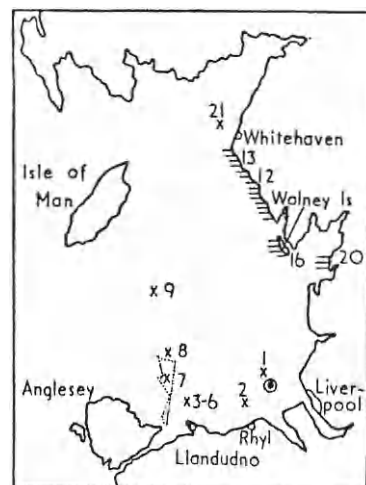


Fig. 1. Oil movement in relation to the coastlines of north Wales and north-west England following the *Hamilton Trader* incident in April-May 1969, and track of the bird-counting transect of 7th May

⊙ collision point between the tanker and coaster on 30th April

x observed position of oil at sea on indicated dates in May

≡ position of the oil on beaches on indicated dates in May

--- track of patrol vessel during transect count on 7th May

On the 8th stronger winds from the south and west began moving the oil fairly rapidly across Liverpool Bay, until on the 12th oil was reported arriving along a 21-mile length of the Cumberland coast between Silcroft and St Bees Head. By 21st May the whole of the Cumberland coast between Haverigg and Grune Point was affected and further pollution, though from a different source, had been reported from the Lancashire coast between Southport and Fleetwood.

The *Hamilton Trader* was on charter to Esso, and that company took the major part in the treatment of the oil slicks at sea. Corexit was the only dispersant used in any quantity, but the amount even of that was small and, since spraying was well offshore, the toxic effects were probably minimal. Crop-spraying aircraft and two fishing boats were used in the operation which lasted only from 3rd to 5th May and took place mainly off Rhyl, but also, to a small extent, in the area of the main slick north of the Great Orme.

OILED BIRDS: NORTH WALES

As early as 30th April oiled birds began to turn up on the shores of south-west Lancashire and the Wirral peninsula of Cheshire. By 7th May a total of 113 Guillemots *Uria aalge*, one Razorbill *Alca torda* and one gull *Larus sp* had been brought to the Merseyside sections of the Royal Society for the Prevention of Cruelty to Animals. Fig. 2 shows the numbers of oiled Guillemots brought to the R.S.P.C.A. in Liverpool during this period.

Live oiled birds began coming in along the north Wales coast on 2nd May, with maximum arrivals apparently on the 3rd and 4th, and numbers tailing off almost to nil by the 10th. Most of these

Table 1. Oiled birds brought in at Rhyl and Llandudno during 2nd-10th May 1969

The figures for Rhyl refer to birds picked up on the shores of north Flintshire and east Denbighshire (13 miles from Point of Air to Pensarn), while those for Llandudno refer to shores of west Denbighshire and the Llandudno area of Caernarvonshire (12 miles from Llanddulas to Great Orme)

	RHYL		LLANDUDNO	
	Number	Percentage	Number	Percentage
Guillemot <i>Uria aalge</i>	341	95.0%	1,129	96.1%
Razorbill <i>Alca torda</i>	12	3.3%	36	3.1%
Red-throated Diver <i>Gavia stellata</i>	3	1.7%	1	0.9%
Common Scoter <i>Melanitta nigra</i>	1		—	
Herring Gull <i>Larus argentatus</i>	2		7	
Kittiwake <i>Rissa tridactyla</i>	—		2	
TOTALS	359	100%	1,175	100%

were taken to the R.S.P.C.A. inspectors at Rhyl and Llandudno, but the vast majority were so badly fouled by oil that they had to be destroyed immediately. Attempts to rehabilitate about 20 of the least badly oiled proved abortive. Details are set out in table 1; only 20 oiled birds were reported from coasts west of the Great Orme up to, and including, eastern Anglesey. The numbers brought each day to Rhyl and Llandudno are shown in fig. 2.

A series of counts was carried out by Nature Conservancy staff along the two-mile beach between Llanddulas and Abergele, Denbighshire, to follow the pattern of fresh arrival of oiled birds on shore. Live birds were either taken to the R.S.P.C.A. (if not too badly oiled) or despatched on the spot, all corpses being buried above high water

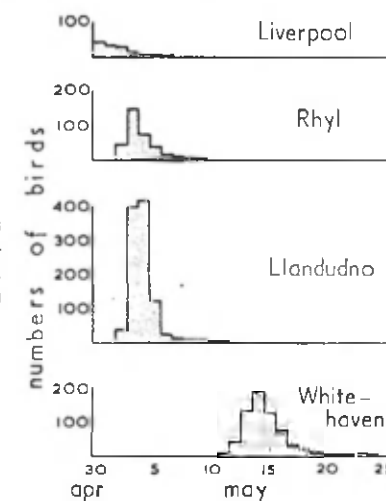


Fig. 2. Numbers of oiled Guillemots *Uria aalge* brought to R.S.P.C.A. Inspectors in four coastal towns of north Wales and north-west England in April-May 1969

Table 2. Oiled Guillemots *Uria aalge* found on a two-mile stretch of shore at Llandulas, Denbighshire, in May 1969

On the 3rd and 4th an unknown number of live Guillemots had been taken from the beach before the count was done. Only five other birds were found oiled: a dead Puffin *Fratercula arctica* on the 3rd; a dead gull *Larus sp* on the 5th; and a dead Razorbill *Alca torda* and two live Herring Gulls *L. argentatus* on the 6th

Date	Alive	Dead	Date	Alive	Dead
2nd	10	0	6th	6	2
3rd	19	2	7th	7	0
4th	9	3	8th	0	0
5th	5	4	9th	0	0

mark. Details are set out in table 2 which confirms that the peak of oiled birds on the shore in this area was 2nd-4th May, thus eliminating any possibility of bias due to the fact that the 3rd-4th was a weekend (when more people were likely to be walking on the beaches).

On 7th May E.I.S.R. and P.H.J. made a sea trip in the patrol vessel of the Lancashire and Western Sea Fisheries Joint Committee, the objects being to survey an area for oiled seabirds and to establish the position, extent and appearance of any floating oil. This was in effect a transect of $42\frac{1}{2}$ miles from the Menai Straits; the track is plotted in fig. 1. On the outward journey 22 oiled birds were noted in the mouth of the Menai Straits, and at a position some 16 miles north of the Great Orme a tideline about half a mile long in the sea was found to contain ten seabird corpses. Over the next few miles, there were extensive patches of oil comprising scattered tarry lumps up to 200 mm across, and several small slicks of thin filmy oil, some of them with thicker black centres. No oil was observed over the course of the inward trip. From 07.15 hours to 14.40 hours GMT a continuous watch was kept and all seabirds were recorded as alive, oiled or dead (table 3). Counts were done by scanning the water and sky with 8×40

Table 3. Numbers of birds recorded on a $42\frac{1}{2}$ -mile transect out from the Menai Straits on 7th May 1969

The track is shown in fig. 3. The totals include neither gulls and Fulmars seen round fishing boats nor birds within the Menai Straits

	Total alive	Number alive oiled	Percentage oiled	Total corpses
Fulmar <i>Fulmarus glacialis</i>	127	29	23%	0
Gannet <i>Sula bassana</i>	55	1	2%	1
Gulls <i>Larus spp</i>	191	6	3%	1
Kittiwake <i>Rissa tridactyla</i>	111	4	4%	0
Razorbill <i>Alca torda</i>	0	0	—	1
Guillemot <i>Uria aalge</i>	51	14	27%	18
Puffin <i>Fratercula arctica</i>	2	0	—	0

binoculars and recording all birds in a notebook; on the prow of the patrol vessel, eye-level was ten to twelve feet above sea-level. About a quarter of the Fulmars *Fulmarus glacialis* were obviously oiled, but, despite this, extremely few are known to have been washed ashore oiled during the incident.

OILED BIRDS: CUMBERLAND

On the Cumberland coast, oiled live birds began to arrive on 11th May, with numbers reaching a peak on the 14th and falling away afterwards. From the counts available, there was evidently a complication in this area of a double arrival of live and freshly-dead birds

Table 4. Numbers of oiled birds collected on the shores of Lancashire and Cumberland in May 1969

The live birds, which were collected only along the Cumberland coast and brought to the R.S.P.C.A. Inspector at Whitehaven, probably represented the local stock, whereas the counts of corpses between the estuaries of the Ribble and the Solway could have included birds killed anywhere off the coasts of north Wales, Lancashire and Cumberland. Percentages are given only for those species which formed more than 1% of the total

	LIVE		DEAD	
	Number	Percentage	Number	Percentage
Red-throated Diver <i>Gavia stellata</i>	4	—	13	—
Great Northern Diver <i>Gavia immer</i>	—	—	1	—
Fulmar <i>Fulmarus glacialis</i>	1	—	17	—
Manx Shearwater <i>Puffinus puffinus</i>	—	—	1	—
Gannet <i>Sula bassana</i>	2	—	42	2.3%
Cormorant <i>Phalacrocorax carbo</i>	1	—	7	—
Shag <i>Phalacrocorax aristotelis</i>	—	—	1	—
Mallard <i>Anas platyrhynchos</i>	—	—	1	—
Common Scoter <i>Melanitta nigra</i>	1	—	3	—
Shelduck <i>Tadorna tadorna</i>	—	—	4	—
Oystercatcher <i>Haematopus ostralegus</i>	—	—	2	—
Turnstone <i>Arenaria interpres</i>	—	—	1	—
Bar-tailed Godwit <i>Limosa lapponica</i>	—	—	1	—
Dunlin <i>Calidris alpina</i>	—	—	1	—
Great Black-backed Gull <i>Larus marinus</i>	—	—	8	—
Lesser Black-backed Gull <i>Larus fuscus</i>	—	—	23	1.2%
Herring Gull <i>Larus argentatus</i>	7	1.1%	38	2.1%
Black-headed Gull <i>Larus ridibundus</i>	—	—	11	—
Kittiwake <i>Rissa tridactyla</i>	—	—	3	—
Little Tern <i>Sterna minuta</i>	—	—	1	—
Razorbill <i>Alca torda</i>	9	1.4%	102	5.5%
Guillemot <i>Uria aalge</i>	601	96.0%	1,558	84.2%
Black Guillemot <i>Cephus grylle</i>	—	—	1	—
Puffin <i>Fratercula arctica</i>	—	—	1	—
TOTALS	626		1,851	

oiled locally, and of longer-dead birds carried up from north Wales. Repeat counts on a few areas by staff of the Royal Society for the Protection of Birds and of the Nature Conservancy suggested that live, badly oiled birds came ashore from 11th to 14th May and that, while there were some dead birds in this period, the majority of corpses came ashore between the 15th and 24th, with a probable peak on the 19th. Two casualty lists have therefore been drawn up in table 4. The daily totals at Whitehaven are also shown in fig. 2.

In the Isle of Man, there was no evidence of any abnormal arrival of oiled birds during May (E. D. Kerruish *in litt.*).

CALCULATION OF GUILLEMOT MORTALITY

Figures for Guillemot mortality have been calculated from three sources (table 5). Those for birds brought in to the R.S.P.C.A. are quite accurate, but represent only a percentage of the total numbers killed by the oil, so numbers of dead and heavily oiled Guillemots out at sea have been estimated from the results of the patrol vessel transect on 7th May. Calculations have been based on two major premises: (i) that the transect travelled by the ship was representative of conditions over a wide area, and (ii) that **Guillemot corpses were visible within 25 yards of the prow of the ship, and live oiled birds within 75 yards.**

In relation to the first point, the trip was a relatively long one, and the area traversed was partly that where the oil slicks were situated and partly that between the oil and the land; the data should

Table 5. Numbers of Guillemots *Uria aalge* and other species known to have died in the oiling incident in the North Irish Sea, May 1969

In addition to the numbers given below, at least a further 1,500 Guillemots are probably unaccounted for, on the basis of numbers estimated from the transect of 7th May (page 103)

	Guillemots	Other species
NUMBERS BROUGHT TO R.S.P.C.A.		
Merseyside	113	2
Rhyl	341	18
Llandudno	1,129	46
Bangor and Llangefni	18	2
Whitehaven	601	25
NUMBERS TAKEN HOME BY PUBLIC		
North Wales	40	4
NUMBERS FOUND DEAD ON BEACHES		
North Wales	98	11
Hilbre Island, Cheshire	30	—
South Lancashire	69	9
Cumberland and north Lancashire	1,558	293
TOTALS	3,997	410

therefore be quite representative of the area where dead and oiled birds could be expected. By checking the tidal drift, it was confirmed too that the vessel did not return through any of the same water. Figures for the distances at which corpses and oiled birds could be seen, although subjective, are thought to represent quite well the distances over which these could be safely identified. Corpses were in any case difficult to spot, and the figures calculated will certainly be minimal in this category; oiled birds were easier to pick out, but even so the observers could not be sure that they saw every one within the prescribed limits. On these assumptions the following calculations have been made:

Outward trip (14.5 miles): 2 corpses and 5 oiled =
4.854 corpses and 4.046 oiled per square mile
Inward trip (16.5 miles): 2 corpses and 3 oiled =
4.266 corpses and 2.133 oiled per square mile
Average values for the above (31 miles) =
4.541 corpses and 3.028 oiled per square mile
Outer area (9.25 miles): 1 corpse and 4 oiled =
3.806 corpses and 5.075 oiled per square mile

On the basis of these calculations, the outer area of approximately 5×5 miles would have contained 95 corpses and 127 oiled birds and, as it was considered that conditions similar to that passed through by the ship extended over a minimum area of 15×20 miles, the transect area would have contained 1,362 dead Guillemots and 908 live ones. In sum, it was estimated that a minimum of 2,465 dead and dying Guillemots were present on 7th May in the sea off the north Wales coast. Some of these are presumed to have turned up later on the Cumberland and Lancashire coasts, and a subtraction of corpse numbers recorded on those shores from corpse numbers calculated at sea gives a deficit of at least 1,500 as shown in the final 'balance sheet' in table 5.

CORPSE DRIFT EXPERIMENT

Permission was obtained from the British Trust for Ornithology to ring dead auks and return them to the sea, in order to discover the proportions recovered, the locations of recovery, and the rates at which auk corpses moved about in the sea in relation to local winds, currents and tides. Ringed and with one wing cut off in each case (see later), 382 dead Guillemots and 28 dead Razorbills were taken out by boat on 9th May and dropped at sea in various positions off the Denbighshire and east Caernarvonshire coasts. In the next few days the wind blew from between south and south-west, and the ringed corpses began to turn up in numbers on the Walney coast of Lancashire on 17th May—eight days after being placed in the sea. More recoveries followed in this area on the 18th, and then the majority

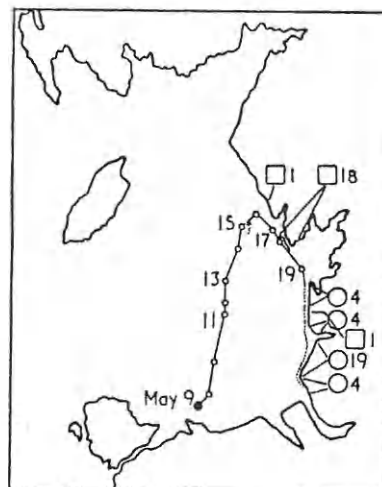


Fig. 3. Recovery locations in north-west England, and probable track, of ringed corpses of auks (*Alcidae*) deposited in the sea off north Wales in May 1969

- area in which ringed corpses were dropped into the sea
- calculated track of floating corpses on indicated dates in May
- localities and numbers of ring recoveries on 17th-18th May
- localities and numbers of ring recoveries on 19th-24th May

on the 19th and 20th were reported from the Fylde and Southport coasts of Lancashire (see fig. 3).

Along most of its length the shore between Liverpool and St Bees Head is of easy access and, because of the pleasant time of the year and the publicity given to the oil pollution and to the critical condition of oiled seabirds, much of this stretch was surveyed both by bird-watchers and by members of the public.

The R.S.P.B. and the Nature Conservancy organised counts of tideline seabirds in many areas, and the R.S.P.C.A. centres became known as places to which oiled birds should be taken. There was therefore as good a coverage of this length of shore as could reasonably be hoped for. This resulted in the reporting of 82 of the 410 ringed corpses, or exactly 20%. Recoveries continued until September, but the majority were in the second week after ringing and all but two within seven weeks. Omitting three which could not be dated accurately, we have the following time scale:

May 17-23	May 24-30	M J 31-6	June 7-13	June 14-20	June 21-27	June 28 to September	TOTAL
51	7	9	4	2	4	2	79

Following the *Torrey Canyon* disaster in 1967, Smith (1968) showed that the oil appeared to move with the wind at 3.4% of the latter's velocity, and other workers (e.g. Hughes 1956) have tended to confirm that in the open sea the surface film of water does move at about this rate, though Tomczak (1964) put it somewhat higher at 4.2%. The thickness of the floating object almost certainly has an important effect on its response to wind, and auk corpses might be expected to

travel at slower rates than floating oil. To check this, mean wind speed and direction figures (calculated from a recording anemograph) were obtained from the Meteorological Office of the Royal Air Force station at Valley on the west coast of Anglesey, and a wind vector analysis was carried out on an hourly basis. It proved possible to fit the track of the auk bodies to the point and time of arrival on Walney Island on 17th May by using the true resultant wind direction and 2.2% of the wind velocity. After several of the floating corpses had gone ashore on Walney on the 17th and 18th, we calculate that late on the 18th and during the 19th most of the remainder would have been moving into the mouth of Morecambe Bay between Walney and Fleetwood. The flow of fresh water out of this bay is known to be quite substantial (A. R. Helliwell *in litt.*) and, despite a light southerly wind on the 20th, this southward current would probably have been sufficient to ensure that the corpses were washed up on the shores between Fleetwood and Formby, where in fact many ringed birds were found on the 19th and 20th.

In an analysis of this kind, there is room for error on several counts. Harvey (1968) drew attention to the possible effects on surface water movement of the general north and south run of the land on either side of the Irish Sea, and Reynolds (1956) observed that wind speed at any one station in the northern Irish Sea may be 'not a very good guide to quantitative estimates of conditions over the area as a whole'. In the present case, oil was first reported on the Cumberland coast on 12th May and continued to arrive over the next few days, while ringed corpses turned up about 20 miles to the south-east of this early oil five days afterwards. The reasons appear to be that the corpses were put into the sea about 20 miles south-east of the main oil patch and that, because of their greater drag, they travelled less quickly. If future studies confirm that auk-sized birds travel in seawater at about 2.2% of the wind velocity, it is likely that bigger corpses such as Gannets *Sula bassana* and Cormorants *Phalacrocorax carbo* will be found to travel slightly slower than this, and small birds slightly faster—perhaps up to 3% of the wind velocity.

One potentially important recovery was made on 9th June when the body of a ringed Guillemot was caught in a trawl on the bottom of the sea six miles off the coast near Southport, possibly the first positive evidence that seabird bodies sink. Although it may be that the bird had arrived there via the seas off Walney Island and Morecambe Bay, there is a possible alternative explanation. Ramster (1965), from returns of seabed drifters, was able to map the residual bottom currents over the bed of the north-east Irish Sea. Below most of the calculated drift track of the ringed corpses in our experiment, the bottom currents between March and October run in a generally eastward direction, so if any corpses were to sink at some stage

along this track they would indeed be most likely to end up along the Lancashire coast between Fleetwood and Liverpool. It should be remembered that 80% of the ringed corpses were not recovered and even if twice as many turned up on the well-watched tidelines as were actually reported, this still leaves over 50% of the corpses unaccounted for. Since ringed corpses were reported only from the Lancashire and Cumberland coasts, it seems relatively unlikely that many drifted off elsewhere. It is thus possible that at least half of the corpses put into the sea sank at some stage between 9th and 21st May. This raises one important point which serves to illustrate the difficulties of estimating numbers involved in seabird mortality incidents: 20% of the ringed corpses were reported on the beaches and, if this same proportion is applied to the 1,558 unringed oiled Guillemots found on tidelines (table 4), then the number of unringed corpses in the Irish Sea on 7th May may have been nearer to 7,790 than the 2,465 estimated from the patrol vessel transect count. Coulson *et al.* (1968), studying an incident of seabird mortality in north-east England, calculated that, despite favourable onshore winds, only 25% of Shag corpses were found on the tidelines examined—a figure very close to that provided by the present experiment—but they were no more able to account for the remainder of their Shags than we are for our missing Guillemots.

This experiment has suggested that oiled birds dying in the slick would have moved slightly more slowly than the oil itself; therefore, since the oil did not come ashore in north Wales, one would not expect many corpses to have turned up on the tidelines there. This explains why the vast majority of oiled auks coming ashore in north Wales were live ones which must have made a positive effort to get to land.

AGE AND SUBSPECIES OF GUILLEMOT CORPSES

The two subspecies of Guillemot breeding in the British Isles can be distinguished by the colour of their upper-parts, *U. a. albonis* (the southern form) being a greyish-brown and *U. a. aalge* (the northern) being much darker and tending towards black. Breeding populations of these two races meet in south-west Scotland and there is a wide zone where mixed populations and intermediate types occur (see *The Handbook*).

All the corpses obtained from the R.S.P.C.A. at Rhyl and Llandudno were inspected; one wing was cut off every Guillemot for future study and each corpse, on the basis of plumage colour, was given a subspecific rank. On a visual assessment of the colour of back, mantle and head, those birds whose plumages were not too fouled by oil were allocated to three categories of 'Southern', 'Northern' and 'Intermediate', and were further divided into those with full summer

Table 6. Subspecies types of corpses of Guillemots *Uria aalge* in north Wales in May 1969

	Southern	Intermediate	Northern
Summer plumage	326 (91.6%)	28 (75.7%)	6 (37.5%)
'Winter' plumage	30 (8.4%)	9 (24.3%)	10 (62.5%)
Proportion	87.0%	9.1%	3.9%

plumage and those with remnants of winter plumage still obvious (table 6). The proportion with traces of winter plumage was much higher amongst the northern birds than amongst the southern, and this presumably reflects the fact that most of the northerners were immature (possibly first-year) non-breeders which were summering south of their natal colonies.

A sample of wings from this collection was later examined by Dr W. R. P. Bourne and P.H.J., when comparison could be made with wings from good northern Guillemot stock. This confirmed the original findings that the vast majority, 87%, showed the characters of the southern race. The wing sample was also examined for age on the criteria described by Bourne, Parrack and Potts (1967)—that pale edgings to the longer under wing-coverts indicate first-year Guillemots. Of the 56 clean southern wings examined, 30 (54%) were considered to have come from first-year birds. This seems an extremely high percentage for such a long-lived species, and two possible reasons suggest themselves. On the one hand, the criterion used for first-year identification may be neither as accurate nor as decisive as one might wish. Furthermore, in Guillemots 'the adoption of summer plumage is still an unknown issue' (Dr W. R. P. Bourne *in litt.*) and this could complicate the picture still further so late in the season. Mean wing-length of the supposed adults from north Wales differed by only a marginal 0.2 mm from that of the supposed first-year birds (table 7), and this is in contrast to wings from *Torrey Canyon* corpses where there was a difference of 1.4 mm between the means of these two groups. On the other hand, an alternative reason for the high percentage of first-year birds could be adduced if the ageing criterion were in fact valid: since the area of the maximum kill is known to be

Table 7. Wing measurements of 56 Southern Guillemots *Uria aalge albonis* killed by oil in north Wales in May 1969

	Number in sample	Mean wing-length (mm)	Standard deviation	Range (mm)
Supposed adult	26	194.2	4.73	186-206
Supposed 1st year	30	194.0	5.38	185-202

extremely rich in small fish (presumably Guillemot food), it could act as a collecting ground for many young birds, as well as a feeding site for adults commuting from their comparatively small Llandudno breeding colonies. In general, we feel that until taxonomic material of known age is available in good quantity, it would be unwise at this stage to lay too much emphasis on this particular ageing criterion.

EFFECT ON LOCAL BREEDING STOCK

Guillemots and Razorbills constituted over 95% of the local mortality in north Wales and Cumberland; breeding sites of these auks are relatively few in the areas which would seem to be potentially vulnerable in this incident (fig. 4). Apart from the birds involved in the corpse ringing experiment there were only two 'genuine' recoveries amongst all the corpses examined: a Guillemot ringed as a nestling on Great Saltee, Wexford, on 3rd July 1966 was found oiled near Bootle, Cumberland, on 14th May 1969; and another Guillemot ringed as a nestling at Port St Mary, Isle of Man, on 3rd July 1965 was found oiled at Lower Heysham, Lancashire, on or about 17th May 1969. Neither contributes directly to resolving the question of the origin of the birds killed by the *Hamilton Trader* oil.

Two north Wales colonies were checked immediately after the peak of the kill. On 6th May a careful count of those at the Ormes was made from the sea: 103 Guillemots on the Little Orme and 195 on the Great Orme compared with 365 and 790 counted in mid May 1966. This is an apparent reduction of 74% which is probably large enough to be meaningful, even bearing in mind that numbers present at

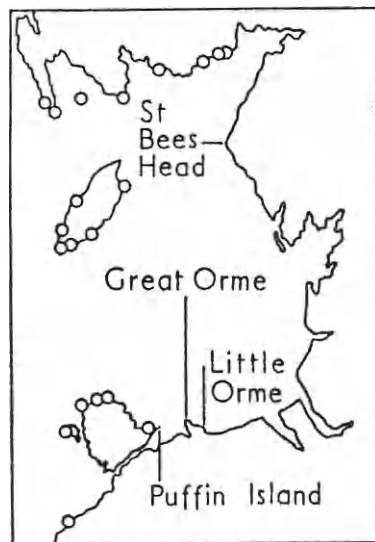


Fig. 4. Breeding colonies of auks (Alcidae) in the eastern half of the Irish Sea. Those considered likely to have been affected in the *Hamilton Trader* incident in April-May 1969 are named; all others are marked with open circles.

auk colonies vary greatly from hour to hour as well as seasonally. As many as 887 were counted at the Ormes on 13th June 1969, but presumably many of these were non-breeders which do not arrive on the ledges until late in the season (Southern *et al.* 1965). A similar count from the sea was made of the Guillemots on Puffin Island on 7th May and 12th June 1969: totals of 330 and 269 indicated a 4% and 22% loss from a count of 345 in mid June 1966. It is not known if there were changes at other Anglesey colonies because of the lack of reliable pre-1969 information, but subjective assessments do not indicate any major reduction in 1969.

Razorbill figures are notoriously difficult to estimate and the evidence for any change is conflicting. At the Ormes in mid May 1966 only 74 occupied sites were counted, while in mid June 1969 the figure was 117 (probably because the birds were counted more efficiently). Conversely, at Puffin Island, 183 occupied sites were counted in mid July 1967, compared with 114 in mid June 1969.

The situation at St Bees Head is not very clear when trying to compare 1969 figures with previous years' counts. J.W. counted 1,329 Guillemots on the cliffs on 16th May, but J. Sheldon found 2,538 there on 22nd June, an increase probably due to the late appearance at the colony of immatures. There was almost certainly a kill of breeders from here, in view of the 601 Whitehaven corpses, but any true reduction in breeding stock cannot readily be calculated.

From the above we conclude that possibly about 850 breeding adults were removed by this oiling incident from the Orme colonies at Llandudno and an unknown number from the St Bees colony. The numbers of Guillemots on the ledges at a breeding colony represent only a fraction of the total in that colony and, if the figures suggested by Southern *et al.* (1965) are any guide, then the losses from the Orme colonies may be nearer 1,500 individual Guillemots. The large number known to have been killed—and the even greater number estimated—presumably relates in fair measure to immatures and non-breeding adults, and so the recruitment rate to the colonies at which they would have bred may be affected accordingly in subsequent years.

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SUMMARY

Following damage to the tanker *Hamilton Trader* off the mouth of the River Mersey on 30th April 1969, about 700 tons of fuel oil were spilled into the north Irish Sea. The oil moved west along the north Wales coast, some miles offshore, almost to Anglesey, and was then blown across the Irish Sea to come ashore along the Cumberland and north Lancashire coasts during mid May.

Over 4,400 birds (91% of them Guillemots *Uria aalge* and 4% Razorbills *Alca torda*) are known to have been killed. Another 1,500—and possibly as many as 6,250—are estimated to have been lost at sea. About a quarter of these almost certainly came from the breeding colonies at Llandudno (whose Guillemots were possibly depleted by 75%); a small proportion came from the colonies at St Bees Head, Cumberland, and Puffin Island, Anglesey, while the remainder were probably immatures and non-breeding adults from unknown sources. About 87% of the Guillemot corpses examined in north Wales showed plumage colours characteristic of the southern form *U. a. albionis*.

An experiment, involving the dropping at sea of ringed dead auks, showed that auk corpses floating in the open sea are likely to move with the wind and at 2.2% of its velocity. Near the coast, local current and tidal movements can have greater influence than the wind on direction of drift, while those corpses which sink are likely to move according to the pattern of bottom currents. 20% of the experimentally ringed corpses were recovered within four months; it is suggested, from circumstantial evidence, that perhaps more than 50% sank within eleven days.

The disaster could have been mitigated by prompt action in cleaning up or 'destroying' the oil soon after the spillage; many inadequacies in ornithological knowledge must be resolved before the true effects of such an incident can be monitored with confidence and precision.

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More examples of the best recent work by British bird-photographers

Plates 16-23

This is the eleventh annual selection of the best contemporary work by British bird-photographers. Six of the species and three of the photographers are new to the series which has therefore now included 150 photographs of 104 species by 59 people. We think that this latest selection, from a short-list of nearly a hundred prints, comes well up to the standard we set out to achieve. There has been a welcome recent trend towards photography away from the nest, mainly brought about by the development of the 35mm camera and telephoto lenses. Before these were available it was very difficult to get sufficiently close to a bird except at the nest or at bait. In the current selection no less than nine of the 14 photographs were taken away from the nest. We hope that this trend will continue because most British and numerous European breeding species have been photographed incubating eggs or feeding young, many of them so often that there is an inevitable sameness about the results. On the other hand, an enormous harvest waits to be gathered in the fields of display and behaviour.

We are always pleased to welcome new names. D. N. Dalton has been a keen photographer for many years and his Turtle Dove *Streptopelia turtur* (plate 18a) makes it surprising that his work has not been included before. On the other hand, Dr D. L. Urry is a comparative newcomer, and few had heard of him and his wife until they took first and second prize respectively in the 'Birds in Flight' competition organised by the Royal Society for the Protection of Birds and their pictures were subsequently shown at the 'Flying Free' exhibition arranged by Kodak Limited and the R.S.P.B. at Kodak House, London, in April 1969; they have both specialised on birds in flight and we have selected Dr Urry's flock of Starlings *Sturnus vulgaris* (plate 20a) as the most unusual. The third new photographer is Peter John Markey, whose charming photograph of Little Terns *Sterna albibrons* (plate 22b) was, however, taken as long ago as 1960 (whereas all the rest relate to 1968-70); it is also the first time that this species has featured in the series. Incidentally, had Mr Markey photographed this nest in the last three years, he would have had first to obtain approval from the Nature Conservancy, for this is a species on Schedule 1 of the Protection of Birds Act 1967. We take this opportunity of reminding photographers that, before attempting to photograph any Schedule 1 bird at or near the nest, they are required by law to apply to the Nature Conservancy, 19 Belgrave Square, London SW1.

Of the other five species (apart from the Little Tern) appearing