

in 1976. There are no substantial seabird colonies within the territory of the latter pair.

It is difficult to ascertain whether the present rate of reproduction by eagles on Rhum is sufficient to maintain the population when so little is known about adult and juvenile survival rates. Everett (1971) tentatively suggested that an annual reproductive rate of 0.5 young per pair may be adequate to maintain a viable adult population. If this figure is correct the rate on Rhum of 0.37 young per breeding pair/0.29 per occupied territory is insufficient to maintain the population without immigration from areas where breeding success is higher.

Acknowledgments

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Summary

Breeding success and feeding habits of the three or four pairs of resident Golden Eagles on Rhum have been recorded for 20 years. Breeding success has been generally poor and an examination of the possible causes for this strongly suggests that contamination by toxic chemicals through marine food chains and seabird prey is depressing reproductive performance.

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GOLDEN EAGLE
AND MANX
SHEARWATERS
J. A. LOVE

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P. Corkhill, Nature Conservancy Council,
5b High Street, Belford, Northumberland

The impact of an oilspill in the Firth of Forth on Great Crested Grebes

LENNOX CAMPBELL ~~Zoological Museum~~

(Plate 5)

Oil and troubled waters again. A small leak caused nearly 1,400 casualties including at least two thirds of 300-350 Great Crested Grebes in the Forth. Scotland's breeding population is only 150 pairs and the Forth is a major wintering area. How much damage had been done?

In February 1978 a small spillage of oil at Leith Docks (Midlothian) affected more than 1,387 birds of 27 species. Most severely hit were Scaup (220), Pochard (244), Eider (179), Guillemot (100) and 241 Great Crested Grebes (subsequently referred to simply as grebes) of which at least 200 died. Full details have been given by Campbell *et al.* (1978). Whilst the overall impact of this incident was unlikely to be great, considerable alarm was expressed at its possible effects on the small Scottish breeding population of Great Crested Grebes, which Smith (1974) estimated to be about 150 pairs in 1973.

Accordingly the SOC rapidly organized a survey of the breeding population during 1978, the results of which are summarized in this paper. Data on the wintering population within the Firth of Forth (mainly collected by the author since 1974) are included to enable the impact of the incident to be viewed in a wider perspective.

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The wintering population in the Firth of Forth

Flocks have been regularly recorded at Seafield (Leith) and scattered 10 km east to Cockenzie (East Lothian) since at least 1960, with peaks over 500 in several winters since 1964. However, it is only recently that it has become clear that large numbers may be present for several months each winter, not only at Seafield but also 5-10 km west at Silverknowes (Midlothian), between Cramond and Granton. For much of the day feeding grebes are widely dispersed but tend to concentrate into relatively dense groups in late afternoon when they are most easily counted and when peak numbers are invariably recorded.

Peak counts since 1974/5 are shown in table 1. Numbers from Seafield eastwards have remained similar in recent years but there are firm indications that Silverknowes has been increasingly important. Peak numbers tend to be recorded at Seafield and eastwards in December or January but at Silverknowes the peak is usually not before February. Although insufficient detailed data are available the two flocks are obviously closely inter-related and do not constitute discrete groups.

Table 1. Peak counts of Great Crested Grebes each winter

	1974/5	1975/6	1976/7	1977/8	1978/9
Silverknowes	109(F)	113(M)	385(F)	204(D)	545(F)
Seafield-Cockenzie	427(D)	405(J)	583(D)	474(D)	508(J)*

*Count by P. A. Hockey; all others by L. H. Campbell. Month of peak in brackets (December-March).

It is not known whether the same individuals remain within the Forth throughout the winter, but there are indications that there may be a regular turnover. Generally numbers tend to fall in January and early February before a second, late winter peak. That this second peak may represent an influx of new birds was clearly demonstrated by events after the 1978 oil spillage. Following the death of at least 200 of an estimated 300-350 birds present in early February, numbers rose to 561 (435 Seafield eastwards, 126 Silverknowes) in late February, much as usual for the time of year. Although small numbers of grebes winter elsewhere in the Forth (e.g. Blackness, Bo'ness, Largo Bay) simple redistribution of these would not account for increased numbers at Silverknowes and Seafield. Indeed, numbers at these alternative sites also tend to rise in late winter. Thus although a large proportion of grebes present at the time of the incident were killed, this mortality

represented a considerably smaller proportion of total numbers visiting the estuary throughout the whole winter.

The Scottish breeding population in 1978

Despite the short notice at which the survey was arranged, local recorders were able to organize reasonably comprehensive coverage and the results are shown by county in table 2.

Table 2. Breeding distribution of Great Crested Grebes

	Number of pairs recorded on:					
	Lochs covered in both surveys		Lochs covered in one survey only		1978	1978
	Pairs in both years	Pairs in one year only	1973	1978	1973	1978
Aberdeenshire	4	(2)	2	2(1)		
Angus	6	(3)	5-6			6(3)
Ayrshire	2-3	(2)	3	2(2)		
Clackmannanshire						
Dumfriesshire	3	(1)	1		5(4)	
Fife	15	(4)	17	7(7)	2(1)	
Kinross-shire	2-4	(1)	16			
Kirkcudbrightshire	9-10	(5)	5+		1(1)	3(3)
Lanarkshire					8(7)	
Midlothian	5	(5)	5	1(1)	2(2)	
Peeblesshire	1	(1)	1		1(1)	
Perthshire	24	(9)	23	7(4)	1-2(2)	7-8(3)
Renfrewshire	10	(5)	7-10	1(1)		6(4)
Roxburghshire	2	(1)	1			1(1)
Selkirkshire	2	(2)	2		4(4)	
Stirlingshire	5	(4)	6-7	1(1)		2(1)
West Lothian	4	(1)	3-5			
Wigtownshire	1	(1)	1		6(2)	
Totals	95-99	(47)	98-105	21(17)	9-10(10)	37-38(24)

- Notes 1. The number of lochs on which pairs occurred are shown in parenthesis.
2. All dates for 1973 are taken direct from the table in Smith (1974).

Table 3. Summary of Great Crested Grebe censuses

		Lochs covered during:		Total
		Both surveys	One survey only	
1973	Pairs	116-120	37-38	153-158
	Lochs	74	24	98
1978	Pairs	107-115	24-26	131-141
	Lochs	74	19	93

Lochs known to have been visited during both surveys have been separated from those visited only once or where data for one year are uncertain. The results are summarized in table 3.

Two points should be borne in mind when comparing the results of the two surveys. Firstly, some lochs may have changed in their suitability as breeding areas. For instance, as a result of greatly increased disturbance one loch that held four pairs in 1973 held none in 1978. Conversely, one did not actually exist in 1973 and held two pairs in 1978. Secondly, because of the rushed nature of the more recent survey many of the 24 lochs visited only in 1973 probably held some pairs in 1978. However, it is less likely that many of the 19 lochs visited only in 1978 held pairs in the earlier survey.

With these points in mind it is suggested that the breeding populations in both surveys were similar, lying between 150 and 160 pairs. County by county there were no consistent trends. Declines in the two main strongholds, Perthshire and Fife, were offset by increases in other areas, such as Selkirkshire and Kinross-shire (Loch Leven). Data for intervening years supplied by some observers indicated that there may have been some localized increases in numbers and that 1978 levels were in fact lower than the immediately preceding years. For instance, there were between 20 and 30 pairs on Loch Leven in 1977 but only 16 in 1978 and up to four in 1973. However, there was nothing to suggest that such changes were general.

It is also evident that many lochs hold breeding pairs irregularly. At least 27 (probably more than 40) of the 117 lochs holding breeding pairs did so in one of the survey years only, which emphasizes the importance of comprehensive coverage in surveys of this species.

Several recorders reported low breeding success in 1978 but this was certainly not a general observation. For instance, four young were reared in Midlothian, the first for many years. In fact, in comparison with 1973, which was itself a poor year, 1978 was notably better (69 young recorded as opposed to 33 on lochs covered in both surveys). Similarly, despite the less comprehensive nature of the recent survey, more unmated birds were recorded in total (at least 40 compared with 30 in 1973).

Discussion

The data above clearly show no evidence of any immediate effect on the Scottish population of grebes. Total breeding numbers, the numbers of non-breeding birds and the size of the winter population in 1978/9 were all similar to, or in excess of, levels prior to the oiling incident. However, three quarters of the corpses examined were first year birds (Camp-

bell *et al.* 1978) and since first breeding may be deferred until the second year (Cramp *et al.* 1977) the impact of the oiling might not be evident until several years after the incident.

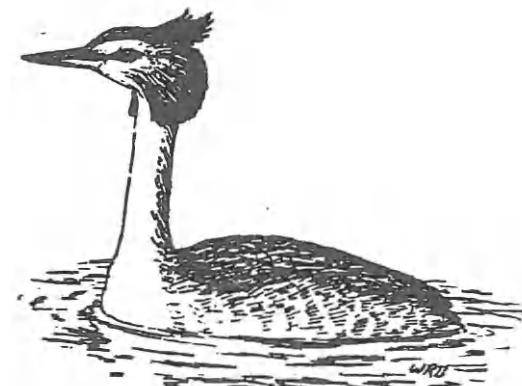
It is thought more likely that the majority of birds wintering in the Forth are immigrants and that Scottish breeders do not return until the second half of the winter. From mid February onwards increasing numbers of displaying birds in breeding plumage are present both on the sea and on some of the breeding lochs inland.

In the wider European context, the numbers killed in the incident must be considered of minor importance. For example, over 20,000 are believed to winter in Switzerland, 6,000 pairs breed in the Netherlands and Denmark (Cramp *et al.* 1977) and the British population is in excess of 2,000 pairs (Sharrock 1976).

However, the incident and subsequent survey work clearly illustrated three important points. Firstly, it highlighted the general lack of information on the origins of Scottish wintering species that are not easily caught for ringing studies. Secondly, it emphasized the importance of the role of the amateur ornithologist in enabling surveys to be carried out successfully at short notice. Finally, it showed how vulnerable bird populations may be to even very small localized spills if these occur where birds are concentrated.

Acknowledgments

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GREAT CRESTED GREBE W. R. Brackenridge

Summary

As a result of oil pollution in the Firth of Forth in February 1978 200-241 Great Crested Grebes died. In a survey of the Scottish breeding population in 1978 150-160 pairs were estimated to be present, similar to 1973. There was no evidence that Scottish populations had been affected and it is suggested that most grebes wintering in the Forth are immigrants.

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Dr Lennox Campbell, The Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire, SG19 2DL.

Birdwatching on Rhum

J. A. LOVE

Rhum became a National Nature Reserve in 1957. It is a large and mountainous island of predominantly wet heath with grassland only in the glen bottoms near the coast. Since it was cleared of its indigenous population in 1826 the only cultivation is around Kinloch on the east coast. Most of the island is cliff-bound with occasional small boulder beaches. The woodland at Kinloch was planted at the turn of the century, but in recent decades the NCC has undertaken a programme of reafforestation of native trees. There are numerous freshwater lochs from which radiate a complex of burns and small rivers. The main mountain mass—the root of a Tertiary volcano—rises to 800m in several peaks. The island merits nature reserve status on geological grounds alone, but also possesses much of biological interest. Access, by prior arrangement with the resident chief warden, is by steamer from Mallaig.

The outstanding ornithological interest of Rhum lies in its extensive mountain-top colonies of Manx Shearwaters, estimated at over 100,000 pairs, and in the reintroduction of the Sea Eagle which has been going on since 1975. The Rhum hills have a long history of occupation by shearwaters and the peak of Trollaval doubtless derives its name thus. A night in the colony is a ghostly and unforgettable experience and it is not



PLATE 5. Great Crested Grebe on nest (Kirkcudbrightshire, July 1979).

B. S. Turner

Following heavy casualties from an oilspill in the Firth of Forth, the SOC organized a breeding census in 1978 to assess the impact on Scotland's breeding population (see p. 43).