

Effects of a severe winter on ducks breeding in north Somerset

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Summary

About 140 pairs of Mallard, 13 pairs of Shoveler and 120 pairs of Tufted Ducks attempted to breed at two reservoirs in Somerset in 1963. These numbers were 6%, 59% and 15% respectively lower than the average for the previous six years. Mallard were more numerous than in 1962. The reduced numbers of Shoveler and Tufted Ducks could well have been due to their exceptional lack of breeding success in 1962. Thus it is unlikely that the severe weather of December, 1962 to March, 1963 increased winter mortality in these populations. Breeding success in 1963 was unusually high.

It is generally supposed that the losses suffered by ducks in prolonged spells of cold weather may be very high. Since the welfare of any population depends essentially on its breeding potential and performance, it is desirable to investigate in as many ways as possible what effects the exceptionally severe winter of 1962-63 may have had on ducks breeding in the summer of 1963. Opportunities for doing so in Great Britain are very few, because so little is known about the numbers of ducks nesting in different parts of the country. A study by members of the Bristol Naturalists' Society that has continued since 1957 enables the numbers and output of ducks in north Somerset in 1963 to be compared with results in the preceding six years. The investigation covers the breeding biology of all the ducks nesting locally, but this paper is restricted to the inhabitants of two large reservoirs and to the three most abundant nesting species: the Mallard (*Anas platyrhynchos* L.), the Shoveler (*Anas clypeata* L.) and the Tufted Duck (*Aythya fuligula* L.). Only those data appearing relevant to the effects of the cold winter are discussed here.

Chew Valley Lake, of 1,170 acres when full, and Blagdon Lake, 440 acres, are drinking-water reservoirs owned by the Bristol Waterworks Company, lying 1½ miles apart and some 12 miles south of Bristol. The methods used to estimate the numbers of adult Mallard present in the nesting season and the numbers of ducklings produced and reared by them have been described by Boyd and King (1960). The breeding population is determined by repeated counts in March, April and early May, males and females being recorded separately and classified as in pairs, in larger groups or singly. For the Shoveler and Tufted Duck the appropriate counts are those made from late April to early June. Production of young is measured, first, by recording the number of ducklings in each brood seen throughout the summer,

together with the approximate state of growth and, also, for the Mallard only, by subtracting from the highest total count in August or early September the number of adults present in early May. The latter method is of no use for the Shoveler and Tufted Duck, because many individuals, both adults and juveniles, evidently leave the reservoirs in the course of the summer.

None of the estimates of breeding population and production can be made very precise. Success in finding, counting and classifying the ducks present is affected by many factors which defy standardisation. Weather conditions, the time of day, disturbance, the skill of the observer and the time he can spend, affect the completeness and accuracy of any single census. Climatic variations may affect the timing of different phases of breeding behaviour by several weeks, as may the level of water in the reservoirs. These factors seem to act both directly and indirectly through their effects on the amount of cover available. Some progress has been made in determining their relative importance, but it is necessary to emphasise that the practical difficulty of the field work restricts what can be done, especially in a study like this making use of nearly 50 observers, none of them able to devote much time to the work. For simplicity, the tables in the text include only a single figure for each statistic, where a range might be more appropriate. An adequate treatment of the sampling errors in studies of this type would involve a digression many times larger than the subject matter of this particular report. For the immediate purpose the important point is that there is no reason to suppose that the reliability of the estimates for 1963 departed widely from that of earlier years.

The effects of a hard winter might manifest themselves in several ways, most obviously by a marked reduction in the numbers of adults present in the breeding season. Since among ducks, males tend to be more vulnerable to the effects of starvation than

females (Jordan, 1953), a change in the sex-ratio might also be apparent. A change in the age-ratio might also occur, since first-winter birds tend to be more vulnerable to all mortality factors than older birds, but this would be difficult to detect since yearlings of the three species considered here cannot be identified in the field.

The numbers of pairs of Mallard, Shoveler and Tufted Duck which are believed to have attempted to breed in each year from 1957 to 1963 are set out in Table I. All three species were less plentiful in 1963 than in most recent years, the total stock being about 15% less than the average of the six previous years. To show that the reductions were due to the effects of the severe weather early in 1963 it is necessary to show that losses from 1962 to 1963 were greater than normal. It is possible to estimate the normal losses in various ways and to relate them to the size of the population in 1962 and 1963. Each species has to be treated separately as the methods of estimation differ.

Fewer Mallard attempted to breed at Chew Valley in 1962 than in 1963. The reduced stock seems to have been due chiefly to the low level of the reservoir in the spring making it relatively unattractive, so that unusually many Mallard left the immediate area in the second half of March. The reductions were not caused by mortality in the short spell of late December, 1961, and early January, 1962, which caused heavy losses of some species elsewhere. Numbers in early March were high.

The stock of Mallard at Blagdon and Chew Valley in early April 1963 was probably about 350 birds (180 males and 170 females). The highest count, on 3rd April, was only 235: (180 males, 45 at Blagdon;

and 55 females, 12 at Blagdon), when many females were absent at nests. The sex-ratio is here assumed to be 106♂♂:100♀♀ after Eygenraam (1957) although the excess of males in Somerset may be rather greater (up to 116:100, from Boyd, 1960). It will be noted that in Table I only 138 pairs (276 birds) are estimated to have attempted nesting. The number of 'non-breeders' may have been rather fewer than is suggested by the discrepancy between these estimates, because the lateness of the season may have delayed the departure of some winter visitors. For the present purpose, the relevant point is that the number of survivors of local origin probably lay between 276 and 350.

The annual mortality rate of adult Mallard in north-west Europe is about 48% (Boyd 1962) and that of young birds in their first year from fledging about 69%. Boyd and King (1960) estimated that losses in north Somerset in 1948-59 may have been rather higher: 57% of adults and 76% of first-year birds. They also showed that, in the particular circumstances of this area, the highest number of Mallard counted on the reservoirs in late August can be used to measure the output of fledged young. The population of the two reservoirs in August 1962 was about 860 birds (220 adults and 640 juveniles). Losses between August and April normally comprise about nine-tenths of the total deaths in a year. Using this correction factor it can be shown that the stock of 860 birds in August, 1962, would have been reduced to 370, or 310, in April, 1963, the former figure derived from the 'European' mortality rates and the latter from the earlier estimates for Somerset birds. Thus, on the unverifiable assumption that the hard winter did not produce any exceptional variations in the

Table I. Numbers of pairs of Mallard, Shoveler and Tufted Ducks attempting to breed at Chew Valley and Blagdon Reservoirs, 1957 to 1963.

year	Chew	Mallard Blagdon	total	Shoveler (Chew only)	Chew	Tufted Duck Blagdon	total	combined total
1957	105	28	133	34	100	4	104	271
1958	106	33	139	28	120	3	123	290
1959	120	45	165	40	157	5	162	367
1960	130	32	162	38	143	7	150	350
1961	140	35	175	31	147	7	154	358
1962	80	30	120	20	140	5	145	275
mean 1957-62	114	34	147	32	135	5	140	318
1963	118	20	138	13	112	6	118	269
% differences between 1963 and 6-year mean	+4	-41	-6	-59	-17	(+20)	-16	-15

liability of Somerset-bred birds to abmigrate or of birds bred elsewhere to stay in Somerset, it appears that the number of survivors after the hard winter did not differ greatly from that expected in an average year.

The Shoveler rarely breeds at Blagdon and seems not to have done so successfully in any of the last seven years. At Chew Valley the population appeared to be thriving until 1962 when not only did the birds attempting to breed diminish by one-third but hardly any young birds were reared. This failure, like that of the Tufted Ducks, seems to have been due to the unusually low water levels in the spring and summer which reduced nesting cover and increased predation: due to differences in nest sites, these two species were much more seriously affected than the Mallard. In years when breeding is successful it is difficult to estimate how many young Shoveler are reared at Chew Valley Reservoir, because most of them leave very soon after fledging, as they do elsewhere in England (Ogilvie, 1962). Thus the failure in 1962, when not more than 10 juveniles were reared, was fortunate from the point of view of estimating the likely survival of the stock from 1962 to 1963. A useful approximation is given by multiplying the 40 breeding birds in May, 1962 by the mean annual survival rate of adults in Britain, 56% (Boyd, 1962) yielding 24 survivors, with the addition of up to 6 yearlings for an estimated stock in May, 1963 of 24-30 birds, compared with the 13 pairs believed to have tried to breed. As for the Mallard, it seems that losses at a normal rate could have produced the recorded drop in numbers.

The production of young Tufted Ducks is as hard to measure as that of Shovelers, while the adults disappear in late summer in a baffling way, as Gillham (1958) has described, so that it is again fortunate that hatching and rearing was so poor at the Somerset reservoirs in 1962 that the output of young was almost negligible - not more

than 30 birds. Over many years the losses of adults between one breeding season and the next average about 46% (Boyd, 1962). Thus the population of about 200 males and 190 females in May, 1962 (including about 100 non-breeders), might have been expected to have been reduced to about 210, with the addition of up to 15 survivors from the young reared in 1962, 220-230 in all in late May 1963. The observed maximum was about 250, on 30th May. The number of non-breeders in 1963 was very small, as would be expected if non-breeders consist principally of yearlings.

It was noted in the introduction that as males are probably more vulnerable to the effects of cold spells than females some change in the sex-ratio might be apparent in the spring after a hard winter. Because the apparent sex-ratio is affected by such variables as the date of onset of nesting and by the banding together of males when females begin to sit, as well as by a tendency for late emigrants in the spring to include more males, it has proved impossible to demonstrate that any significant change in sex-ratio occurred in 1963. There was an excess of males in all three species, as in all the other years of the study.

In some species of Anatidae there is evidence that winter conditions may affect breeding performance in the following summer. It is thus worth recording that 1963 was a very successful year for the ducks breeding at Chew Valley and Blagdon Lakes, as the statistics of Table II show, for Mallard and Tufted Ducks. Brood data for the Shoveler are too few for effective comparison between years.

This investigation seems, therefore, to have arrived at the somewhat unexpected result that the ducks breeding at the two Somerset reservoirs were not seriously affected by the hard winter of 1962-63. The sample is, of course, small so that it would be unwise to generalise sweepingly from it, but the suggestion that local Mallard and Tufted Ducks were not badly hit is in

Table II. Breeding success of Mallard and Tufted Ducks at Chew Valley Reservoir, 1957 to 1963.

year	mean size of 1st broods	Mallard		Tufted Duck
		young reared per female		mean size of 1st broods
1957	7.9	3.6		5.0
1958	5.5	3.7		7.3
1959	6.9	4.4		5.4
1960	7.3	4.1		5.5
1961	7.6	6.4		5.9
1962	4.9	5.8		4.5
mean 1957-62	6.9	4.7		5.7
1963	6.8	6.7		7.4

accord with other lines of evidence, such as the indices of the Priority Wildfowl Count scheme and the analysis of recoveries of British-ringed Mallard (Boyd, unpublished). The finding that the Tufted Duck was relatively untroubled is, however, surprising in view of the demonstration by von Haartman (1957) that a great reduction in breeding stocks in Finland occurred after freezing of the Baltic in hard winters.

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Wildfowl mortality in the Slimbridge collection during the winters of 1961-62 and 1962-63

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Summary

The unusually cold winters of 1961-62 and 1962-63 caused a marked increase in mortality of established Anatidae kept outdoors at Slimbridge. Whistling Ducks (*Dendrocygna*) showed the highest mortality while the true geese and swans (*Anserini*) were hardly affected. Other tribes were intermediate. In general the smaller species from hotter climates suffered a higher mortality while the increase, compared with normal winters, was proportionately greater in these species than in others. Comparison is made with mortality in wild birds. Practical measures to reduce mortality under these adverse environmental conditions are suggested.

Introduction

Since 1958 as complete a record as possible has been kept of the losses from the Wildfowl collection at Slimbridge, Gloucestershire, where a high proportion of the dead birds is found and reported at all times of the year.

Until the end of 1961 the winters did not show any long period of very low temperatures or heavy snowfall. In 1961-62 and again in 1962-63 the weather was unusually severe for long periods and the mortality in the collection increased markedly both dur-