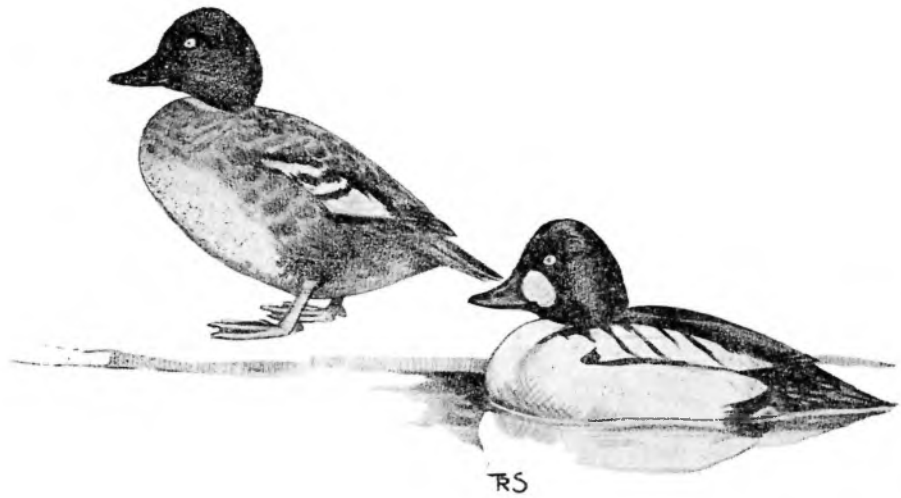

Pre-dusk and nocturnal behaviour of Goldeneye, with notes on population composition

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King (1961) drew attention to the flocking of European Goldeneye *Bucephala clangula* at the approach of dusk. His observations were made in March and April on reservoirs in Somerset, but he quotes J. W. Campbell as having observed the same phenomenon at Abberton Reservoir, Essex. The present situation there was therefore examined and observations extended throughout the night at full moon periods. The birds were observed from the relative comfort of a car overlooking a bay on the main Reservoir.

Bispham (1945) wrote that the record number of Goldeneye on any inland water during the period 1924-1936 was about 50, and he regarded the count of 200 at Abberton on 23rd February 1945 as phenomenal. But on 16th March 1966 there were 510, 14% of the total counted throughout Britain, and three days later the numbers peaked at 765. Unfortunately there were fewer birds in the subsequent two years when the most intensive observations were made. The peak in 1967 was 641 on 1st March and in 1968 only 252 on 13th March. An increase in numbers on the Essex coasts probably contributed to the diminution at Abberton. In 1969 the position was restored, no fewer than 720 Goldeneye were present on the official wildfowl count day, 16th March. In fact, for the first time Goldeneye were the most plentiful duck on Abberton.

In the three years of observations no pre-dusk gatherings were observed in November, December or January, birds remaining as scattered as by day into the first three hours of darkness. Small gatherings were observed about the middle of February and they became marked in March (Table I).

A substantial but variable fraction of the total population had thus gathered into one flock by sunset. Birds often swam considerable distances, over 400 yards, to join the flock but were seldom observed flying to it. The shape of the raft of birds was typically spoon-like, a long straggling line ending in an oval mass. In 1966 observations were maintained each night until three hours after sunset, using 10 × 70 binoculars in bright moonlight. No further accretions to the raft were

Table I. The sizes of Goldeneye rafts on Abberton Reservoir, Essex

Date	*Total count on Reservoir*	*Main congregation 1 hour before sunset*	*At sunset*
1966			
March 4	574	204	274
5	596	335	460
6	587	262	338
7	594	297	389
1967			
March 25	273	60	96
26	267	57	86
1968			
March 13	252	46	76
15	202	41	73

observed but courtship behaviour, other than Neck-dipping by the female (Johnsgard 1965), continued.

During the four moonlit nights in 1967 and 1968 observations were carried right through until one hour after sunrise, using 22 × 80 binoculars. On all these occasions further accretions to the flock were seen in the two hours following sunset, the maxima reached being respectively 130, 126, 104 and 94, until roughly half the population was in a single raft. Activity ceased between 23.30 hrs. and 23.50 hrs. by which time all the birds appeared to be in the sleeping attitude with head tucked in the back.

A little later the most remarkable form of behaviour was observed. Two 'brown-heads' were seen to leave the oval end of the raft and swim its entire length, one on either side. On reaching the last bird they turned about and swam back to the oval end. The 'patrolling' was carried out, always by two 'brown-heads', at regular intervals of about a quarter of an hour throughout the night. The first 'patrol' was recorded at 00.15, 00.20, 00.48 and 00.15 hrs. on the respective nights and the last at 05.40, 05.35, 05.57 and 05.55 hrs. There may have been an earlier 'patrol' than the first recorded on 13th March 1968 because the moon was obscured until 00.30 hrs. and, with choppy water conditions, close observation was not possible. Indeed the second 'patrol' on 15th March began at 00.33 hrs. Attempts were made to ascertain whether the same two individuals carried out the 'patrols' throughout a night. However, the birds at the oval end of the raft, although apparently asleep, continually changed their relative positions as they slowly rotated on the spot or drifted a short distance. Coupled with the eye-strain, this made it impossible to keep one's eyes fixed on one of the 'sentries' for more than a few minutes after its return.

As far as is known, comparable behaviour to this regular 'patrolling' has never been observed before and it would be most interesting if workers elsewhere could observe nocturnal flocks of Goldeneye and of other ducks. The present limitation to bright moonlit nights is undesirable. It is perhaps worth recording therefore that when, during a dark overcast spell, the car headlights were shone for 10 minutes on a raft about 100 yards distant, not a head was raised and no other disturbance was noted. Probably, however, the use of an infra-red telescope would be the best, if expensive, solution.

It is certainly tempting to seek an explanation of the behaviour by analogy with the patrols of human sentries around a sleeping encampment. But, one may ask, against what are the patrols directed? It is not impossible that the behaviour subserves some different function.

To complete the nocturnal behaviour study, it can be said that the awakening of the flock followed an essentially similar pattern on all four nights in 1967 and 1968. Birds started to wake, in the oval end of the flock first, within a few minutes of 06.00 hrs. and coincident with the first calls of Sky Lark *Alauda arvensis*, Lapwing *Vanellus vanellus* and Redshank *Tringa totanus*. Fifteen minutes later all were awake and swimming about but not diving or taking to the wing. Head-throwing by drakes commenced but evoked no response from the females. By 07.00 hrs., when observations ceased, about half the flock would have dispersed, with the rest well scattered over the bay.

In the course of these and other intensive observations on the Goldeneyes, it became clear that age and sex of the 'brown-heads' could be determined with a considerable degree of certainty, at least during March and April. The Goldeneye frequently swam to within 15 yards of the observer seated in a car on one of the causeways. Young birds have brown or greyish tips to the bill instead of the adult's pinky-yellow. Their eyes are whitish, greyish or dull brown instead of the bright golden yellow of the adult. Both these characteristics are distinct in sunny conditions up to 400 yards. In flight the young birds' wings lack the conspicuous black bars and show much less white, it being confined to the secondaries instead of extending to the greater and median coverts. At rest, the white seldom shows on young birds as it invariably does on adults. The clean-cut white collar of the adults and the contrasting appearance provided by their greyer upper-parts are also lacking in the young.

Adult males, of course, present no problem and, as generally reported in Britain (Nilsson 1969), they were in a distinct minority. Over the three years 32 counts, made when total numbers exceeded 100 in March and April, gave median values of 13%, 17% and 15%. In the last two years the above criteria were used for the detailed analysis of the 'brown-heads' on 18 occasions in the same two months. The results are set out in full (Table II) so that the reliability of the technique may be judged. The median

Table II. Composition of the Abberton Goldeneye population by age and sex.

Date		*Adult* ♂	*Adult* ♀	*Young* ♂	*Young* ♀	*Total*
1967						
March	1	101	487	5	48	641
	3	91	372	1	48	512
	8	92	320	1	25	438
	15	81	258	4	27	370
	21	71	211	9	44	335
	22	59	182	6	51	298
	29	43	181	9	22	251
April	1	34	157	15	57	263
	5	32	142	16	68	258
	7	40	178	11	59	288
	15	20	110	11	44	185
1968						
March	1	33	173	2	25	233
	8	29	187	0	29	245
	13	37	180	1	34	252
	15	24	160	0	18	202
	22	41	153	0	15	209
	29	51	158	2	23	234
April	4	21	87	1	9	118

values for the proportion of adult females were 63% and 74% of the total population. The heavy preponderance of females (median ratios of 4.1 and 4.7 per male) confirms a differential migration of the sexes to Abberton. From January onwards young males have begun to show some whiteness around the facial spot and/or along the flanks and their identification is clinched when they indulge in Head-throws. On these criteria the imbalance of the sexes is even more extreme in the young birds, median values (with a wide scatter) for the same periods as the adults being 5.4 and 12.5 females per male.

It will already have been noticed that the proportion of young birds of both sexes is low. In March the median proportions were 10% and 11% in the two years. Unless there had been particularly bad breeding seasons, these figures would indicate a differential migration by age as well as by sex. It would be interesting to know whether the remaining young birds had travelled further, or less far, than the adults. The latter certainly appear to start leaving Abberton earlier, for as numbers fell in April the proportion of young rose to around 30% in 1967, and probably to a similar figure in 1968 though the small total numbers then made the analysis of uncertain value.

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Summary

Up to 460 Goldeneye *Bucephala clangula* studied at Abberton Reservoir, Essex, gathered into flocks at dusk in March. Night-long observations in 1967 and 1968 revealed regular 'patrolling' by 'sentries'. Differential migration by age and sex is shown by the heavy preponderance of adult females on the reservoir.

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