

Sheldrake *Tadorna tadorna*

THE SHELDUCK POPULATION IN THE BRIDGWATER BAY MOULTING AREA

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Summary

MOST British Shelduck undertake a moult migration in July to areas on the German North Sea coasts, but in 1951 the existence of a moulting population was discovered in Bridgwater Bay, Somerset. The present paper describes the results of a number of aerial counts of the moulting population during 1959. The first migrants appeared in July but many of these appeared to leave before the end of the month without moulting. There is evidence of a second peak in early August followed by a steady build up in numbers to the seasonal maximum of nearly 3,300 recorded at the beginning of September. The largest number of moulting birds (roughly estimated at 2,700) was found at this time also with a smaller concentration later on in October. It is believed that there were at least two and possibly three waves of immigrants in July, (August) and September. Moulting birds were found during August, September and October with maxima in September and October. It seems probable that the first Shelduck were largely passage birds followed by the moult migrants with the non-breeders preceding the breeding birds. Most of the moulting Shelduck were found between Hinckley Point and Steart.

The Shelduck population elsewhere in the Bristol Channel and Severn Estuary did not appear to use Bridgwater Bay as a moulting area.

The largest number of young birds was seen in early July, suggesting a rather late breeding season in 1959.

Introduction

The moult migration of the north European Shelduck *Tadorna tadorna* (L.) is a peculiar phenomenon which has come to light comparatively recently. Hoogerheide and Kraak (1942) suggested, from an analysis of ringing data, that Shelduck in Northern Europe migrated in July to the south-east corner of the North Sea in order to moult. These theories were confirmed by Coombes (1949, 1950) who showed from a study of Shelduck in Morecambe Bay that the moult migration of British Shelduck is intense, taking place in July, and that their destination is a comparatively small area of the Heligoland Bight around the island of Mellum near the Weser and on the Grosser Knechtsand off the mouth of the Elbe. The return of the Shelduck from these moulting areas is more gradual than the outward migration and may take up to six months to complete. It appears from observations made by Lind (1957) in south-west Denmark that the moult

migration proceeds in two waves, caused by the non-breeding and one-year-old birds migrating before the breeding Shelduck. Allen and Rutter (1957) have studied the moult migration from the River Mersey, Cheshire, since 1950 and have confirmed that most birds leave in July although adverse winds will hold up the migration, which is made overland in a direct line.

Doubts that all British Shelduck migrated to Germany arose in 1950 when it was noticed that large numbers of Shelduck were present in Bridgwater Bay throughout the summer (Perrett 1951). Further observations, particularly by Messrs. D. H. Perrett, B. King and D. E. Slocombe, proved conclusively that the Shelduck remained to moult (Perrett 1953). These observers suggest that a large body of adults arrive in July and are followed in late August by an influx of juveniles. No other moulting area in Britain has since been discovered. It is not known for how long Bridgwater Bay has been used as a moulting area but an observation in June 1906 of several hundred to the south of Brean Down suggests that the Shelduck have been coming here for many years.

Apart from a few incomplete counts, little study of the moulting Shelduck seems to have been carried out since the discovery of Bridgwater Bay as a moulting area and it was decided to make a survey in 1959 to investigate some of the more immediate problems. The preliminary information required was the size of the population, the proportion actually in moult and the chronology of the major movements that occurred. In order to examine possible interrelationships with other local Shelduck it was considered necessary to include the northern coasts of the Bristol Channel in the survey. An adequate cover of these coasts is not easy because of the lack of approach roads, etc. while the time factor precludes regular simultaneous counts being made on the two shores of this large estuary. In Bridgwater Bay itself the Shelduck are difficult to count, even at high tide, because of the large area involved and the tendency for the moulting birds to keep well out to sea; sometimes as much as two miles from the shore. At low tide they are almost impossible to approach because of the large areas of exposed mud. It is therefore a formidable task to undertake regular counts of Shelduck in the Bristol Channel, but most of the difficulties are resolved if the observations are made from the air. Consequently this investigation was made one of the major projects in the expanding aerial survey programme of the Wildfowl Trust.

Methods

Twenty aerial counts were made of the Shelduck in the Bristol Channel/Severn Estuary area north-east of a line between Bridgwater Bay and Cardiff. These counts have been most frequent during the moulting season when they averaged about one flight per week. A map of the area covered is given in Figure 1. The average time taken to fly these surveys was $2\frac{1}{2}$ hours, of which about 30 minutes were spent over Bridgwater Bay (defined as the area between Hinckley Point and Brean Down). The surveys were timed to coincide with high tide in Bridgwater Bay as Shelduck are more easily seen from the air under these conditions than they are when scattered over the mud at low tide. Most of the flights were made from Staverton Aerodrome near Gloucester, using an Auster 5D of the Cotswold

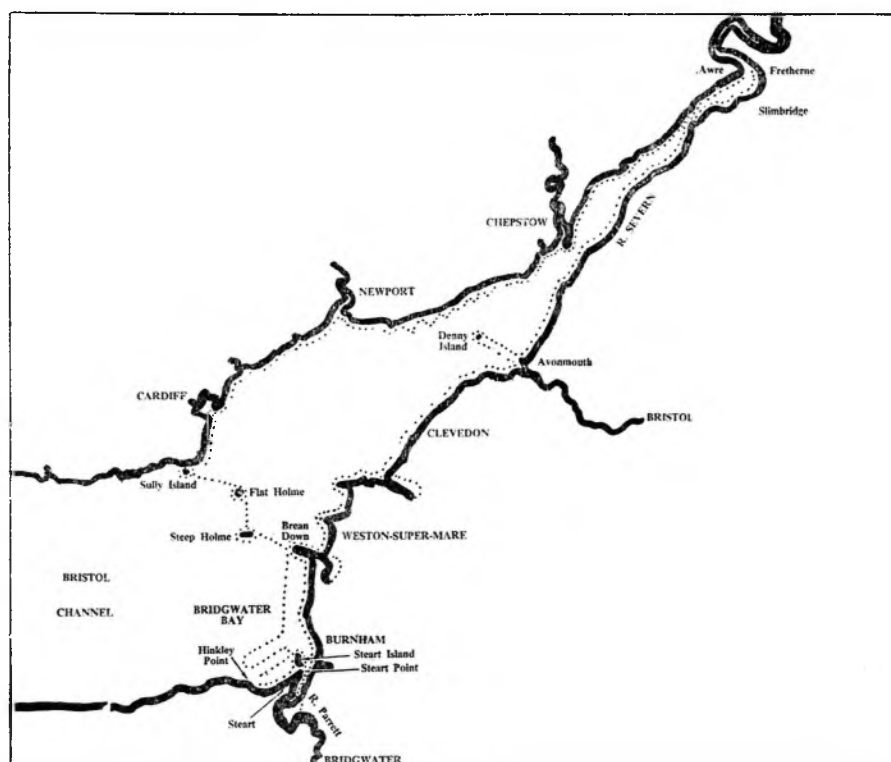


FIGURE 1

Aero Club. This aircraft was not available during August and during this month surveys were made with an Auster Alpha of the Bristol & Wessex Aeroplane Club, operated from Bristol (Lulsgate) Airport. This aircraft was of limited endurance and consequently the complete route could not be flown during August. The survey team consisted of two observers, one of whom was the pilot, sitting side by side and looking out of either side of the aircraft. The surveys of the coasts were flown about 100 yds. offshore at an altitude of about 100 ft. and at an airspeed of 90 m.p.h. Shelduck could be recognised and counted up to half a mile from the aeroplane on the seaward side and diversions were made to inspect unidentified birds further out than this if they were suspected of being Shelduck. A modified technique was required to count the more concentrated population in Bridgwater Bay. The height was increased to 3-400 ft. and the airspeed reduced to about 70 m.p.h. while a series of transects was flown across the sea at varying distances from shore. These optimum conditions enabled large flocks to be seen as units and allowed more time in which to count them. Counts were made with a hand tally in units of 10 or 50 according to the size of the flock. Some photographs were taken in Bridgwater Bay with a K20 aerial camera using Kodak super XX aerofilm but, because of the wide dispersion of the Shelduck, a complete photographic cover was almost impossible to achieve with a hand held camera and visual counts were always made. A rough idea of the proportion of moulting birds was obtained by flying low

over the flocks. Those remaining on the water were assumed to be flightless and therefore in moult. It is a curious fact that Shelduck will not dive to an aircraft although they invariably do so when approached by a boat.

The following results deal with surveys flown during 1959. A few flights were made in 1958 and during the succeeding winter but the regular series was commenced towards the end of April and continued until the beginning of October, except for a few weeks in May and June when the team was away on aerial survey work in Scotland. A few flights have been made since October to assess the level of the winter population.

Flying weather during the summer of 1959 was generally good and only on three occasions was it necessary to postpone flights because of bad weather. The frequency of the surveys was to some extent dictated by the times of high tide as flights from Staverton could be made only between the hours of 8.30 a.m. and 5.30 p.m.

Results

The total number of Shelduck seen in Bridgwater Bay on each survey is shown in Figure 2, which also includes the number of birds estimated to be in moult. The most striking feature of this histogram is the considerable fluctuation which it shows in the number of Shelduck present during July and August even over periods of only a few days. The seasonal increase was first detected in May and numbers reached their first peak in early July, followed at roughly monthly intervals by two further peaks in August and

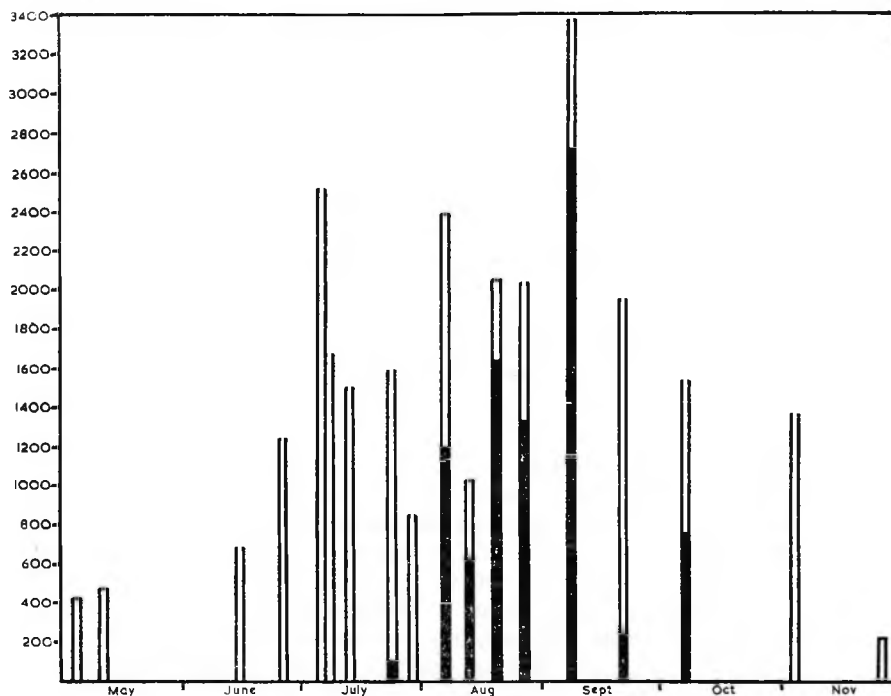


FIGURE 2

September. In between these peaks numbers fell to relatively very low values, only about 30% of the maxima. A fairly large population was maintained well into the autumn but there was a great decrease during November to the winter level.

The proportions of birds which were in moult show some interesting features. Very few flightless Shelduck were seen in the first concentration during July and it was not until the beginning of August that moulting birds became apparent. The largest number in moult was seen in the first week of September. There appear to be considerable fluctuations in the numbers of flightless birds during August but it must be emphasised that these estimations can only be very rough approximations and it is suggested that these figures show a general rise to the September maximum. The drop between the first and second August count is, however, relatively large and may indicate an early August peak of moulting birds. More significance is attached to the large increase in flightless birds between September and October and it is believed that these October moulting birds form a group distinct from the large August—September population.

The regions of Bridgwater Bay most favoured by moulting Shelduck have been determined by noting the frequency of observations in various areas throughout the summer. The areas considered are the coast and sea between 1) Hinckley Point and Steart Village, 2) Steart Village and Steart Point, 3) Steart Island, 4) estuary of the River Parrett and 5) between Burnham and Brean Down. Table 1 shows the total number of Shelduck seen in each of these areas on all flights made between July and October.

TABLE 1. Observed frequency of Shelduck in Bridgwater Bay

Region	Grand Total of Shelduck seen on 12 flights between 6th July and 7th October	%
1. Hinckley Point—Steart Village	10590	48
2. Steart Village—Steart Point ..	5820	26
3. Steart Island	4610	20
4. Estuary of R. Parrett ..	360	2
5. Burnham—Brean Down ..	830	4

It is apparent from this analysis that the great majority of Shelduck in Bridgwater Bay keep west of the mouth of the River Parrett. The area between Hinckley Point and Steart Village is the most frequented of all and most of the flightless birds were seen in this sector. The region between the River Parrett estuary and Brean Down does not appear to attract moulting Shelduck although large concentrations may often be seen there at other times of the year.

The numbers of Shelduck seen elsewhere in the Bristol Channel and Severn Estuary are shown in Figure 3. The coast searched is from Awre to Cardiff on the north and Brean Down to Fretherne on the south, with four islands in the Channel: Sully Island, Flat Holme, Steep Holme and Denny Island. There were no records during August as the complete cover could not be flown. The results suggest that the Shelduck began to leave their breeding grounds, presumably to migrate, in the middle

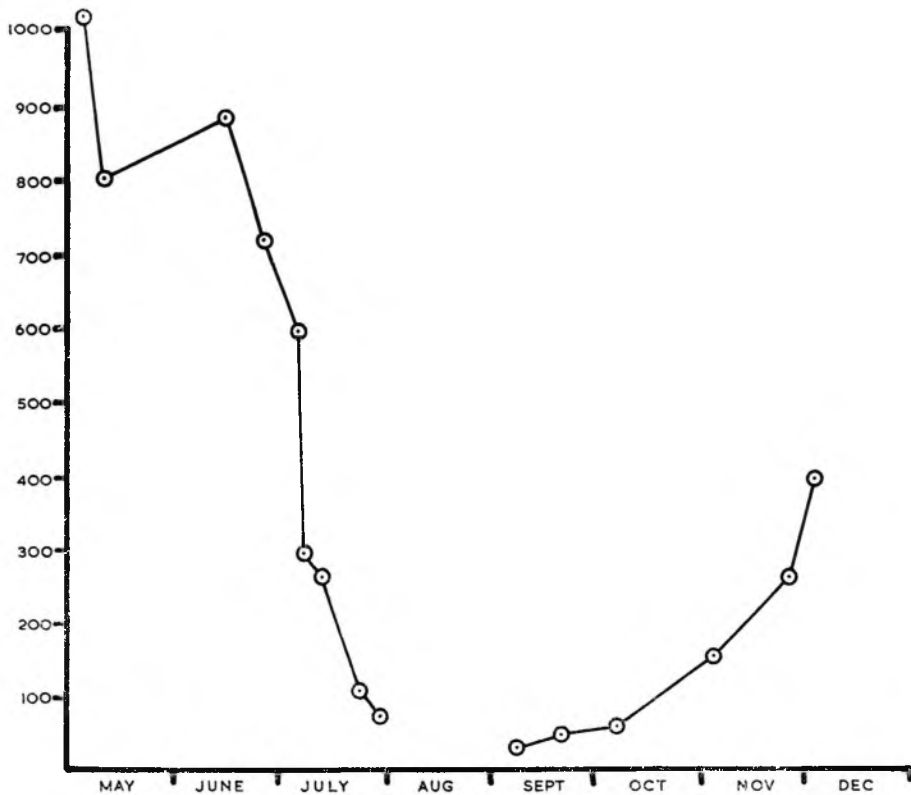


FIGURE 3

of June and that most of the birds had left by the end of July. The return of the migrants was not indicated until early November and, although there was a substantial number present by December, the population was still less than half of its size in the previous spring.

Figure 4 shows the number of young Shelducks seen in the whole of the area surveyed. These figures include all groups from downy young to the fledgling stage. The first young were seen on 15th June and peak numbers were rapidly reached, but after 8th July there was a slight decline. Observations could not be carried on into August as the whole region was not covered but very few young were noticed when the complete census was resumed in September (it was not always possible to distinguish between flying juveniles and adults in the short time available).

Discussion

a. Movements of the Shelduck population in Bridgwater Bay

It is clear from the present results that some modifications are required in our ideas of the status of Bridgwater Bay as a moulting area. The simple picture of a concentrated migration to the Bay followed by the moult is no

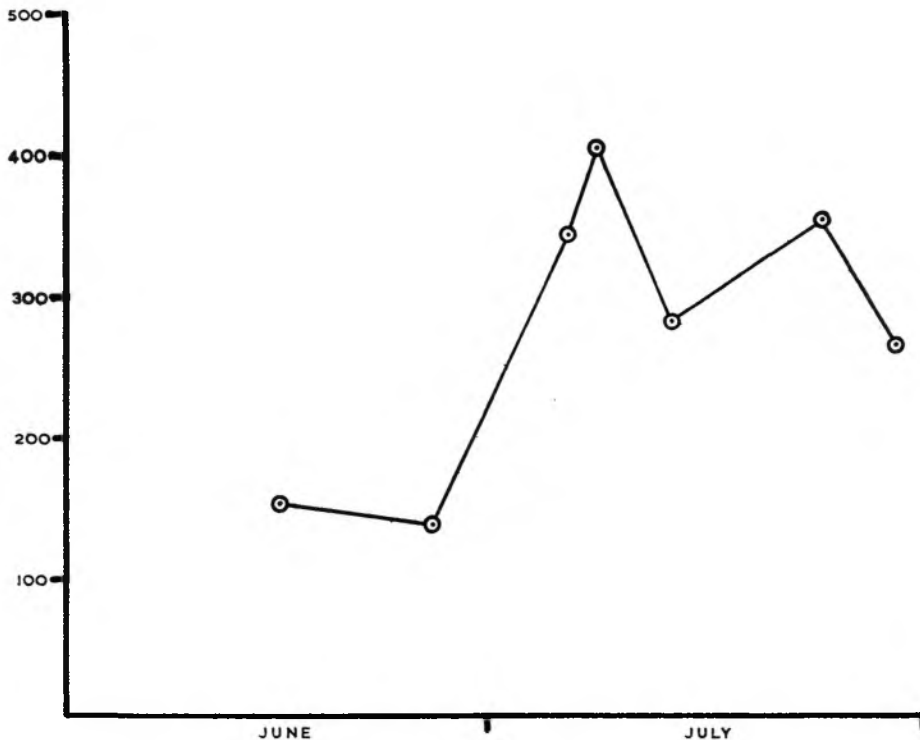


FIGURE 4

longer tenable. The first large influx occurred in July, the month in which other workers have found that Shelduck migrate to the German moulting grounds. However, none of these birds were in moult and it seems likely that many of them were birds of passage, for two-thirds had left by the end of July. The obvious inference is that these birds were using Bridgwater Bay as a staging point on their way to Germany. The absence of flightless birds in July had previously been noted on an aerial survey flown in 1958. By the beginning of August, however, numbers had risen again and the first moulting birds had appeared. It is not clear whether this concentration represents a genuine early August peak for its demarcation is largely dependent upon the small number seen in the next (second) August survey. There is no evidence that this latter survey was less thorough than the others although it was flown in bad weather with high winds, rough sea and low cloud which added to the difficulties of observation. However, there is no doubt of a further peak in numbers in early September when most moulting birds were seen. The evidence for an earlier peak of moulting Shelduck in August is as inconclusive as that for a peak in total numbers. After the September maximum there was a sharp decline in numbers although the population was maintained at a fairly high level (c. 1500) during the whole of October. A study of the Wildfowl Count data for October has shown that large concentrations of Shelduck have often been seen off Steart late in the month (e.g. 1800, 28th October, 1951; 1287, 14th October, 1952; 1000, 16th October, 1956; 1600, 21st October, 1958). The final evacuation from the

Bay seems to take place about the beginning of November. This is apparent from the observations made in 1959 and is also suggested by a few aerial surveys flown in 1958. There is no evidence of a late autumn peak in total numbers but there is a significant rise in the number of moulting birds in October compared with late September. These are obviously birds which have arrived late (September) in Bridgwater Bay.

These somewhat complicated fluctuations seem susceptible to explanation although any interpretation must at this stage be highly tentative. It is believed that there were at least two and possibly three peaks in numbers occurring in July (August) and September, followed a month later by peaks in the number of moulting birds. It is probable that the Shelduck arrived in the Bay a few weeks before moulting and that the August–September moulting birds arrived during July and August. The first birds arrived in June but it seems likely that these and many of those arriving early in July did not remain in the Bay to moult.

The suspected double peak occurring in August and September may be explained on the basis of Lind's observation (1957) mentioned above that the non-breeding and one year old birds migrated before the breeding birds. It is likely that such a phenomenon obtained in Bridgwater Bay and that the early moulting birds were the non-breeders while the later moulters were birds which had bred that year. The build-up in numbers during August would therefore be caused by the continuous arrival of breeding birds which had recently left their young. The later peak of moulting birds in October may be due to late breeding or re-nesting birds but a further possibility is that these Shelducks were those that remained behind as 'nurses' to look after the creches of young after the parents had left for the moulting grounds. It does not seem improbable that the Bridgwater Bay area would be a more appropriate moulting ground for such birds than the more distant Heligoland Bight. Perrett's observations (1953) suggest that 'juveniles' (presumably birds of the year) arrive late in August and these may have contributed to the September population.

b. The origin of the moulting Shelduck

No information is available on the extremely interesting question concerning the origin of the Bridgwater Shelduck. It is unlikely that they are local birds because their numbers are too high and in any case there is some evidence that the local birds undertake a normal migration to the German moulting areas. This is based largely on the pattern of movements, which show a slow return of birds to the breeding grounds long after Bridgwater Bay itself is clear of moulting duck, and also on observations of birds migrating eastwards from Slimbridge. More direct evidence was obtained when a dead Shelduck was recovered in a decayed state on the Wash in August 1959 very close to the direct line between Slimbridge and the German moulting grounds. This bird, a female, had been ringed at Slimbridge Decoy in May 1955 and recaptured there in April 1956 as a breeding bird. It is also unlikely that the Bridgwater Shelduck come from the south or east coasts of this country for no westward migrations have ever been observed. Shelduck from north-west England seem to migrate to Germany (Coombes 1950). It is possible that the Bridgwater Bay Shelduck come from regions to the west such as Ireland.

Goethe (1957) and Leach (1958) have recently published details of 22 recoveries in Britain of German-ringed Shelducks. These include two in Ireland and four in Wales. Migrants from the south of Ireland and South Wales would seem likely to pass over Bridgwater Bay.

Assuming an Irish origin for at least some of these Shelduck, it is not unlikely that such migrants *en route* for the moulting grounds in Germany would use Bridgwater Bay as an intermediate point where they could rest and feed. Thus the first July peak could be interpreted as being caused by such birds, supplemented perhaps by the local Shelduck which may congregate in Bridgwater Bay before leaving for the German moulting grounds. It is not impossible that all the Shelduck in Bridgwater Bay are potentially passage birds and that the area provides such favourable conditions that they tend to linger until they are overtaken by the moult. The moulting to the flight feathers is a very rapid process in Shelduck and one individual in Bridgwater Bay was observed to lose all its flight feathers at once while attempting to take off on being approached by a boat. That Shelduck migrations may be halted through a sudden loss of the power of flight is suggested by a report from Kent (Jolly *in litt.*) of nine Shelduck in flightless moult on Swanscombe marshes in July 1959.

c. Location of the moulting Shelduck

The factors which govern the suitability of Bridgwater Bay as a Shelduck moulting ground are not clear but presumably they are connected with food and the topography of the area. The analysis of the distribution of the birds shows that the region between Hinckley Point and Steart is the most favourable moulting ground, closely followed by Steart Point and Steart Island. The proportion of flightless birds on these last two sites, however, was usually low. The absence of appreciable numbers of Shelduck in the Parrett estuary and off the Berrow coast between Brean Down and Burnham is most likely to be due to disturbance factors. The traffic to and from Bridgwater Docks would make the river estuary an unsuitable area for flightless birds while the Berrow shore in summer is a popular rendezvous for holidaymakers who in turn would tend to drive away the Shelduck. At other times of the year, Shelduck are often found in these places and there are probably no factors which would make them inherently unsuitable moulting grounds.

d. The Shelduck population elsewhere in the Bristol Channel and Severn estuary

The pattern of the Shelduck movements elsewhere in the area surveyed is similar to that expected if these birds migrated to the German moulting ground. The spring population of about 1000 was maintained until the middle of June when there was a sharp drop in numbers which continued to fall until only a very few birds remained by the end of July. During this period, there was a very noticeable decline in the first week of July suggesting a further mass exodus at about this time. These observations support the belief that the Shelduck leave in two waves with the non-breeding birds preceding those which have bred. The results also agree with those of Coombes (1950) who found that the moult migration took place in July. He

also established that the return from the moulting areas was in the nature of a drift back spread over a period of at least six months. This is in accord with the present findings, for the repopulation by the Shelduck of the Bristol Channel and Severn Estuary after the moulting season of 1959 was very slow.

Very few Shelduck have bred on either Flat Holme or Steep Holme in recent years but considerable numbers were seen on these islands between May and July (in all, 55 on Flat Holme and 62 on Steep Holme). Some of these birds may form part of the Somerset population for evidence of movements between the islands and the shore was obtained on 15th June when two pairs of Shelduck were seen over the sea between Brean Down and Steep Holme. One pair was flying towards the island and the other in the direction of Bridgwater Bay. No Shelduck were seen on these islands after 8th July.

e. Breeding success

The study of the brood production was continued until the beginning of August. It is improbable that all the young Shelduck were seen from the air although a comparison with some ground counts made by members of the Bristol Naturalists' Society suggests that a high proportion of the young were recorded from the aircraft. However, the method should suffice to show trends and the results could be used as samples for comparing the breeding success in different years. The first young were seen in the middle of June and had presumably hatched a few days earlier, as the ducklings are led to the water soon after hatching. Maximum numbers were recorded during the first week in July. These results suggest that breeding was a little late this year as the peak period for egg laying is usually given as the second week in May with an incubation period of 28 days. A report on the breeding survey in the Bristol district (Taylor, 1960) gives fuller details of breeding success, and also compares the completeness and accuracy of counts from the ground and from the air.

Conclusion

This survey of the Bridgwater Bay Shelduck seems to have been sufficiently promising to warrant further investigation. There is little doubt that aerial survey is the most efficient and also the cheapest method of obtaining a census of the birds present but any further work ought to be linked with investigations made on the ground. It seems desirable to know what type of birds (*i.e.* breeder or non-breeder, *etc.*) is in moult in order to test the theory of a double wave of immigrants. This would require the collection of a sample of birds from which details of weight, plumage and gonad development could be extracted and used to throw some light on the problem. It is highly desirable that some of the moulting birds should be ringed in order to ascertain their place of origin, but this is a difficult task for which at the moment there is no easy solution.

The factors which make Bridgwater Bay a suitable moulting area are not known and call for further research. The causes are likely to be found in conditions of food and topography and a detailed study of these factors is required. Stomach analyses should detect the nature of the food and field

observations ought to disclose the feeding areas. An ecological investigation of the food organism would follow next and should yield information allowing the limiting factors which prevent the dispersal of the moulting Shelduck to be more clearly understood.

At the same time more aerial counts are necessary to examine further the several peaks detected in 1959. These surveys ought to be carried on throughout October for there appears to be a sizeable moulting population during this month.

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