

# THE LONG TERM STUDY OF *CYGNUS COLUMBIANUS BEWICKII* AT SLIMBRIDGE

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## Introduction

Observations of wintering *Cygnus columbianus bewickii* began at the Wildfowl Trust, Slimbridge, England, in 1964, and the study method has continued almost unchanged to the present day. The purpose of this paper is to summarize the findings to date, most of which have been published or are in press, and to assess both the method of study and its future.

## Study area and methods

The swans breed in northwest Siberia and winter mainly in Denmark, the Netherlands, England and Ireland. In February 1964 small numbers from the Severn Estuary, near Slimbridge, were attracted to a lake inside the fox-proof perimeter fence of the Wildfowl Trust by the provision of grain and protection from disturbance. Although Acland (1923) had noted differences between the bill patterns of *C. c. bewickii*, their representation was crude and Scott (1966) was the first to record the bill patterns in such detail that the same bird (second winter or older) could not only be recognized throughout one winter but could also be identified when it returned the following year.

From an initial 24 different swans visiting the lake in winter 1963/64, numbers increased steadily each winter to 439 in 1968/69 (Evans 1979a). Thereafter annual totals fluctuated according to weather conditions (Evans 1979b), peaks of 626 and 721 being recorded in 1970/71 and 1978/79 (Rees 1979) respectively. Every swan was given a name as an 'aide memoire' and, when birds arrived each winter, their names (either those allocated in a previous winter or, if the birds had not been recorded before, new ones) were entered on a register. Every day during the winter the presence on, or absence from, the lake of every swan on the register was checked and new arrivals added. In addition, a printed card was kept for each swan comprising a) basic data: name, age (at first arrival), sex (observed or by cloacal examination), parents, ring numbers, date first caught; and b) annual data: arrival and departure dates, name of mate or other associate(s), number and identity of cygnets, sightings away from Slimbridge, recapture dates and additional notes.

As numbers of swans increased, so too did the problems, not only of recording every bird in one winter but also of recognizing the bill patterns of, and remembering the names of, birds recorded in earlier years. Cygnets (first winter birds) were of particular interest as a group, for both their age and parentage were known. However, when they left in the spring, their bill patterns were still ill-defined. Partly

to help solve these problems and partly so that 'Slimbridge' birds might be identified when away from the lake, as many swans as possible were ringed. From 1967/68 onwards large plastic rings, readable with a telescope from up to 300 m, were used (Ogilvie 1972). Most of the swans were caught in a screened channel leading off the lake, into which they were attracted by liberal feeding. When sufficient birds had entered it, a gate was closed by pulley. The whole was netted over, so that ducks and geese were also caught (Evans and Rees 1978). The birds were then driven to a catching area, where the swans were put in individual plastic 'jackets' for processing (Evans and Kear 1975). To date, the largest number of swans caught at once was 145 in December 1978 (Rees 1979).

As well as being ringed, the birds were measured (lengths of bill, head, tarsus and tarsus thickness) and weighed (Evans and Kear 1978). Their bill patterns were photographed. This allowed the reliability of identification by bill pattern by both experienced and inexperienced observers to be assessed (Evans 1977; Brown and Lewis 1977) and a comparison of their bill markings with those of *Cygnus columbianus columbianus* to be made (Evans and Sladen 1980). From 1970/71 to 1972/73 the swans were x-rayed. Over a third of them had lead pellets in their tissue, having been fired at out of range, although they are a protected species (Evans *et al* 1973). During these same winters, the swans' tails and wing tips were dyed yellow to attract the attention of observers at other sites. It was hoped that these dyed birds would not become targets for shooters, and careful monitoring of their returns showed this not to be the case (Evans 1972). During 1976/77 to 1978/79 swans caught were again dyed, because of increased Anglo-Soviet co-operation on migratory species, which enabled a visit to the breeding grounds in 1978 (Scott 1978).

## Results

There were four major areas of investigation:

- 1) The data on the record cards from 1963 to 1978 were analysed to reveal aspects of the swans' life cycle (Evans 1979a). Thus, the average brood size was 2.1 and single cygnets were more often lost on the wintering grounds than those in broods of two or more. Former offspring often associated with their parents; one even did so in its fifth winter; and sibling pairs occurred, although none returned as a breeding pair. Pairing took place between two and four years old with females being more precocious, perhaps because there was an excess of males in the population. The average pair bond lasted 3.6 years. Divorce was unrecorded but 57% of birds losing mates found replacements in the same year; 15 birds found their mate again, after losing them for at least one winter. First breeding was mostly between four and six years but only a third of birds pairing brought young. Some individual pairs were more frequently successful and had larger broods. The annual survival rate for adult birds was not less than 87.1%.

2) The population composition, and returns of different classes of swans, from 1963 to 1976 were investigated (Evans 1979c). The four main classes were: yearlings (second winter birds, recognized by vestiges of grey cygnet plumage on neck and head), singles (unpaired adults), pairs and families. Birds in each class could have been to Slimbridge before and thus be 'Experienced' or 'New'. Up to 1968/69, when annual numbers were increasing, recruitment to the lake was from all the classes but thereafter it was predominantly from single birds. From 1969/70 the number of 'New' families was extremely low (representing 3.6% of total 'New' birds) compared with 'Experienced' families (21.4% of 'Experienced' birds).

There was no difference between the return proportion of males and females. Birds more likely to return were those which had had a long initial visit (Evans 1980). Such birds were more likely to be caught as a result. Significantly more ringed birds returned than unringed. Pairs and families returned in higher proportions than singles, but returning proportions were lower in all classes later in the study (20.5%). Swans with two winters' experience at Slimbridge were more likely to return (54.9%) than those with just one. Returns were not necessarily made in consecutive winters; a third of swans returning missed one or more winters at Slimbridge.

3) The attendance patterns of the swans recorded in the registers of the eight winters 1968/69 to 1975/76 were analysed in detail.

The register clearly showed days of heavy arrivals and departures as well as attendance on, and absence from, the lake. The effects of weather were examined first (Evans 1979b); wind direction was vital. For both arrivals and departures the swans favoured tail winds. Calm, then side winds, were selected next. Head winds were avoided. The proportions of the prevailing winds (south to west) each winter correlated negatively (being head winds) with numbers of swans arriving, and positively with the proportions of swans missing winters. These birds probably stayed on the Continent, for south to west winds are mild and would keep feeding grounds there open. Such winds also correlated positively with how much absence there was during a season by birds visiting Slimbridge; and, finally, correlated negatively with the number of swan-days recorded each year. These results have practical management value. Thus, it was feared that the very low number of swans (259) visiting Slimbridge in 1974/75, their subsequent high amount of absence and the resulting very low number of swan-days resulted from some mismanagement of the lake, eg too much catching in previous years and too little feeding. However, the proportion of south to west winds during that winter was 78%. Thus large numbers of birds were prevented from arriving and those that did come were encouraged to leave early by the abundance of tail winds.

Secondly, the effects of experience and breeding status (ie 'class', as defined earlier) were examined (Evans 1980). 'Experienced' birds arrived proportionally earlier, stayed longer, were absent less and departed later than 'New' birds. The

'Experienced' classes showed few differences in behaviour, except for families, which were absent more and which, in the early part of the winter, left proportionally ahead of the other 'Experienced' classes. New classes showed more differences. Arrivals of yearlings built up most quickly, followed by singles, pairs and families. Pairs had more absence than the other classes. The departures of families were different from those of the other classes and closely paralleled their arrival pattern. This resulted from the number of 'New' families that made only very short visits.

4) An analysis of the sightings of ringed and dyed swans away from Slimbridge from 1961 to 1979 is in progress. Taking only one sighting per swan per site per winter, some 1300 sightings (usually by ring number, occasionally by bill pattern) have been made, in four categories.

- a) During the autumn migration: Only 61 sightings made at four places in the Federal Republic of Germany, three in the Netherlands and five in Britain. There were eight examples of birds seen at another Wildfowl Trust reserve (Welney) 200 km to the northeast being recorded at Slimbridge the next day.
- b) Between first arrival at and last departure from Slimbridge in one winter: 200 sightings made at three places in Britain and two in the Federal Republic of Germany. The latter resulted from severe weather conditions on the spring migration, which forced the birds back to Britain (Evans 1979b).
- c) During the spring migration: 478 sightings made at two places in Ireland, 16 in Britain, ten in the Netherlands, ten in the Federal Republic of Germany, two in Denmark, two in the German Democratic Republic, one in Estonia and two in the USSR. Several swans seen at Slimbridge one day were reported from other places in England the next day and one bird had travelled in that time as far as the Elbe Estuary, Federal Republic of Germany.
- d) During a winter when the bird did not come to Slimbridge: 555 sightings at seven places in Ireland, one in France, 18 in Britain, one in Belgium, 18 in the Netherlands, ten in the Federal Republic of Germany, three in Denmark, two in the German Democratic Republic, one in Latvia, six in Estonia and one in the USSR.

There were many additional records of ringed/dyed swans where the bird was not identified, including the Camargue (in southern France), the Shetland Islands (off the northeast of Scotland), in Sweden, Poland and at the mouth of the Pechora River in the USSR, the nearest sighting to the breeding grounds.

## Discussion

It would be impossible in this paper to discuss the results in any detail, because

they are so many and varied. Precisely for this reason it is perhaps worth evaluating this long-term study.

First of all the study area; it can by no means be called natural. However, it is clear that the swans were well able to exploit the artificial situation. Moreover, the study would not have been possible without a Slimbridge-like situation, for the data depended on the very close observation enabling individual recognition.

There is no doubt that such extensive use of individual identification has produced a wealth of data, but what of the future? Obviously the longer annual records can be kept on the individual birds already on file, especially those of known age, the more valuable they become. However, the bill pattern method of recognition poses many problems in a long-term study and Rees (1981) describes the efforts to computerize the bill pattern data so that a bird may be identified by an observer who has not seen it before. Nearly 4000 different swans have been recorded at Slimbridge.

Instead of recording the bill patterns of further new birds, the study should perhaps concentrate on continuing the records of the birds already on file. A thousand of the swans have been ringed and so are easily recognizable by inexperienced observers. An interesting and important study would be to monitor the effects of feeding the swans, by comparing the detailed behaviour of the Slimbridge birds with that of swans at an unprovisioned site.

Once birds returning to Slimbridge have been recorded, the effort required to monitor their subsequent presence or absence daily will probably produce relatively little new information. Registers now exist for 16 years, so it is likely that nearly every 'idiosyncratic' behaviour (such as a swan staying for only one day in one winter when in a previous winter it stayed over 100 days) is already on record. Existing details from the printed record cards and registers are being put into a computer so that even more detailed analyses than those described above can be made.

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### Summary

*Cygnus columbianus bewickii* wintering at Slimbridge are recognized by bill pattern and some are caught for ringing and closer examination. The four main areas of investigation are: study of life cycle, population composition and return rates, attendance patterns from 1968 to 1975,

and analysis of sightings of marked birds away from Slimbridge. The author discusses future developments emphasizing the need to maintain annual records of known individuals, preferably computerizing descriptions of bill patterns, and to monitor the effects of feeding swans.

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