The Bewick's Swans at Slimbridge

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The study of individual birds in the wild has been made possible by capture and marking techniques followed by further catching or by close observation, as well as the normal flow of information through recoveries. Observation of breeding birds has been the easiest because of their strong attachment to a limited area. Some work has been done outside the breeding season using conspicuous marks in the form of harness or collar attachments. Individual variation in birds of one species has been recognised for many years but it has been exploited for research purposes only in a limited way—for instance in observing family behaviour in the White-fronted Goose, and in the recording of occurrences of the Lesser White-fronted Goose, at Slimbridge, both concerned mainly with the variation in the black belly bars, and in differences in the shape and extent of the white frontal shield.

The exceptionally favourable circumstances for observation from my studio window of birds on the studio pond in the Rushy Pen (now re-named 'Swan Lake') at Slimbridge have enabled very close observations to be made on wild Bewick's Swans *Cygnus columbianus bewickii* and considerable variation in their yellow and black bill markings were immediately apparent. The intricate patterns over the culmen and behind the nares form the most ready means of distinguishing individuals but this can be combined with the underbill colouring and pattern, with shape, size and stance, with eye and eyelid colour, and with other characteristics such as missing feathers, plumage stains or behaviour. The last are only useful as additional confirmation and of limited value over the long term.

It has been possible to devise a formula by which any Bewick's Swan can be described using the variable features and listing them in a conventional order. The diagram shows these eleven characteristics. Five refer to the meeting of yellow and black on the upper mandible, two to the extent of pink or red on the lower mandible, plus the eye and eyelid colour, bill shape, head shape and carriage, and lastly general size. Within the main headings there are up to nine sub-divisions giving 56 separate points that can be described. This makes a total of combinations of something over 23,500,000!

Whilst this formula can be used by anyone to describe in letters and figures the facial pattern of a swan that can then be converted into a recognisable drawing, the day-to-day identification of individuals of the Slimbridge flock is nothing like so laborious as the formula might imply. A detailed drawing (see front cover) is used to ensure the correct recording of new arrivals but once a bird is being seen daily its most obvious features soon assume a prominence in the observer's memory that enables almost instant recognition of any bird. Additional items are of course used in confirmation in the daily recording, one of the most useful here being the presence of a mate or family.

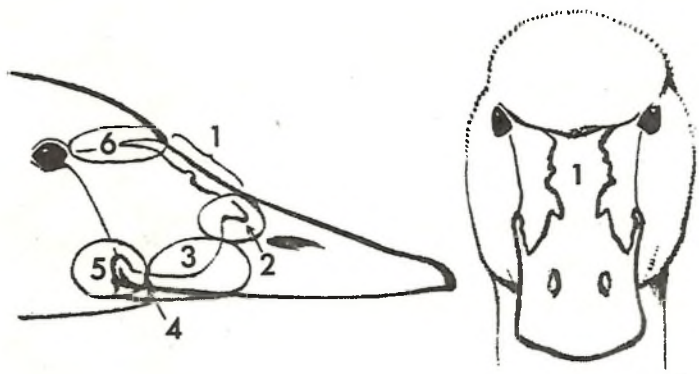
It has proved possible for someone coming new to the swans to master the characteristics of the birds quite quickly, assisted by the drawings.

The face patterns of cygnets present additional problems, particularly early in the winter. The black markings appear progressively over the reddish pink areas of the bill and the limits of the yellow are ill-defined at first. The drawings are made of them as late in the season as possible to get the best picture of what they may look like the next year. In their second winter it is usually obvious from a bird's behaviour whether it has been to the pond before (new birds start upending for food in deep water and away from the feeding place). There is a tendency for siblings to associate, and also to consort with their parents, even if new cygnets of the year are also with them. All these points help to confirm identification if the bill pattern is not immediately recognisable. There is no doubt that this is a possible difficulty in future. Another difficulty is that the patterns of the adults are subject to minor changes from year to year. Some change more than others, and the changes may involve more yellow or more black.

In only three winters experience of these changes no system of prediction has emerged but after a further period it may be possible with greater knowledge of the physiology involved to discover certain rules governing the changes.

Bewick's Swans were not very frequently recorded on the Severn Estuary in the early years of the Wildfowl Trust but by 1956 the occurrence of the species had become regular and up to 16 birds were visiting the Big Pen in the late winter. The numbers increased slowly until by the winter of 1963–64 more than 20 were present for a considerable period. In

FORMULA FOR IDENTIFICATION OF BEWICK'S SWANS



1. Shield on top of culmen:

A. "DARKY" All black from feathering, along culmen, to tip of bill.

(i) No spots anywhere on shield.

(ii) Some small yellow spots on black of shield. (Conspicuous yellow spots in this area constitutes a "Shieldy").

B. "YELLOW NEB" A straight line can be drawn over the culmen connecting the yellow on each side along yellow pigment.

(i) Bland. Relatively few black spots.

(ii) Peppery. Yellow heavily spotted.

(iii) Y-fronted.

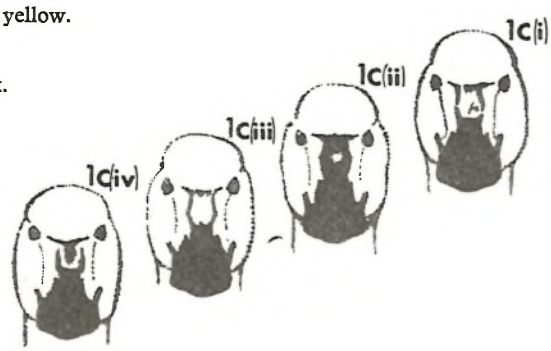
C. "SHIELDY" Some patterning of black and yellow on shield of upper culmen:

(i) Shield area predominantly yellow.

(ii) Shield predominantly black.

(iii) No connecting yellow between one side and the other.

(iv) Winding connection on yellow pigment.



2. Edge of black and yellow immediately behind nostril:

A. "TOOTHY"

(i) Prominent 'tooth' mark—yellow pointing down, black behind it, pointing up.

(ii) Small yellow 'tooth'.

(iii) No 'tooth' at all.

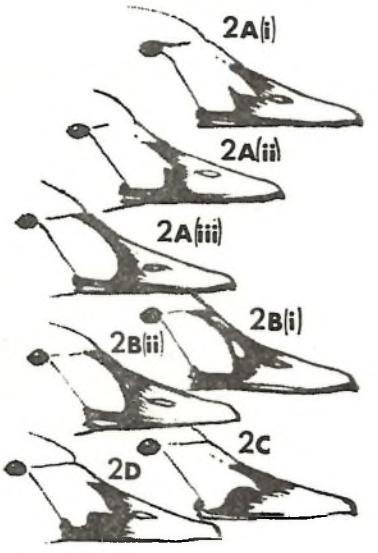
B. "TEAR-DROP"

(i) Large yellow spot near nostril.

(ii) Small yellow spot.

C. "WAVY" Edge of black conspicuously waved.

D. "STEPPY" Edge of black conspicuously shaped in a square black step.



3. Forward lower edge of yellow:

A. "ROUNDY" Forward lower edge of yellow rounded.

B. "SQUARE" Forward lower edge of yellow making a sharp right angle.

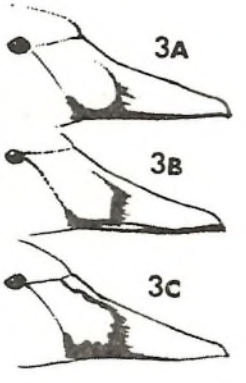
C. "NOBBLY" Black edges broken by black markings encroaching on yellow or yellow on black.

4. Side of lower mandible showing when bill is closed:

A. "POSY" Very prominently pink.

B. "ROSY" Some pink visible.

C. "BLACK-JAW" No sign of pink.

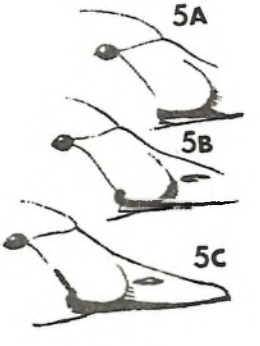


5. Corner of the gape:

A. "STRAIGHT-FACE" No noticeable upward curve.

B. "SMILER" Corner curled up.

C. "MOUSTACHIO" Black extending upward along edge of feathering.



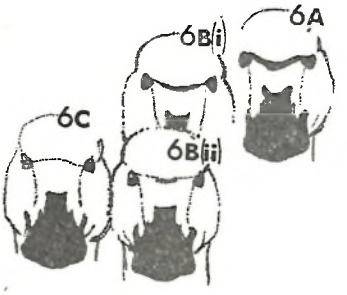
6. Brow—edge of feathering between eyes:

A. "BLACK-BROW"

B. (i) More than half brow black.

(ii) More than half yellow.

C. "YELLOW-BROW" No Black whatever.



7. Eyes:

A. EYE-LIDS:

(i) Both yellow.
(ii) Top one yellow.
(iii) Lower one yellow.
(iv) No yellow.

B. IRIDES:

(i) Dark.
(ii) Conspicuously paler.

8. Under-bill:

A. PATTERN

(i) Large pale patch.
(ii) Small patch.
(iii) Spotted.
(iv) All black.

B. COLOUR OF UNDER-BILL:

(i) Pink.
(ii) Orange.

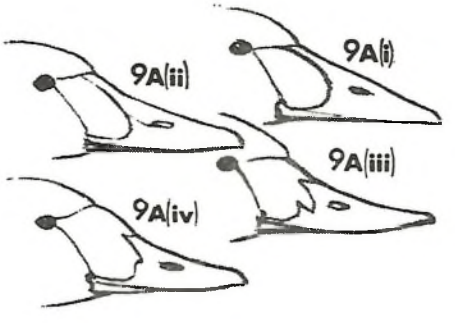
9. Bill:

A. SHAPE:

(i) Droopy.
(ii) Straight.
(iii) Turned-up.
(iv) Bulgy.

B. COLOUR:

(i) Dull or pale.
(ii) Lemon.
(iii) Bright.
(iv) Orangey.



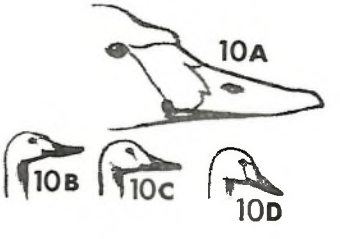
10. Head shape and carriage:

A. "CAT-FACE"

B. "HEAD-IN-AIR"

C. "NORMAL"

D. "SLEEPY-HEAD"



11. Size of Swan.

A. LARGE. B. AVERAGE. C. SMALL.

February 1964, by dint of moving 3 pinioned Bewick's Swans and 4 pinioned Whistling Swans (which the wild Bewick's do not apparently differentiate from their own race) into the Rushy Pen, 24 wild birds were persuaded to come regularly to the pond in front of my studio window where they were liberally fed. In the following winter of 1964–65 there were 55 wild Bewick's at the peak time, and 68 were recorded during the winter. During the winter of 1965–66 the pond for a considerable period held over 120 swans with 125 as a peak and 147 different swans were recorded in the season.

Detailed drawings of the facial patterns of 188 different swans have now been made, and each bird has been named for easier reference. The names are used as aide-memoires in identifying the birds and may refer to a particularly well-marked facial characteristic (Two-spot, Shieldy, Freckles), to unusual colouring (Lemon, Amber, Pink) or to a behavioural feature (Caesar, a very aggressive male).

Given the possibility of individual identification it follows that after the second complete winter of the study we must already have learnt something. The most important fact so far is the confirmation in yet another species of Anatidae of the strong traditions inherent in the birds in their choice of winter quarters. This is borne out by the return year after year of the same birds, bringing their young of the year, thus leading to a part of the increase taking place, and guaranteeing a continuing increase in years to come. However, the arrival here of adult birds that have not previously wintered, and these form a considerable proportion of the increasing flock, does argue that this tradition can break down under certain circumstances. What these circumstances are we can only guess at, though we would perhaps be justified in thinking that the unlimited food (wheat)—and to a lesser extent the security—at Slimbridge must be the principal attractions. We cannot be sure how these attractions are discovered by new swans, though we suppose that some attach themselves to swans who know the place at earlier staging posts during migration. Others meet up at nearby places when our birds wander and are subsequently brought in by them. A third method may be the actual sighting of the flock by passing migrating birds.

The return of birds in succeeding years has been most encouraging. Even before the start of facial recognition we had evidence of this from ringing. An adult caught in the pens on 2nd April, 1961, was subsequently recaught on 21st November, 1961, and again on 10th February, 1963. Of the 24 birds identified in winter 1963–64, 16 returned during the next season 1964–65. These were five established pairs, one of which brought two cygnets, and another which brought three of the previous year's four cygnets, having apparently failed to breed in 1964. The single young of the only other successful breeders of 1963 did not reappear. Of the three unattached birds of 1963–64 which returned, two brought mates with them.

The first birds to arrive in 1964–65 were a pair (Pink and Rebecca) that had been here the previous year, and they brought two cygnets with them. This was on 4th December. The next arrivals were not for a fortnight, and then all the next eight (Maria, Pop, Mom, Ranger, Sis, Big Bro, Owl, Pussycat) were from 1963–64. In early January some new birds started trickling in, not all staying very long. Some longer lasting influxes took place in the middle of January and in early February with up to 55 swans regularly using the pond. A mass departure took place on 15th and 16th March, 1965, a single family (Pink and Rebecca) hanging on for another week. Altogether 52 swans were identified in addition to the 16 from the previous year, so that the total number that came to the pond was 68, 13 above the maximum reached on any one day.

On 21st October, 1965, the same pair that arrived first and left last the year before (Pink and Rebecca) arrived on the pond with three cygnets, together with a single new adult. They were six weeks earlier than in the previous autumn. In the next three days 14 more swans came: two pairs (Kon and Tiki with three cygnets, and Pepper and Amber with two cygnets) that had been last year, a single old adult—originally paired but a widow during the previous winter (Maria) and four second winter birds all of which had been before as cygnets. Two of these were Reuben and Rachel, the young of Pink and Rebecca in the previous year. They immediately joined up with their parents and the new cygnets making a flock of seven. By 1st December 86 birds had arrived and stayed, of which 27 were cygnets (one of these was killed in November flying into a tree). Of the 59 adults or two-year olds, 29 had been in 1964–65, and 11 of these in 1963–64 as well. During the rest of the winter a further 61 swans, of which 15 were cygnets, came for shorter or longer periods, but only four of these had been in 1964–65, and none from 1963–64. The maximum on any one day was 125 and the total for the season 147. Thus there is a very strong tendency for the birds, having

once learnt of the place, to come here fairly early in the winter.

The duration of stay of the swans varied in the two seasons, mainly because of the greatly differing dates of arrival. In 1964–65 most of the birds stayed in the area once they had arrived, occasionally missing a day in visiting the pond for food. The main exception to this pattern was the first family to arrive (The Pinks) which came on 4th December, departed on 19th January and did not return until 9th February. They then stayed without a break until a week after all the other birds had departed. Eight single birds that arrived in late December or early January stayed for short periods only, from one to 27 days, one other stayed for 17 days, departed for three weeks, and came back for two days more before departing for good.

The longest continuous stay was 87 days (by Maria) with several more families or individuals between 60 and 80 days. The mean stay of all 68 birds was 48 days, and of those which stayed until the general departure in mid-March, 55 days.

In 1965–66, there were two important differences from the previous winter. First the arrival of the birds started six weeks earlier, 86 birds having arrived by early December, and secondly, the very wet period in December with widespread floods in the Severn Valley and elsewhere caused many birds to depart for up to four weeks; though, with the exception of two birds (Romeo and McJuliet) which never reappeared, they had all returned by the second week in January when ice covered many of the flood waters. There were other shorter or longer gaps in the attendance on the pond of some other birds, but none more than a few days in duration, and not necessarily indicating that the birds had wandered far. The goose shoots in January had temporary effects of this nature.

The longest continuous stay was by the Pink family, which had again been the first arrivals and this year had scarcely an interruption in their stay, even during the floods, though they were missing for some odd days at this time. They stayed in all for 154 days. There were many more stays of over 100 days. The mean of all 147 swans was 79 days, and for those which stayed until departure time in March the mean was 89 days. Thus the swan usage of the pond was very considerably higher than in the previous winter, roughly 11,700 days compared with 3,250 days, or an increase by a factor of $3\frac{1}{2}$.

The maximum numbers of swans regularly using the pond over a period also went up enormously, from 50–55 maintained for the period 11th February, 1965, to 15th March, 1965 (33 days), to 110–125 almost continuously from 19th January, 1966, to 10th March, 1966 (51 days). This kind of usage of a small pond raises the question of when the birds will begin to feel overcrowded. The other more frequent limit of numbers, namely food supply, will not arise in this case as the amounts of wheat fed twice a day can be increased in proportion to the number of birds. For 120 swans $2\frac{1}{2}$ cwt. of wheat were fed daily, with a much smaller amount of biscuit meal. There is some observational evidence that the more birds there are on the pond, the greater the frequency of aggressive encounters between families or individuals, but so far there have been few records of birds being prevented from reaching the ample food supply because of the presence of either too many or too aggressive birds. It may be necessary in the future to enlarge the area over which the food is scattered, but the water area now seems adequate, both for landing and taking off (for which it has been enlarged already) and for the normal bathing and resting activities. It seems possible that 'Swan Lake', as it is now called, could accommodate up to 500 Bewick's Swans.

The normal pattern of day to day usage of Swan Lake is as a daytime feeding place. During each winter, however, there have been periods when the birds have roosted there all night instead of flighting out to the river mudflats; this despite the floodlighting of the pool. The habit was particularly pronounced in January 1965 and again in November 1965. As these were both times when swans were arriving almost daily, this may well be a reflection of their desire for food and sleep. The 'tired' appearance and behaviour of recent arrivals has frequently been noted.

The timing of the morning flight from the river seems to be greatly dependent on the weather, being delayed by rough or cold conditions. Once in, the birds often stay until late afternoon, until after the arrival of the barrow bringing the second feed of the day. A disturbance during the morning will tend to induce for several days a pattern of flighting out in mid-morning, with a return a few hours later. In March there is more variation in behaviour and a more regular evening flight caused partly by longer daylight and partly perhaps by migratory restlessness.

The occasional disappearance of birds apparently settled in the area has led us to wonder about casualties occurring during the winter. The only times we can be fairly certain about these are when the lost birds are members of a family party. In

1964–65, the father of a family of four 1963 cygnets still consorting with their parents a year later (Pop) disappeared in mid-January, after the whole family had stayed away for four days. In November 1965 during a night-time fly round by several birds in fog a cygnet (belonging to the Major and Ethel) hit a tree near the pond and got hung by its neck in a fork. Another parent bird (Poet) failed to return after the December floods, though its mate and two cygnets did.

We have so far ringed 23 Bewick's Swans, catching all of them in the pens, usually when they have got into a confined space where take-off is difficult. Two recoveries have been made away from Slimbridge. The first was an adult male caught on 10th February, 1963, and kept in the pens until the following September. It was found dead on 19th May, 1964, in the Nenetsk National Okrug, U.S.S.R., within the known breeding range of the species and about 2,300 miles from Slimbridge. The second recovery was of Elmer who arrived on 11th January, 1965, and was ringed the next day when he hit a chimney and fell into the garden. Although injured at the time, he made a complete recovery and departed on 16th March with his mate (Petula). He was found dead at Frodsham, Cheshire, about 25th November, 1965. His mate has not returned. It is hoped in future to use rings with large numerals so that they can be read with binoculars and positively confirm identification of birds on the pond.

The behaviour of the birds and the relationships between them are being closely studied. The pattern of aggression between families and individuals is noted each time it is observed, and a nominal order of dominance is being drawn up. Already there are nearly 200 records of aggressive encounters and a peck order can be worked out. As in the geese, the larger families tend to dominate the smaller, but not so rigidly, and a really aggressive male (such as Caesar) with only two cygnets can defeat parents of larger broods. Pair-formation behaviour has been noted many times and in 1965–66 seven pairs were apparently formed during the winter. The two-year-old birds spend quite a lot of time in courtship display, often to different birds within a few days. There are some indications that birds pair with others having a similar bill pattern to their own, but this must be the subject of further work, possibly using the formula method of description. The inheritance of the various features of the bill pattern is also under study, and so is the degree of change from year to year in each bird's pattern.

We believe that the discovery of this method of individual recognition may in the course of a few more years lead us to a number of new discoveries about the biology of the Bewick's Swan.