# A possible advantage for the 'Polish' morph of the Mute Swan

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The cygnets of the Mute Swan *Cygnus olor* generally are grey and have a grey-brown juvenile plumage which functions, in part, to inhibit parental aggression, and aggression from other adults when the cygnets are in winter flocks (Kear 1970; Scott 1978). However, a plumage polymorphism 'Polish' exists in which the cygnets have white down and juveniles white plumage. This morph occurs in about 20% of individuals in eastern Europe, forming a cline with frequencies dropping to about 1% in western Europe. Early records of the morph go back to the 17th century but they have always been rare in Britain. They became known as 'Polish' swans, the name given them by poulterers in London, who used to import them from the Baltic.

There are occasional records of swans drowning their Polish cygnets (Scott *et al.* 1972) so the high frequencies found in eastern Europe suggest there must be some advantage in favour of the Polish morph to counteract this. In past centuries the Polish morph was selectively bred in the Low Countries for both meat and 'fur'. Scott *et al.* (1972) suggest that as only young swans in their first autumn are considered tender enough for the table, brown juveniles were probably selectively caught, or shot in the wild. This would give a considerable advantage to the Polish morph. However it has not resulted in an increase in Britain (D. Stone, A. E. Coleman, pers comm.), although swans were long harvested there for food.

Munro *et al.* (1968) have shown that the morph is inherited as a sex-linked recessive gene. Because the female is the heterogametic sex in birds, females with a Polish gene are always white. Only homozygous males are white, the effect being suppressed by the 'normal' gene in those heterozygous for the Polish gene. Genetic traits are rarely sex-linked, so any advantage conferred by the Polish gene might be expected to benefit by being so linked.

The plumage and bill colour of Polish Mute Swans in their first winter (less than 10 months old) are extremely similar to those of normal second-winter birds (15–20 months old); in effect Polish individuals appear twelve months older than they actually are. Now, swans breeding for the first time are slightly less successful and have smaller clutches (Minton 1968; Reynolds 1972); swans breeding when 'young' are marginally less successful (Coleman & Minton 1979); and swans prefer to mate with birds of similar ages to themselves (Minton 1968). It is thus reasonable to suppose that any swan which could pair unusually early with an older bird would gain advantages by extending its overall breeding span and also by extending its more productive breeding period. The Polish gene could permit precisely this.

Wild male Mute Swans do not pair in their second spring whereas females do; further, males seldom breed in their third spring, but females do so more often, and perhaps more successfully (Perrins & Reynolds 1967; Minton 1968; Reynolds 1971; Bacon 1979). It is likely that young males, although physiologically mature, are not generally 'strong' enough to defend territories from rivals; such a lack of strength would matter less in young females. The difference in breeding success is not shown by the data of Coleman & Minton (1979), so there may be variation with population density. The proportion of 'early' breeders is higher in low density populations, as will be seen by contrasting the data of Minton (1968) with Coleman & Minton (1979), and Perrins & Reynolds (1967) with Bacon (1979). Some of the highest frequencies recorded for the Polish gene are in low density and expanding populations (Munro *et al.* 1968; Bloch 1971).

Field data are thus well in accord with the suggestion that female swans would have an advantage in being more likely to obtain older mates in their first winter. They could thereby gain nesting experience during their infertile second spring and breed more successfully in their third, so extending their breeding life by one season. Male swans, on the other hand, do not pair at the age of one; if they should do so, and/or nest at the age of two, they would probably have their bluff called by older stronger males, at least in high density populations. By the third spring all normal swans are also white. The gene expression is thus recessive in the homo-



Wildfowl 31 (1980): 51–2

gametic sex which, on this hypothesis, could not benefit from its expression.

The gene is always expressed in the heterogametic females, which could benefit from the Polish plumage. We may thus conclude that the Polish gene would confer a net advantage outweighing losses through parental aggression, at least in low density populations. Its recessive conditions in males would shelter it from extinction at high population densities. The hypothesis predicts that Polish genes should be commoner in low density and expanding populations.

**Summary**

A hypothesis is advanced as to the possible advantage to the white phase 'Polish' morph in Mute Swans *Cygnus olor*. The benefit is to the heterogametic female enabling her to breed early in low density populations. Its presence as a recessive condition in males may prevent its extinction in high density populations.

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**A brood of Mute Swans *Cygnus olor* with three normal and one 'Polish' cygnet showing white plumage.** (*C. P. Rose*)