

AUTO-SEXING GEESE

now being recognized from
Shetland to Australia



By: Chris Ashton (UK)

Telling domestic ducks from drakes is easy, but when it comes to goose and gander there are few obvious clues. Of course, the birds always know, and to experienced keepers it's usually obvious too. But there has long been a fascination with auto-sexing goose breeds where the plumage colour is the instant giveaway. It's very useful to be able to tell the sex of a bird by plumage colour and to know that you have got it right; that must be why the auto-sexing breeds developed in the farmyard. Continued selection of grey for the goose and white for the gander - a maxim recorded in Victorian times - has meant that these breeds were produced by continued human selection of the goose colour genes. And the most fascinating part of the story is that the process is still happening in Australia today where both Pilgrim geese (diluted grey in the female) and West of England geese (diluted grey pied markings in the female) have even recently been found in a flock of white geese. The 'white' Pilgrim ganders are there too – but hiding!

Goose Colour

Colour in geese is less complicated than in ducks. Ducks and drakes (except with the black gene and in pure white) show marked differences according to the sexes; just compare the mallard drake with the drab brown duck. Wild and domesticated geese do not show this sex-difference in colour, and this is thought to be related to their mating habits. Adult geese tend to stay paired to rear goslings, whereas mallard males leave when the females sit. So bright, sexy plumage matters for the mallard breeding season but needs to be cast off for the summer camouflage. Geese keep the same plumage all year and moult only once. Ganders don't need the latest style and the bling to attract a new mate. They are happy to stay with the same partner and the family group, at least until breeding time again, when the juvenile ganders must leave.

European domesticated geese have been selected from the wild greylag goose, and the first domesticated birds were probably grey. But domestication always brings selection and inbreeding and therefore changes in colour and type of the farmed stock. Sedentary habits, more food, and the choosing of heavier birds will all slowly change the type; and natural colour mutations, which might be lethal in the wild, are often encouraged. That's why we have Blue and Buff geese today. Yet these colours have arisen only recently because, for many centuries, the alternative to 'wild-colour' seems to have been white, and it's interesting to reflect upon what this 'white' may have been.

White geese

Although goose colour is less complex in its distribution over the whole plumage than in ducks, the expression of 'white' is more complicated.

Geese have evolved two ways of looking 'white'. In the Asiatic geese (the Chinese and the African), white genes do what you would expect: with two white alleles the bird looks white. In the heterozygous form the white is almost hidden and the bird is wild-colour, except for perhaps a 'half moon' of white on the breast.

In the European geese, it's more complicated. There is no 'white' gene. The 'white' is produced by the interaction of two separate genes: one called 'spot' (producing the Buff Back and Grey Back pattern, also referred to as 'saddleback') and the other called 'dilution'. Birds carrying both of these genes look white though the females can show a bit of grey on the rump, and look grey saddleback on hatching—a useful auto-sexing characteristic in white Embdens and Roman geese. Such white birds may have been the geese which warned of the attack on the Roman citadel in the 4th century BC.

Summary of research by Jerome on plumage colour, 1970		
'White' gander	<i>Sd/Sd</i>	<i>sp/sp</i>
'Witte' goose	<i>Sd/—</i>	<i>sp/sp</i>

KEY	
<i>sd</i> ⁺	no dilution [+wild-colour]
<i>Sd</i>	sex-linked dilution
<i>Sp</i> ⁺	solid pattern, no spot [+ wild-colour]
<i>sp</i>	spot gene [saddleback]
+ wildcolour geese are grey, like the greylag. Capitals denote dominance.	
NB Female gametes determine the sex in birds: the goose can only have one dilution gene. The male can have two such genes.	

Footnote: The original research by Jerome suggested that the *sp* gene for (spotting) was sex-linked. More thorough investigation (reciprocal crosses) led him to revise this. He (and we) believe that the spotting gene is autosomal and recessive to the solid colour *Sp*⁺. Thus the female offspring of a spotted gander to a solid goose will be heterozygous (like the males) and therefore unlikely to show the recessive spot. In our experience, however, it is not so simple. Dominance can vary. It can be affected by other genes and other processes within the cells. We believe that the expressivity itself is variable. Some heterozygotes can show elements of white (e.g. on some primary feathers, beneath the chin, etc.) Solid colour birds such as the Toulouse or Brecon Buff can have hidden spot genes that reveal themselves in future offspring in the way of the above faults. Getting rid of white spotting from the flocks can take many years.

Saddleback or Pied geese

White geese and 'another kind which is of various colours' were mentioned in Roman times by Columella (first century AD). These were assumed to be wild or crossed with the wild: maybe they exhibited the Grey Back pattern which is not sex-linked. This pattern was later selected in north European geese, resulting in regional breeds such as the Pomeranian, Öland and Skåne. Such pied geese may have been first recorded in Britain by Gervase Markham as 'pyde' in the 1600s. There seems to be no firm evidence of birds with sex-linked colour then, yet they must have been there, for it is the interaction of both the pied spot gene and dilution which makes white. The dilution gene must have been there if there were white females.

The dilution gene

The basic spot (pied) gene is not wanted in Pilgrim geese. It is the dilution gene alone which is the key to 'auto-sexing' geese of the Pilgrim type. If the birds just have the sex-linked dilution gene this is enough to turn ganders almost white, and geese a soft shade of grey.

Pure males are homozygous for dilution, but females can only have one dose of the dilution gene because the gene is sex-linked i.e. not on the female sex chromosome.

In this case, both genes cannot be accommodated and the female is hemizygous for dilution. She can only have one dilution gene and she remains pale grey.



Above: Young Pilgrim geese. The gander is almost white and the geese are light grey, developing white spectacles with age. Photo: Chris Ashton.

A further complicating factor, which is still not understood, is that saddleback (apparently spot pattern) auto-sexing geese do exist – in the West of England, Shetland and Cotton Patch of the USA. These females also show a soft grey or grey-brown colour, indicating a dilution gene. The problem here, in these breeds, is that spot and dilution together do not behave in the 'normal' way to produce a white bird. Spot in this case seems to be expressed as a visible grey back pattern, albeit diluted. Further test breeding needs to be done to see if there is 'special spot' gene which produces the pied pattern in this diluted form.

Victorian Times

Perhaps the first inkling that birds with sex-linked colour existed at all comes from Victorian times. Harrison Weir (1902) wrote that the "the 'common' goose is a short and smaller bird than of the 'farmyard' and 'better land' goose, being very plump and full on the breast, and seldom, when fully grown, exceeds ten to twelve pounds in weight . . . the ganders are invariably white, and that even if the geese are grey. But this may be and is probably attributable to centuries of selection as to colour, and is in some parts proverbial . . ."

Weir does not make it clear if these geese of the Common Lands could perhaps be both whole grey 'Pilgrim' females, or pied females of the 'West of England' type. Indeed, as we shall see, there were probably both colour types. As early as 1854, these geese was illustrated at a show, for the early waterfowl shows (1845) already had a category for the **Common Goose** which was, of course, the goose kept on the **Common Lands**.

So when were these sex-linked colour-types formally recognized? Robinson 1924 (Popular Breeds of Domestic Poultry) listed the Normandy goose amongst French breeds and stated that 'the Normandy geese resemble the common goose of England and America before the introduction of the Embden and Toulouse. The females are grey and white; males mostly white'. These geese were therefore auto-sexing and looked rather like the West of England if they were white and grey in the pied pattern. It may be that both types were there, and in the Magazine of Ducks and Geese of winter 1959, Normandy 'Pilgrims' were illustrated. The females appear all grey on the main feathers, having no white flights. They have the typical spectacle pattern on the face. One gander may be all white; the other is a typical specimen with pearl grey on the flanks and some on his wings, rather like the Pilgrims now illustrated by the American Livestock Breeds Conservancy (ALBC).



Left: Several birds were entered as Normandy Geese at the European Waterfowl Show 2003. Ganders are white, geese are grey and white). They are similar in size and colour to the Shetland. The older females typically lose the grey on the head. Some of the birds are crested (Bavent)

Photo: Chris Ashton.

Robinson's findings are not surprising. Perrier & Salmon (1905) referred to the Sequanian goose where sexual dimorphism is sometimes very pronounced, so that adult males are almost entirely white. "The Goose is common and widespread as in the whole Europe, its breeding is practised in all regions where there are grain, meadows and ponds . . ." Whether this was the auto-sexing Sequanian or the Roman/Padovarna type of goose is open to debate: it is not clear if auto-sexing birds were widespread in Europe—or just white and grey birds, which may not be auto-sexing and simply of the Roman and Padovarna type. Voitellier (1918) said the Sequanian goose was most prevalent in the region of the Loire, Normandy, Beauce and Champagne; also Jenyns even in 1835, recorded that 'the Common Gander after attaining a certain age is invariably white.'

Despite Robinson's recognition of the sex-linked colour pattern, it was Oscar Grow in the USA who formalised the breed in the 1930s. Grow was a geneticist and he coined the name 'Pilgrim' for this breed after the family's 'pilgrimage' during the Depression. Paul Ives, who became the Editor of Cackle and Crow became interested in an article by Grow about the geese published around 1934/35, and ascertained from Grow that the ancestors of the flock came from Vermont circa 1895.

Grow maintained that the breed was of comparatively recent origin - and his recognition of it was. However, Ives came to the conclusion that from all the evidence that he could find, the ancestor of the Pilgrim was nothing other than the common or farmyard goose of early Britain.

Ives also found a small auto-sexing flock in Connecticut where they had been kept as a closed flock for 35 years, and illustrated the birds on the cover of Cackle and Crow-the Poultry Paper in 1937. Also, C.D. Gordon, writing in the Journal of Heredity (1938) described auto-sexing geese from Alabama, which he discovered in 1935.

Robert Hawes (1996) of the USA investigated the intertwining of the name 'Pilgrim geese' with the name of the Pilgrim Fathers. Research at Plimoth Plantation revealed that although the domesticated birds must have arrived as the common English goose in the mid to late 1600s, they were not on the Mayflower and Fortune. The name Pilgrim is simply the invention of Oscar Grow, as indeed he said it was.

Below: West of England type goose in Australia from a flock of 'white' geese.



© Chris Ashton

More Geese

Once one starts looking for sex-linked geese on the internet they start popping up everywhere. There are now Shetland geese in the USA, and the American Livestock Breeds Conservancy describes the Cotton Patch: a West of England look-a-like (for colour).

I had always been told by waterfowl breeder John Hall that auto-sexing geese were to be found in the goose flocks of East Anglia years ago, and that they were much larger than Pilgrim geese seen today. After a visit to Australia, I now believe him, because the same phenomenon has long been happening there. Dilute grey geese are popping out in flocks of white geese in New South Wales too.

Out there to judge the geese at the Canberra Show in 2008, we were fascinated to find very good examples of Pilgrim geese from two breeders at the show, and to be told that flocks also existed elsewhere in Australia. We had indeed suspected that they did. A Queenslander, Andreas Stoll, had written about the 'Settler Geese' in 1984 (cited in Ashton, 1999). One of these flocks was certainly the descendant of an import from London in 1836. What was even more interesting was our visit to another breeder of Embden geese – Les Simone – and there they were in his flock too.



Above: Pilgrim type female in Australia, from a flock of 'white' geese. Maybe these birds with sex-linked colour will be standardized as Australia's own breed of 'Settler Geese'.

When a flock is closed, as the Simone flock had been for 50 years, then interesting things happen. Flocks can be 'closed' i.e. no 'new blood' introduced for many years when there is a wide gene pool in the first place. If there are no damaging recessive genes, the flock can stay healthy. Inevitably, in the long run, some recessive genes will get together and come out, and that is what is happening here. Les's flock occasionally produces lovely 'Pilgrim' and 'West of England' females. Of course the comparable pure ganders are hiding. They just look white unless examined very closely.

Maybe the mystery of the colour genetics of the West of England goose will eventually be unravelled. Right now, like the sex of many ordinary white geese and ganders, it remains a bit of a mystery.

References Cited

- Ashton, C. *Domestic Geese* Crowood Press, 1999
Gordon, C.D. *Sexual Dimorphism in the down colour and adult plumage of geese*. Journal of Heredity 29:335-7 1938
Grow, O. *Modern Waterfowl Management* (American Bantam Association, 1972)
Hawes, R. *The Origin of Pilgrim Geese Fancy Fowl*, 1996
Ives, P. *Domestic Geese and Ducks* Orange Judd Publishing Co, Inc. 1947
Jenyns, Leonard, *A Manual of British Vertebrate Animals: Or Descriptions of All the Animals Belonging to the Classes, Mammalia, Aves, Reptilia, Amphibia, and Pisces*, 1835
Jerome F.M. *Inheritance of plumage colour in domestic geese*. Proc. 14th World's Poultry Congress (Madrid) 2:73-76 1970
Perrier, Edmond; Salmon, Julien, *La Vie des Animaux Illustrée – Les Oiseaux* (1905)
Robinson J.H. *Popular Breeds of Domestic Poultry*. Reliable Poultry Journal Pub.Co.: 324-5, 1924
Weir, H. *Our Poultry* (Hutchinson & Co., London) 1902
Voitellier, Charles, *Avicultura, Encyclopédie Agricole* (1918)



Above: A pair of Pilgrim geese at the Ashton's. Photo: Chris and Mike Ashton.
www.ashtonwaterfowl.net