Notes on colour aberrations in Common Guillemot *Uria aalge* and Northern Gannet *Morus bassanus*

van Grouw, H. J.[1], Russell, S.[2] & Merne, O. J.[3]

Correspondence Author. Email: h.van-grouw@nhm.ac.uk

[1] *Bird Group, Dept. of Zoology, The Natural History Museum, Akeman Street, Tring, Hertfordshire HP23 6AP, UK;*

[2] *Clober Farm, Milngavie, Glasgow G62 7HW, UK;*

[3] *20 Cuala Road, Bray, Co. Wicklow, Ireland.*

Introduction

Colour aberrations in birds are not uncommon and many observations have been published over the years in the ornithological literature. Unfortunately, ornithologists tend to use descriptive names that refer to the colour of a particular bird with unusual plumage. However this is confusing, as for each species the normal plumage colour varies, and therefore the appearance of any given mutation will be different for each species.

Albino and *Leucistic* are the two most misused names for plumage aberration. *Alba* and *Leukos* both mean white, but both names are often mistakenly used for colour aberrations that involve no white feathers at all. *Brown* is the most common colour mutation in birds (van Grouw 2006, 2010) but in records of observations of this particular mutation it is called by many different names. *Albino, Fawn, Isabella, Leucistic, Cinnamon* and *Pale* morph are the most common terms but the same terms are also often used for *Dilution*. Mutations should not be named in relation to the appearance of the final plumage colour, as this can differ between species. Rather, they should be named in relation to the relevant gene action on the pigmentation process as this is the same each time.

The most common pigments in birds that give the plumage its colour are melanins. Melanins can be distinguished in two forms: eumelanin and phaeomelanin. Depending on their concentration and distribution within the feather, eumelanin is responsible for black, grey and/or dark brown feathers, whereas phaeomelanin is responsible for warm reddish-brown to pale buff. Both melanins together can give a wide range of greyish-brown colours. In many species the (adult) colour is caused by eumelanin only, as is the case in the Common Guillemot *Uria aalge*.

The development of the actual melanin that is deposited and distributed into the feathers is the result of a chemical process within special cells called the melanin synthesis. The final colour stage of eumelanin is normally black but due to the gene for the mutation *Brown* the melanin synthesis is incomplete which results in brown eumelanin. A Carrion Crow *Corvus corone* with the mutation *Brown* will appear

chocolate-brown. However if the normal colour of a certain species is the result of dark brown eumelanin instead of black, as in the Common Guillemot, the mutation *Brown* will cause a light brown plumage colour in that species. So while the final appearance of *Brown* may be different in different species, the gene action is the same in all species: an incomplete synthesis (oxidation) of eumelanin. *Brown* can therefore be defined as a qualitative reduction of eumelanin. In this mutation the amount of pigment remains unchanged but the appearance of the eumelanin is changed.

Common Guillemot *Uria aalge*

On 20 June 2011, SR was shown an aberrant coloured Common Guillemot chick by visitors to RSPB's Fowlsheugh Nature Reserve south of Stonehaven, Aberdeenshire, Scotland. Its underparts were white but where there would normally have been the dark coloration of the back and head, the colour was a beautiful creamy-fawn, although the demarcation between the two colours was still clear (Figure 1). The eye was dark and looked very prominent against the creamy head, the bill was a pinkish-brown colour and, although the feet were not seen clearly, the impression was that they were also slightly darker than the upperpart colour but not black. The chick was well camouflaged on the ledge, which was of course covered in the usual layer of droppings, and seemed healthy, preening and testing its wings in the same way as other chicks on the ledge. Much of the time it was brooded by an adult of normal coloration. On the night of 20 June, there was a 'fledge' of Common Guillemot young, and the following day the 'leucistic' chick along with some others on the ledge had gone. It was assumed therefore that it fledged, although whether successfully, was unknown.

Figure 1. A *Brown* Common Guillemot *Uria aalge* chick, Fowlsheugh, Aberdeenshire, Scotland, 20 June 2001. © Sheila M. Russell.

Figure 2. Left: A *Brown* Common Guillemot *Uria aalge* in a non-breeding 'club' area, Hornøya, northern Norway, 3 April 2010. © Jari Peltomaki. Right: What is assumed to be the same individual but photographed off Hornøya almost three calendar months later in summer, on 21 June 2011, by which time the plumage has been almost fully bleached by the sunlight. © Sakari Lehikoinen.

The fawn colour of this chick indicates that the eumelanin is incompletely oxidized so in this case the mutation *Brown* is responsible for its aberrant pale colour. Similarly pale (*Brown*) Common Guillemot chicks have been encountered only very rarely in long-term ringing programmes, involving the handling of tens of thousands of chicks (M. P. Harris & J. D. Okill pers. comm.). *Brown* is, however, the most common colour aberration seen in guillemots *Uria* spp.. In European museum collections, at least six *Brown* Common Guillemot specimens are known to HvG, two of which are kept in The Natural History Museum at Tring. One specimen is without any data but was collected at least 100 years ago, while the second was collected at Scarborough Harbour, North Yorkshire, on 4 December 1898. Two *Brown* Brünnich's Guillemot *Uria lomvia* specimens are also present in the museum's collection.

In general, in juvenile plumage the melanin distribution and concentration is lower than that in adults and therefore the mutation *Brown* in juveniles results in remarkably lighter plumage colour than in adults; the same applies to the colour of the bill and feet. However, *Brown* plumage is very sensitive to sunlight and bleaches very rapidly. *Brown* birds in old plumage therefore often have an almost white appearance, which makes it understandable that people may think the birds are *Leucistic*. A good example of this is the record of a bird seen off Great Saltee Island, Co. Wexford, southeast Ireland on 26 June 1976 (Kelly 1980). It was recorded as being *Leucistic* but according to the description ('pale greybrown' … Primaries very pale, almost creamy white') this bird was almost certainly a bleached *Brown* individual.

Figure 3. A *Brown* Common Guillemot *Uria aalge*, Monterey Bay, California, USA, 10 August 2008. © Jeff Poklen.

Although melanin is an important structural component of feathers and its lack or reduction may result in increased wear (Harrison 1985), and thermoregulation may also be a problem if feathers are pale and worn as they will not absorb as much radiant heat (Jehl 1985), many aberrant coloured birds reach adulthood. The Common Guillemot at Great Saltee mentioned above proves this, as it was an adult in full summer plumage (Kelly 1980). Another example is a *Brown* Common Guillemot that has spent the summers of 2009–11 off Hornoya, north Norway (Figure 2), but has never knowingly been seen in the breeding colony there (R. T. Barrett pers. comm.), while an adult *Brown* individual was also photographed in Monterey Bay, California in 2008 (Figure 3).

Another aberrant coloured but fully-grown bird was seen at Bempton Cliffs, eastern England in 2010 (Figure 4). Its grey plumage colour is caused by *Dilution*. Mutations that cause *Dilution* all have the same effect on the melanin pigments; they do not change the pigment itself but they reduce the amount of the pigment deposited in the feathers. So the eumelanin granules keep their original colour but there are less of them and because of the lower pigment concentration we observe a 'diluted' colour compared with the original coloration. *Dilution* is therefore defined as a quantitative reduction of melanin.

Besides *Brown* and *Dilution*, other mutations are *Melanism* and *Leucism*. *Melanism* can be defined as an abnormal deposit of melanin in feathers (and skin). Melanistic mutations are the only colour mutations in which there is no loss of pigments, neither quantitative or qualitative, but the melanin is deposited in places where it normally doesn't occur. A melanistic adult Common Guillemot is known from Buckton, East Yorkshire, collected on 24 June 1896 (Figure 5).

Leucism seems to be the opposite of *Melanism* and is defined as the partial or total lack of pigments in feathers (and skin). The lack of pigment is due to the congenital and heritable absence of pigment cells from some or all of the skin areas where they are normally present and where they normally provide the growing feather with pigment. Depending on the type of *Leucism*, the amount of abnormal white feathers can vary from only a few white feathers (= partial leucistic) to totally white individuals (= 100% leucistic). The totally white individuals always have colourless skin as well. *Partial leucistic* birds can have normal coloured bill and feet depending on where the colourless patches occur on the specimen. However leucistic birds always have normal coloured eyes. In *Partial leucism* the amount of white feathers does not change with age and normally each individual feather is fully white or fully coloured. Partly coloured individual feathers are very unusual in *Leucism*. A properly leucistic Common Guillemot was also seen in Monterey Bay, California, in 1996 (Figure 6).

Another leucistic-like adult, pure white apart from a few grey feathers in the wing coverts, and with ochre-yellow legs, feet and bill but dark eyes, was in the Common Guillemot colony at Sumburgh Head, Shetland in the summers of 1995 and 1996 (Figure 7). It occupied the same site each year, but with no evidence that it bred or was paired. There are many leucistic-like heritable aberrations in birds and the most common one is *Progressive Greying*. Whereas *Leucism* is congenital, *Progressive Greying* is a progressive condition that arises after a certain age. *Progressive Greying* is defined as the heritable progressive loss of pigment cells with age. From a certain age, when the progressive loss starts, the bird will get more white feathers after every moult and finally becomes completely white. There are different forms of *Progressive Greying*; some individuals begin with fully-coloured plumage while others already have a 'piebald' appearance as a juvenile. An example of the latter form is *Grizzle*. In *Grizzle* each feather is an intermixture of white as some barbs are white and others are coloured. With age, after every moult, the amount of white barbs increases and finally the bird will become fully white. A

Figure 4. A *Diluted* Common Guillemot *Uria aalge,* Bempton Cliffs, Yorkshire, England, 11 June 2010. © Andy Jones.

Figure 5. A *Melanistic* Common Guillemot *Uria aalge*, female, Buckton, East Yorkshire, 24 June 1896. © NHM.

Figure 6. A *Leucistic* Common Guillemot *Uria aalge*, Monterey Bay, California, USA, 27 October 1996. © Jeff Poklen.

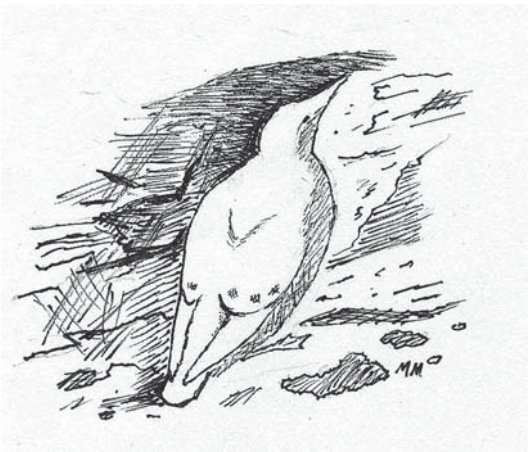

Figure 7. A 'white' Common Guillemot *Uria aalge*, Sumburgh Head, Shetland, 5 June 1995. The plumage colour is presumably caused by a form of *Progressive greying*. From a field sketch by Mick Mellor.

Figure 8. A *Grizzle* Common Guillemot *Uria aalge*, male, Helgoland, Germany, February 1880. © NHM.

Grizzle Common Guillemot was collected in Helgoland, Germany in February 1880 (Figure 8). It is probable that the white plumage of the Shetland bird was also caused by some form of *Progressive Greying*.

Northern Gannet *Morus bassanus*

On 10 September 2007 OM observed an aberrant coloured juvenile in the colony of c. 200 pairs of Northern Gannets on Makestone Rock, a sub-colony of Great Saltee, southeast Ireland, which held 1,930 pairs by 1998–2000 (Wanless & Harris 2004), and 3,000 pairs in 2009 (O. Merne pers. obs.). Although having monitored the Great Saltee colony annually from 1960 to 2009, OM had never previously seen any chick, immature or adult Northern Gannet there with aberrant plumage. However, this large, fully-grown and fully feathered juvenile appeared pale brown all over, including the bill and feet (Figure 9). The bird was still present on 14 September, but was gone (presumably fledged) on 15 September. Fledgling Northern Gannets can show a range of background plumage coloration (Nelson 1978), but all should normally show dark-grey legs, feet and bill (S. Wanless pers. comm.), and the Makestone Rock juvenile was "distinctly abnormal in its warm, light brown plumage (and) undoubtedly it would stand out amongst normal juveniles, even given their variation from blackish to silvery" (J. B. Nelson *in litt.*). The aberrant coloration of this bird was due to the mutation *Brown*.

Records of aberrant coloured Northern Gannets are rare. However, an internet search found a photograph of a 'leucistic' chick at an earlier stage of development (6+ weeks, J. B. Nelson *in litt.*) at Sula Sgeir, northern Scotland, on 17 August 1997 (Figure 10). The plumage of this chick is difficult to classify, since the juvenile feathers are still mostly covered by white down, but is definitely not *Leucistic*. According to the visible tips of the tail and primaries it appears to be *Diluted*, as in *Diluted* the normal black will be grey.

Figure 9. A nearly fledged *Brown* Northern Gannet *Morus bassanus* chick, Great Saltee Island, Co. Wexford, Ireland, 10 September 2007. © Cian Merne.

In a literature search for references to aberrant colour in Northern Gannets, the only report found was of an 'albino' chick at the Ailsa Craig colony, southwest Scotland in 1973 (Nelson 1978), which "had creamy (or slightly darker) white plumage, and dirty pink eyes, bill and feet". However this chick could not have been an *Albino* as it was not white, the dark cream coloration meaning it still retained some melanin pigmentation (an *Albino* is not able to produce any melanin at all); that bird was very likely an *Ino*. In the form *Ino* there is hardly any oxidation of eumelanin which results in a very pale brown (almost white) colour. *Ino* can therefore be defined as a strong qualitative reduction of eumelanin. However, as with all plumage aberrations caused by qualitatively reduced eumelanin, *Ino* feathers bleach quickly and strongly in sunlight and soon they appear to be pure white, and therefore difficult to distinguish from 100% *Leucistic* birds. Confusion with *Albino* is most unlikely as *Albino* birds do not survive for long after fledging due to poor eyesight caused by the mutation.

Figure 10. A *Diluted* Northern Gannet *Morus bassanus* chick, Sula Sgeir, northern Scotland, 17 August 1997. © John M. MacFarlane.

As stated earlier, aberrant eumelanin pigmentation caused by the mutation *Brown* is very light sensitive and if the Great Saltee juvenile Northern Gannet survived, it

would have become barely recognisable as being *Brown* within a few months of fledging as its plumage would have been bleached completely by the sun, resulting in a whitish appearance. The chances of it surviving through immaturity *and* being observed at sea must surely be small, but if it survives to breeding age and recruits to Great Saltee, there should be a better prospect of resighting it. The adult plumage however would be less obviously aberrant as only the primaries would be brown in this bird instead of black (which in turn would soon become bleached after growing and appear whitish), while the bill and feet would be slightly lighter coloured than normal.

Overview

Identifying colour mutations in the field can be extremely difficult because the bird may be too far away, or the bird is moving too quickly, or the light is wrong. Or, as is often the case, the plumage may already be bleached strongly by sunlight and therefore doesn't properly show the coloration originally caused by the mutation anymore. However, first always make sure you know exactly how the original plumage colour of the relevant species should look. Then try to see parts of the plumage that should be less influenced by sunlight, such as the inner webs of flight feathers when the bird is stretching its wings, to determine whether the plumage appears to have been bleached differentially by the light. Finally, if the plumage has been examined properly with the original coloration in mind, the summary in Table 1 should make it easier to name the mutation correctly. In almost all seabird species the plumage colour is determined by eumelanin only, so the effect any mutation may also have on phaeomelanin is not mentioned in the Table.

Table 1. Summary of the main forms of plumage aberrations referred to in the text, the mechanism of pigment deposition, and the resultant changes in appearance.

Mutation name	Mechanism	Change in appearance
Albino	No melanin synthesis at all	Complete white plumage without any melanin pigmentation and pink bill, feet and eyes
Leucism	Congenital absence of melanin cells in (parts of) the skin	White plumage or white feathers mixed with normal-coloured ones. Pink bill and feet or normal coloured bill and feet. Always normal coloured eyes
Brown	Qualitative reduction of eumelanin (incomplete oxidation)	Original black/dark brown plumage is chocolate-brown/fawn
Ino	Strong qualitative reduction of eumelanin (hardly any oxidation)	Original black/dark brown plumage is pale cream
Dilution	Quantitative reduction of eumelanin (decreased amount)	Original black/dark brown plumage is silvery-grey
Progressive Greying	Progressive loss of melanin cells in (parts of) the skin with age	White plumage or white feathers mixed with normal-coloured ones. Pink bill and feet or normal coloured bill and feet. Always normal coloured eyes
Melanism	Abnormal deposit of eumelanin	Overall dark plumage

Acknowledgements

This paper evolved from Short Notes submitted independently by SR and OM. We thank Rob Barrett, Mike Harris, Bryan Nelson, Sarah Wanless and Andy Webb for their helpful comments, Steve Duffield, Hugh Harrop, Martin Heubeck, Neil Lunn and Martin Scott for help in sourcing photographs, and the photographers concerned for allowing their use.

References

van Grouw, H. J. 2006. Not every white bird is an albino: sense and nonsense about colour aberrations in birds. *Dutch Birding* 28: 79–89.

van Grouw, H. J. 2010. How to recognize colour aberrations in birds (in museum collections). *Journal of Afrotropical Zoology. Special Issue*: 53–59.

Harrison, C. J. O. 1985. Plumage, abnormal. In: Campbell, B. & Lack, E. (eds.) *A Dictionary of Birds*: 472–474. Poyser, Calton.

Jehl, J. R. Jr. 1985. Leucism in eared grebes in Western North America. *The Condor* 87: 439–416.

Kelly, T. C. 1980. Leucism in a Guillemot. *Irish Birds* 1: 532–535.

Nelson, J. B. 1978. *The Gannet*. Poyser, Berkhamstead.

Wanless, S. & Harris, M. P. 2004. Northern Gannet *Morus bassanus*. In: Mitchell, P. I., Newton, S. F., Ratcliffe, N., Dunn, T. E. (eds.) *Seabird Populations of Britain and Ireland*: 115–127. Poyser, London.