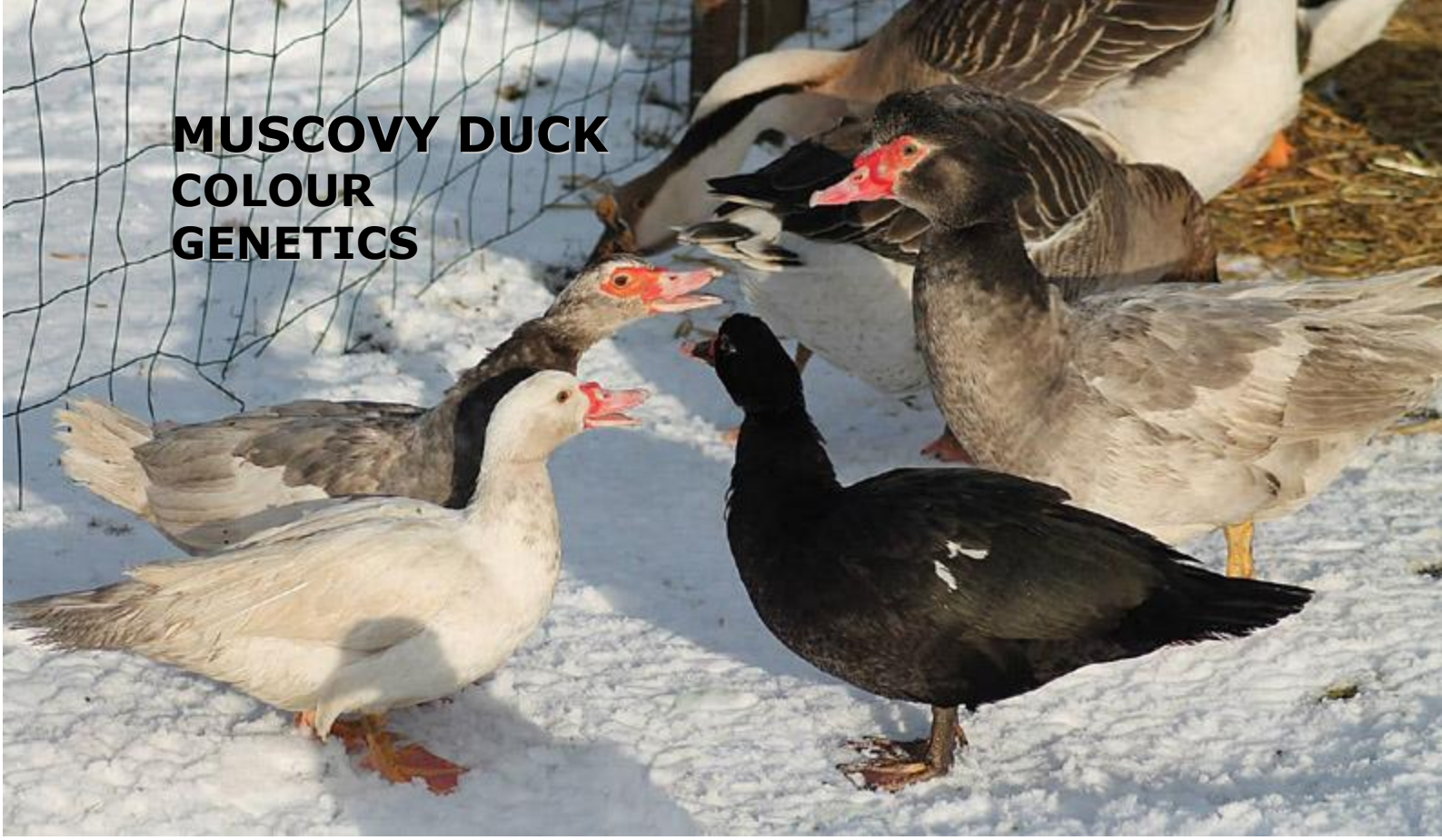

MUSCOVY DUCK COLOUR GENETICS

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Photos: Norbert Schollaert, unless stated otherwise.

Because little information is available about the colours of the muscovy duck and their combinations, either in Dutch literature or on the internet in general, I would like to elaborate on my own findings so far. The 'base' colours, if you like, are common, blue, chocolate, lavender, white and bronze (the latter is not present in Belgium).

Common is the usual wild-type colouring without visible mutations and therefore the base for all other patterns and colours. The direct translation of what the Dutch call it would be "*Black*".
The colour formula (genotype) is: ppnnChChLLDDcc
It's the most common colour, hence the name, though it is often combined with some form of pied. The reason for this is probably because most colour mutations are recessive.
The **wild-type** muscovy duck always has white wingtips and shoulders/ wing triangle.

Right: Common Muscovy drake.

Pied: symbol P abbreviating Pied, causes white plumage, but since P is only incomplete dominant it causes white spotting in heterozygous state (Pp) also called pied or piebald, whilst homozygous PP animals are fully white feathered. The mode of inheritance is autosomal dominant. (An autosome is a chromosome

that is not a sex chromosome: the normal kind). Piebaldness is seen in most muscovies that are not bred for colour and exhibition.

So "Pied" is a black duck with a lot of white. If you select pieds for more white, you could get fully white ducks even in heterozygous state.
"Common" is a duck that is mostly black. It's visually a black duck with white wing triangle.

"Wild-type" can be viewed as a pattern, like its counterpart "self". This pattern can be combined with every colour. Wild-type ducklings typically have an eye stripe and 4 yellow spots on the body. This and the mentioned white areas on the wing are the signs of this pattern.

Opposite of this is the so called "*Dusky*" or "*Atipico*" pattern. This is autosomal and recessive to wild-type. No stripes or spots in the chickdown, just a uniform even down colour. This type (and even more so the below mentioned "self") is to be preferred by the exhibition breeder to the wild-type. Often bibs to fully white breast can be achieved. But then this can moult away fully, leaving a perfectly (un)marked duck. On a mature duck the effects of atipico can be hard to detect; the most significant difference is the duckling's down.
(Prof Dr. W.F. Hollander discovered and documented the gene in 1963 in his "Homology of color mutants in two species of Ducks")

We distinguish 3 kinds of solid coloured muscovies:

Atipico dusky: makes the duckling down look chocolaty and removes the "wild-type" pattern. Exceptional is the chocolate atipico: in that case you get a chocolate duck with a green sheen. Some are so dark that they are hardly distinguishable from black.

Self coloured: With *self coloured* the duck is born with a completely even shade; down, feathers, legs/webs, and beak have the same colour. The inheritance is not the same as atipico, because it can also be based on wild-type (non atipico). *Self coloured* is a recessive trait that has to be passed on from both parents. Not all *solid coloured* ducks are also *self coloured,* because they can have a different beak or legs and webs colour.

Normal atipico: every duck that misses the eye stripe and the yellow spots as duckling; can be pied or solid coloured.

Then there are terms like "*canizie*", meaning white on the face or head, "*bibbed*" for white on the neck and breast, and "*solid*" for animals of one feather colour. "*Self*" is a step up from "*solid*" having a matching beak colour; except with white and bronze where the beak is pink and the legs/webs are yellow.

Right: Solid coloured hen.

THE COLOURS AND COMBINATIONS

Common

The colour areas of the muscovy are on the head, neck and tail. These can be influenced independently from the body.
Common ducklings have a black shade to the body with a more brownish shade to head and neck. Beak, legs and webs are black.

Common x white (homozygous Pied)	= pied
Common x pied	= common & pied
Common x silver (homozygous Blue)	= blue
Common x chocolate	= common (except when father carries the chocolate)
Common x lavender	= common
Common x sepia	= common
Common x whitehead (canizie)	= whitehead
Common x magpie (duclair piebald)	= common

Above: Silver and common.

Blue

"*Blue*" inherits autosomal incomplete dominant or intermediary. When a diploïd organism is heterozygous (2 differing alleles eg. mutant and wild-type) for the trait, then both alleles can result in a mixed effect that is unlike both parents (example: pink flowers, from one allele red flowers and one allele white flowers). This is called intermediary; the outcome depends on the other colours present in the cross.

NN or purebreed/homozygous results in silver (splash in ducklings) // Nn is blue // nn is black (or not blue). Silver is also called "pearl grey".

Blue x blue	= 25% black – 25% silver – 50% blue
Blue x silver	= 50% blue - 50% silver
Blue x black	= 50% black – 50% blue
Blue x chocolate	= 50% black – 50% blue/split for chocolate (note: mother = chocolate)
Blue x white	= 50% pied – 50% blue pied
Blue x pied	= 25% blue – 25% blue pied – 25% common – 25% pied
Blue x common	= 50% blue(wild-type) – 50% common
Blue x lavender	= 50% blue – 50% black
Blue x magpie	= 50% blue – 50% black
Blue x whitehead(CC)	= blue whitehead and whitehead
Blue x whitehead(Cc)	= blue + blue whitehead + whitehead + black

The best blues have an edging (*lacing*) to the feather, meaning a dark edge/rim on each feather.
Blue ducklings have a grey/blue down, whilst beak, legs and webs are more pale (grey) compared to blacks/commons. (On silver ducklings, having double factor blue, these parts are even more pale, almost white with yellow down.)

Above: A juvenile blue drake.

Lavender
"*Lavender*" is autosomal recessive. The Dutch call this colour, like in the chicken world, "parelgrijs", which directly translated means "pearl grey", a word that some English speaking breeders use for homozygous blue (or "silver"). This causes some confusion for Dutch users of the English colour calculator.

Link to the calculator:
http://kippenjungle.nl/Overzicht.htm?run=muskuscalculator
Instead of changing the word "pearl grey" to "silver", this article led to a Dutch version of the Muscovy duck calculator:
http://kippenjungle.nl/Overzicht.htm?run=muskuscalculatorNL

Above: A pair of Laveneder Muscovy ducks.

Maybe a good thing that this colour is sometimes called "*self blue"*. But "self" here is used to point to the mutation not tending to form lacing unlike the other "blue". So it's neither self as in colour uniformity pattern, nor is it actually blue as in the other mutation.
Lavender is an independent mutation, and not a combination of chocolate and blue like in other domesticated ducks. It can be viewed as an untypical colour too, as it suppresses both black and red, creating a pastel effect. In a cross the other ingredients will affect the outcome as well, eg. lavender combined with chocolate will result in "cream". Lavender allows for a red tinge in the plumage, whilst silver (double factor blue) does not.

Lavender x silver	= 100% blue
Lavender x lavender	= 100% lavender
Lavender x white	= 100% pied
Lavender x common	= 100% common (F1 x F1 = ¾ common and ¼ lavender)
Lavender x blue	= 50% blue and 50% black
Lavender x brown	= 100% black
Lavender x pied	= 50% common – 50% pied
Lavender x magpie	= black
Lavender x whitehead(Cc)	= black and whitehead
Lavender x whitehead(CC)	= whitehead

The ducklings are light grey / blue with a pink beak with a dark saddle to it, and the legs and webs are grey.

The only pastel colour besides lavender is "buff" (chocolate + silver)

To verify a light lavender from a silver you best do a backcross to black:
Silver x black = 100 % blue.
Lavender x black = 100 % black.

Left: Juvenile lavender ducks.

Chocolate
"*Chocolate*" (Ch) is the only colour that is sex-linked recessive.
Ch causes a brown plumage, because all black pigment is replaced by a less light-absorbing version of it (brown). It does not affect red.

Above: Chocolate duck with ducklings.

Chocolate x chocolate	= 100 % chocolate
Chocolate x black	= black (split chocolate) males – chocolate females
Chocolate x blue	= 25 % black and 25 % blue males/split chocolate – 25 % chocolate and 25 % lilac females
Chocolate x lavender	= black males/split chocolate/split lavender and chocolate females/split lavender. Crossing these animals can deliver the combination "cream" (12,5%). When the black males are backcrossed to lavender, you can get chocolate females and 12,5% "cream" females next to black and lavender.
Chocolate x silver	= 50% blue males en 50% lilac females
Chocolate x lilac	= 50% chocolate – 50% lilac
Chocolate x white	= 50% pied males and 50% chocolate pied females
Chocolate x pied	= 25% chocolate females – 25% black males – 25% pied males – 25% chocolate pied females
Chocolate x whitehead(CC)= chocolate whitehead females	
Chocolate x whitehead(Cc)=chocolate / chocolate whitehead females – black / whitehead males	
Chocolate x magpie	= chocolate females and black males

The lilac colour (chocolate + blue) is also called *blue fawn* or *calico* (Inheritance of white – black – brown – Casinable 1987)
Chocolate is absent in Australia, but bronze is abundant, whilst in America there is a lot of chocolate and little bronze.

Chocolate like mentioned is sexlinked recessive whilst bronze is autosomal recessive.

Blue x lilac	= ¼ blue –⅛ black–⅛ silver– ⅛ chocolate –⅛ lilac – ¼ buff
Black x lilac	= ¼ blue- ¼ black- ¼ chocolate- ¼ lilac
Chocolate x lilac	= ½ chocolate – ½ lilac
Lilac x lilac	= ½ buff – ¼ lilac – ¼ chocolate

Right: Blue and chocolate Muscovy ducks.

Below: Isabel and common.

White

"*White*" inherits autosomal incomplete dominant. This is caused by the same gene "Pied" that is mentioned above. For a complete white you need double factor, or homozygous, Pied: PP

Homozygous ducks give only pure yellow ducklings.

Best only cross white with white, because all other combinations will produce white spotting/piebaldness, and also other pied genes can be hidden underneath the white. These can be hard to get rid of.

Homozygous = yellow duckling down (purebred, all alleles are the same on both chromosomes). Plumage white.
Heterozygous = light duckling down with dark cap (not purebred, alleles differ). Plumage becomes pied, partly dependent on other genes present. The pictures in the colour calculator may depict other types of pied, like combinations with whitehead, bibbed etc…

Pied
Pied is the heterozygous form Pp, and causes a lot of white in the plumage. Crosses between 2 pieds gives a percentage of fully white animals.
These will be lemon yellow with pink beaks and orange / yellow legs and webs at birth.

Left: White hen.

Whitehead (Canizie)
Another pied pattern of the muscovy duck is "Whitehead" or "Canizie".
Newborn ducklings have a little white spot behind the eye.
The pattern also exists in the above mentioned colours and <u>combinations</u>: black whitehead, blue whitehead, lavender whitehead, chocolate whitehead etc…
C (*Canizie*) is the mutation that causes the white head pattern.
Mode of inheritance is autosomal dominant:

Whitehead x common	= whitehead
Whitehead x magpie	= whitehead

Blue whitehead, lavender whitehead and silver whitehead. Photo: Dirk de Jong.

Magpie (Duclair piebald)
A last pattern is the magpie pattern (in Dutch: "ekster")

Magpie Muscovy hen. Photo: Rupert Stephenson.

Duclair Piebald (d) is a recessive gene that causes a regular white spotting/piebaldness with coloured upside (viewed from above), and white body.
This pattern can also be combined with all the base colours. Mode of inheritance is autosomal recessive.
The mutation on the gene disturbs the normal full feather colouring.
Duclair piebald mutation gives the attractive magpie pattern: white with black cap, black shoulders and black tail.

More colours
In England, Australia and America there are a lot more colours than in Belgium and the Netherlands. Colours like *cream, fawn, buff, fume, tortora, sepia, bronze* and also other patterns like "barred" and "*rippled*" are recognized.

Buff is a combination of silver and chocolate.
Cream is a combination of lavender and chocolate. (Resembles silver, but hold the blue tinges).
Fume is a combination of blue and bronze (also called *smokey*). Fumes have orange legs and webs, pinkish belly and a slight metallic sheen to the tail. Darker towards the neck.
Tortora is a combination of silver and bronze (also called *Turtle Dove*). A white duck with a light orange glow to the ends of the feathers.
Sepia (*faiogeno*): This is a true mutation, like most it is autosomal and recessive. Ducks have yellow/orange legs and webs, pink beaks and a green (khaki) sheen to the feathers.
Bronze: The Australians describe this duck as dark brown-orange. We don't know if this mutation is the same as "Sepia".
Bronze x silver = blue split bronze
F1 x F1 intercross = blue – fume – black – silver – tortora – bronze.

Various colours, including sepia. Photo: D. Sörensen, Sweden.

Appendix: DOWN COLOUR IN DUCKLINGS

Left: Common and atipico ducklings; the common /wild-type ducklings typically have an eye stripe and 4 yellow spots on the body, the atipico ducklings miss these marks. Photo: Rinke Berkenbosch.

Right:
Choc – atipico.

Left: Dusky black.

Right: Solid choc - atipico.

Above: Silver – common.
Right: Silver atipico.

Below: Pied – common.

Above, right: Fume. Photo: Ian Morrison.

Left: Blue atipico.
Photo: Ian Morrison.

The following photos of ducklings are kindly granted for publication here by Dot Porter of Ugly Duck Farm USA.

Below, right: Whitehead/Canizie. Whitehead ducklings have a little white spot behind the eye.

Below, left: Lavender.


Above, left: Blue. Above, right: Self blue.

Black whitehead drake in the snow.
Photo: D. Sörensen, Sweden.

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