

# Shetland Color Genetics:

## A Basic Understanding of the Colors and Patterns Displayed in Shetland Fleece

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This document is a very brief overview of the patterns and colors expressed which involve Shetland fleece. Each pattern and color can easily warrant a whole book of study. Therefore, an in depth review will not occur.

### Shetland Genetics

The fleece color genetics of Shetlands basically involve six genes.

- Pattern
- Color
- Spotting
- Modified
- Light/Dark or Intensity
- Extension

Pattern consists of the following:

- Awt – white
- Ag – grey
- Ab – katmoget
- At – gulmoget
- Altb – light badgerface/katmoget (rare)
- Aa – solid

### Pattern – White

White is the most dominant pattern. This means that only one allele is needed to 'cover/hide' all other patterns a sheep may carry. It is actually the cancellation of the expression of the pattern/color in the wool fiber and can also be considered the absence of color. Sometimes a breakthrough of color can show in the leg, face, or body of a sheep. This is called incomplete dominance and also occurs in other patterns.



### Pattern – Grey, Katmoget, Gulmoget

Grey (Ag), katmoget (parted fleece below), gulmoget (ewe lamb at top right), and the rare light badgerface patterns are all co-dominant. This means that any two of these patterns can be expressed at the same time, such as an Ag/Ab, which would be called a grey moget, as opposed to a grey katmoget. Combinations of these patterns usually will dilute the patterns of both, giving a washed out expression of either one. Generally this is not as pleasing to the eye of most breeders due to the lightness of the expressed colors. But the combination



of two of these patterns can help in breeding decisions, as we will see later under extension.

### Pattern – Light Badgerface (Alb)

Pattern differences compared to a normal katmoget can be seen in the picture below. The first clue would be the light colored chin, but don't confuse this with grey (Ag) 'sugar lips'. The top lip is still fully colored. The breech



is a more smoky color instead of black, but a fully black chest stripe is present. The fleece has coloration when parted. Knees are light colored as well (hard to tell in this picture). As this lamb matured, her markings became more dilute in coloration but she is still distinguishable as a light badgerface.



### Double Pattern Example – Ag/Ab, Grey Moget

This ewe is a grey (Ag) moget (katmoget pattern but simplified to just moget, Ab). Her fleece is basically white and she has no real neck striping common to the katmoget pattern. She also has 'sugar lips' indicative of the Ag gene. When bred to a solid B/b or bb ram, she can produce grey or musket (if she is B/b) or grey or fawn katmoget.

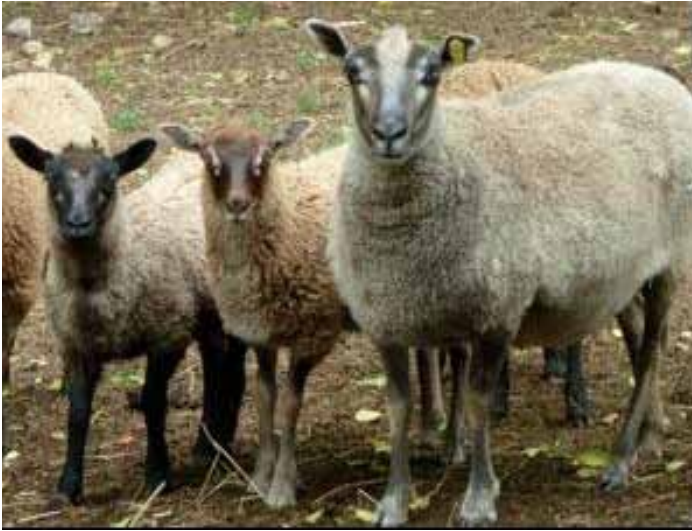
### Double Pattern Example – Ab/At, Katmoget/Gulmoget

This is one of the pattern combinations displaying a washed out appearance that may be less pleasing to the eye but can have a large genetic impact in breeding results. The ewe (top of next column) is Ab/At and has produced a katmoget and a gulmoget when bred to a solid patterned ram. You can see that the dam is 'washed out' in the legs, face, and body markings compared to her two ewe lambs.

### Solid

• Solid pattern is the most recessive pattern so you need two Aa/Aa alleles to get a solid animal, either black or moorit (unless it has Extension – more on that later).





**Color**

- Black (B – dominant). Only one copy is needed. Black sheep can hide a brown allele.
- Brown (b – recessive). Two copies are needed to produce moorit. This is the most recessive color (bb).

**Spotting**

- Spotting is recessive which means you need two alleles to fully express (s/s). Sometimes, though, you can get faint spots/head markings/horn striping/spotted tongues that indicate an animal carries spots. There are numerous spotting genes that express in different ways as you know by the Markings chart. Many breeders don't want a flock of all spotted Shetlands because you can never "unexpress" this gene in a totally spotted flock. This means that in a totally recessive spotted flock you'll only get spotted animals, never solids.

**Modified**

- Modified genes control whether a sheep will be fully black or brown or whether it will be "off" in its color. This is where fawn, mioget, shaela, and emsket come from. Two modifiers (m/m) will make mioget (yellow gold) or emsket blue/gray (gray spelled with an A not an E). These are whole colors, not Ag influenced. One modifier gives fawn (silvery or rosy brown), shaela, or a very dark brown. Another gene is most likely involved, however this is yet to be determined. Shaela is expressed as a black frost coloration. Of course, there are a lot of variations in the expressed colors. It is more like a continuum instead of the 11 whole color chart.
- There are some tips that can be used to distinguish the 'off' solid modified colors in Shetlands. For the double expressed modifieds (m/m), mioget sheep have 'golden' hooves and light rosy pink eye rims and lips. Emsket sheep have bluish/off black colored hooves, bluish eye rims and lips, and a light blue tongue.

- In distinguishing black from 'off' black, one copy of modified (M/m) needs to be present. A black sheep will have black eye rims, lips, and tongue whereas a shaela colored sheep will have a dark blueberry-colored tongue, with lighter eye rims and lips (but not as light as emsket). For browns, a moorit will have brown to dark brown eye rims and lips whereas a sheep with one modified gene

(fawn) will have dark rosy pink/tan eye rims and lips.

**Modified - Mioget (Aa/Aa, b/b, m/m)**

The rosy/tannish nose leather and eye rims can be seen on this mioget ewe lamb. Hooves are a rosy golden tan color. Some of the variation in the mioget color is displayed by the two parted fleece pictures, which are from adult sheep.



**Modified – Emsket (Aa/AA, B/b or B/B, m/m)**

Below is an adult emsket ram. His pale blue adult color is better seen beneath his chin where it is not sunbleached. Emskets show a blue tone to their fleece (right) and have a smoky colored face as opposed to black. No sugar lips are present, which would indicate Ag.



**Modified – Shaela (Aa/Aa, B/b or B/B, M/m)**

In the picture of the ewes at top right, the ewe on the right is shaela. The ewe in the middle is black with some sunbleaching. The shaela ewe sun bleaches more and is a 'black frost' color when her fleece is parted. You may also note that her face is an off black or





lighter, slightly smoky black than the middle ewe. Shaelas exhibit a purple cast to their fleece.

#### Light/Dark or Intensity

• Light/Dark isn't really talked about in the Shetland world but Adalsteinsson did a lot of research in the Icelandic colors which are expressed similarly in Shetlands. Light is dominant over dark. You need two dark alleles to express a dark grey (or dark musket) fleece or any other dark colored fleece. Dark grey or dark musket Shetlands are rare unless you specifically breed for it because of this. Usual grey and musket Shetlands are very pale in coloration, almost white, due to the dominant light allele.

• The expression of this gene is also referred to as intensity, as you can have light colored katmogets or dark colored katmogets. This refers to how much pigmentation or color granules are present in the wool fibers.

• The intensity of modifieds is also controlled by this gene. It is sometimes difficult to know whether an animal is double modified (m/m) with a dark intensity or one that has a single modified gene (M/m).



#### Very Dark, Intensely Colored Katmoget

According to what is in the foundation animal genetics of a particular flock or location, patterns such as katmoget can be very 'clear' in the facial markings (just stripes on the eyes and such) or can be more like this ewe lamb and be very dark with just tear drop markings and a lighter grey face to distinguish the katmoget pattern.

#### Extension

• Extension(E+) is dominant and covers up all patterns. It only allows the color to appear. This means that you can have a genetically white/katmoget sheep that LOOKS black or brown (the phenotype) but is just actually carrying either one or two alleles of extension. This is NOT what you would normally expect; only if extension is present does this happen.

• This is why it is preferred to import (to the US) white, grey, kats, or guls and not black or moorit – because of the potential of importing the extension gene. This has already happened with the Canadian importations several years ago, but the breeders discovered how to distinguish/tease out the correct genes. This resulted in controlling the extension alleles with the use of double patterned animals. An example would be to breed a solid colored ram (from questionable extension-carrying possibilities) to double patterned ewes, such as Ag/Ab, or Ab/At, or Awt/Ab. All lambs should show a "pattern" – white, grey, kat, gul – not solid black or brown. If it is solid black or solid brown then the ram carries one or two copies of extension, depending on whether or not he threw a patterned lamb. If he threw at least one patterned lamb, that means he would carry only one allele of the extension gene. If he threw all patterned lambs, he would not carry extension, provided a large enough group of ewes was used to be statistically valid.

#### Conclusion

Shetland pattern and color genetics are complex but can be easily broken down to sort out what is going on both visually and sometimes, 'underneath the surface.' It is infinitely rewarding for those of us who delight in the variety of the natural colors of the Shetland breed.

It should be remembered though, that different areas, according to the foundation genetics, will have slightly different colorations. Katmoget patterning, for example, differs depending on the flock. Here in the States, many katmogets tend to have more facial and wool coloration than those in the UK.

Let us enjoy the many varieties of pattern and color displayed in the Shetland breed, while striving for wonderfully fine and soft fleece on a strong frame.



Handspun Shetland skeins in black tones – from left to right, true dark brown (B/b), true black, shaela, and various shades of shaela and emsket (some with the sun bleached tips flicked off before carding to give a truer blue color). Bottom two skeins are millspun Shetland yarn in light and medium grey.

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