

The markings – Hooded-locus; Head Spot and Roan

BY ANNALIE PRINSLOO (APRIL 2015)

Due to the complexity of the hooded locus, being that it mutates a lot and is affected by many other genes, one cannot be sure if all the hooded locus marked rats are genetically exactly the same all over the world. This is probably the reason why you find so many contradictory genotypes of hooded locus markings on the internet. I will therefore first give the scientifically published data before I move on to discuss the resulting markings with the genotypes deduced from the scientific findings*. I personally think there are more alleles on the hooded locus than we have symbols for in the fancy or than what scientists have studied.

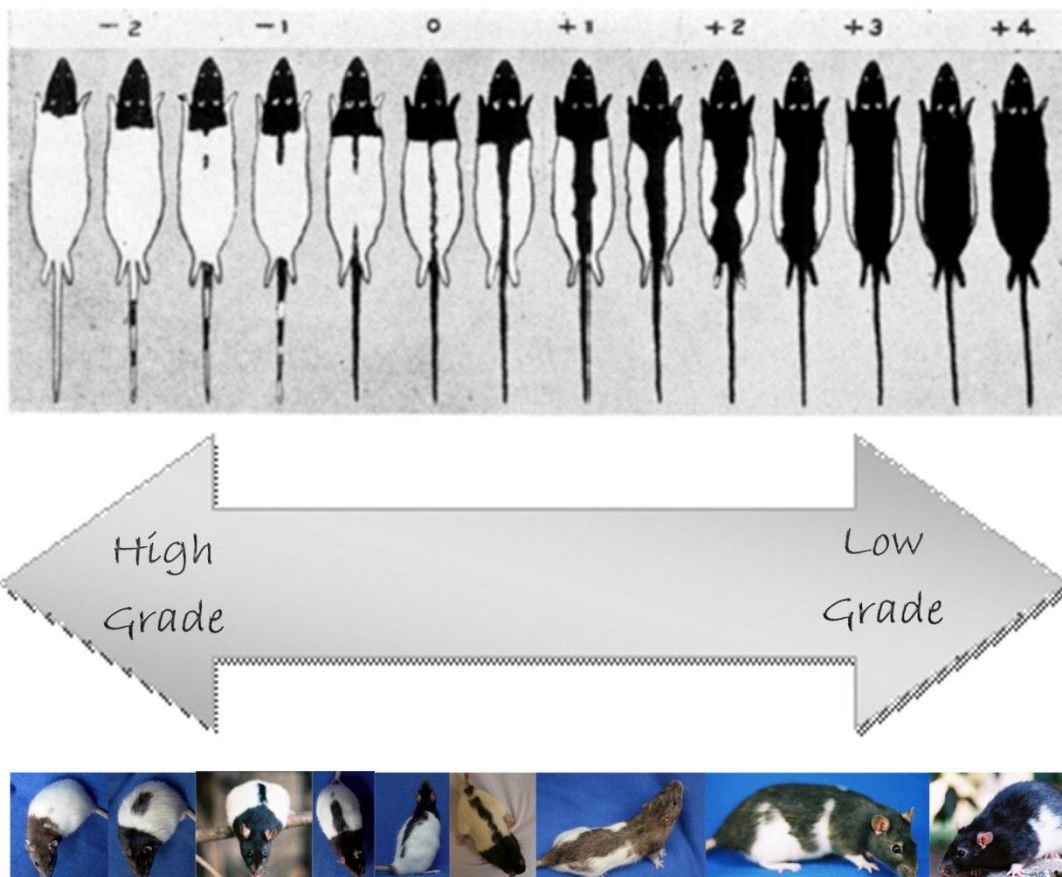
*I deliberately tried to avoid using, as far as I could, the genotypes published on the internet by rat fanciers and fancy rat organizations. I have to assume that the scientific studies are accurately done under controlled conditions where other genes and alleles of the hooded locus did not influence the results. In the fancy our rats carry many genes making it hard to study markings since we do not know what else could be hidden in our breeding lines which might influence our results.

The Hooded Locus

The hooded locus is located on chromosome 14 (Torigoe, *et al.*, 2011).

HOW HOODED IS GRADED AND THE HOOD MODIFIER GENE

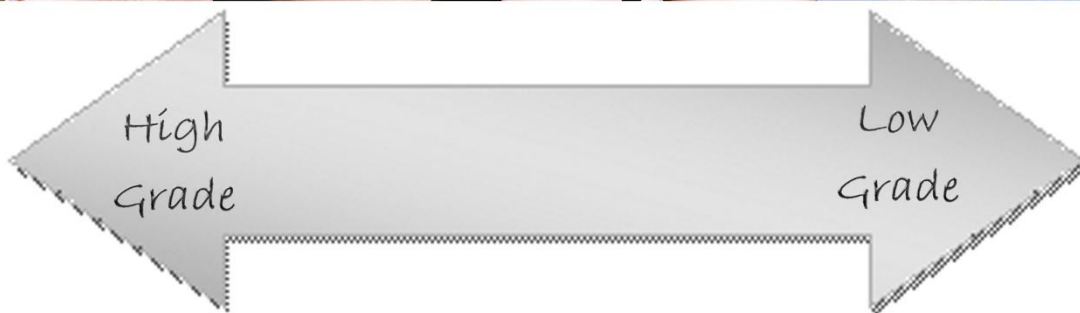
Castle started a system where he graded the variation in the hooded marking (h/h):



His research showed that hooded could be influenced by minor modifiers which results in a variation of the hooded pattern. He selectively bred hooded to have high grade markings as well as hooded to have low grade markings (Castle, 1951). Castle's research shows that we in the fancy can selectively breed hooded rats to be of show quality (grade +1); broad stripe hooded which almost resemble Berkshire rats (grade +4) and stripe-less hoodeds known as bareback in the fancy (grade -2). Already we notice that just within the scope of the hooded marking one can have much variety and that the marking can even overlap with other genotypes, like for instance with the bareback rats that can also be bred with other genotypes, e.g. h^n/h . This variation influence all possible combinations (genotypes) of the hooded alleles, which causes confusion since most genotypes overlap in phenotypic expression in the most extreme grades. This is why one can breed a bareback rat with either the h/h combination or the h^n/h combination.

Below is the grading system applied to berkshire (H/h) and to baldie (H/h^{ro}). This grading system can be applied to any marking.

Grading of berkshire



Grading of baldie

To complicate matters even more, there is also a hood modifier gene which lengthens or shortens the stripe on the hooded rat's back (Stolc, 1984). Obviously this modifier gene will also affect all other hooded allele combinations making hooded locus based markings a very complicated business indeed.

THE HOODED LOCUS ALLELES

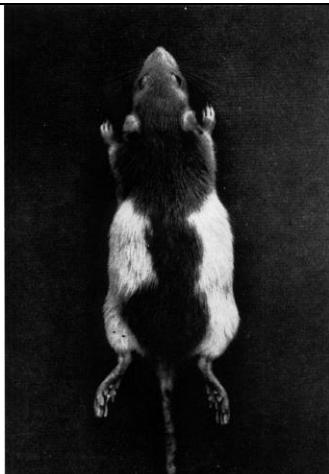
THE HOODED ALLELE (h)

Origin: Known since the early 1900's (Robinson, 1965).

South African history of the allele: The hooded allele was found in South African pet shops before the 2006 import.

Key characteristics: Causes white spotting in the rat (Robinson, 1965).

Described phenotypes: See other sections (below) on how "h" is influenced by other alleles.

Genotype	Scientific description	Possible varieties in the fancy
H/H	Self(Gumbreck, et al. 1971).	Self
H/h	Shows a variable white patch on the stomach. Can be phenotypically similar to H/h(i) (Robinson, 1998)	Berkshire (without headspot) American irish (oval marking on belly)
h/h	 <p>(Castle, 1951)</p> <p>Show typical hooded pattern (Robinson, 1989).</p> <p>Hooded(Gumbreck, et al. 1971).</p>	Hooded Bareback

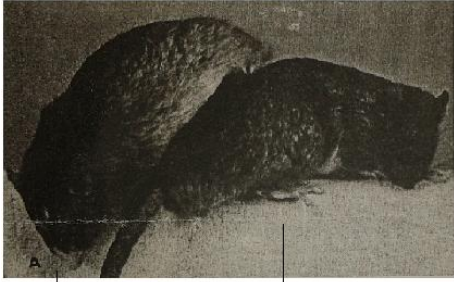

THE RESTRICTED HOODING ALLELE (H^{re})

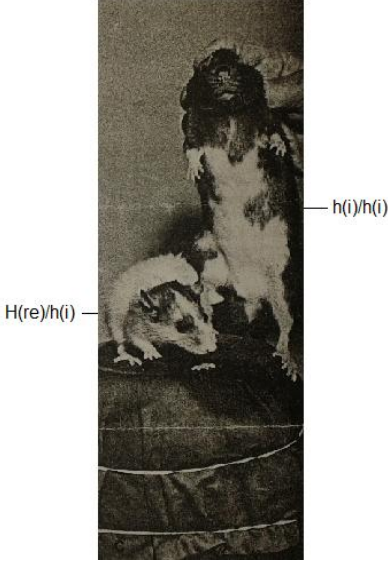
Origin: Arose in the Stanley-Grunbreck colony of laboratory rats at Stanley's laboratory (Gumbreck, et al. 1971).

South African history of the allele: To my knowledge this allele does not exist in South Africa.

Key characteristics: Male rats with the H^{re} allele become sterile shortly after puberty (Gumbreck, et al. 1971).

Described phenotypes:

Genotype	Scientific description	Possible varieties in the fancy
H^{re}/H^{re}	Lethal (Gumbreck, et al. 1971).	Lethal
H^{re}/H	<p>Small white spot on forehead and a variable expanse of white on the ventral surface and limbs. Males become fertile shortly after puberty</p>  <p>(Gumbreck, et al. 1971).</p> <p>Self with white chest and/or belly spots (Robinson, 1989).</p>	Berkshire (with headspot)
H^{re}/H^{ro}	<i>Not described</i>	<i>Unknown</i>
H^{re}/H^{du}	<i>Not described</i>	<i>Unknown</i>
H^{re}/h	<p>Reduction in the size of the pigmented area to such an extent that the white spot on the forehead becomes continuous with the expansion of white from the body. Males become fertile shortly after puberty</p>  <p>(Gumbreck, et al. 1971).</p> <p>White head with variable sized coloured spots (Robinson, 1989).</p>	Spotted Masked
H^{re}/h^e	<i>Not described</i>	<i>Unknown</i>
H^{re}/h^i	Variable reduction in the area of lateral pigmentation as well as a white spot on the forehead. Males become fertile shortly after puberty	Bareback (with headspot) Blazed bareback

	 <p>(Gumbreck, et al. 1971).</p> <p>High grade of hooded pattern (Robinson, 1989).</p>	
H^{re}/h^n	<i>Not described</i>	<i>Unknown</i>

THE ROBERT ALLELE (H^{ro}) (AKA: ESSEX ALLELE)

Origin: Essex rats were first found in a petshop in the UK in 1996 by Sheila Sowter (AFRMA Rat Standards – Marked). Essex has not been scientifically described yet.

South African history of the allele: The essex allele became available after the 2006 import. Essex based rats are either descendants of the MS Thor x MS Bushbaby cross or of the MS Clyde x MS Bonnie cross.

Key characteristics: Slight dilution of coat colour. Colour on back is darkest evenly fading to lighter colour on the sides. White spotting accompanies this colour dilution. Baby essex rats already appear faded in colour.

Genotype	Scientific description	Possible varieties in the fancy
H^{re}/H^{ro}	<i>Not described</i>	<i>Unknown</i>
H^{ro}/H	<i>Not described</i>	Essex (faded colour)
H^{ro}/H^{du}	<i>Not described</i>	Mock capped (faded colour)
H^{ro}/H^{ro}	<i>Not described</i>	Lethal
H^{ro}/h	<i>Not described</i>	Baldie (faded colour)
H^{ro}/h^e	<i>Not described</i>	Spotted (faded colour) BEW
H^{ro}/h^i	<i>Not described</i>	Variegated essex (faded colour)
H^{ro}/h^n	<i>Not described</i>	Dalmation (faded colour)

THE DOWNUNDER ALLELE (H^{du})

It is speculated that the downunder gene might be separate dominant gene not on the hooded locus, but further research are needed (Perez, 2004).

Origin: Discovered in Australian fancy rats among hairless breeding stock in 1999 (Perez, 2004).

South African history of the allele: The downunder allele was imported in 2006, but became extinct in South Africa due to fertility problems in the line.

Key characteristics: Display prominent ventral spotting (Perez, 2004).

Described phenotypes:

Genotype	Scientific description	Possible varieties in the fancy
H^{re}/H^{du}	<i>Not described</i>	<i>Unknown</i>
H^{ro}/H^{du}	<i>Not described</i>	Mock capped (faded colour)
H^{du}/H	<i>Not described</i>	Berkshire downunder
H^{du}/H^{du}	<i>Not described</i>	Possibly lethal
H^{du}/h	<i>Not described</i>	Hooded downunder
H^{du}/h^e	<i>Not described</i>	Spotted downunder
H^{du}/h^i	<i>Not described</i>	Variegated downunder
H^{du}/h^n	<i>Not described</i>	<i>Maybe spotted downunder</i>



A “mock capped” kitten
(a/a H(ro)/H(du))

THE IRISH ALLELE (h^i)


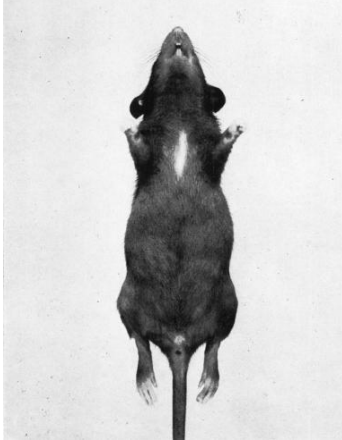
Origin: Known since the early 1900’s (Robinson, 1965).


South African history of the allele: The Irish allele was found in South African pet shops before the 2006 import.

Key characteristics: Causes white spotting in the rat, but of a lesser grade than the hooded allele (h) (Robinson, 1965).

Described phenotypes:

Genotype	Scientific description	Possible varieties in the fancy
H^{re}/h^i	Variable reduction in the area of lateral pigmentation as well as a white spot on the forehead. Males become fertile shortly after puberty	Bareback (with headspot) Blazed bareback

	 <p>(Gumbreck, et al. 1971).</p> <p>High grade of hooded pattern (Robinson, 1989).</p>	
H^{ro}/h^i	<i>Not described</i>	Variegated essex (faded colour)
H^{du}/h^i	<i>Not described</i>	Variegated downunder
h^i/h^i	 <p>(Castle, 1951)</p> <p>Irish (white belly)</p>	<p><u>Gumbreck, et al. 1971 says:</u> Berkshire</p> <p>Variegated berkshire</p> <p><u>Castle, 1951 says:</u> English Irish (white triangle on chest)</p>

	 <p>(Gumbreck, et al. 1971).</p> <p>Note: The Castle results are contradictory to the Gumbreck results, yet in both articles it states that the rats pictured are h^i/h^i. Castle says in his article that he “assumes” the genotype of the rat pictured.</p>	
h^i/h	White belly spot (Castle, 1951). Normal Irish (Gumbreck, <i>et al.</i> 1971).	American Irish (oval marking on belly) Berkshire
h^i/h^e	Minor grade of the “self with white chest and/or belly spots” (Robinson, 1989).	English Irish (white triangle on chest)
h^i/h^n	Belly entirely white with a sprinkling of white hairs low on the sides (Castle, 1951).	Variegated berkshire
H/h^i	Shows a variable white patch on the stomach. Can be phenotypically similar to $H/h(i)$ (Robinson, 1998)	Berkshire (without headspot) American Irish (oval marking on belly)

THE EXTREME HOODING ALLELE (h^e)

Origin: The extreme allele originated in 1983 in fancy rats in the UK (Robinson, 1989).

South African history of the allele: The extreme hooding allele became available after the 2006 import. They are descendants of the MS Clyde x MS Bonnie cross or of MS Monkey.

Key characteristics: Superficial black eyes that glow dull red in bright light accompanied by white spotting (Robinson, 1989).

Described phenotypes:

Genotype	Scientific description	Possible varieties in the fancy
H^{re}/h^e	<i>Not described</i>	<i>Unknown</i>
H^{ro}/h^e	<i>Not described</i>	Spotted (faded colour)

		BEW
H^{du}/h^e	<i>Not described</i>	Spotted downunder
h^e/h^e	Completely white or white with variable sized spots of pigmented fur on the sides of the head, pupil glows dark red (Robinson, 1989).	BEW Spotted
h^e/h	Typical hooded pattern and lighter shades of white spotting (coloured head with scallop of white between the ears). Pupil glows red (Robinson, 1989).	Variegated
h^i/h^e	Minor grade of the “self with white chest and/or belly spots” (Robinson, 1989).	English Irish (white triangle on chest)
h^e/h^n	<i>Not described</i>	Capped
H/h^e	Head is solid coloured but the body fur is a mixture of white and coloured hairs. The expression is variable, ranging from individuals with solid coloured dorsums but with roan coloured venters, to individuals with extreme roaning all over the body. A suggestion of the hooded pattern may be shown by a lessening of the roaning along the spine. The more extremely roaned animals have completely white stomach fur and there may be invasion of the solid coloured head by white hairs. Pupil glows red (Robinson, 1989).	Variegated berkshire Variegated

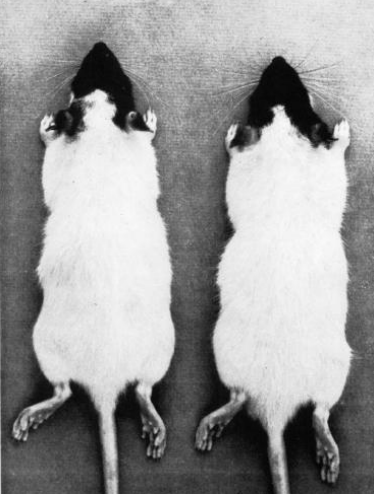
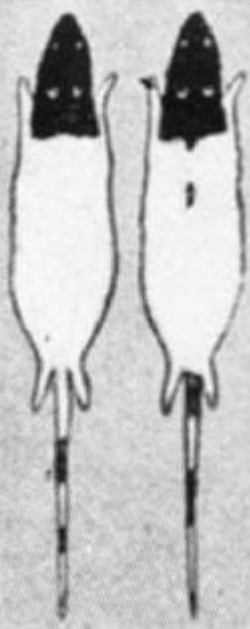
THE NOTCHED HOODING ALLELE (h^n)

Origin: It is not clear when the notched allele first appeared. Castle found some notched allele rats in his breeding lines bred for research conducted on variation in the hooded pattern (Castle, 1951).

South African history of the allele: The notched hooding allele was available in pet shops before the 2006 import.

Key characteristics: Causes white spotting in the rat, but of a higher grade than the hooded allele (h)
Described phenotypes:

Genotype	Scientific description	Possible varieties in the fancy
H^{re}/h^n	<i>Not described</i>	<i>Unknown</i>
H^{ro}/h^n	<i>Not described</i>	Dalmation (faded colour)
H^{du}/h^n	<i>Not described</i>	<i>Maybe spotted downunder</i>

h^n/h^n	 <p>(Castle, 1951)</p> <p>High grade of hooded pattern with notch of white between the ears (coloured head with scallop of white between the ears)(Robinson, 1989).</p>	Capped
h^n/h	 <p>(Castle, 1951)</p>	Bareback
h^n/h^e	<i>Not described</i>	Capped
h^n/h^i	Belly entirely white with a sprinkling of white hairs low on the sides (Castle, 1951).	Variegated berkshire
H/h^n	<i>Not described</i>	Berkshire Variegated berkshire

NON HOODED LOCUS MARKINGS

THE HEAD SPOT GENE (hs)

Origin: Head spot is the mutation that causes recessive blaze in fancy rats in specific genetic combinations. The mutation is given the symbol "hs". Head spot was first observed in a population of agouti rats from wild origin and is scientifically described by Roy Robinson in 1998 (Robinson, 1998). It was proven by another scientific article, *Genetic Analysis of Fancy Rat derived Mutations*, that recessive blaze in fancy rats is indeed caused by the head spot mutation. Fancy stock from Spoiled Ratten Rattery in the USA was sent to Japan and Takashi Kuramoto identified the head spot mutation in the rat "SRR04" (Kuramoto, *et al.* 2010). It is possible that the head spot mutation in modern fancy rats came from the agouti rats described in the 1998 article by Robinson. Roy Robinson helped the NFRS acquire the first himalayan rats (Mays, 1997), thus it may also be possible that he supplied the fancy with the head spot mutation as well. The head spot mutation is located on chromosome 15 (Kuramoto, *et al.* 2010).

South African history of the gene: Blazed rats became available after the 2006 import. Most blazed rats are descendants of the MS Blue x MS Raven cross.

Key characteristics: Cause a white spot on the forehead just before the eyes together with a white belly marking. Upon selection the head spot can become a full blaze marking.

Described phenotypes: The head spot mutation usually just adds a head spot or a blaze effect* to any known hooded genotype. The amount of white on the hooded locus phenotype will also slightly increase. For instance, in blazed hooded rats (h/h hs/hs) the spinal stripe is often shorter and less continuous (Robinson, 1998).

*Note: Some hooded locus combinations can also result in head spot or blazes without the help of the head spot gene. See descriptions above.

THE ROAN GENE (ro)

Origin: In an old article from the Blue Rat Support group it states that Husky rats came from feeder rats in Chechoslowakia. At the time of publication in 1999, Huskies were already popular in Nederland and Germany but were new to the UK. Husky rats were known in Sweden since 1994 (Liem, 1999). The roan gene is a recessive gene which causes the markings and colour of Husky rats.

South African history of the gene: Husky rats became available after the 2006 import from the MS Wolf x MS Raven cross.

Key characteristics: Causes roaning, a fading effect of the coat where hairs become more silvered, accompanied by white spotting and a blaze marking. Eye colour is superficially black with a red glow in good light. Baby Husky rats are not yet faded, fading only starts after 6 weeks old mould or later in life. Some Husky rats fade a lot until they are completely white whilst others fade very little. The fading effect becomes more intense as the rat ages.

Described phenotypes: This variety has not been scientifically described yet. See description of markings below for known genotypes.

MARKINGS IN THE SOUTH AFRICAN FANCY

HOODED LOCUS

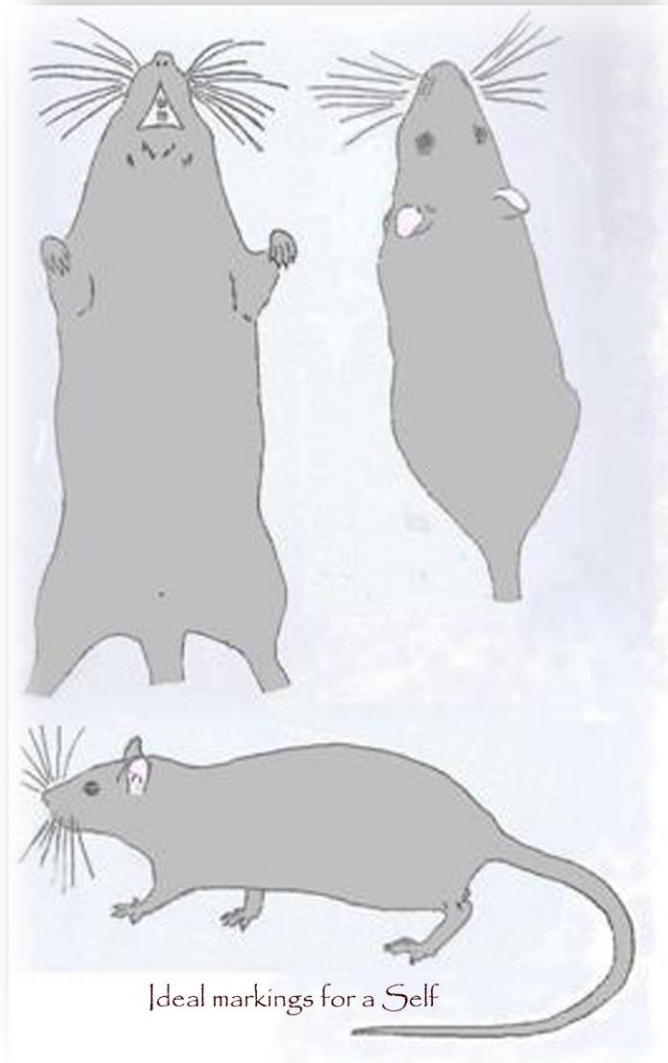
SELF

History of the marking in the fancy: Self is the natural wild type form of the hooded locus, thus the first rats ever tamed must have already been selfs.

S.A.R.F.C. Standards: To be a completely single coloured rat with no white markings anywhere on the body. Faults: White toes, a white tail tip or any other white markings, such as a small white spot on the belly.

Possible Genotypes: H/H

SELF



Dumbo Russian blue agouti
Self doe



Dumbo Black Self doe



Dumbo Russian blue Self buck

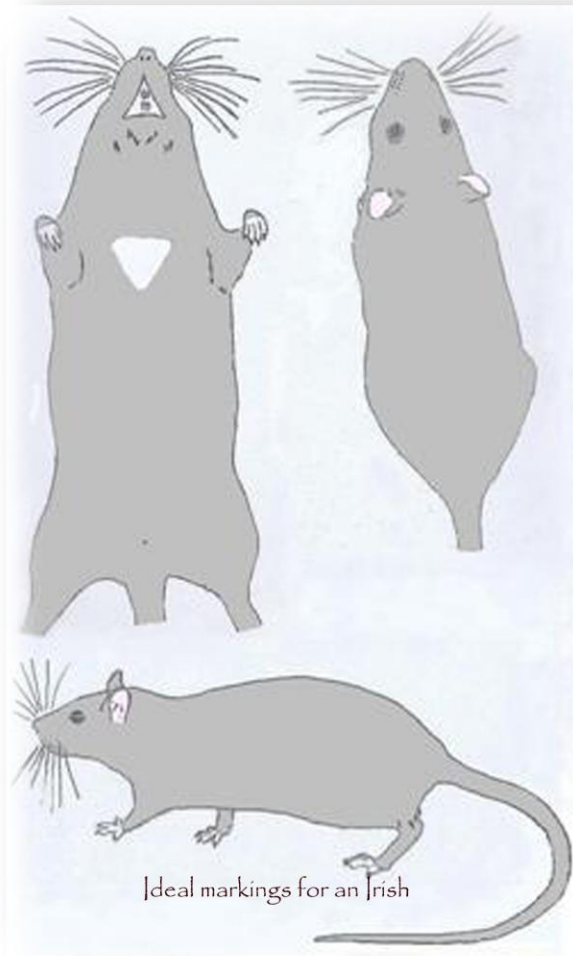
IRISH (ENGLISH)

History of the marking in the fancy: Accepted in standards in the UK in 1907 and taken over by the NFRS in 1976 (Mays, 1997). Irish originated from the UK. In America there are two kinds of Irish and AFRMA refer to the Irish we describe here as “English Irish” (AFRMA Rat Standards – Marked).

S.A.R.F.C. Standards: To have a white equilateral triangle on the chest, which must be of good size, clear cut and devoid of any brindling. Toes on front and back feet should be white. Tail may have small white tip, but it is not compulsory. Faults: Triangle extending down the belly or occupying all the space between the front legs.

Possible Genotypes: h^e/h^i or h^i/h^i (according to Castle, 1951)

IRISH



Dumbo Black Irish buck



Black Irish doe



Black Irish doe



Dumbo Black Irish buck

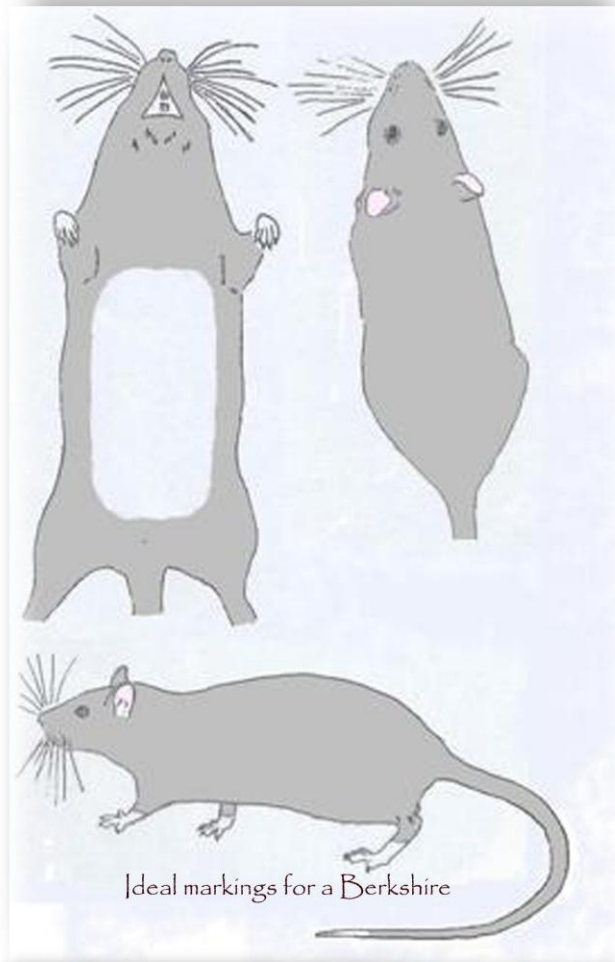
BERKSHIRE

History of the marking in the fancy: Berkshire was introduced in 1957 in the UK and the name was based on a variety of marked pig (Mays, 1997). In America Berkshire rats look different in that the whole belly should be white instead of the white marking on the belly. American Berkshire rats are bred from their Dalmatian lines (AFRMA Rat Standards – Marked).

S.A.R.F.C. Standards: To have a symmetrical white marking extending from chest to belly, to be of good size, clear cut and devoid of any brindling. Back feet white from toes to halfway between ankle and toes. Front legs to be white to half the leg. Tail to be white from tailtip to no more than half its length. May have a small white spot on forehead, but this is not required. Faults: Bell marking extending down the legs. Belly marking extending up the sides. Coloured spots within belly marking.

Possible Genotypes: H^{te}/H ; H/h ; H/h^i ; H/h^n ; h^i/h or h^i/h^i (according to Gumbreck, *et al.*, 1971)

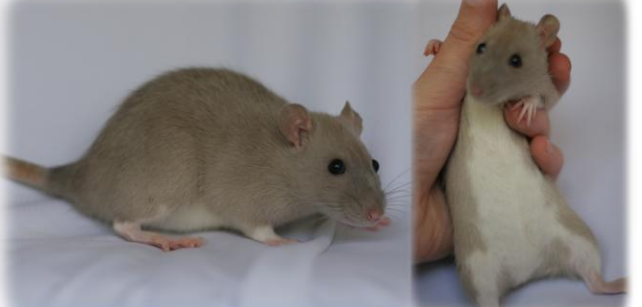
BERKSHIRE



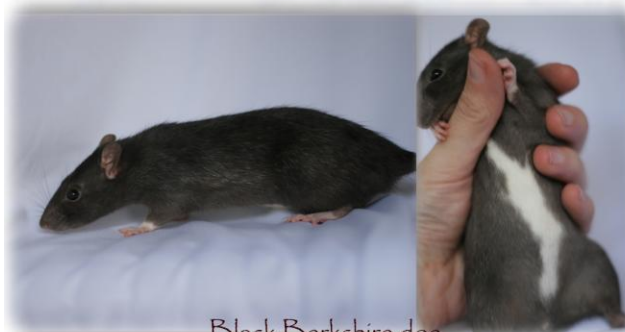
Black Berkshire doe



Black Berkshire kitten



Russian blue Burmese Berkshire doe



Black Berkshire doe



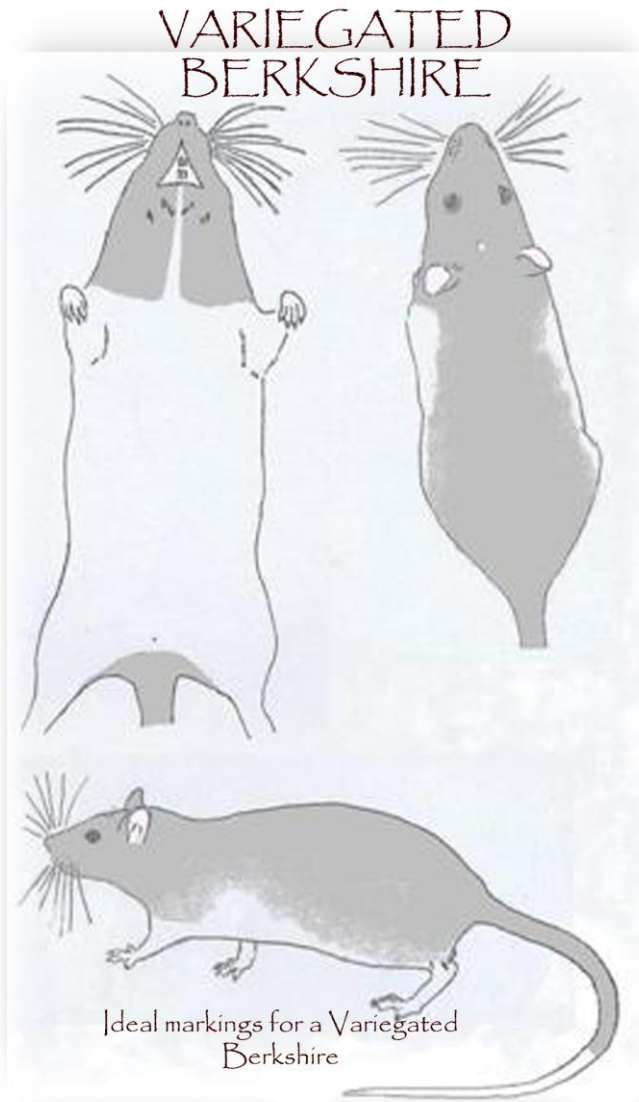
Black Berkshire kitten

VARIEGATED BERKSHIRE

History of the marking in the fancy: Variegated Berkshire is usually not recognized by overseas rat clubs, but this mutation has been found in pet populations for many years.

S.A.R.F.C. Standards: To have a white body with white feet. Lower sides to be white with brindling of marking (compulsory). Small white spot on forehead preferred but not required. Throat to be coloured with an white line running from chin to white chest area (pale throat permissible in light coloured varieties). Tail to be white to half its length. Faults: Coloured spots on belly. Coloured areas extending to belly.

Possible Genotypes: H/h^e ; H/h^n h^i/h^i or h^i/h^n



Dumbo Agouti Variegated Berkshire buck



Black Variegated Berkshire doe



Dumbo Black Variegated Berkshire doe



Black Variegated Berkshire doe



Black Variegated Berkshire buck



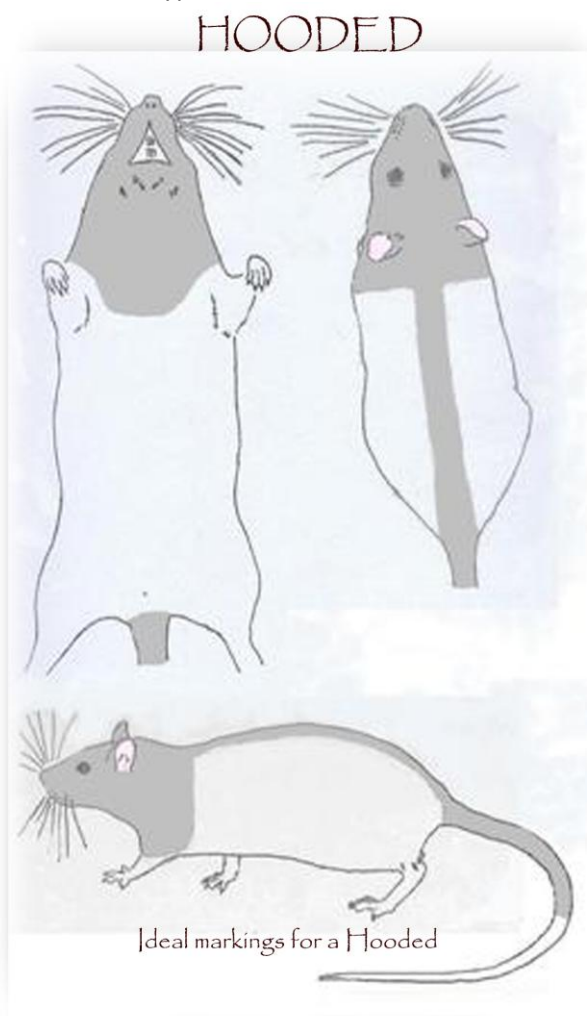
Black Variegated Berkshire doe

HOODED

History of the marking in the fancy: Introduced in UK standards in 1901 as “even marked”. Renamed “Japanese” in 1915, and from that to “japanese hooded” in 1957. In 1976 the NFRS named it “English hooded” and finally in 1977 the variety was named “hooded”, the name by which it is still known today (Mays, 1977).

S.A.R.F.C. Standards: To have a coloured hood covering head, neck and shoulders as well as throat and chest with white front feet. Pale throat permissible in light coloured varieties. One to two centimeter broad, clear cut coloured line following spine extending from back of hood to tail. Tail to be white to half its length. White line on throat extending from chin is optional. Faults: Spinal line brindled or broken. Colour spots within white areas.

Possible Genotypes: h/h



Agouti Hooded buck



Agouti Hooded doe



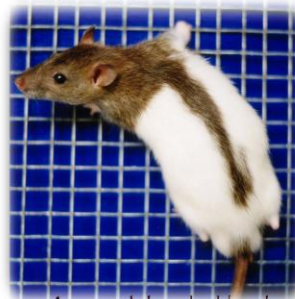
Black Hooded doe



Black Hooded doe



Black Hooded doe



Agouti Hooded buck

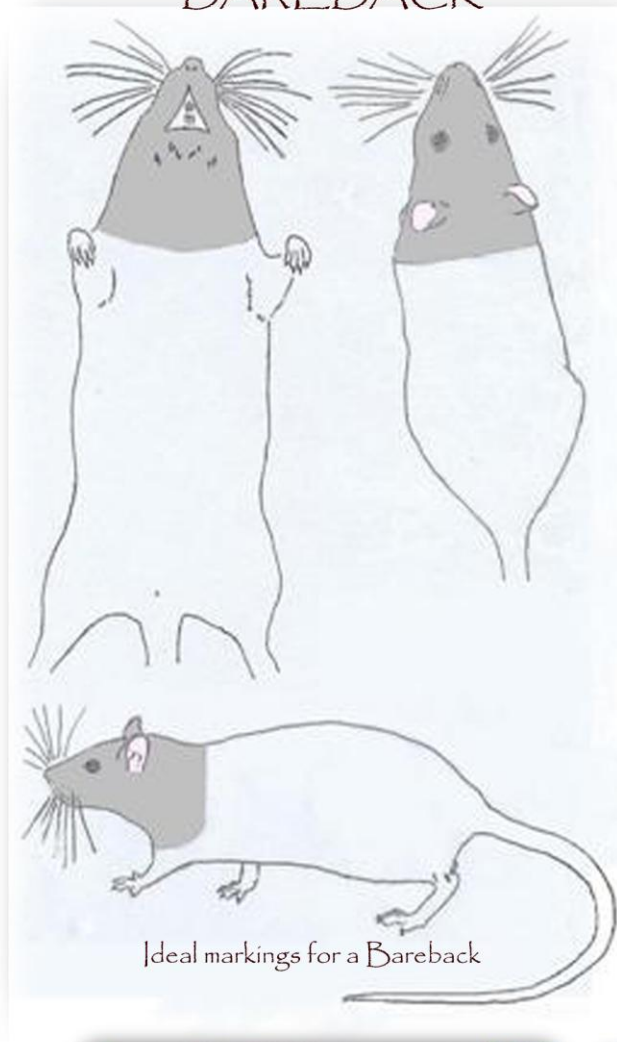
BAREBACK

History of the marking in the fancy: In America bareback was first bred by Karla Barber in 1984 (AFRMA Rat Standards – Marked).

S.A.R.F.C. Standards: To have a coloured hood covering head, neck and shoulders as well as throat with white front feet. Hood shall be clear cut and devoid of any brindling. Pale throat permissible in light coloured varieties. The remainder of the body should be white. Faults: Spots on back.

Possible Genotypes: H^{re}/h^l ; h/h or h^n/h

BAREBACK



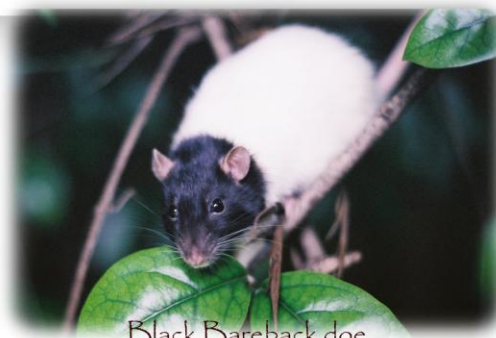
Agouti Bareback does



Black Bareback doe



Black Bareback buck



Black Bareback doe



Black Bareback doe

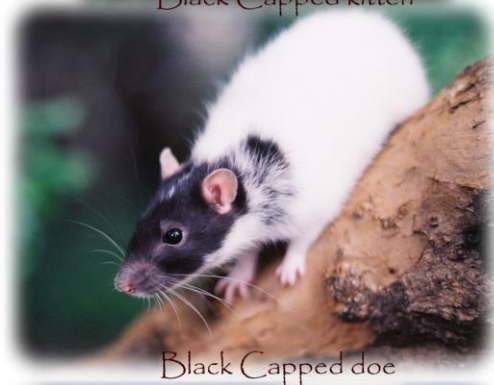
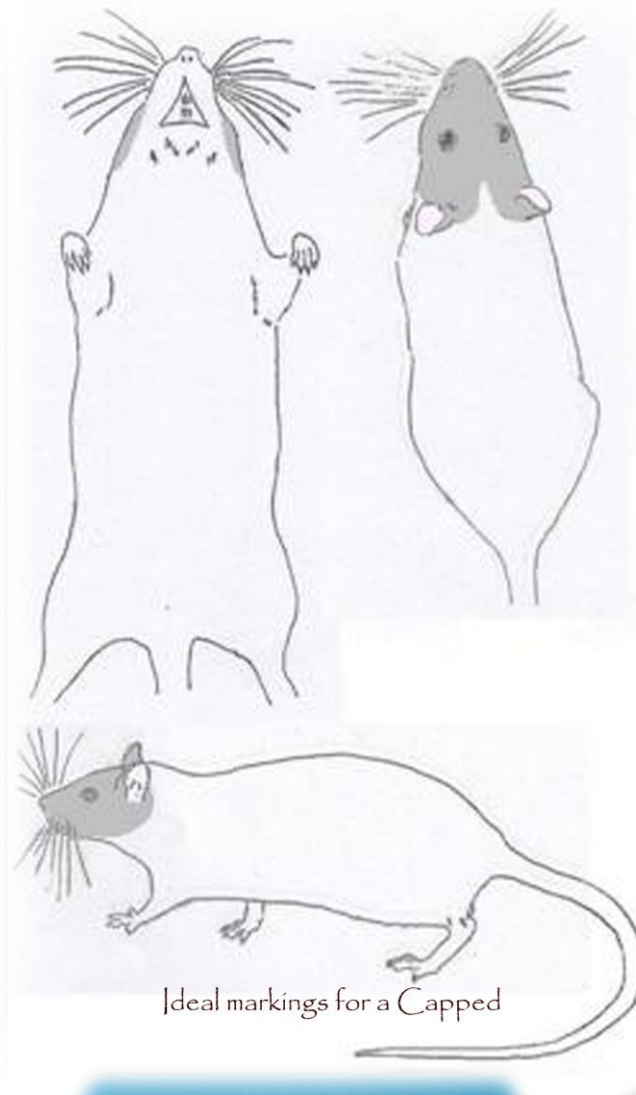
CAPPED

History of the marking in the fancy: Introduced in the UK by H.C. Brooke in 1915 as “Dutch headed even”, but it was later renamed as “capped”. Fully standardized by the NFRS in 1981 (Mays, 1997).

S.A.R.F.C. Standards: To have colour on the head, with rest of body completely white. The marking should be confined to the head only and a “notch” should be present between the ears. The coloured area should follow the line of the lower jaw bone and throat should be white. Faults: Coloured areas extending past ears or coloured areas anywhere else on the body.

Possible Genotypes: h^e/h^n or h^n/h^n

CAPPED



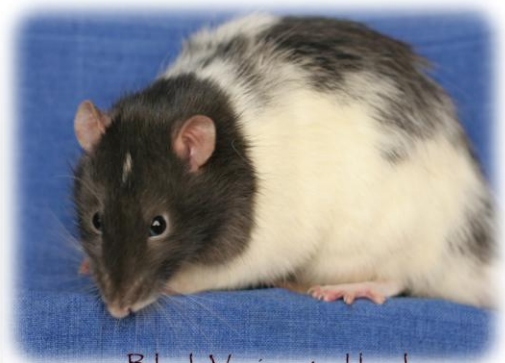
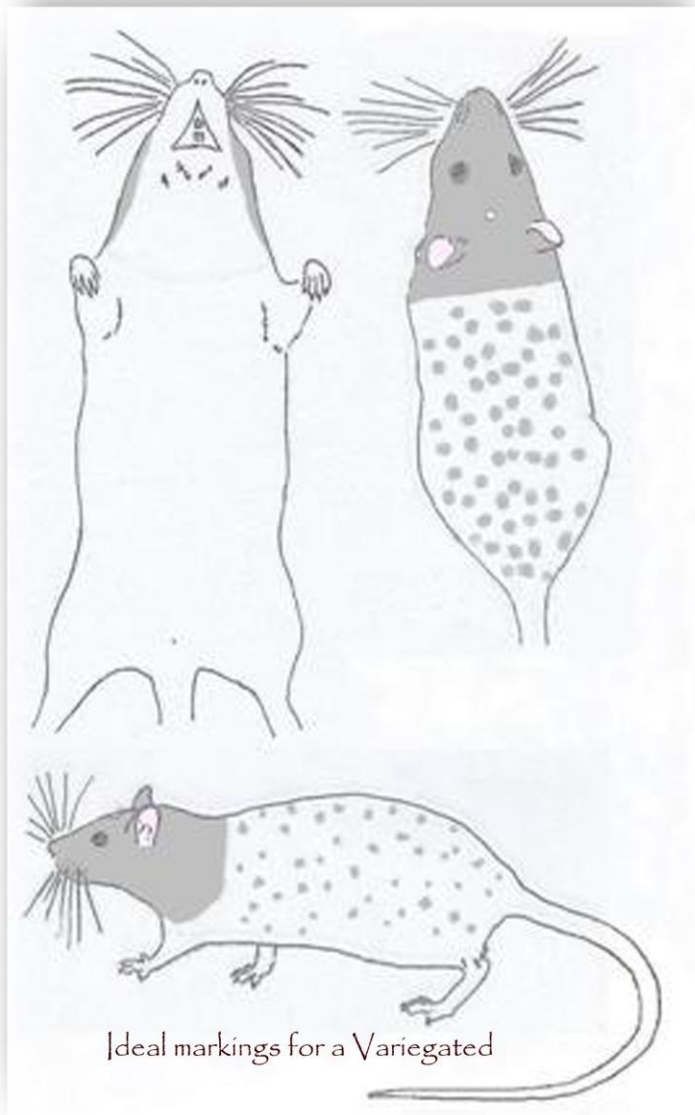
VARIEGATED

History of the marking in the fancy: Called “broken marked” in 1900 in the UK. Bred as “variegated” by Mr. Butler-Adams in 1921. Fully standardized by the NFRS in 1984 (Mays, 1997).

S.A.R.F.C. Standards: To have a coloured area covering head, neck and shoulders with white front feet and a white spot no bigger than the rat’s eye placed on the forehead. Throat to be white, but back and sides to be evenly marked with coloured patches or flecks. Underside to be white. Tail to be white to half its length. Faults: White areas extending to cheeks. Coloured patches merging or too few coloured patches.

Possible Genotypes: H/h^e or h^e/h

VARIEGATED



Black Variegated buck



Agouti Variegated buck



Russian blue Variegated doe

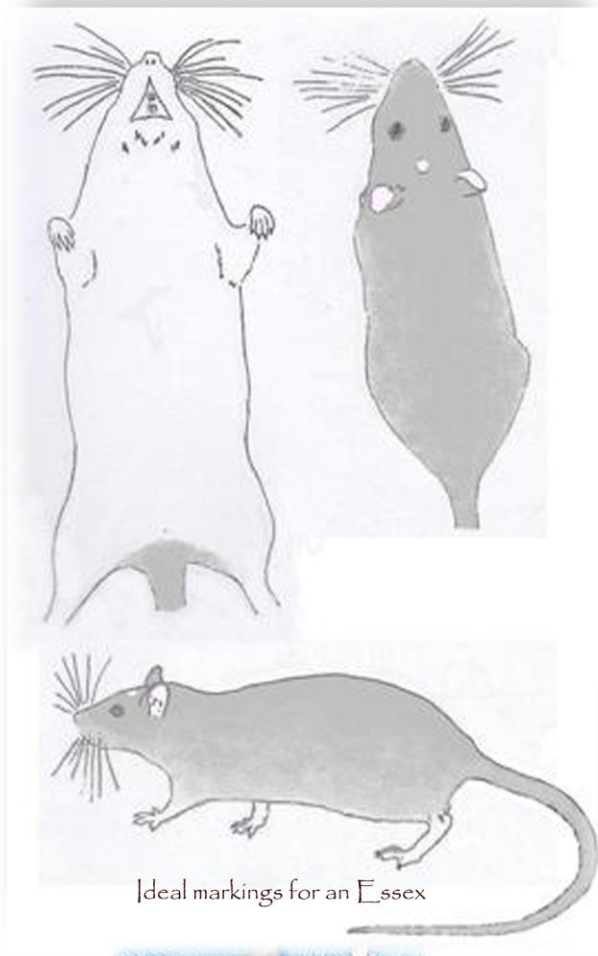
ESSEX

History of the marking in the fancy: Essex rats were first found in a petshop in the UK in 1996 by Sheila Sowter (AFRMA Rat Standards – Marked).

S.A.R.F.C. Standards: To have a small white spot on forehead. Rest of body is coloured, but colour should gradually and evenly fade from spine to belly. Colour should be darkest at the spine and fade gradually to off-white underneath. Fading effect should be symmetrical and even without spotting of darker colour. Legs are also off-white. Pied tails not to be penalized. Faults: Darker patches in coloured areas. Coloured spots on belly.

Possible Genotypes: H^{ro}/H

ESSEX

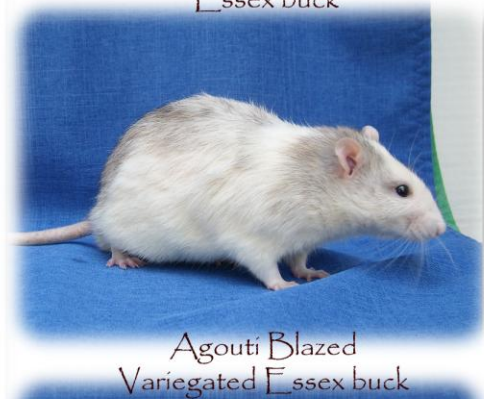
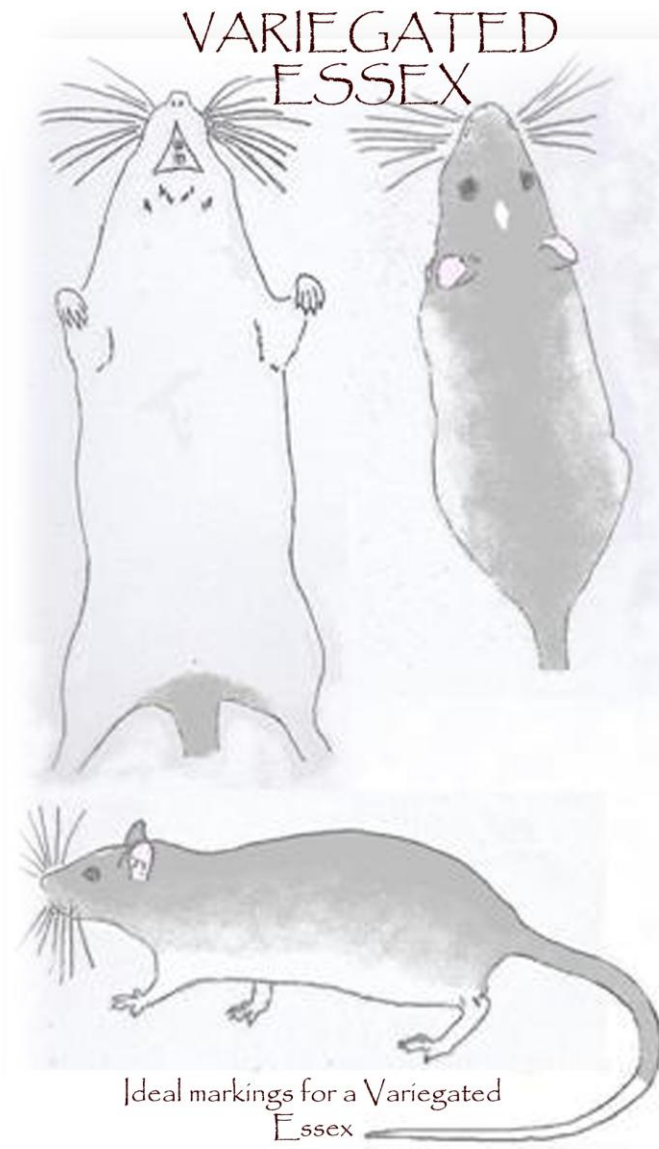


VARIEGATED ESSEX

History of the marking in the fancy: Bred from Essex lines.

S.A.R.F.C. Standards: To have a white diamond shaped spot on forehead. Belly should be white with white feet. Lower sides to be white with brindling of marking (compulsory). Rest of body is coloured, but colour should gradually and evenly fade from spine to brindled marked areas on the lower sides. Colour should be darkest at the spine and fade gradually to white marked areas. Fading effect should be symmetrical and even without spots of darker colour. Pied tails not to be penalized. Faults: Darker patches in coloured areas. Coloured spots on belly. Head spot extending to nose.

Possible Genotypes: H^{ro}/h^i



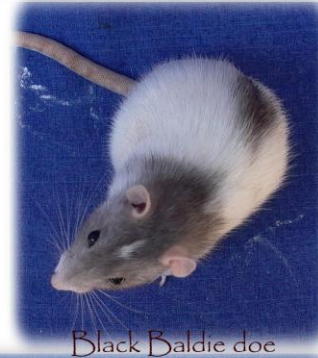
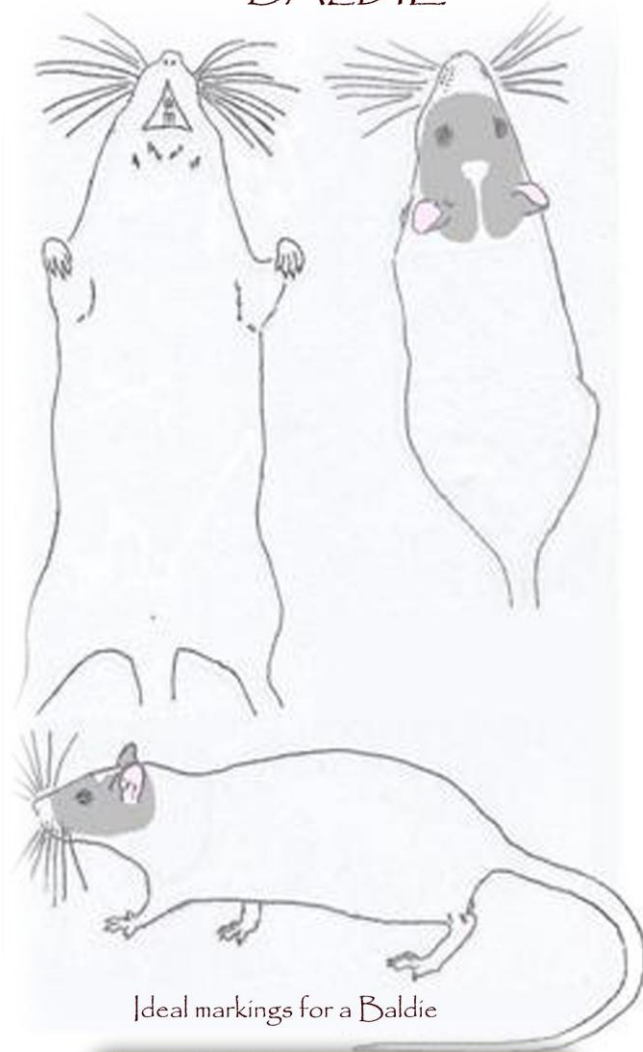
BALDIE

History of the marking in the fancy: Bred out of Essex stock by crossing Essex with hooded.

S.A.R.F.C. Standards: To have a coloured head, with white nose tip and colour reaching just beyond ears. Rest of body, including throat to be white. A white triangle should be present pointing rearwards with a white line running from point of triangle to white nape of neck. Colour must be faded as in Essex variety. Faults: Coloured spots on back.

Possible Genotypes: H^{f^o}/h

BALDIE



SPOTTED (AND BLACK EYED WHITE)

History of the marking in the fancy: Black eyed white rats have been available for many years overseas. Spotted and black eyed white rats are bred from various genetic combinations.

S.A.R.F.C. Standards: BEW - Completely white coat. Eye colour is black. Any coloured hairs will be penalized.

Possible Genotypes: h^e/h^e ; H^{re}/h or H^{ro}/h^e

SPOTTED AND BLACK EYED WHITE



Black eyed white buck



Black eyed white doe



Black spotted doe



Black spotted doe



Black spotted doe



Black spotted buck

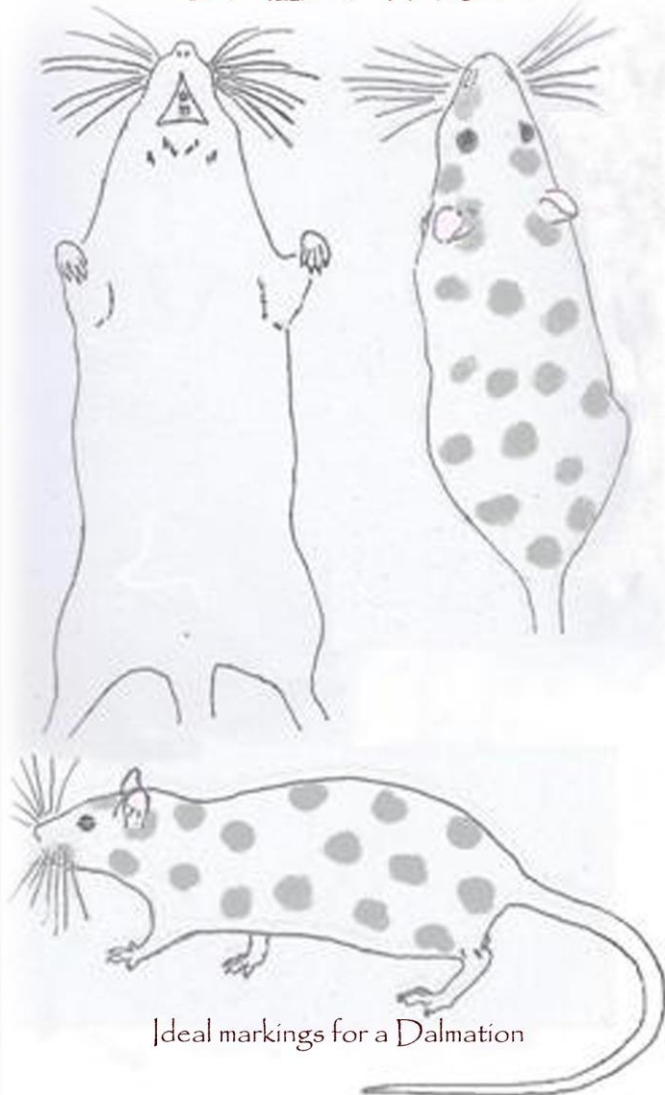
DALMATION

History of the marking in the fancy: Dalmation originated in the USA in 1986 when the first Dalmation buck named Badger was bred by Joy Ely (Royer & Robbins, 2012). American Dalmation rats are however not the same as South African Dalmation rats. In America they have a separate dominant gene, which we do not have here to breed Dalmation rats (Robbins, 2012). We have to use the Essex allele to breed our Dalmations.

S.A.R.F.C. Standards: Body to be covered in splash spots with a white background. Splash spots must be numerous with brindled edges and must be of approximately equal size and should cover the whole body (excluding the belly). Faults: Merging splash spots or too few splash spots.

Possible Genotypes: H^o/h^n

DALMATION



Agouti and Black
Dalmation does



Agouti and Black
Dalmation does

BERKSHIRE DOWNUNDER

History of the marking in the fancy: Downunder rats originally came from Australia where they were discovered amongst hairless breeding stock in 1999. They were imported to the USA in 2002 (Perez, 2004).

S.A.R.F.C. Standards: To have two mirrored white markings present running from each front foot down the belly to the back foot (on same side as front foot). When viewed from above, Berkshire DU should appear similar to a Berkshire. Tail to be white from its tip to a quarter of its length. Faults: White areas extending up the sides of the rat. Not correct white areas on belly.

Possible Genotypes: H^{du}/H

VARIEGATED DOWNUNDER

History of the marking in the fancy: Downunder rats originally came from Australia where they were discovered amongst hairless breeding stock in 1999. They were imported to the USA in 2002 (Perez, 2004).

S.A.R.F.C. Standards: To have a marking present on the head similar to a capped rat. Back and underside to be covered in coloured patches or flecks running from shoulders and chest to tailbase. Throat to be white. Faults: Patches merging.

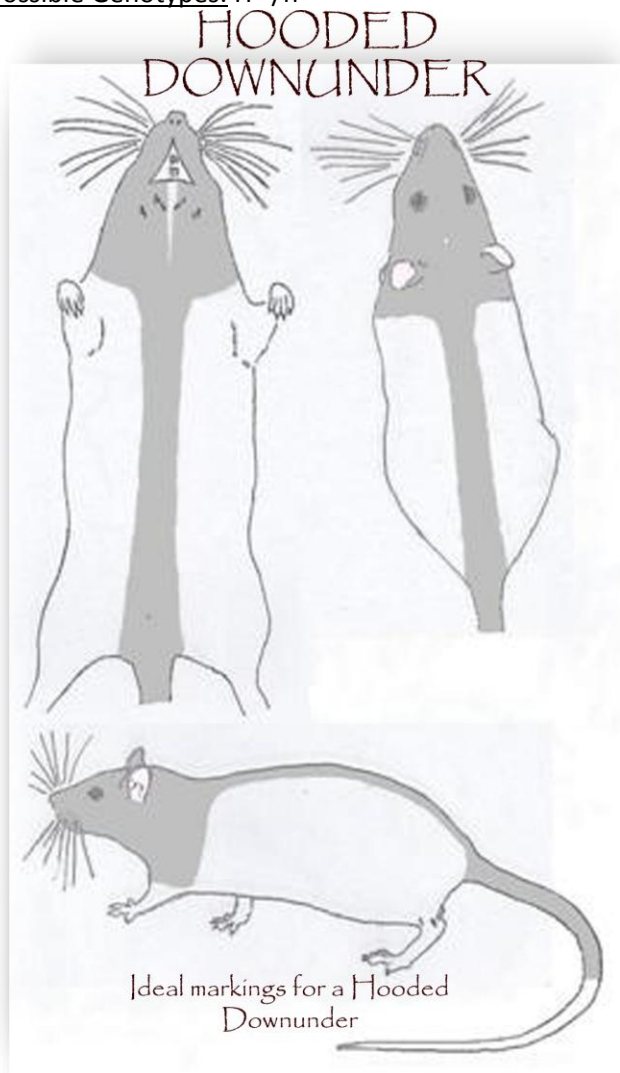
Possible Genotypes: H^{du}/h^i

HOODED DOWNUNDER

History of the marking in the fancy: Downunder rats originally came from Australia where they were discovered amongst hairless breeding stock in 1999. They were imported to the USA in 2002 (Perez, 2004).

S.A.R.F.C. Standards: Same as hooded except that a small white spot is allowed on the forehead, but it is not compulsory. A one to 2 cm broad line should be present from the chest to tailbase on the underside of the rat. This line as well as the spinal line must be clear cut, devoid of brindling and unbroken. A white line from chin to throat area is allowed but not compulsory. Faults: Broken or brindled markings. Coloured spots next to spinal and belly line.

Possible Genotypes: H^{du}/h



Black Hooded Downunder buck



Black Hooded Downunder buck



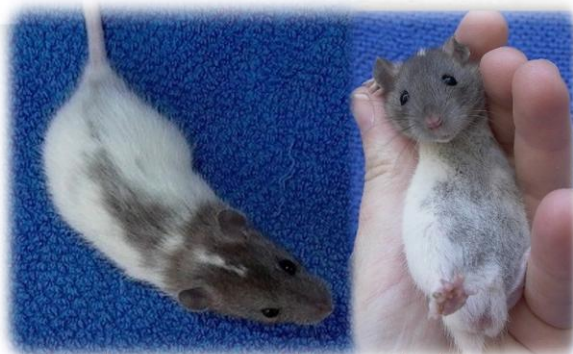
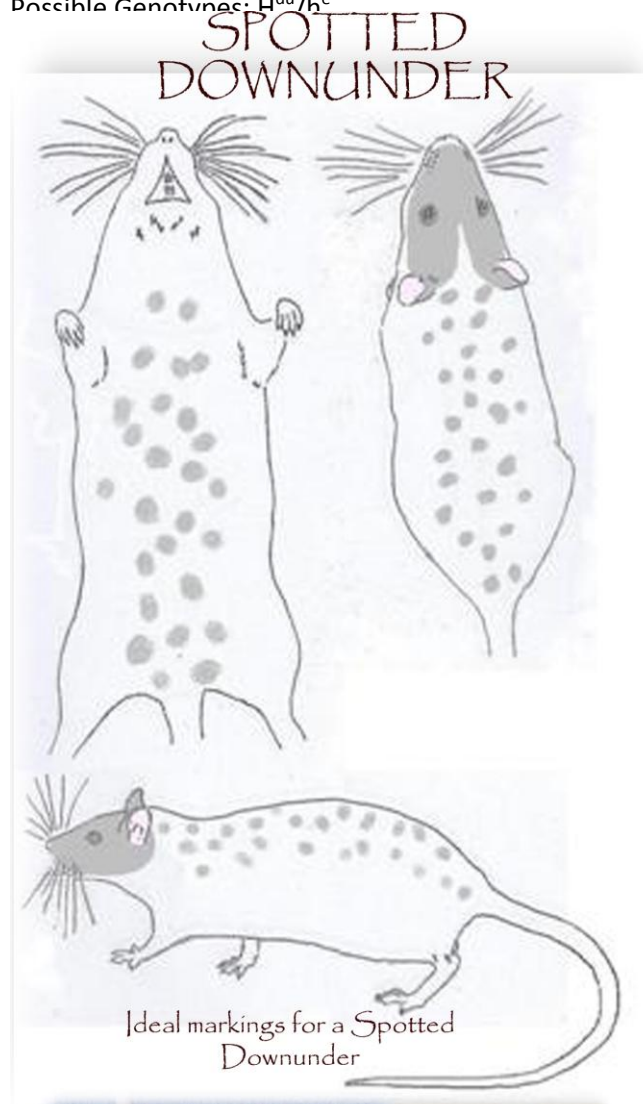
Tailless Black Hooded Downunder doe

SPOTTED DOWNUNDER

History of the marking in the fancy: Downunder rats originally came from Australia where they were discovered amongst hairless breeding stock in 1999. They were imported to the USA in 2002 (Perez, 2004).

S.A.R.F.C. Standards: To have a marking present on the head similar to a capped rat. Back and underside to be covered in coloured patches or flecks running from shoulders and chest to tailbase. Throat to be white. Faults: Patches merging.

Possible Genotypes: H^{du}/h^e



Agouti Spotted Downunder kitten

OTHER GENES

RECESSIVE BLAZED AND HEAD SPOTTED RATS

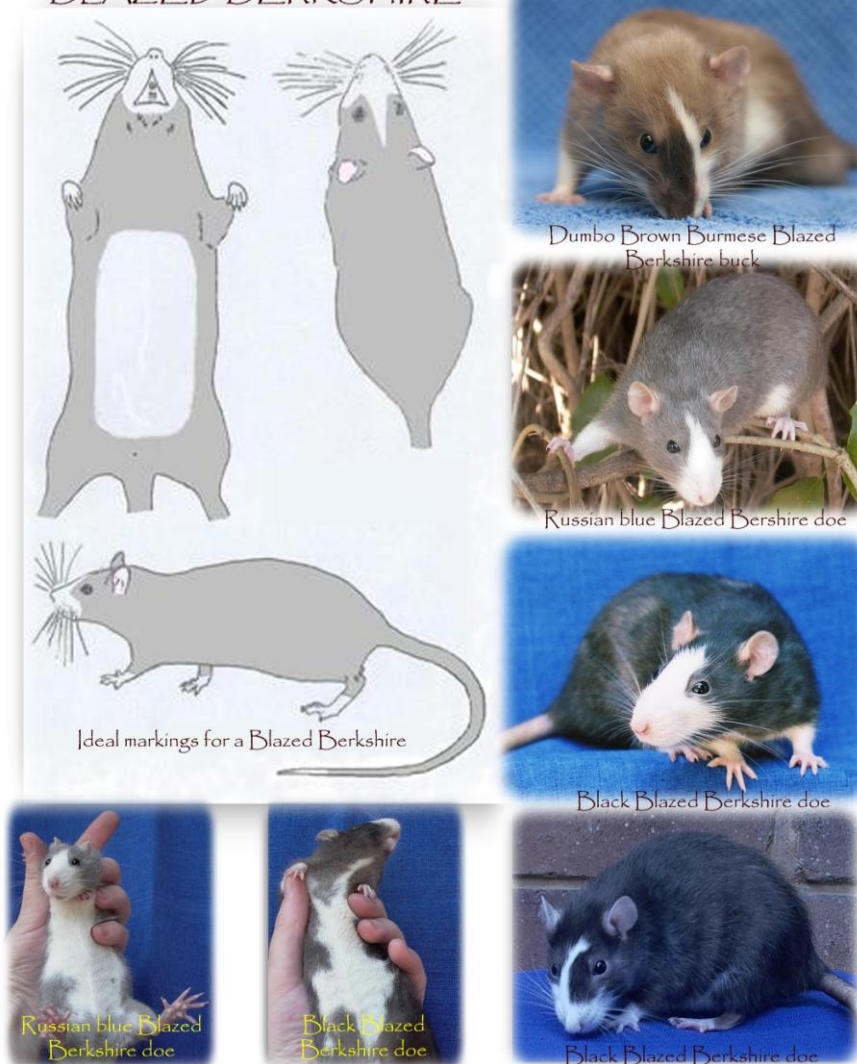
History of the marking in the fancy: I did not find any specific information on where fancy recessive blazed rats came from, but if one look in the book *The Proper Care of Fancy Rats* published in 1997, a photo of blazed berkshire rats (Aka: badger in the UK) are shown (Mays, 1997). Blazed rats must have been accepted in the NFRS standards some time in or after 1997. AFRMA standardized blazed in 1989, but it is not clear if the original AFRMA blazed rats were indeed recessive blaze (in the USA there is also a separate dominant blaze mutation) (AFRMA Fancy Rats – Marked).

S.A.R.F.C. Standards:

BLAZED BERKSHIRE - To have a symmetrical white marking extending from chest to belly, to be of good size, clear cut and devoid of any brindling. Back feet white from toes to halfway between ankle and toes. Front legs to be white to half the leg. Tail to be white from tailtip to no more than half its length. To have a facial blaze which must be wedge shaped and symmetrical. White area of blaze must cover whisker bed and nose and should extend up the face by tapering to a point between ears. Faults: Belly marking extending down the legs. Belly marking extending up the sides. Coloured spots within white areas.

Possible Genotypes: H/H hs/hs

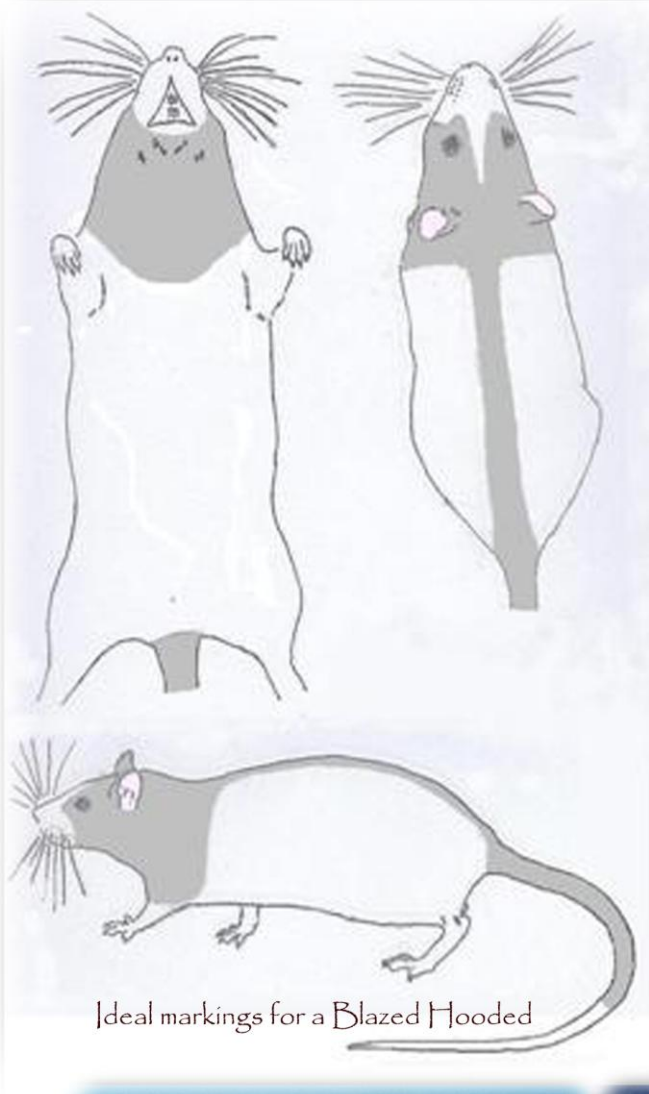
BLAZED BERKSHIRE



BLAZED HOODED - To have a coloured hood covering head, neck and shoulders as well as throat and chest with white front feet. Pale throat permissible in light coloured varieties. One to two centimeter broad, clear cut coloured line following spine extending from back of hood to tail. Tail to be white to half its length. White line on throat extending from chin is optional. To have a facial blaze which must be wedge shaped and symmetrical. White area of blaze must cover whisker bed and nose and should extend up the face by tapering to a point between ears. Faults: Spinal line brindled or broken. Colour spots within white areas.

Possible Genotypes: h/h hs/hs

BLAZED HOODED



Black Blazed Hooded buck



Dumbo Black Blazed Hooded doe



Dumbo Agouti Blazed Hooded doe



Dumbo Agouti Blazed Hooded doe

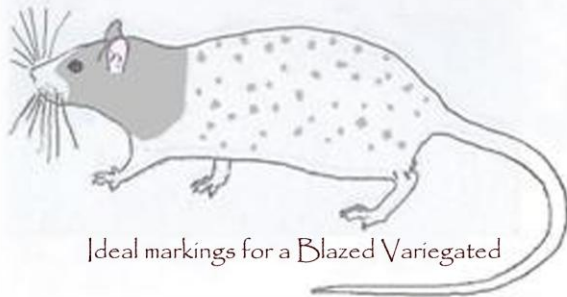
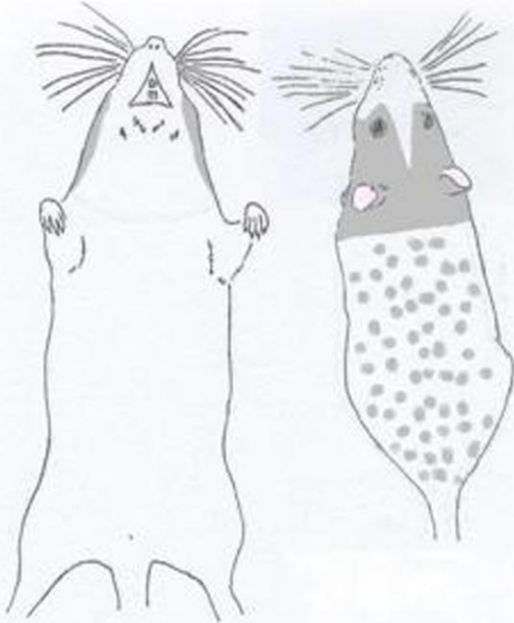


Black Blazed Hooded buck

BLAZED VARIEGATED - To have a coloured area covering head, neck and shoulders with white front feet. To have a facial blaze which must be wedge shaped and symmetrical. White area of blaze must cover whisker bed and nose and should extend up the face by tapering to a point between ears. Throat to be white, but back and sides to be evenly marked with coloured patches or flecks. Underside to be white. Tail to be white to half its length. Faults: White areas extending to cheeks. Coloured patches merging or too few coloured patches.

Possible Genotypes: H/h^e hs/hs or h^e/h hs/hs

BLAZED VARIEGATED



Ideal markings for a Blazed Variegated



Dumbo Russian blue Blazed Variegated doe



Dumbo Black Blazed Variegated buck



Russian blue Blazed Variegated doe



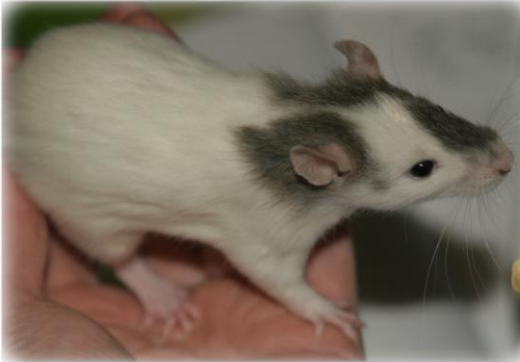
Dumbo Black Blazed Variegated buck



Dumbo Black Blazed Variegated buck

OTHER BLAZED:

BLAZED BAREBACK



Agouti Blazed Bareback kitten



Black Blazed Bareback buck



Agouti Blazed Bareback doe



Dumbo Black Blazed Bareback buck



Dumbo Black Blazed Bareback doe



Agouti Blazed Bareback doe

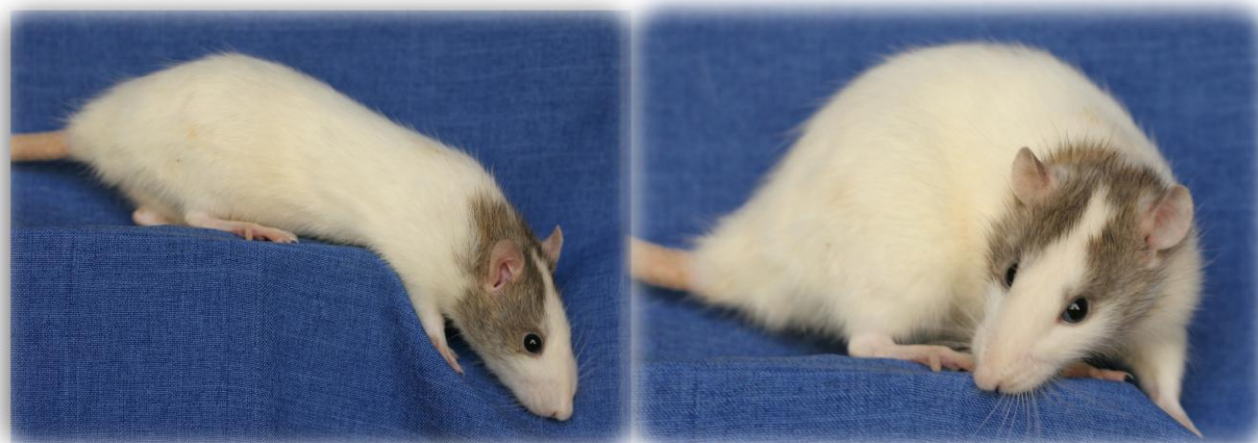


Agouti Blazed Bareback doe



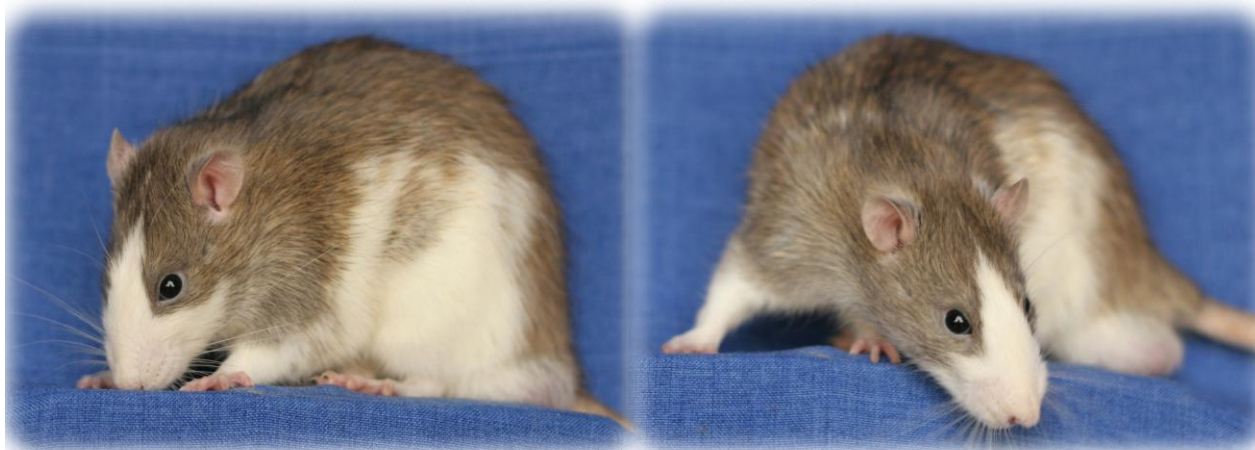
Black Blazed Bareback doe

BLAZED CAPPED



An Agouti Blazed Capped doe

BLAZED VARIEGATED BERKSHIRE



An Agouti Blazed Variegated Berkshire buck

THE HUSKY (AKA: ROAN) INFLUENCE

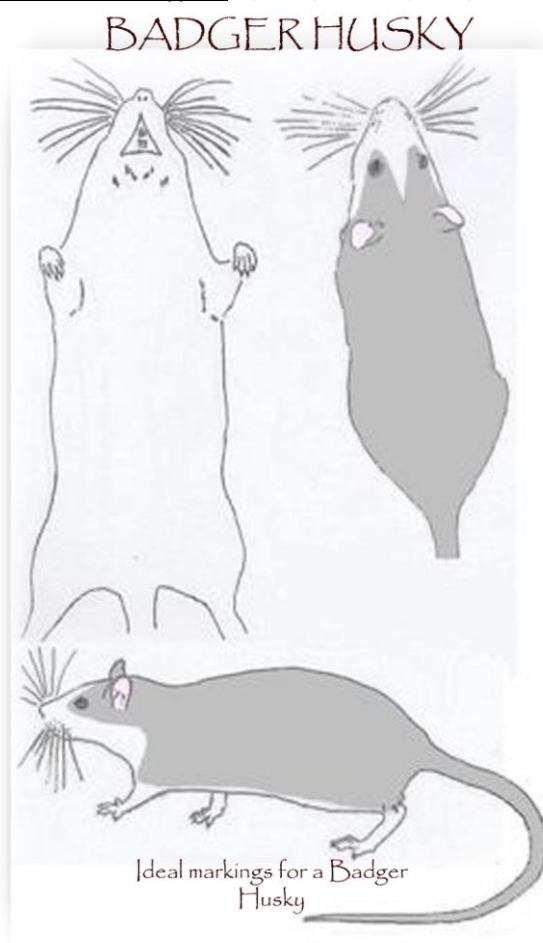
History of the marking in the fancy: Originated in Czechoslovakia and spread throughout Europe (Liem, 1999). Later imported to the USA and to South Africa.

BADGER HUSKY

S.A.R.F.C. Standards: To have a white V-shaped blaze, which includes whisker bed and comes close to eyes without touching them. Feet, belly and throat to be white. Rest of body roan coloured (see also roan under AOC). Tail to be a single colour. Faults: Coloured spots in white areas.

Roan (a colouring effect seen in adult Huskies) - A mingling of white and various shades of coloured hairs. The colour of the hairs depend upon the base colour. The roan effect should be as even as possible. Eye colour depend on base colour. Note: Only Badger Huskies and Banded Huskies can be roan (see also marked section).

Possible Genotypes: H/H ro/ro or H/h ro/ro



Black Badger Husky buck



Black Badger Husky doe



Black Badger Husky buck



Black and Agouti Badger Husky kittens amongst their Agouti Berkshire and Hooded siblings - The Husky kittens are not faded yet, they only start fading after their first moult.



Agouti Badger Husky doe

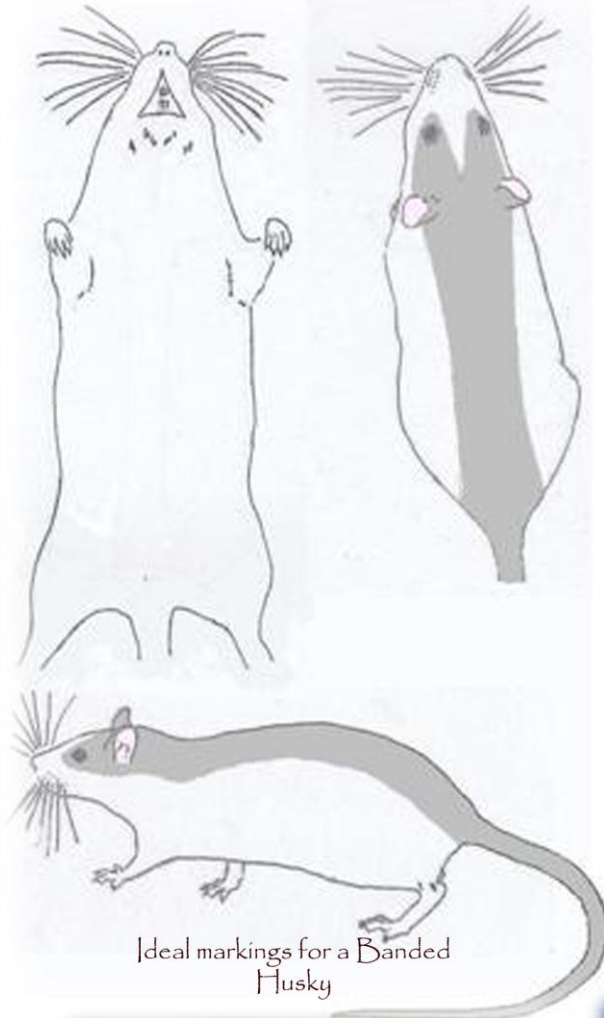
BANDED HUSKY

S.A.R.F.C. Standards: To have a white V-shaped blaze, which includes whisker bed and comes close to eyes without touching them. A 3 to 5 cm broad roan coloured stripe should run from head to tail base (see also roan under AOC). Rest of body to be white. Tail to be a single colour. Faults: Coloured spots in white areas.

Roan (a colouring effect seen in adult Huskies) - A mingling of white and various shades of coloured hairs. The colour of the hairs depend upon the base colour. The roan effect should be as even as possible. Eye colour depend on base colour. Note: Only Badger Huskies and Banded Huskies can be roan (see also marked section).

Possible Genotypes: h/h ro/ro

BANDED HUSKY



Black Banded Husky doe



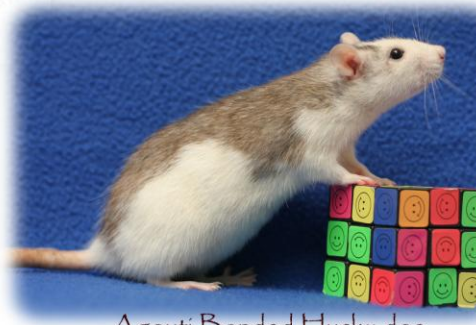
Black Banded Husky buck



Black Banded Husky kitten



Agouti Banded Husky kitten



Agouti Banded Husky doe

TURPIN

S.A.R.F.C. Standards: Not included in the S.A.R.F.C. Standards, but is basically a rat with small coloured spots all over the body.

Possible Genotypes: Possibly be an Essex based Husky.

CAP-STRIPE HUSKY

S.A.R.F.C. Standards: Not included in the S.A.R.F.C. Standards. It is a Husky with a broken stripe on the back and a capped marking on the head.

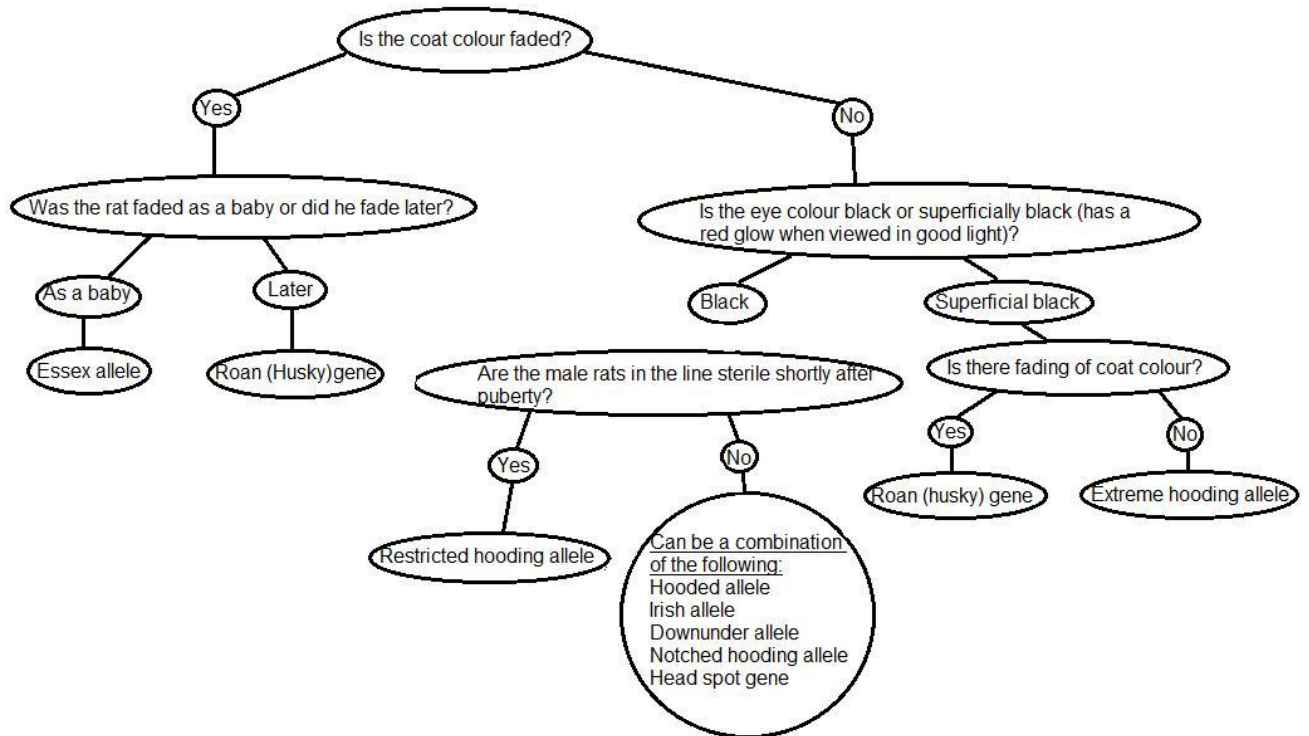
Possible Genotypes: Possibly a Husky with a combination of the h^e or h^n hooded alleles.



Beige Cap-stripe Husky kitten

DETERMINING THE GENES CAUSING A MARKING

The flowchart below can help in determining the possible genes that cause a marking in a specific rat. The key of determining a rat's genotype is to look for the key features that point out a specific hooded allele or other marking. Thereafter study the phenotypes described above that involves the target gene and hopefully the genetics can be figured out.



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