

About pied pigeons

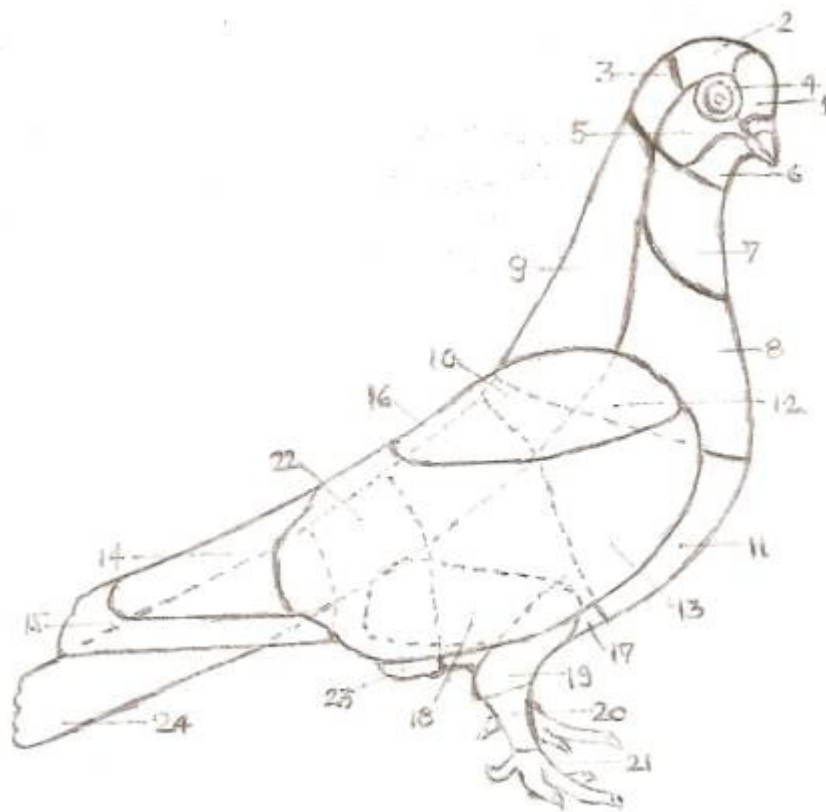
I was started raising pigeons (Galati Roller) since 1982. The main reason to breed pigeons is their ability to roll. They are found in a diversity of colors but most of them are pied (probably 'z*pi'/'z*pi'). I want to share here my observations connected to the inheritance of piebald patterns. At the beginning I observed that the colored parts of the body are related to the anatomic parts. In 1990, when I was studying human embryology, I was thinking that different skeleton segments with different embryologic origin might have different information about color and each skeleton segment is corresponding certain skin area. These different colored parts of the body can be observed also looking at feathers growing areas on 5-15 days old baby pigeons.

Today, after 15 years of observations, I can say that different colored areas are different markers of piebald with different genetic inheritance. For each skin area pigeons inherited a pied marker from each parents, which can be 'colored' or 'white'. If both pied markers are the same, a skin area is totally colored or totally white. If the pied markers are different skin area is partial colored, totally colored (if 'colored' is dominant), totally white (if 'white' is dominant) or left side and right side are totally different.

Every pied pigeons (with certain white areas) can be described with these pied markers like a sum of some white spots (a pied pattern is a sum of many pied markers). I am thinking that the markers of piebald are:

No	Body part	Skeleton part	Full color	Mookee	Baldhead	Lahore	Gazzi	Nun	Saddle	Magpie	Solid white
1	Forehead	Frontal	+	W	W	+	+	+	W	+	w
2	Top of the head	Parietal	+	W	W	+	+	+	W	+	w
3	Backhead	Occipital	+	+	W	+	+	+	W	+	w
4	Eye	Eye brow	+	+	W	w	+	+	W	+	w
5	Face	Ear	+	+	W	w	+	+	W	+	w
6	Chin	Lower beak, hyoid	+	+	W	w	+	+	W	+	w
7	Upper fore neck	Cervical vertebra	+	+	+	w	+	+	w	+	w
8	Lower fore neck	Cervical vertebra	+	+	+	w	w	w	w	+	w
9	Back neck	Cervical vertebra	+	+	+	+	w	w	w	+	w
10	Posterior cervical - thoracal joint	Cervical - thoracal joint	+	+	+	+	+	w	w	+	w
11	Chest	Clavicle, coracoid	+	+	+	w	w	w	w	+	w
12	Arm	Humerus	+	+	+	+	+	w	+	+	w
13	Forearm	Radius, ulna	+	+	+	+	+	w	+	w	w
14	Hand	Carpus, carpometacarpus	+	+	W	+	+	+	W	W	w
15	Fingers	Phalanges	+	W	W	+	+	+	W	W	w

16	Upper back	Scapula, thoracic & lumbar vertebra	+	+	+	+	+	w	w	+	w
17	Thorax	Sternum, cervical & thoracic ribs	+	+	+	w	w	w	w	+	w
18	Thigh	Femur	+	+	+	w	w	w	w	+	w
19	Ankle	Fibula, tibiotarsus	+	+	W	w	w	w	w	w	w
20	Foot	Tarsometatarsus	+	+	W	w	+	w	W	W	w
21	Toes	Phalanges	+	+	W	w	+	w	W	W	w
22	Lower back	Ilium, sinsacrum	+	+	w	w	+	w	w	w	w
23	Belly	Ilium, sinsacrum	+	+	w	w	w	w	w	w	w
24	Tail	Caudal vertebra, pygostile	+	+	w	w	+	+	w	+	w



Colored marker = "+". Dominant white marker = "W". Recessive white marker = "w".

I think that exists more than three alleles for 'Z' locus: 'Z+', 'z*pi' group (which include 'z' gene) and 'z*wh' ('Z+' >> 'z*pi' group >> 'z*wh'), that there is many loci who produced pied patterns (not only 'z' locus) and different loci affect different regions.

Probably there are many 'z*pi' alleles because some pied markers (different colored or not) have a linked inheritance in certain pied patterns. Sometimes, some pied markers have a dorso-ventral linked inheritance : back neck and lower fore neck, cervico-thoracic joint and chest, upper back and thorax, lower back and belly.

Some breeds have, for example a gene for dominant white tail. Dominant white wing tips and muffs (together), dominant white tail and dominant white head result from the same mechanism: incomplete migration of melanocytes from neural crest (probably these genes aren't alleles of 'z' locus). All recessive white pied markers (inclusively recessive white wing tips and muffs, white tail and white head) probably are parts of 'z*pi' alleles and result from a different mechanism like early melanocytes' death in these areas or a blockade of melanocytes' proliferation after entering the epidermal layer.

I don't know yet that splash ('z*sp') or pencilled ('z*pc') are alleles for 'Z' locus (probably 'Z+' >> 'z*sp' or 'z*pc' >> 'z*wh'). I suppose that a splash (or pencilled) colored area is recessive to an uniform (partially or totally) colored area. A mechanism for splash areas is: some melanoblasts survive in the affected area and produced pigment patches. Probably pencilled is a regulatory gene (like grizzle) who modifies certain colored regions of pied patterns.

If each pied pattern have different white spots (white areas), a complete white color might be one big spot ('z*wh' might be a part of 'z*pi' group). I am thinking that are two kind of solid white : the first (one big spot) is 'z*wh'/'z*wh' and the second (a sum of many white spots) is a combinations of pied patterns ('z*pi'/'z*pi') in association (or not) with some dominant white genes. Sometime a 'Z+'/'z*wh' pigeon looks like a 'z*pi'/'z*pi' pigeon (like a mismark pied pigeon).

For every pigeon I know 6 big areas:

1. upper area: forehead, top of the head, backhead, eye (brow), face (ear), chin, upper fore neck;
2. anterior area: lower fore neck, chest, back neck;
3. wings;
4. feet;
5. posterior area: thorax, back, belly;
6. tail.

1. For example, the upper area have the most complex inheritance. Recessive white pied markers have a different inheritance. Dominant white head (I think that it isn't an allele for 'z' locus) don't include upper fore neck and probably have an allele: only forehead, top of the head and eye brows are white.

I think that there is two kinds of baldhead. One of them (with bull eye and, sometime, with beard - white anterosuperior neck) might be an allele of white cap. The other (with colored eyes) don't and, probably, it is allele with white bib (under beak). Both can be together at the same pigeon. The first is recessive and epistatic to second (the second is dominant). I suppose that more white on antero-superior neck (white beard) is linked to more white on belly.

About pearl-eye (with white pigment granules on the outer surface on the iris = 'colored') and bull-eye (without granular pigment = 'not colored'), which is linked with white head, I think that bull-eye is recessive.

2. For anterior area I know three possibilities (parts of 'z*pi' alleles):

- a. colored back neck, cervico-thoracic joint, lower fore neck and chest, dominant,
- b. colored back neck and cervico-thoracic joint, white lower fore neck and chest (ventro-lateral white spot),
- c. white lower fore neck, chest, back neck and cervico-thoracic joint, recessive.

There is another mutation (probably not a part of 'z*pi' group) with white back neck and lower fore neck, colored cervico-thoracic joint and chest and (probably) with a recessive allele: white back neck and lower fore neck, white belly and lower back.

3. I think that for wings there is:

- a. colored wing (arm, forearm, hand and fingers), dominant = 'Z+';
- b. colored arm, white forearm, hand and fingers, recessive, (a part of) a 'z*pi' allele;
- c. white arm (linked with white posterior cervical-thoracal joint), colored forearm, hand and fingers, probably 'Z+' + a recessive gene for white arm;
- d. white shield (arm and forearm), colored wing tips (hand and fingers), recessive, probably (a part of) a 'z*pi' allele or 'Z+' + a recessive gene for white shield;
- e. colored shield (arm and forearm), white wing tips = colored wing (a) + a gene for white wing tips;
- f. white wing = b. + c. or white shield (d) + a gene for white wing tips (probably it isn't an allele of 'z' locus). Probably there is an allele for that gene: only last 2-3 feathers are white.

4. There is a similar conclusion for feet.

5. For posterior area (thorax, back, belly) I know three possibilities, too:

- a. colored area, dominant;
- b. colored thorax, white back and belly (dorso-lateral white spot);
- c. white area, recessive.

Probably white lower back (and colored thorax, belly and upper back) at a self color pigeon is a different mutation.

6. About tail, I know that there are :

- a. dominant white tail, an independent gene;
- b. recessive white tail, a part of a 'z*pi' allele;
- c. dominant colored tail, a part of a 'z*pi' allele.

The conclusion is: a body part = a skin area = a pied marker (for some colored birds the conclusion is: a body part = a skin area = a different colored marker).

.....But you know, there are only speculations, I can't prove that by scientific facts.