Soft Scale and “Scatter” Scale
The source of confusion around the Soft Scale gene in Crested Geckos

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The following history of the Soft Scale gene in Crested Geckos is highly enlightening regarding how we have arrived at our current definition. Please spend the time reading the article in its entirety to fully understand the unraveling of our current understanding.

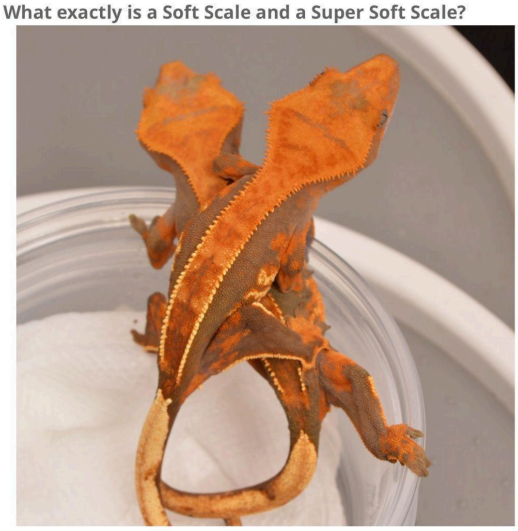
The Soft Scale gene was first discovered in 2003 by Anthony Caponetto, who noted it as “subtle”, but different enough for him to take note, and to “*keep an eye on*”. He did this by, (in his own words) *“Breeding the original Soft Scale female with Harry* (The male Crested Gecko behind the “Harry Line”) *and held almost everything back for years”.*

In an updated section from his website, (www.acreptiles.com) written in 2018, Anthony states “*it appears these geckos (soft scale) exhibit fewer bumps or "scales" on their skin, leaving more space between”* and that “*On some geckos the pinstripe scales seem to flatten and somewhat enlarge in diameter, while on others, the pinstripe scales seem to be of normal shape and size, but they're far more spread out.”*

Here, the original sire to the future soft scale line (Harry) is mentioned once again… “*Our famous Harry lineage's structure is a big part of the founding group of Soft Scales, so I think that gives us a bit of a* ***wildcard****, and is probably why we see some variation”* Anthony describes his decision for this pairing “*Since it was a unique scale structure or texture that I hadn't seen (or felt) before, I decided to breed her to Harry, an unusually* ***spiny/shaggy*** *looking male that matched her color and pinstripe pattern. I figured that way I would have two unique "side projects" in one, and regardless of how soft the soft scales got, Harry's DNA would provide me with the best chance of maintaining great crest structure with the Soft Scales. The softness was indeed inherited by several of the first generation of Soft/Harry offspring, and we got some nice examples of Harry's structure as well.”*

From 2018:

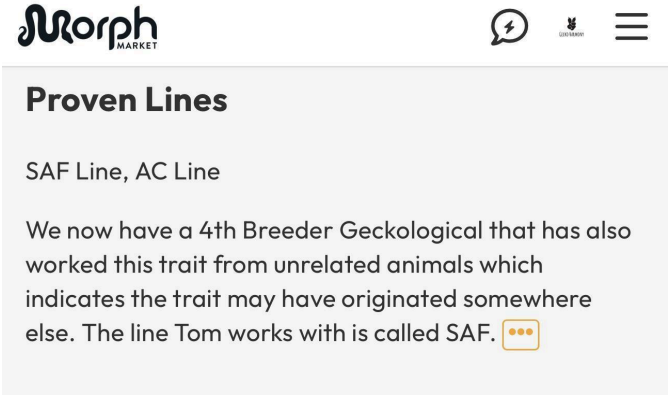
What exactly is a Soft Scale and a Super Soft Scale?



For years I wasn't sure, physically, what exactly it was causing these geckos to look and feel different from anything else I had seen. Upon examining some professional macro photographs, and looking at some of the more extreme examples of Super Soft Scales under a photographer's loupe, it appears these geckos exhibit fewer bumps or "scales" on their skin, leaving more space between. On pinstripe pattern scales along the dorsal crests, things can vary a bit. On some geckos the pinstripe scales seem to flatten and somewhat enlarge in diameter, while on others, the pinstripe scales seem to be of normal shape and size, but they're far more spread out. Our famous Harry Lineage's structure is a big part of the founding group of Soft Scales, so I think that gives us a bit of a wildcard, and is probably why we seem some variation in the way pinstripe scales are arranged or shaped.

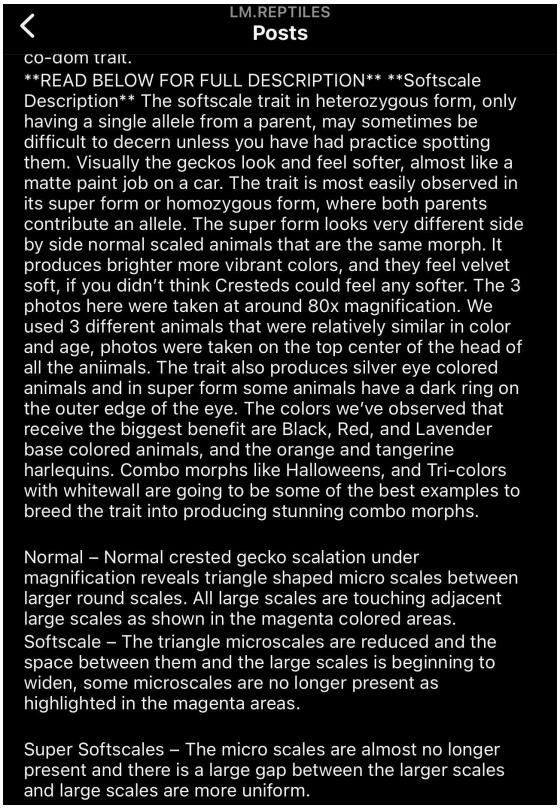
acreptiles.com

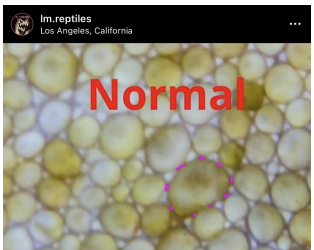
While Anthony Caponetto is widely accepted as the founder of the Soft Scale gene, it is also noted that another line has arisen in the last few years. This line is known as SAF (Soft As F***). This line originates from Tom Favazza of Geckological, a founder of Foundation Genetics. SAF is recognized on Morph Market and Foundation Genetics website as a Proven Line. According to the Morph Market description, this line is claimed as having originated from unrelated animals, however it is safer to assume it is the same gene at play until proven otherwise.

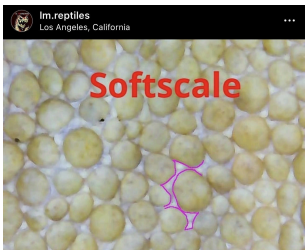


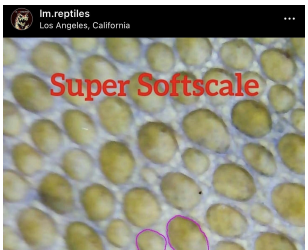
Refining the definition

The next major event surrounding this gene occurred in April 2020 when Soft Scale was independently verified by Anthony Vasquez of LM Monsters, another founder of Foundation Genetics. The description, which includes phenotype descriptions (visual differences between Normal, Softscale, and Super Softcale), can be seen to the right. This is the first mention of "*triangle-shaped micro scales"* that we could find. The description states that these "*micro scales"* are "*almost no longer present, and there is a large gap between the larger scales*" in the Super Softscale (Homozygous) form. The description here states that photos were taken of 3 different animals (n=3) at 80x magnification and that the photos were taken at the top center of the head**.** The photos used as examples in this post are included below, and were the first accepted visual guides to assist in identifying the gene.

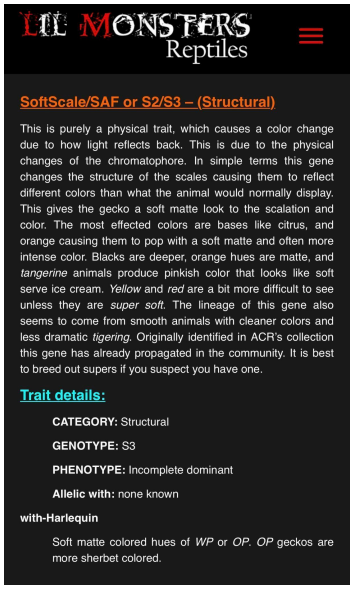


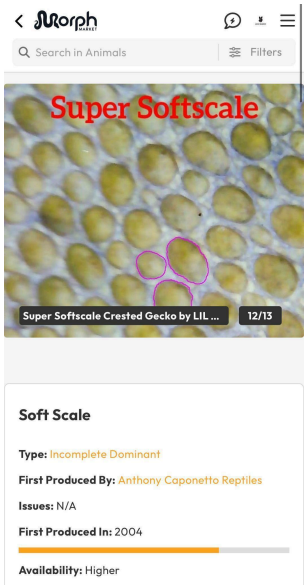






The current descriptions from the Foundations Genetics website (a widely used resource for describing Crested Gecko genetics) can be seen to the right. This description lists SoftScale/SAF together as a "*Structural*" trait, defining it as *"purely a physical trait*" that changes the structure of the scales, which in turn causes light to reflect a different color. The Current Morph Market definition lists the gene as incomplete dominant and includes the images from the above mentioned post as examples to identify the gene. Morph Market describes the gene as follows: *"It appears these geckos exhibit fewer bumps or scales on their skin than most non soft scale geckos, leaving more space between them, giving a soft feel to the gecko."*





The descriptions listed above are what we consider the most widely accepted and are currently used across the hobby to aid in identifying Soft Scale when present in an animal.

Finding the Heterozygous Form

In 2023, Nicholetta Donaldson of Giuliana's Geckos and Daniel Foley of Gecko Harmony published the article "Soft Scale Explained," which outlined a study conducted as an attempt to find a consistent Heterozygous marker for the Soft Scale gene. Using the above-mentioned definitions and visual guides that identify scale spacing as the main marker, the sole focus of the study was to measure scale spacing in all forms of the gene accurately with laboratory equipment and practices.

******Note*** When we began the scale spacing study, we were initially very disappointed by how few of our "expected" (by the look and/or lineage) Soft scale animals showed the scale***

spacing that defined the homozygous form (n = 46 combined / 200+ expected). Regardless, we conducted the study by "resetting" our collections, with spacing as the identifier. ***End note**

The study was robust, analyzing a large group of animals, and concluded that there was no statistically significant spacing difference between Wild Type (Normal) and Heterozygous animals (p > .05). In summary, the study found that the Soft Scale genetic (As defined above by scale spacing) acts in a recessive manner. The "Soft Scale Explained" research summary can be read in its entirety here: https://www.giulianasgeckos.com/soft-scale-explained

Another outcome of this study was a better understanding of the "interscale structure" and how this gene affects it. Below is a comparison of the earlier images used to identify "Super Softscale" on the left and a higher resolution image showing more detail on the right. The image on the right clearly shows a scale "splitting" of the secondary scales. While this splitting can vaguely be seen in the image on the left, they were previously identified as a diminishing "micro-scale."

Findings

Because many believe they can see a visual difference in heterozygous Soft Scale animals, once the study was concluded, many asked the same question…"How do you explain the soft scale "look" in animals if there is no spacing (structural impact of the gene)?" Initially, we proposed a few alternative possibilities to explain how this could be accomplished, which included a form of hypo being responsible/confused as the soft scale "look", or a selection for a "clean" phenotype (low levels of tigering/pattern) being the cause. Still, it was until we began to track the Soft scale look on its own, and compare the results with those from the scale spacing study, that an understanding began to take shape. The tracking results below formed four readily apparent phenotypes:

1.) Super Soft phenotype (the look of), with NO spacing. These animals originate from Anthony Caponetto's Super Soft scale animals. They typically have a very clean "hypo" like

appearance with a homogenous color, (more uniform) and a smooth appearance/texture to their skin. There is no additional space between primary scales when compared to wild type specimens. Scale **height** *may be* affected, which could account for the "soft" appearance, however, the lack of scale spacing remains consistent with the wild type. **This look is inherited in either a recessive or incomplete dominant fashion, and is believed to be closely related to the current "Hypo" gene. It has been separated from the scale spacing that previously defined the Soft Scale genetic in multiple generations.**

2.) Homozygous for spacing with NO "Soft scale appearance." (Scatter Scale)These animals were included in the scale spacing study and have a larger spacing between primary scales (~20% wider), with scale splitting between primary scales seen over most of the body. These animals were also noted as well structured (large pins, heads, and bodies) and can be quite "bumpy" in texture. **This phenotype, along with the scale spacing trait, appear to be passed down in a recessive manner and has been tracked over multiple generations.**

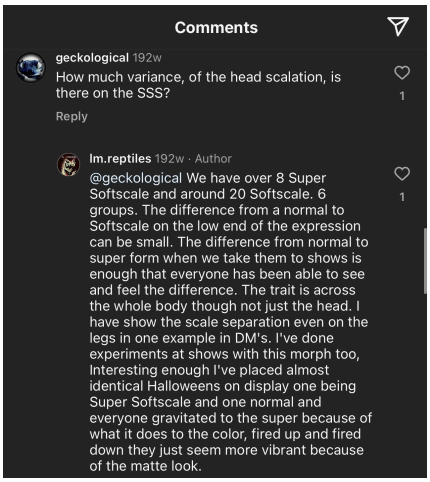
3.) Double Homozygous - (Super Soft Scale appearance AND Scatter Scale) These animals are considerably rare and coincidentally are our most exceptional examples. There seems to be an intermediate expression of scale height somewhere between the "bumpy" texture from category (1) above and the smooth texture from category (2). Scale spacing is consistent with category (2) animals.

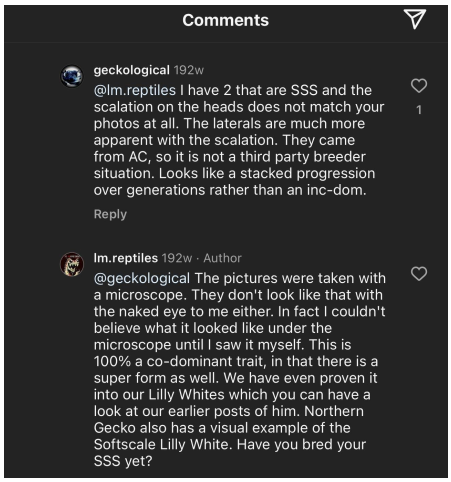
4.) Hets - While the spacing genetic that was tracked in "Soft Scale Explained" is inherited in a recessive nature, the inheritance of the "Soft Scale" look (in Heterozygous animals) has been noted as subtle since its founding in 2003.

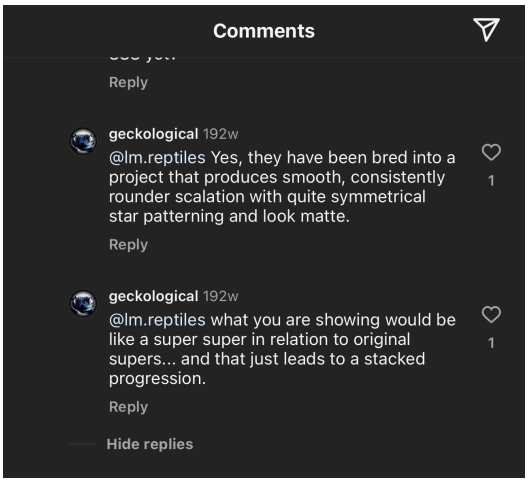
The most important thing to note about the categories above is that the scale spacing and the soft scale "look" can, and have been separated over multiple generations. In other words, we believe the Soft Scale gene should not be defined by scale spacing, nor as purely structural gene. At this point, we want to point the reader back towards the original definition on Anthony Caponetto's website and his mention of the "***wildcard***," which is the Harry line structure that is so embedded into the soft scale line. We believe that the examples previously used to describe the gene fell into category (2) or (3) above and hence misattributed a causal relationship when, in fact, there were multiple genes at play. For our own purposes, and because of the way it impacts scale spacing we have begun using the term **"Scatter Scale"** when describing the scale spacing structural trait, and continue to pursue the best way to describe the Soft Scale gene now that a more precise understanding has been found. We are researching the relationship between AC's Harry Line and the information we have offered with this research, as we believe there to be a correlation between the "Scatter scale" gene (as we call it), and AC's Hairy Line animals. It is worth noting, that because these two traits (soft scale and the scale spacing gene) have been so thoroughly intertwined since the

very beginning of the Soft Scale line, it is not surprising that there has been confusion in the past, especially when only a small number of animals were considered for assigning previous definitions.

Unanswered questions







In the "Soft Scale Confirmed" post, (announcing the independent confirmation of the Soft Scale gene), Tom Favazza of Geckological initially questioned the explanation of findings shortly after the post was written, noting that his Super Soft Scale animals (bought directly from Anthony Caponetto) did not match the proposed images. While in hindsight, we now see that these questions should have been explored further, the comments also shed light on a scenario that could potentially arise when information is shared and accepted without a robust analysis. Whether or not “new” lines (or genes) were, or have been “found” due to the early mislabeling of the Soft Scale gene as a structural trait in the scales is unknown. These traits have been in the hobby for quite some time…and, therefore, have likely worked their way into various projects.

As an example: If a line of animals looks very “Soft Scale” but after multiple breeding seasons had never displayed the structural change that had previously defined the Soft Scale gene (scale spacing), one could easily be fooled into thinking they had found a new form of “Soft Scale,” or Hypomelanism (e.g. “SAF”, “Cold Fusion”). The same thinking could be applied to the “Split Scale” trait, as some genes/traits that are currently described as impacting scale structure (eg. “Furry,” "Aberrant scale”) could also be “misattributed”.

What's Next?

While we continue to unravel some of the confusion around the Soft Scale gene, we have been rewarded in gaining some insight into some of the more unique color hues found among Crested Geckos. Results that didn’t always make sense have become more evident now that we have two independent variables at play that can impact color: Soft Scale, by its very

“hypo” like impact, and Scatter Scale (as we refer to the findings in our “Soft Scale Explained” research), through its impact on the scale and thus the refraction of light through it. As mentioned above, in category (3) animals, combining these two traits produces the most impressive animals (in our opinion). Thus, credit should be given to Anthony Caponetto for his vision of combining the two traits from the very start.

Our goal in offering this extended information is to continue providing more insight for consumers to use and figure out within their collection. Crested Gecko Genetics are ever-evolving, and indeed picking apart each gene in its entirety will continue to help us grow and learn more about this amazing species. We do not expect anyone to rename the gene on our behalf, however, we feel it would be a disservice to anyone passionate about this gene if we are not honest with our continued findings. We look forward to sharing more details, including all supporting examples and lineages, in our upcoming E-book!