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Blue Cattleyas

BY COURTNEY HACKNEY

EVEN AFTER MORE than 50 years, I still remember my first blue cattleya. It was a seedling from Stewart Orchids carefully nurtured until two big buds emerged from the sheath. As a naïve teenager working weekends at an orchid nursery, I could not wait to get back the following Saturday to see a blue cattleya. To my great disappointment, it was not blue at all, but instead poorly shaped and normally colored. A few years later, a seedling of *Cattlianthe* Blue Boy purchased from the B.O. Bracey Company bloomed. I then understood why so many cattleya growers were entranced by coerulea cattleyas.

Courtney Hackney

It is unfortunate that the coerulea color form in cattleyas was ever called blue. According to the Exotica Horticultural Color Guide, coerulea cattleyas fall in the cyanic color range described as lavender, lilac, mauve, amethyst, and at the darkest end of the spectrum, indigo. Each grower has their own description they apply to a coerulea cattleya, but critically they find them distinctly different from the typical cattleya color form. Describing this color form is even more complicated by variations seen in natural versus artificial light. It is impossible to appreciate a coerulea cattleya under artificial lighting. No matter how the color is described, it is not blue and is not generated by blue pigments in the flower. Typically, a coerulea-colored cattleya will be listed as variety coerulea or forma coerulea, although in most cases these names have no formal taxonomic significance.

During my years of literature study and interviews for *American Cattleyas*, I could not identify clear patterns in hybrid lines that led to coerulea cattleya seedlings. Repeatedly, two good coerulea clones produced lavender hybrids and not the desired color form. Many interviewees admitted making a coerulea hybrid or two in the 1960s and 1970s, but with no success when it came to producing seedlings that were coerulea colored or in producing coerulea flowers superior to their parents. As a consequence, the few good coeruleas available were cloned and widely distributed. Commercial attempts to improve coerulea cattleyas hybrids were largely abandoned by the 1980s.

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[1] *Cattlianthe* Blue Boy 'Gainesborough' HCC/AOS (Ariel × *Cattleya* × *elegans*). This clone incorporated a hybrid developed by the first serious hybridizer of coerulea cattleyas, Sir Jeremiah Coleman, in early twentieth-century England with a famous blue *C.* × *elegans* that had been collected from the wild.

[2] *Guarianthe bowringiana* (*Cattleya bowringiana*) is widely available in the coerulea form and used extensively in hybrids because of the intense pigmentation on its sepals and petals; usually passed on to its hybrids.

[3] *Cattlianthe* Portia 'Sir Jeremiah Coleman' (*Gur. bowringiana* × *Cattleya labiata*) made in the early part of the twentieth century is still in cultivation and an excellent example of the coerulea color form.

Most coerulea cattleyas selected for cloning were highly influenced by one species, *Guarianthe bowringiana*, which has some of the darkest and most widely available coerulea forms. Unfortunately, decades of hybridizers focusing on coerulea forms of *Gur. bowringiana* limited the range of possibilities found within the cattleya alliance. This review summarizes my recent study of coerulea cattleyas and provides some insight into approaches for categorizing and improving coerulea hybrid lines.

HISTORY Sir Jeremiah Coleman deserves credit for intentionally making the first coerulea hybrids in the early 20th century. Clones of his remake of *Cattlianthe* Portia and *Cattlianthe* Ariel using coerulea parents can still be found in collections today. In the latter half of the 20th century, there were a number of independent hobbyists who had an interest in producing coerulea cattleya hybrids even when commercial nurseries did not. The best known is Carson Whitlow, who shared his research and approach in hybridizing in a series of articles published in the *American Orchid Society Bulletin* and *Orchid Digest*; these articles remain important sources of information even today. His collaboration with Stewart Orchids in the 1960s and 1970s produced numerous coerulea hybrids.

A number of amateur hybridizers, including Joe Grezaffi, followed Carson Whitlow's recommendations and made

crosses where the goal was improving the coerulea cattleya lineage. Grezaffi's willingness to share both failures and successes provided important data for the analyses that follow. Early hybridizing efforts were made more difficult by the large number of coerulea-like clones that were sold as coeruleas, but were genetically light lavender. Unfortunately, there is similarity between some light lavender clones and true coerulea clones. Ervin Granier was an amateur hybridizer who discovered that drying coerulea and coerulea-like flowers provided a way to determine if a clone was a true coerulea or a coerulea imposter. Once dried, flowers would clearly be coerulea or lavender, allowing him to make hybrids with a high degree of success. His hybrids, many of them remakes of earlier hybrids, resulted in many AOS quality awards. This led to a renewed appreciation of the coerulea color form by a new generation of hobbyists who had not experienced the frustration of buying coerulea hybrids only to find that they did not flower with the desired color. Fred Clarke, at Sunset Valley Orchids, also made and distributed many coerulea hybrids. He expanded the realm of coerulea cattleyas by adding Brazilian bifoliate species to the mix, creating unique spotted coerulea hybrids. His knowledge of species compatibility confirmed most of the conclusions found in this article.

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GENETICS It is difficult to avoid a discussion of exactly what causes the perceived color within the cattleya flower to move into the coerulea color range. There is no evidence to suggest a genetic change that produces a different pigment from the normal form. Some growers report intensification of coerulea colors in cattleyas and phalaenopsis when they decrease pH or add supplements to water. A good working theory is that coerulea color is produced by a recessive mutation that results in a pH change within plant tissues. This change in tissue pH impacts leaves, roots and, of course, flowers. True coerulea clones are often identified by a lighter-green color of leaves and the lack of pigment on roots, a method allowing the identification of a seedling that will exhibit coerulea flowers.

Based on an examination of seedlings from many coerulea hybrids, there is clearly a distinct genetic cause. Data from many hybrids support the idea that there are at least two independent, recessive genetic mutations that lead to coerulea flowers in cattleyas. Hybridizing two coerulea clones with different mutations produces normally colored flowers, not coerulea clones. Back crossing these F1 (first generation) seedlings to either parent produces a proportion of coerulea F2 (second generation) seedlings. Unfortunately, few making such F1 backcrosses tracked proportions of normal versus coerulea F2 seedlings. Based on a small sample size, a coerulea clone of *Cattleya aclandiae* 'Blue Surprise' that arose from a selfing of the noncoerulea clone 'Gulf Glade' AM/AOS produced approximately 50% coerulea offspring when crossed back to its parent. There are likely cases where the loss of a portion of a chromosome also leads to coerulea color in flowers. This condition typically also leads to infertility, a common trait of many potential coerulea hybrid parents. The answer to the exact genetic cause of the coerulea color form awaits detailed genetic study.

Cattleya hybridizers decided which species add desired characteristics to their hybrids largely through trial and error. For the past 100+ years, they selected hybrids with the proportions of floral characteristics from many different

[4] *Rhyncattleanthe* Grezaffi's Blue (Victoria × *Cattleya* Holdenii) garners attention whenever it is exhibited because of its intense color magnified by its vigorous growth, which produces an abundance of flowers on a standard-sized cattleya. This 'Shawn' HCC/AOS clone was exhibited by Allen Black.

[5] *Cattleya* Granier's Charm 'Gran Patty' AM/AOS was awarded in 2003 with four, well-spaced flowers over 5 inches (12+ cm) in natural spread on one inflorescence. Ervin Granier's hybrid received a total of six awards, with the clone 'Blue King' receiving an 88-point Award of Merit in 2004.

species until they had the desired proportions of each species in a clone. *Cattleya* species and hybrids almost always produce viable hybrids, providing hybridizers with a large number of possible primary hybrids and an almost unlimited number of second-generation hybrids if all the different color forms of species are added to the equation. Unfortunately, species important in producing key floral characteristics were either not available in coerulea form or, when combined with coerulea hybrids or species, did not produce coerulea hybrids. For example, adding the coerulea color form of *Cattleya trianae* that contributes large overlapping petals to cattleya hybrids did not produce coerulea flowers in numerous crosses. Inconsistency in predicting the coerulea color along with other desired floral characteristics has severely limited development of coerulea hybrids.

An examination of many coerulea hybrids, some made many times, leads to the following observation consistent with the existence of two different genetic mutations designated here as Type A and Type B. Although it is tempting to assume that all coerulea clones found in nature can be assigned to Type A or Type B based on the species in which the color form is found, that may not be appropriate. It is more likely that both Type A and Type B mutations can occur in many *Cattleya* species. Most coerulea clones in cultivation arose from a small number of wild-collected plants. Carson Whitlow noted the rarity of coerulea clones when he began his exploration of coerulea hybridizing. Consequently, current coerulea breeding stock of any species would have the same mutation. Most *C. trianae* clones will not produce coerulea offspring when crossed with any member of Type A species. A recent, wild-collected coerulea clone, 'Quimbaya', matched to a Type A hybrid successfully produced coerulea progeny (*Cattleya* Catahoula Blue) implying that this clone has the Type A genetic mutation and not the normal Type B found in other *C. trianae* clones. Unfortunately, this clone of *C. trianae* does not have overlapping petals and sepals that would lead to improvements in floral form in hybrids. Future hybrids will confirm if this is the case. There may be other genetic mutations, Types C, D, etc., that could also lead to coerulea color forms.

Data are consistent with *Cattleya amethystoglossa*, *Cattleya bicolor*, *Gur. bowringiana*, *Cattleya gaskelliana*, *Cattleya guttata*, *Cattleya harrisoniana*, *Cattleya intermedia*, *Cattleya labiata*, *Cattleya lawrenceana*, *Cattleya loddigesii*, *Cattleya maxima*, *Cattleya mossiae*, *Cattleya nobilior*, *Cattleya pumila*, *Cattleya purpurata*, *Cattleya schilleriana*, *Cattleya sincorana*, *Cattleya tigrina*, *Cattleya walkeriana*, *Cattleya warneri*, *Cattleya warscewiczii*, and *Laelia anceps*, having the same genetic mistake, i.e., Type A. *Cattleya aclandiae*, *Cattleya lueddemanniana*, *Cattleya percivaliana* and *C. trianae* have a different genetic mistake, Type B, and do not usually produce coerulea hybrids when matched to the species listed as Type A. Coerulea forms of *Cattleya eldorado*, *Cattleya jenmanii*, *Cattleya mendelii*, *Cattleya quadricolor*, *Guarianthe hennisiana* (an older name for *Guarianthe patinii* long confused with × *deckeri*, a synonym of *Guarianthe x laelioides*; the older name for *x guatemalensis*), *Cattleya schroederae*, *Gur. skinneri* and *Cattleya violacea* were not placed in either group because no reliable data on coerulea hybrids was found for these species beyond selfing. Originally, *C. guttata* and *C. tigrina* (*C. guttata* var. *leopoldii*) were considered the same species, making analyses of coerulea hybrids with this form difficult to interpret, but *C. guttata* likely contains the Type A mutation. Also, *C. nobilior* was once considered a form of *C. walkeriana* (*C. walkeriana* var. *nobilior*) and produced coerulea hybrids when matched with Type A species. It is also worth noting that *C. purpurata* is placed into Type A for the werkhauseri form only. There are other varieties/forms of *C. purpurata* that are described with violet-blue colors, notably roxo-violeta (Menezes 2009) that may also produce coerulea-type hybrids, albeit with distinct violet-colored lips. Other *Cattleya* species do not have coerulea forms. That does not mean that these species cannot produce coerulea hybrids when crossed with coerulea *Cattleya* species or hybrids. A wild-collected clone of a natural hybrid *Cattleya* × *elegans* involving the coerulea werkhauseri form of *C. purpurata* (*tigrina* × *purpurata* var. *werkhauseri*), was

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[6] *Cattleya* Granier's Felicity 'Blue Honey Pie' AM/AOS possessed the best color found in coerulea hybrids contrasted with a mostly yellow lip. It was one of five clones of this hybrid that garnered quality awards from the AOS.

[7] *Cattleya aclandiae* (Coerulea color group) 'Blue Surprise' arose from a grex of normally colored siblings.

used to produce some famous hybrids including *Ctt*. Blue Boy. *Cattleya* Elegans (coerulea form) was also produced artificially by crossing a green (alba) form of *C. tigrina* with the werkhauseri form of *C. purpurata.*

It is worth repeating that both mutations, A and B, could exist in all *Cattleya* species. There were also several other anecdotal examples of two coerulea color forms that should have the same mutation, A or B, but did not produce coerulea offspring. Unfortunately, photo verification of parents involved was not available for confirmation that they were true coerulea forms.

Hybridizers have focused most of their attention on producing coerulea cattleyas with the most intense pigment without considering other attributes of *Cattleya* species that have coerulea forms. There are clearly several approaches possible that can produce coerulea cattleya hybrids with distinctly different floral attributes, each beautiful in their own way. The following list separates coerulea hybrids into five approaches and notes important parent species.

GROUP 1

Multifloral with Colored Sepals and Petals Where the Lip is Not the Central Focus

Most coerulea hybrids belong in this group largely because *Gur. bowringiana* has been so important in adding the coerulea color to sepals and petals. *Cattlianthe* Blue Boy, *Ctt.* Portia and *Rhyncattleanthe* Grezaffi's Blue are excellent examples of the role *Gur. bowringiana* plays in this hybrid line, even after several generations. *Cattleya loddigesii* also contributes to this hybrid line, bringing saturated coerulea color to the sepals and petals along with a flat carriage. It does reduce flower count in hybrids and results in a more open flower. *Guarianthe bowringiana* increases flower count, but leads to poor arrangement of flowers on a stem. Often there is a contribution in a hybrid's background of a unifoliate cattleya such as *C. gaskelliana* or *C. warneri* in this hybrid lineage, both of which have been widely available in coerulea forms. Hybrid combinations including *C. loddigesii* can produce offspring with coerulea sepals and petals and a yellow lip, especially if *C. loddigesii* is prominent in the background.

GROUP 2

Multifloral with Distinct Coerulea Lip Color

Seldom are any unifoliate *Cattleya* species or *Gur. bowringiana* a part of this coerulea line. Instead, *C. intermedia*, *C. loddigesii* and *C. amethystoglossa* are prominent. The best of this lineage have many open-form flowers well arranged on a strong stem with the defining characteristic being a distinct coerulea lip and white sepals and petals. On some clones, sepals and petals may be light coerulea in color as long as the color does not distract from the contrasting lip.


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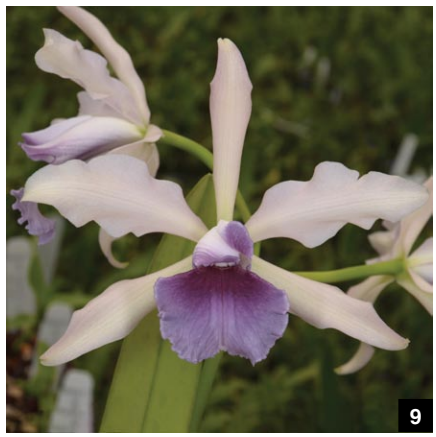
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GROUP 3

Miniatures

Several miniature species provide excellent starting points for both coerulea color and small plant stature. *Cattleya walkeriana*, *C. sincorana* and *C. pumila* in various combinations have produced excellent coerulea hybrids. Generally, there are few flowers per stem, but often these hybrids flower several times per year and are good candidates for windowsill culture, making them popular with hobbyists. Mixing these hybrids with large-flowered coerulea species or hybrids generally produces larger flowers in hybrids, but with the loss of the sought-after miniature characteristic as in *Cattleya* Blue Velvet 'Surprise' (Kazuko Takamatzu × Mini Purple). The best hybrids in this lineage seem to be primary hybrids or backcrosses to one of the miniature parental species. As better coerulea forms of the three key species become available, hybrids should also

[8] *Cattleya purpurata* (Werkhauseri color group) (*Laelia purpurata* var. *werkhauseri*) is one of many color forms of *C. purpurata*. All clones are reported to have come from one wild-collected plant. It has violet overtones in its lip and its hybrids identified by distinctly different blue coloration. This cultivar is 'Kathleen' AM/AOS.

[9] *Cattleya* Elegans (*tigrina* × *C. purpurata* [Werkhauserii color group]) is the parent of *Ctt*. Blue Boy. No photos of the original, wild-collected clone used to make the cross are available, but artificially produced hybrids show the color and form of the original.

[10] *Cattleya loddigesii* 'Blue Sky' AM/AOS is an excellent example of the intense color found in many excellent coerulea clones and an important parent for coerulea hybrids.

[11] *Cattleya gaskelliana* has contributed to increased size in coerulea hybrids. There are also some of the best colored forms within the unifoliate group in this species and *Cattleya warneri*.

improve with respect to flower color, intensity and form.

GROUP 4

Standard Unifoliate Hybrids

Large flowers with overlapping petals and intense coerulea color on the sepals, petals and lip should be the goal in this hybrid line. Some of the most beautiful coerulea forms of species can be found among the unifoliate cattleyas, notably *C. gaskelliana*, *C. labiata*, *C. lueddemanniana*, *C. mossiae*, *C. percivaliana*, *C. trianae*, *C. warneri* and *C. warscewiczii*. There is major genetic incompatibility between some species, as noted earlier. However, there are no clones of any of these species that match the intense coerulea color found on the sepals and petals of *Gur. bowringiana*. Matching *Gur. bowringiana* with unifoliate cattleyas has produced excellent coerulea-colored hybrids and clones, e.g., *Ctt*. Portia 'Sir Jeremiah Coleman', but with the subsequent loss of flower size and stem arrangement. Attempts to hybridize this type of hybrid back to large-flowered species have been unsuccessful with respect to increasing flower size, while maintaining the intensity of colors in the sepals and petals. Coerulea cattleya hybrids with the form of *Cattleya* Horace and pigment density of a *Cattleya* Bonanza should be the goal of this hybrid line. The best to date, *Cattleya* Memoria Jerry Rehfield (Dupreana × Indigo Mist), still lacks both coerulea pigment density and flower form.

GROUP 5

Multifloral (Bifoliate), Spotted Coerulea Hybrids

This is distinctly different than the previous multifloral group in the mix of dominant species, but admittedly, there is overlap. Fred Clarke, at Sunset Valley Orchids, has been a prominent force in producing this unique form (Clarke 2017). The availability of coerulea forms of *C. guttata*, *C. bicolor*, *C. tigrina* (*leopoldii*), *C. amethystoglossa*, *C. aclandiae* and *C. schilleriana* have provided many different ways to explore coerulea hybrids from giants with high flower count generated with the use of *C. tigrina*, *C. guttata*, *C. bicolor* and *C. amethystoglossa* to semiminiatures with the use of *C. aclandiae* and *C. schilleriana*. Note that *C. aclandiae* is a candidate for a species with both Type A and Type B mutation in different clones. Typically, members of this hybrid line have sepals and petals and that are light coerulea-colored with indigo spots and a distinct coerulea lip, but there are many variations including green sepals and petals with indigo spots. Sporting sepals and petals that are almost the same size and shape on excellent stems is also a characteristic of a hybrid line generated with the use of bifoliate species. There are clones of *Cattleya* Leoloddiglossa that appear almost metallic, a color impossible to capture in a photograph; others appear in an array of different expressions within the coerulea color range. Clearly, there are many different ways to combine these species and hybrids that await the hybridizer's toothpick.

Although many cattleya color forms have reached a high state of perfection, coerulea cattleyas await the talents of future hybridizers to reach that state. The


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13 BRIDGET UZAR


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[12] *Cattleya warneri* (Coerulea color group) clones have been discovered several times in the wild and like *C. gaskelliana*, it has more color in the sepals and petals than most unifoliate species. This clone was widely used by Stewart Orchids in their coerulea hybridizing program.

[13] *Cattleya* Interglossa 'Hackneau' AM/AOS is an excellent example of a coerulea hybrid line where emphasis is on the contrast between a blue lip and white or nearly white sepals and petals on an inflorescence well held above the foliage.

[14] *Cattleya walkeriana* (Coerulea color group), along with *Gur. bowringiana*, usually guarantees excellent color in its offspring when matched with Type A mutation members.

[15] *Cattleya* Blue Velvet 'Surprise' SM/JOGA (Kazuko Takamatsu × Mini Purple) incorporates *C. warneri* into the ancestry in an attempt to increase flower size and form, but is intermediate with respect to flower size, form and pigment intensity.

current availability of superior coerulea forms of *Cattleya* species makes the development of these different coerulea hybrid lines not just possible, but probable, once hybridizers develop an appreciation for the myriad ways coerulea cattleyas can be combined.

Additional Reading

Clarke, F. 2017. A New Approach to Blue Cattleyas: Spots. *Orchids* 86:442-447.

Hackney, C.T. 2004. *American Cattleyas*. Courtney T. Hackney, Wilmington, North Carolina.

Hetherington, E. 1985. Blue Cattleyas. *AOS Bulletin* 54:543–552.

Holguin, L. 1968. The Illusive Blue Cattleyas. *Orchid Digest* 32:101.

Menezes, L.C. 2009. *Orchids Laelia purpurata: The Queen*. Ibama, Brasilia.

Whitlow, C.E. 1966. Current Aspects of Blue Cattleya Breeding. *AOS Bulletin* 35:647–648.

_. 1966. Blue Hybrids of the Cattleya group. *AOS Bulletin* 35:915–916.

_. 1967. Notes on Breeding Laeliocattleya Parysatis coerulea. *Orchid Digest* 31:119.

_. 1968. From the beginning—Blue Cattleyas. *Orchid Digest* 32:102–106.

_. 1969. An Adventure in Blue: Notes on Breeding Laeliocattleya Parysatis coerulea. *Orchid Digest* 33:261.

_. 1969. Thoughts on Laeliocattleya Blue Boy Hybridizing. *Orchid Digest* 33:261.

_. 1969. The Large Blue Cattleya Hybrids. *Orchid Digest* 33:261–262.

_. 1970. Blue Cattleyas—Hopes, Observations and aspirations. *Orchid Digest* 34:292–295.

_. 1970. Cattleya Ariel Coerulea—The Keystone in Blue Breeding? *AOS Bulletin* 39:496–498.

_. 1970. Stabilization and Enhancement of Blue Color in Cattleyas. *AOS Bulletin* 39:343–344.

_. 1972. Fundamentals in Breeding for Blue Cattleyas and Laeliocattleya Hybrids with Recent Notes on New Development. *Orchid Digest* 36:201–204.

_. 1976. An Update on Blue Breeding. *AOS Bulletin* 45:43–47.

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[16] *Cattleya* Memoria Jerry Rehfield 'Hackneau' (Dupreana × Indigo Mist) has several large-flowered species in its background, resulting in larger flowers, but it still lacks the desired coerulea pigment density of sepals and petals.

[17] *Cattleya* Leoloddiglossa (Coerulea color group) 'Darkest Blue' (*tigrina* × Loddiglossa) is an excellent example of the potential for the hybrid line that incorporates coerulea bifoliate cattleyas into the mix.

[18] *Cattleya tigrina* (*leopoldii*) (Coerulea color group) is relatively new to the coerulea hybrid mix, despite its importance to *C.* Elegans. It has been expertly used to create a whole new type of coerulea hybrids with metallic gray–coerulea sepals and petals with, or without, indigo spots matched with a bright coerulea lip.