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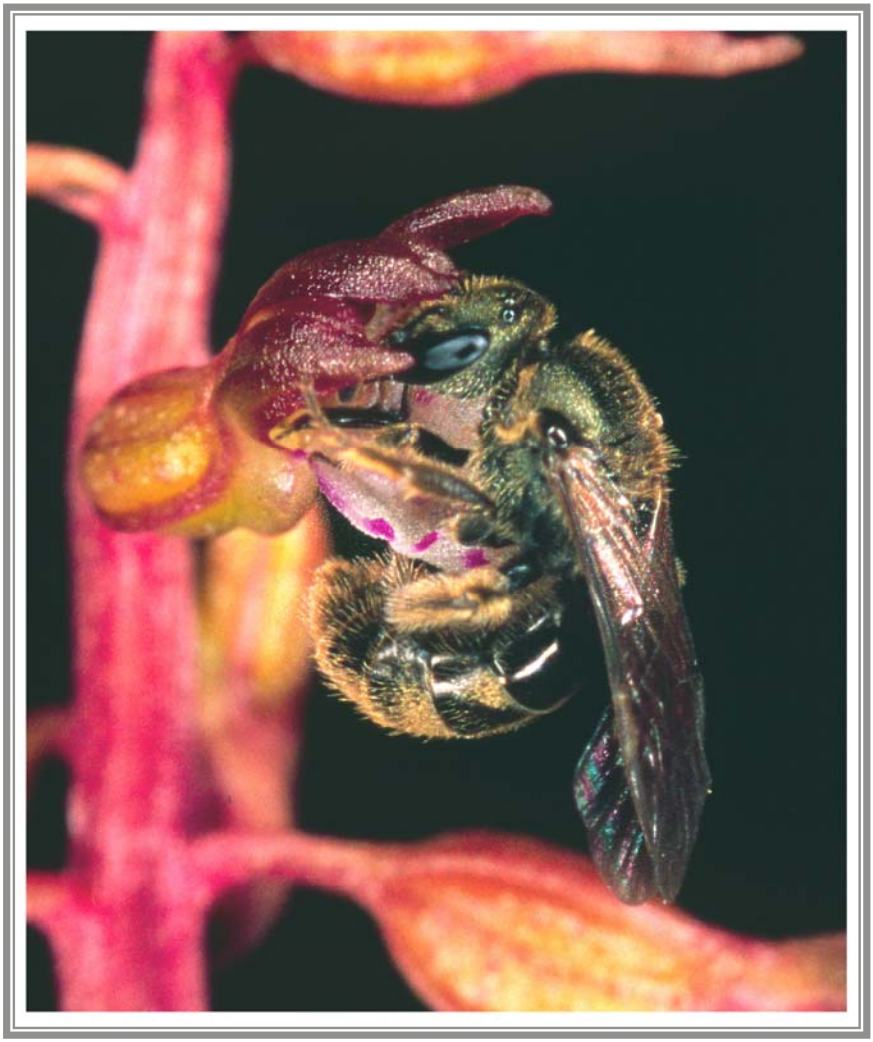

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A Cranefly Orchid of a Different Color

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Although I am a flatlander from subtropical Florida by birth, I have been visiting the Southern Appalachian Mountains of western North Carolina and east Tennessee since 1957, when I was 10 years old, and I have been seriously botanizing in the area since the mid-1980s. In all those years, I have been privileged to observe 25 of the 40-plus orchid species that grow in those mountains. Of these, I have come to know that one of the most common is *Tipularia discolor*, the Cranefly Orchid (or sometimes called the Crippled Cranefly Orchid).

As an example of the abundance of this species in that area, on August 22, 2013, during an afternoon stroll along a hiking/biking path through the woods beside the Nantahala River so popular with casual whitewater rafters, I counted more than 50 flowering stems of this orchid in a distance of only one mile. Surely, there were hundreds more in the forest beyond the path.

Tipularia discolor has been a "friend" of mine since I first encountered it when I was a very young teenager and realized it was an orchid. The species fascinated me more and more as I learned about its lifestyle.

As with most people who get to know this orchid, I first saw it as a leafless stem thrusting up out of the

Figure 1. The green-flowered *Tipularia* plants found in the Great Smokies on August 15, 2013, probably represent a clonal grouping. Where they grew at the base of a large tree probably protected them from being trampled by the many visitors who come to this site each summer. Photo by author.

Figure 2. A green-flowered *Tipularia discolor* photographed on July 31, 2010, in Upstate South Carolina (left) shows the asymmetrical lateral petals that make this species unique among North American orchids. On the right is a typically colored flower. Photos by Jim Fowler.

forest floor in late summer. The upper one-half to one-third of the brownish stem bore the oddly shaped, watery purplish-brown flowers. The lateral petals were slanted off at different angles from one another, and a long nectar spur trailed out behind the narrow, basally three-lobed lip.

Only later did I come to know that this species not only produces these oddly asymmetrical (non-zygomorphic) flowers that are unusual in the orchid family, but that the plant's timing of its leaves doesn't follow the pattern typical of most of the orchids in that area. When it blooms, there are no leaves present. They don't emerge until the very late summer or into autumn. Each plant then usually produces a single petioled (stemmed) leaf that is dark green on the top and reddish-purple beneath. The species epithet, *discolor*, apparently refers to these two-colored leaves. These so-called hibernal leaves persist through the winter, then die back in the spring, sometimes as late as early May in the Southern Appalachians. There is then no sign of the plant until its flowering stalk begins to emerge in July or August. The only other orchid of those mountains that follows this pattern of producing hibernal leaves is the related but very different *Aplectrum hyemale*, the so-called Puttyroot Orchid.

Because the typically colored flowers of *Tipularia discolor* have been familiar to me for all these years, it came as quite a surprise when, in the summer of 2013, I came upon a Cranefly Orchid of a different color.

I had planned my summer sojourn to my little cabin in the mountains for the months of August and September to enjoy and photograph the wealth of late-

Figure 3. The hibernal (winter) leaves on the green-flowered *Tipularia discolor* that I found in the Great Smokies. They show that the underside of the leaves, which, instead of being the typical bright reddish-purple color (3b, photo by Jim Foiwler), are almost totally green (3a photo by Keith Langdon).

summer wildflowers of the region. On my first foray into the Great Smoky Mountains National Park for the year on August 15, I stopped at an historical exhibit not far from the Oconaluftee Visitor Center inside the park's main North Carolina entrance near the tourist town of Cherokee. (I am being intentionally vague about the precise location of this find.) I had not visited this historic site for many years. Right where the path to the exhibit started at the parking area, I was immediately greeted by some healthy typically flowered plants of this old friend, so I obliged them by stopping to take their picture. Farther along the path through the woods, and especially along the little stream that flowed through the site, I encountered some of the largest, most robust plants of this species that I had ever seen.

After visiting the historical exhibit, I wandered a little farther through an area paved with crushed rock that is visited by hundreds of tourists every day. At the edge of this area, growing at the mossy base of a large tree, were three flowering stems of what, at first glance, reminded me of some of the tropical spiranthoid orchids that I knew from my native South Florida. But there are no tropical spiranthoids in those mountains, so it finally dawned on me what I was seeing. It was an "albino" *Tipularia discolor*, something I had never encountered in all my years of familiarity with this orchid. In fact, I wasn't even aware that such a genetic mutation existed. Of course, it was not really an albino in the literal meaning of that word, even though orchidists tend to throw that term around rather freely. The flowers of this specimen were not white. Instead, the sepals, petals, lip and nectar spur were apple green, with no hint of the purplish pigments that give the flowers of typical forms of this species their usual brownish color. Even the flower stalk was green, with no purplish pigments. The column at the center of each flower was bright white, not significantly different from the typical forms.

I was stunned by this unexpected discovery and stood there staring at the sight for quite some time.

The three flower stems of this orchid grew so close together that this was obviously a clonal grouping. Where they grew at the base of that tree, enfolded by two arms of its root base, probably accounts for how they had survived at this spot. The location protected the orchid from the feet of the hundreds of visitors who tramp through the area to see the historical site.

I shot numerous photographs of the specimen with my new digital camera. At the time, I was a novice with digital photography, but on the camera's viewing screen, some of the shots looked like they might be acceptable. When I got home to Florida in the early fall and finally saw the pictures on my computer, I was relieved to see that they were better than I initially had thought.

Later on in the day, I stopped by the Oconaluftee Visitor Center to make a wildflower expert who worked there aware of this find and its location and

asked her to share this information with the park's biologists. In a later letter, I also informed park scientists of this discovery.

I didn't visit the site again before I left the mountains at the end of September 2013, so I didn't know if the leaves on this green-flowered specimen had begun to emerge, but I really wanted to know whether they were all green, rather than the typical reddish-purple on the underside. However, in response to my letter about the find to Great Smoky Mountains National Park personnel, on December 3, 2013, I received an e-mail from Keith Langdon, a former National Park Service biologist who managed the inventorying and monitoring of plants and animals in the Great Smokies. Now retired and living in Sevierville, Tennessee, just outside the national park, he says he still devotes some of his time to searching for rare plants and animals throughout the park, and he graciously agreed to my request to check the hibernal leaves on my little grouping of green-flowered plants. On December 19, 2013, he did just that, and the following day, I received an e-mail from him containing photographs of those leaves. They revealed that the hibernal leaves were almost solid green on top and bottom, although the underside of some of the leaves did reveal the faintest blush of purplish color, but very different from the intense deep reddish-purple typical for the species.

In the December 2000 issue of *North American Native Orchid Journal* (Vol. 6, No. 4, Pages 336-337), Paul Martin Brown cites a few plants of *Tipularia* found in North Florida's Marion County that produced leaves with no purple pigmentation, and he illustrates one of the leaves on Page 348. He makes no mention of the flowers of these plants being clear green because apparently he was dealing only with the leaves, which are borne at a different time of year from the flowers. With his penchant for assigning a name to every minor variant of a species, he called the green-leaved plants *Tipularia discolor* forma *viridifolia*. Based on leaf coloration, the green-flowered Great Smokies plants of *Tipularia discolor* would probably be known by that name, even though these plants are, at best, a rare chance genetic mutation of the species and the forma name has little taxonomic significance.

In an interesting turn of events, in January of this year, while I was seeking digitized photographs of the typical two-colored leaves for the species to accompany this article, James Fowler, the author of *Wild Orchids of South Carolina*, kindly offered to allow the use of his images showing these leaves. But in his e-mail, he also mentioned having seen a green-flowered plant of this species. In subsequent e-mails, he gave details about the find and provided a close -up of one of the green flowers. He noted:

"I found the green *T. discolor* on July 31, 2010. It was growing among scattered dozens of 'normal' specimens in [a nature preserve] in upper Greenville County, SC. I have gone back to that same spot in the intervening years, but

Figure 4a. This green-flowered form of the Cranefly Orchid (*Tipularia discolor*) was discovered at the edge of a much-visited area of the Great Smoky Mountains National Park on August 15, 2013. The normal-colored form of *Tipularia discolor* is one of the more common late-summer orchids in the Southern Appalachians. Figure 4b. This shot was made along the Nantahala River in Macon County, North Carolina, on August 22, 2013. The site is in the Swain County, North Carolina, portion of the park. Photos by author.

have not found the green-flowered plant again. … I have no idea if the leaf of the green-flowered plant showed any difference from the 'normal' ones, since the leaf is withered at the time of anthesis."

Note: For a thorough review of the pollination of this fascinating orchid, see Charles L. Argue's article titled "The Pollination Biology of *Tipularia discolor* (Pursh) Nuttall (crane-fly orchid)" in the October-December 2013 issue of *The Native Orchid Conference Journal*.

Pretty Parasites — The Mycoheterotrophs of the Genus *Corallorhiza*[1]

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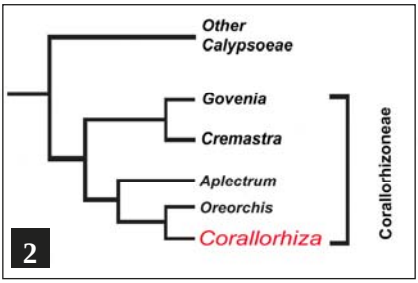
The word parasite evokes strong negative images; when we hear it we think wood-ticks, mosquitoes, leeches, or wheat stem rust. What we forget is that all orchids in the wild begin life as parasitic organisms. The technical term is mycoheterotroph. These are plants that obtain their carbohydrates and other nutrients from fungi. In the earliest stages of germination long before chlorophyll containing photosynthetic tissue develops, microscopic orchid embryos lacking nutritional reserves must begin their developmental journey by consuming fungal hyphae that penetrate their seed coats. Most orchids grow up to become autotrophic citizens in good standing deriving all or at least some of their nutrition from photosynthesis. The term mixotrophic has been applied to those orchids that hedge their bets by keeping one foot in the heterotrophic world while at the same time carrying out photosynthesis. Some orchids however are mycoheterotrophs for life. These species never develop functional photosynthetic tissue and parasitize soil fungi for their entire lives. This relationship is often highly specific. Presented with a fungal buffet, these orchids dine on just one

Figure 1 The fleshy branched rhizomes of *Corallorhiza odontorhiza* are typical of the genus. The generic name *Corallorhiza* refers to their resemblance branching corals. The species epithet *odontorhiza* is derived from Greek meaning tooth-root and refers to the bulbous thickening at the base of the stem just above where it attaches to the rhizomes. All photos by the author.

1. Reprinted from *Orchids* 83:1 (January 2014), pp. 40-51.



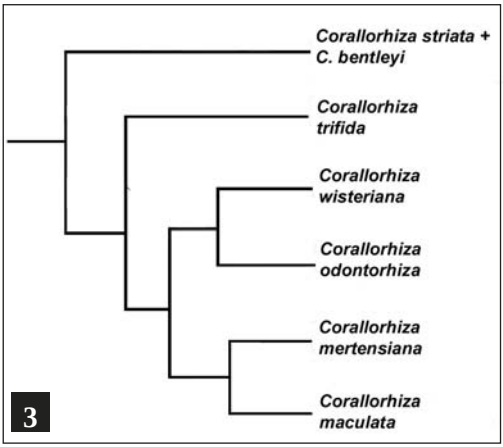


Figure 2. The Genus *Corallorhiza* is currently classified in the subfamily Epidendroideae, tribe Calypsoeae, subtribe Corallorhizoneae. In addition to *Corallorhiza* this small subtribe as presently circumscribed includes the neotropical genus Govenia, the North American Genus *Aplectrum* (puttyroot), and the Asiatic genera *Oreorchis* and *Cremastra* . The above simplified cladogram is shamelessly adapted (i.e. stolen) from the work of John Freudenstein of Ohio State University. (Freudenstein and Senyo, 2008) It should be noted that the common name coralroot is shared with the genus *Hexalectris* of the southern United States and Mexico; the two genera are not closely related.

Figure 3. Cladogram showing the relationship of the seven North American members of the genus Corallorhiza. Again simplified and adapted from the work of Freudenstein.

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dish. It is only with the application of genetic analysis of both the orchids and their fungal partners that scientists have begun to puzzle out these interactions (McCormick, 2009).

Not all orchids are beautiful awe-inspiring plants. Among the ugly ducklings of the family Orchidaceae are the coralroot orchids of the genus *Corallorhiza*. . Gangebain in 1755 published the first recognizable description of the genus *Corallorhiza* clearly segregating it from other Orchid genera. Professor John Freudenstein of Ohio State University has studied the taxonomy of the coralroots and their associated fungi for over two decades. His 1997 monograph in Harvard Papers in Botany is the standard reference work for the genus; covering all members except for *C. bentleyi*, which he subsequently formally described in 1999. (Freudenstein, 1999) This genus is comprised of about 11 species primarily found in the New World from Guatemala to Canada. (Freudenstein, 1997) The remainder of this article will deal with the seven species that occur within the geographic boundaries of the Unites States and Canada; *C. trifida, C. odontorhiza*, *C.. wisteriana*, *C. maculata*, *C. mertensiana*, *C. striata*, and *C. bentleyi*. Several of these species have ranges that extend into Mexico and Central America, where the other members of the genus are found.

Only *Corallorhiza trifida* is found in Europe and Asia. Its range is circumpolar; being found in arctic and alpine regions of both Eurasia and North America.

The above ground portion of the plant consists of a single leafless stem bearing from 5 to 20 or more flowers. Except for *C. trifida*, which is pale green, the typical coloration for the other members of the genus is brown, reddish-brown, or purple due to the presence of anthocyanin pigments

The relationship of orchids to soil fungi was once termed symbiotic, where both partners benefit from the interaction, but botanists have been hard pressed to identify any benefit to the fungal partner and the relationship is thus best described as parasitic. The fungi commonly associated with *Corallorhiza* do form true symbiotic relationships with the roots of adjacent trees. Studies of nutrient flow have shown that carbohydrates synthesized by photosynthesis in the leaves nearby trees are transferred via the root system to the fungus, which in turn invades the roots of the orchid and is consumed. *Corallorhiza* species thus can in fact be characterized as epiparistic upon the surrounding trees. (McKendrick, Leake, and Read, 2000; McKendrick et al., 2000).

Evidence is accumulating that the members of the genus *Corallorhiza* have only recently made the transition from autotrophy to obligate mycoheterotrophy. Only *C. trifida*, *C. odontorhiza*, and *C. wisteriana* display any observable green coloration indicating the presence of chlorophyll and the possibility of carbon dioxide fixation and carbohydrate synthesis through photosynthesis. The timing of this transition was examined by Freudenstein and Barrett who studied the *rbcL* gene, which codes for the protein RUBISCO responsible for fixing carbon dioxide in the dark reaction of photosynthesis. Once the transition to mycoheterotropy is made the rbcl gene becomes unnecessary and mutations will no longer be deleterious and will continue to build up with time. In species that adopted the heterotrophic lifestyle long ago the *rbc*L gene and other genes related to photosynthesis have been lost from the genome or mangled so badly by repeated mutations that they are nearly unrecognizable. Studies of the rbcl gene in the *C. striata* and *C. maculata* lineages showed that it is still largely intact, but has undergone a small number of mutations that render it nonfunctional, thus indicating a relatively recent transition to obligate mycoheterotrophy.

Most C*orallorhiza* species show numerous color forms.. Most of these forms result from differences related to the presence/absence and distribution of anthocyanin pigments within plant tissues. The most striking color forms are golden yellow individuals that result from their complete absence. Anthocyanins are versatile pigments present in most plant species that have been shown to serve several functions; the coloration they provide may serve to attract and direct potential pollinators, they protect against excess light, they signal unpalatability to potential herbivores, or they simply camouflage plants against the

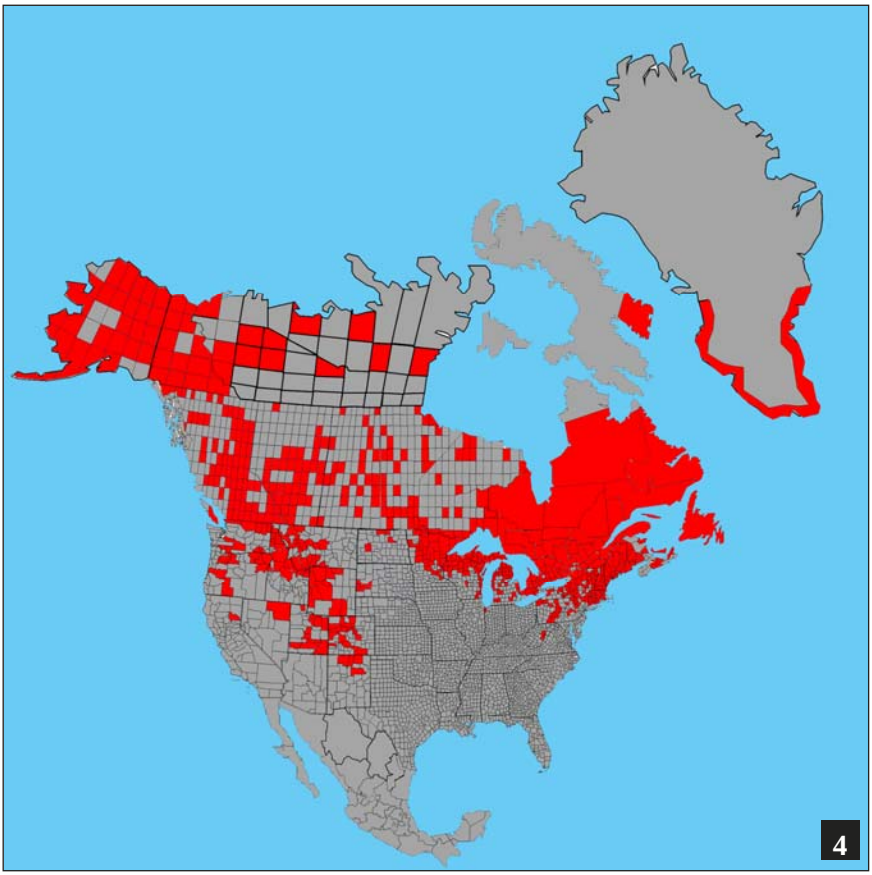

Figure 4. *Corallorhiza trifida* is one of the most geographically widespread species of orchid in the world. It is a true denizen of the arctic and other cold places of the northern hemisphere. In the United States it is found in the mountainous areas of the American west, the northern Great Lakes region, and New England. Further north it is found from Alaska, across Canada to Newfoundland and coastal Greenland; even surviving on Baffin Island in the Canadian Arctic. In Eurasia it is known from Iceland, the British Isles, Scandinavia, and the alpine regions of Western Europe. The range extends across Siberia to the Pacific and as far south as the Black Sea coast of Turkey, northern India, and the mountainous regions of China.

forest background. For taxonomic botanists they provide numerous opportunities to immortalize oneself by naming a new color form.

***Corallorhiza trifida* Chatelain** (Northern Coralroot) This species was well known to Linneaus who in 1753 included it in Species Plantarum under the name *Ophrys corallorhiza.* The name *Corallorhiza trifida* Chatelain

dates from 1760. The species epithet trifida refers to the distinctly three lobed lip. Other names now reduced to synonymy include Corallorhiza Corallorhiza (L.) Karst and *Corallorhiza innata* R. Brown. Corallorhiza trifida is the "greenest" of all the Corallorhiza species, but even here isotopic tracer studies demonstrated minimal uptake of Carbon-13 labeled carbon dioxide. The study showed that carbon fixation was negligible in comparison to true autotrophic plants, but was similar to that observed for fully myco-heterotrophic achlorophyllous orchids growing nearby, thus confirming the status of C. trifida as a myco-heterotroph (Cameron, 2009).

It is a diminutive plant, generally only 3 to 6 inches tall. The single pale green stem bears 5 to 12 tiny pale-green flowers with white lips. Plants differ in the amount of anthocyanin pigment present. In the Lower 48 one generally encounters bright green plants with a pure white lip. Plants with a purple spotted lip and column having petals and sepals tinged with brown are encountered further north in Alaska and Canada. For those who like to apply names the two forms have been named forma *verna* and forma *trifida* respectively. The flowers easily self-pollinate. Shortly after opening the anther cap shrivels and the pollinia which are attached to viscous caudicles swing downward and come into contact with the stigma. Fruit set is often high (50-100%). As a result one tends to encounter the plants more often at the fruiting stage, since the stems and their fruiting capsules persist through the summer.

Corallorhiza wisteriana and *Corallorhiza odontorhiza* are known as spring coralroot and autumn coralroot respectively. The two species are physically similar and molecular genetic studies indicate they are closely related sister

Figure 5. *C. trifida forma verna* (left) *C. trifida forma trifida* (right). In both the pollinia have rotated downward to make contact with the stigma to initiate self pollination. All photographs are from the author unless otherwise noted.

Figure 6. Fruiting capsules of *C. trifida.* Consistent with self-pollination, each flower produces a seed capsule.

taxa. Both are easily overlooked.; the slender stems of both are brown to reddish-brown and easily blend in with surrounding vegetation and leaf litter. In the deciduous forests of the eastern United States where the their ranges overlap they are easily distinguished by their blooming times. *C. wisteriana* blooms in spring as the deciduous forest canopy is beginning to develop, while *C. odontorhiza* blooms in late summer or early fall.

Corallorhiza wisteriana Conrad (Spring Coralroot) Solomon Conrad named this species in 1829 in honor of Joseph Wister who first collected it near the Shuykill River in eastern Pennsylvania.

The flowers of *Corallorhiza wisteriana* typically bear four to fifteen tiny flowers along a three to nine inch tall stem. The sepals and petals form a hood over the column and almost never open wide. The flowers are about one-half inch long with a tongue-like lip about one-fourth inch long. The lip is white spotted with purple. The lateral sepals are fused at their base to form a short

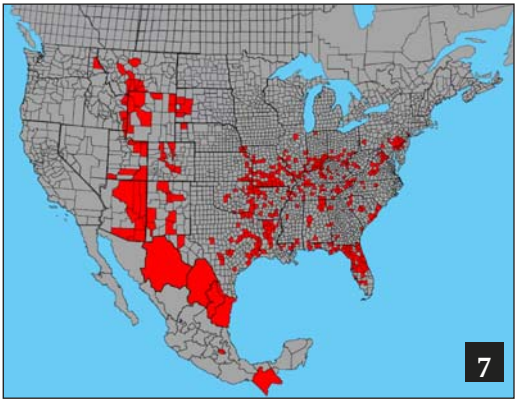

Figure 7. *C. wisteriana* has two centers of distribution. It is at home in the deciduous forests of the eastern United States. It shuns the Great Plains, but reappears in Mexico and in the Rocky Mountains of the western United States. It is the only *Corallorhiza* species at home in the deep South. The eastern U.S. population begins blooming in February in south Florida; blooming moves northward with spring; ending in mid May in northern Illinois. In the Rocky Mountains it is again an early bloomer, typically emerging in May or June.

Figure 8. The inconspicuous tan to reddish brown flowering stems of *C. wisteriana* blend in amazingly well with leaf detritus on the forest floor.. In this case oak leaves and White Pine needles. Figure 9. Frontal close-up of *C. wisteriana* showing the prominent purple spotted lip. The ridges at the base presumably serve to direct potential pollinators.

spur-like structure known as a mentum that is fused tightly to the underside of the ovary. The pollination process was studied briefly by Freudenstein who found minimal evidence of self-pollination in *C wisteriana*, in sharp contrast to the closely related *C. odontorhiza*, which readily undergoes self-pollination.

Corallorhiza odontorhiza (Wildenow) Nuttall (Autumn Coralroot) Originally named Cymbidiun odontorhizon by Wildenow in volume four of Species Plantarum in 1805, it was transferred to the genus *Corallorhiza* by Thomas Nuttall in 1818. It is a tiny plant that can be best appreciated viewed through a magnifying glass while lying on your stomach on the forest floor. Five to fifteen tiny flowers are borne along a two to eight inch tall stem. The flowers of the most common variety (var. *odontorhiza*) undergo self-pollination so early that the fruit capsule begins to develop before the flower opens fully. Many populations contain plants that do not self-pollinate as readily (var. *pringlei*). The flowers of this variety do open fully and may or may not self pollinate. The difference results from the presence or absence of a small flap of tissue known as the rostellum that prevents the pollinia from contacting the

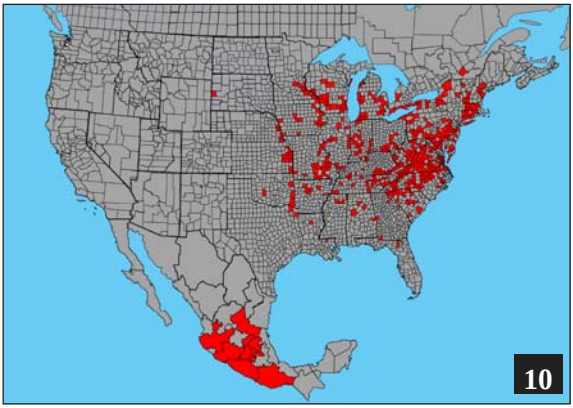

Figure 10. *Corallorhiza odontorhiza* is found in the deciduous forests of the eastern United States and in the mountains of southern Mexico. Disjunct populations occur at the periphery of its range where suitable forest habitat is found; such as the black Hills of South Dakota, the Caddo Hills of central Oklahoma, northeast Florida, and southern Louisiana.

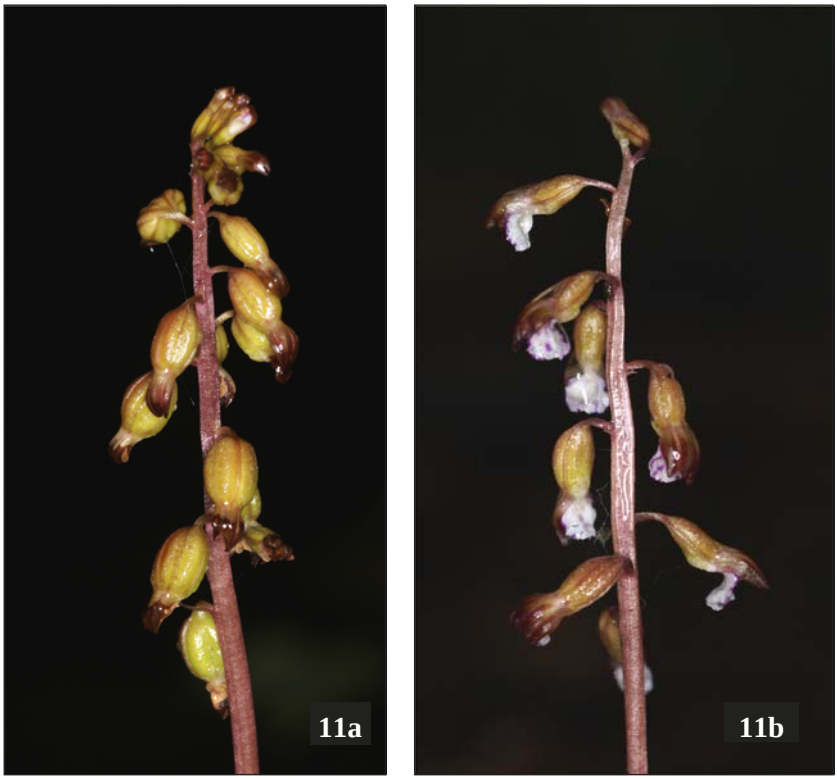

Figure 11. The differences between *Corallorhiza odontorhiza var. odontorhiza* (11a) and var. *pringlei* (11b) are clearly shown here. The flowers of var. *odontorhiza* self-pollinate before they open. The flowers of var. *pringlei* open to allow pollinator visitation.

Figure 12. Frontal closeup of *Corallorhiza odontorhiza* var. *pringlei* Note the similarity to *Corallorhiza wisteriana* (Figure 9).

Figure 13. No pollinators or insect visitors. of var. *pringlei* have been formally identified in the botanical literature. The author observed this tiny unidentified bee intensely probing numerous open flowers in Peninsula State Park in Door County Wisconsin. Since the bee was not collected but allowed to continue on its way, its efficacy as a pollinator could not be evaluated. But based on its size in comparison to the flower, it seems likely to have come into contact with the pollinia at the end of the column,

stigmatic surface. In var. *pringlei* it is well developed, while on var. *odontorhiza* it is minimal or non-existent. (Catling, 1983)

The typical coloration is brown or reddish brown; occasional plants have a greenish cast or may even be intensely green due to residual chlorophyll becoming visible as a result of the complete or partial absence of anthocyanin pigments.

Among practitioners of herbal medicine *C. odontorhiza* has the common names Crawley Root or Chicken-toes. The root is harvested and brewed into a sweat-inducing tea. The identity of the chemical compounds present in the roots responsible for these medical claims has not been investigated.

Corallorhiza maculata Rafinesque (Spotted Coralroot) *Corallorhiza maculata* was first described in 1817 by Rafinesque from western Long Island New York. A few years later Thomas Nuttall independently named this species *Corallorhiza multiflora*, by which name it was known throughout the nineteenth century. The common name and the species epithet both refer to the purple spots that commonly mark the lip and are sometimes visible on other flower parts. *Corallorhiza maculata* bears 10 to 30 flowers along a 6 to 20 inch tall stem. The plants lack any green coloration. The three-lobed lip is white, often spotted with purple, with the central lobe much larger and more prominent than the two lateral lobes. A short mentum is present fused to the underside of the ovary.

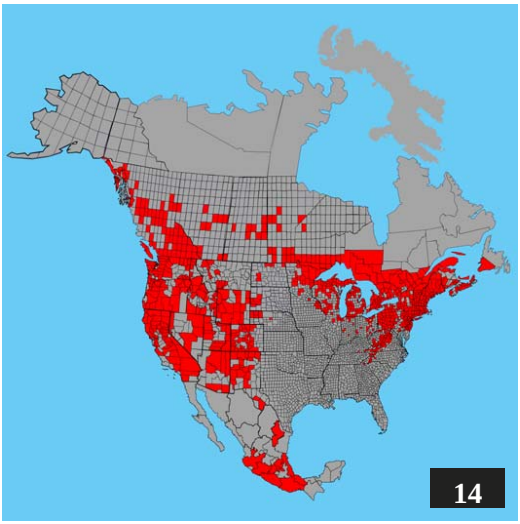

Figure 14. *Corallorhiza maculata* is the most common coralroot in North America. It has three primary centers of distribution. The first is in southern Canada from Newfoundland to Manitoba extending into the northeastern United States and southward in the Appalachians. The second center of distribution is in western North America from British Columbia to southern California. The eastward limit of this distribution is quite well defined by the boundary of the Rocky Mountains and the Great Plains. The third center of distribution is in the Mountainous regions of southern Mexico.

Two varieties var. *occidentalis* and var. *maculata* are widespread and extensively overlap across much of their ranges. Although these varietal names were long used, their clear delineation is relatively recent and can be attributed to the work of Freudenstein, who noted that the two varieties can be best distinguished by the shape of the lip. In var. *maculata* the lip is not dilated relative to the base; the two edges running more or less parallel. In var. *occidentalis* the lip is dilated and often appears rounded with the widest center portion being 1.5 times or more wider than the base. For the most part var. *maculata* and var. *occidentalis* are able to maintain their separate identities even when they grow in close proximity. Hybridization is minimized by the tendency of the plants to

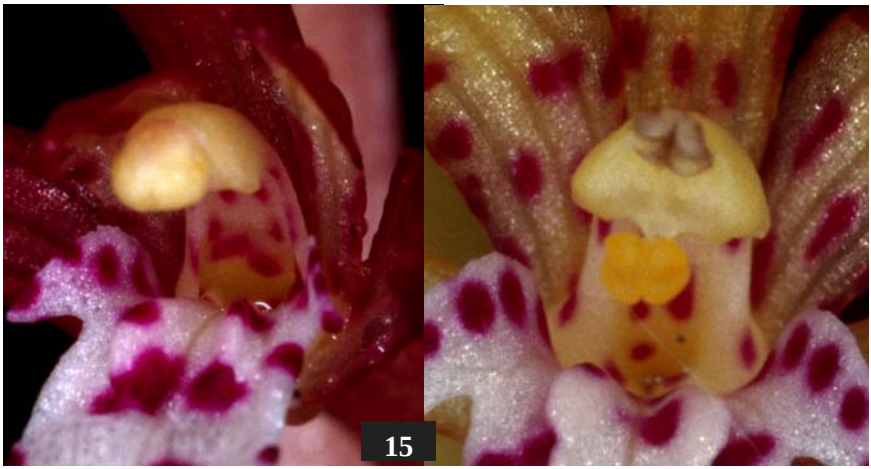

Figure 15. Self pollination in *Corallorhiza maculata.* As the flower opens the pollinia are located terminally on the column under an intact anther cap. After several days the anther cap degenerates leaving the pollinia to rotate forward and downward onto the surface of the stigma. The delay creates a window of opportunity for pollinator visitation.

Figure 16-17. Color variation in *Corallorhiza maculata* var. *maculata* and var. *occidentalis*. Note the parallel sided undilated lip in var. *maculata* and the rounded dilated lip in var. *occidentalis*. The presence, absence and distribution of anthocyanin pigments lead to striking differences in appearance. Apparently the genes that control the number of spots and their distribution are inherited separately from genes controlling background pigmentation. The background color of the stems and flowers can range from pale yellow to bright yellow to cinnamon-brown to intense reddish-purple. At the same time the number of spots can range from none to numerous, leading to an array of color forms.

undergo self-pollination and by the poor temporal overlap of their blooming times. In the Great Lakes region var. *occidentalis* tends to bloom 1 to 3 weeks later than var. *maculata*; often starting to bloom as var. *maculata* is finishing.

Corallorhiza mertensiana Bongard (Mertens' Coralroot) *Corallorhiza mertensiana* is a unique and unmistakable plant of the northwestern United States and Western Canada. It is similar in general appearance to its close relative *Corallorhiza maculata*, from which it can readily be distinguished by the gracile appearance of the flowers. The lip, petals, and sepals of *C. mertensiana* all having a much narrower and elongated profile than in the more robust appearing flowers of *C. maculata.*

Corallorhiza mertensiana was first collected by Karl Heinrich Mertens near what is now Sitka Alaska. Mertens served as chief botanist on a Russian voy-

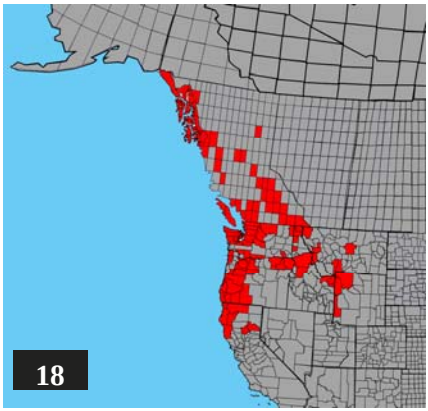

Figure 18. The range of *Corallorhiza mertensiana* is limited to the Northwestern United States and to western Canada. One center of distribution extends from southwestern British Columbia and the Alaska Panhandle south along the Pacific coast through Washington and Oregon into northern California. A second center of distribution extends from east central British Columbia south in the Rocky Mountains through Idaho and western Montana south as far as the Yellowstone region of western Wyoming.

Figure 19. Color Variation in *Corallorhiza mertensiana* The lip ranges in color from entirely purple to entirely white. The stem color ranges from purple to lavender to tan to golden yellow.

Figure 20. *Corallorhiza mertensiana*

age of exploration along the Pacific Coasts of North America and Asia From 1826 to 1829. After his death in 1830, the plant was posthumously named for him in 1833 by the German-Russian botanist August Gustav Heinrich von Bongard.

Corallorhiza mertensiana bears 10 to 30 flowers along a 1-2 ft tall leafless stem that is most commonly reddish-purplish or lavender in color. The most prominent feature of the flowers is the long slender column that arches upward over the elongated lip. Unlike other coralroots the entire column from base to tip is readily observed even from the side. The slender elongated strap-like lateral sepals spread wide and are often reflexed backward exposing the column. The dorsal sepal and the petals arch upward behind the column but do not enclose it. The column itself can range in color from white to intense purple. Intermediate plants have a pale column streaked with purple. The tip of the column along with the anther cap and pollinia are bright yellow. The petals and sepals are brown or yellowish-brown with varying amounts of purple. The lip is three-lobed, with the center lobe much more prominent. The lip first projects forward and then arcs downward; its length being 2.5-3 times greater than its width. It can range in color from entirely purple to entirely white, but is most commonly described as purple streaked with white or white streaked with purple. A short mentum is present; it is not appressed to the underside of the ovary as in *C. maculata*, but appears as a small knob projecting backward and downward from the base of the lateral sepals.

Corallorhiza striata Lindley (Striped Ccoralroot) Lindley first named Corallorhiza striata in 1840 in Genera and Species of Orchidaceous Plants. It is the largest and most impressive of the Coralroots with a flowering stem up to 20 inches high and flowers up to one inch across. The species epithet refers to the bright reddish-purple stripes that mark the sepals and petals.

There are three varieties; C. *striata* var. *striata* and var. *vreelandii* found in North America and var. *involuta* confined to southern Mexico. Var. *striata* is the largest and showiest; The robust dark reddish-purple to crimson stems range from 6 to 24 inches tall and bear from 6 to 20 flowers. As the flowers

Figure 21. *Corallorhiza striata* is widespread across North America and Central America But unlike many other coralroot species it seems to completely eschew the deciduous forest region of the eastern United States. The range extends across southern Canada from British Columbia to Quebec, with a tiny disjunct outpost in western Newfoundland. In the east the range barely extends into the United States in the Great Lakes region and northern New England. In the west it is found from Washington to northern California. In the Rocky Mountains the range extends from British Columbia south into Mexico. The map shows all varieties.

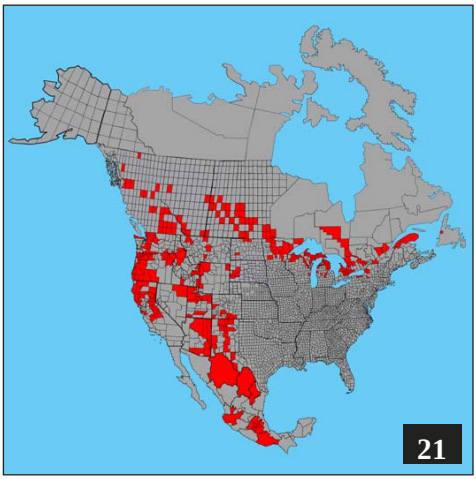

Figure 22. *Corallorhiza striata* var. *striata* (a ,California) and *C. striata* var. *vreelandii* (b, Wisconsin). The photos highlight the size difference between the two varieties. The lip of var. *vreelandii* is typically about 5 mm in length, whereas the lip of var. striate is about 1 cm in length.

open the sepals and petals spread wide to reveal a light colored column with bright yellow pollinia at its tip. The sepals and petals bear 3 to 6 crimson longitudinal stripes on a background that ranges from white to light reddish purple. Var. *vreelandii* is generally described as a somewhat smaller plant with subdued coloration; having dull-purplish brown stripes over a yellowish background.

Corallorhiza bentleyi Freudenstein (Bentley's Corallroot) *Corallorhiza bentleyi* is an enigmatic species that is slowly beginning to yield its secrets. This tiny relative *of Corallorhiza striata* was first noticed by Stan Bentley, an expert on the orchids of the Appalachian Mountains, who recognized their unique features and contacted John Freudenstein who named them in honor of their discoverer. The entire range of *Corallorhiza bentleyi* is limited to a small area along the Virginia-West Virginia border. It was not until DNA studies were conducted that the true uniqueness of this species was revealed. The studies revealed that *Corallorhiza bentleyi* is most closely to *Corallorhiza striata* var. *involuta*, which is found only in southern Mexico (Barrett, 2009). Any coherent explanation of how this came about is far beyond the scope of this

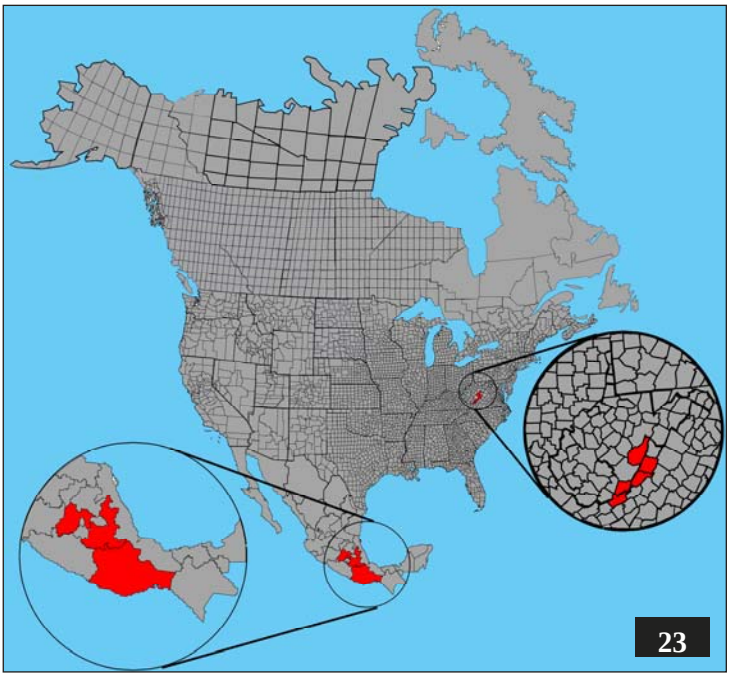

Figure 23. Distribution Map of *Corallorhiza bentleyi* (Appalachians) and *Corallorhiza striata* var. *involuta* (Southern Mexico) showing the geographic separation of the two closely related taxa.

Figure 24. Color forms of *Corallorhiza bentleyi*

article. The flowers of *Corallorhiza bentleyi* readily self-pollinate and rarely open fully. The stout robust brown, reddish-brown, or purplish brown flowering stems are only 6-8 inches tall; bearing up to 15 tiny flowers. The lip may be lemon-yellow or reddish purple streaked with white.

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From the President-

Full Circle and More

I am pleased to announce the appointment of Bob Ferry as our new Editor effective June 1, 2014. Bob served as our first editor and after my solicitation for someone to fill this position he has volunteered to again serve as the editor of the Native Orchid Conference Journal starting with Volume 11 (4). I would like to extend heartfelt thanks to retiring editor Duane Erdmann for stepping up to continue for one more issue until his replacement was found. If any of you has an inclination to help on the Publication Committee please feel free to contact Bob at (361) 575-1006 or email him at noceditor@gmail.com.

I would also like to thank Duane for his service to the Native Orchid Conference these past four years and with all this experience he has agreed to remain on the Publication Committee for the time being. Under his leadership our journal has become an even better publication with the many improvements he has implemented. With a wonderful working relationship with the American Orchid Society and other organizations we have indeed become a first class publication earning respect worldwide.

As I write this final “From the President” I find myself both sad and excited. I have enjoyed helping to move the Native Orchid Conference ahead in a positive manner these past four years. I think the organization is in excellent shape both financially and leadership wise. I am sad that I won’t be as active in the everyday running of our society but feel that our new Officers and Board will continue the fine traditions of the previous Officers and Board of Directors. I would hope that each and every member will to continue to support the society in the future.

Finally thanks to everyone for their past support and words of encouragement during these past four years. Let us keep the Native Orchid Conference rolling along in the years to come.

I look forward to seeing many of you in Minnesota in July for the annual conference. Remember to bring your insect repellant and boots and ….more!

Regards,

Mark

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