

The Genus *Cyrtorchis* in Central Africa With a Focus On Its Two Sections

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SINCE ITS DESCRIPTION by Rudolf Schlechter in 1914, the genus *Cyrtorchis* has always been prized for its long-spurred and fragrant flowers. *Cyrtorchis* was described to accommodate a small group of species related to the former *Angraecum arcuatum*, which is currently named *Cyrtorchis arcuata*. The genus belongs to the Vandaeae tribe, and more specifically to the subtribe Angraecinae. This group of approximately 760 species, known as the “angraecoid orchids,” is one of the most taxonomically problematic clade of the large subfamily Epidendroideae (Chase, Cameron, Freudenstein, Pridgeon, Salazar, van den Berg, and Schuiteman 2015; Freudenstein & Chase 2015). According to The Plant List (2016), *Cyrtorchis* has 18 accepted species distributed in Continental Africa and the Gulf of Guinea Islands (Bioko, São Tomé and Príncipe). *Cyrtorchis* species are easily recognizable, even though their accurate identification remains difficult (Stewart, Hermans, and Campbell 2006). When describing *Cyrtorchis*, Schlechter (1914) only named four species but stated that the genus might contain about 15 species altogether. Twenty-two years later, after its publication Summerhayes (1936) revised the genus for the *Flora of West Tropical Africa*, and recognized seven species, including three additional species, one of which he divided into three subspecies. Twelve years later, Summerhayes split the genus into two distinct sections according to the nature of viscidium, section *Heterocolleticon* and section *Homocolleticon*. Then, Summerhayes (1960) again revised the genus and replaced the sectional name *Heterocolleticon* by *Cyrtorchis*, recognizing a total of 15 species for the whole genus. More recently, Chiron (2001) described a new species from Cameroon and produced an identification key for 12 species among the 15 revised by Summerhayes in 1960. At the same time, while preparing the treatment of Ochidaceae for the *Flore du Cameroun*, Szlachetko and Olszewski (2001) raised the two sections at the generic level, based on different features of the viscidium, recognizing two genera *Cyrtorchis* and *Homocolleticon*. Recent molecular studies have proved the monophyly of the genus (Carlsward, Whitten, Williams, and Bytebier 2006; Simo 2014). In addition, morphometric study was used to produce a synoptic revision of the Central African species (Azandi 2014; Azandi, Stévert, Avana, Sonké, Simo-Droissart, and Droissart 2016), resolving some



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taxonomic ambiguities and providing an identification key for the 15 Central African taxa, along with the description of a new typical species from submontane vegetation, *Cyrtcs. submontana*. However, this preliminary taxonomic work needed to be completed by taking into account all specimens of the genus. Indeed, solving the remaining species complexes (*Cyrtcs. ringens*, *Cyrtcs. brownii* and *Cyrtcs. guillaumetii*) is still needed before we can produce a revision of the whole genus. In the present contribution, we aim to highlight some of the little-known *Cyrtorchis* species with emphasis on the sections and their allied species occurring in Central Africa. This genus is the subject of the first author’s PhD research, funded by the American Orchid Society, which aims to elucidate the taxonomy, the reproductive biology and the conservation of the *Cyrtorchis* species.

Morphological Description and Ecological Requirement of the Genus

Cyrtorchis species are epiphytic or rarely lithophytic orchids, found in the open, in shade or in partial shade in semideciduous and evergreen forests and riverine forests, in *Brachystegia* and savanna woodlands, ranging from sea level to 8,530 feet (2,600 m). They represent relatively large African orchids with roots emerging all along the erect or branching stem. Leaves are distichous, fleshy or coriaceous, flat or conduplicate, unequally and obtusely bilobed at the apex. *Cyrtorchis* species have one or more axillary inflorescences, which are few- or many-flowered and are usually shorter than the leaves. Bracts are generally large and pale green, and loosely enclose the flowers in bud and turn black or dark brown. Flowers are easily recognized



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- [1] *Cyrtorchis letouzeyi* taken in situ by Vincent Droissart.
- [2] *Cyrtorchis chailluana* in cultivation.
- [3] *Cyrtorchis ringens* grown in cultivation.
- [4] The first author, Laura Azandi, pointing out a plant of *Cyrtorchis letouzeyi*.

by their ivory white or cream-colored resupinated and star-shape that fade to yellow or orange when old, with rather similar recurved sepals and petals. Lip passes gradually into a long curving and tapering spur. Most *Cyrtorchis* species flowers are sweetly scented, particularly in the evening and at night. They are thought to be pollinated by hawk moths.

Two Sections Based on Reproductive Floral Parts

Summerhayes was the first to notice fundamental reproductive features on the structure of the viscidium that induced him to divide the genus into two sections: the *Homocolleticon* section and the

Cyrtorchis section. These differences are not easy to observe except with a hand lens or binoculars. In the absence of a global taxonomic study of the angraecoid orchids that demonstrates the monophyly of these two groups as genera, we follow the segregation of species into these two sections as widely followed in the literature.

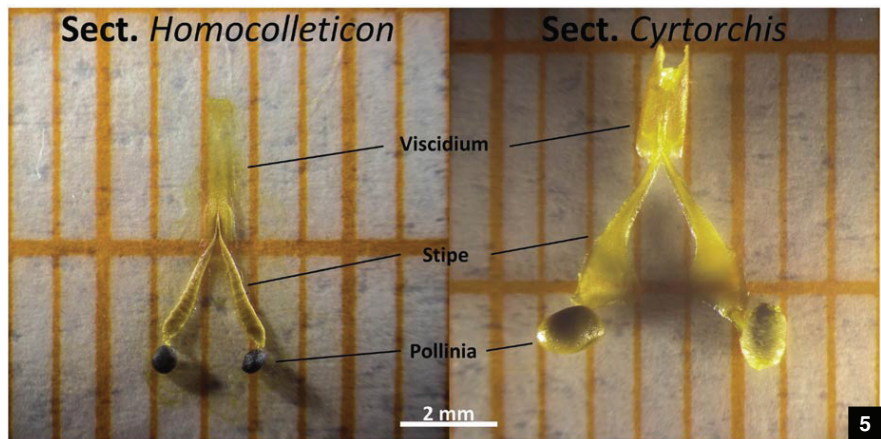
SECTION HOMOCOLLETICON Species in this section are characterized by the uniformly linear viscidium, gradually tapering from the apex to the base with equal hyaline texture throughout its length, and thin apex of the stipite (<0.5 mm). The flowers of species allied to this section are, on average, smaller than those in the other section. Seven species have been described in Central Africa, including one restricted to submontane vegetation.

SECTION CYRTORCHIS Originally called section *Heterocolleticon*, species of this section are recognized by their composed viscidium texture with a broad and rather stiff hardened upper portion with recurved edges and a linear hyaline and very thin lower portion, and a wider apex of the stipite (≥ 0.5 mm). Seven species have been recognized in Central Africa, one of which is divided into two subspecies. After characterizing the two sections of the genus, we present now the Central African taxa of each section.

Species of *Cyrtorchis* Section
Homocolleticon

Cyrtorchis brownii is characterized by the relatively short ligulate but flat and fleshy leaves and the very dense inflorescences of 2.7–3.1 inches (7–8 cm) long, up to 14 flowered. The characteristic floral bract is imbricate and longer than the pedicel and ovary. Flowers are small with a slightly curved spur. *Cyrtorchis brownii* is an epiphytic plant growing in lowland to submontane evergreen forests, riverine forests, saxicolous forests around inselbergs and on mossy branches of tall trees between 1,640–4,000 feet (500–1,219 m) elevation. Flowering peaks are observed in November and December. *Cyrtorchis brownii* occurs in 15 countries extending from Sierra Leone to Malawi and is thus widely distributed in sub-Saharan Africa.

Cyrtorchis guillaumetii is closer to *Cyrtcs. brownii* but is characterized by its subimbricated bract, shorter than the pedicel and ovary; anther cap is noticeably extended forward, covering the base of the rostellum. It is an epiphyte in high rainforest on upper branches. Flowering peaks are observed in November and



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- [5] Comparison of the pollinarium structure in *Cyrtorchis*.
- [6] A cultivated plant of *Cyrtorchis guillaumetii*.
- [7] *Cyrtorchis brownii* taken in shadehouse cultivation.
- [8] *Cyrtorchis henriquesiana* taken in shadehouse cultivation.
- [9] *Cyrtorchis injoloensis* photographed in cultivation. The inset is a close-up of a single inflorescence.
- [10] *Cyrtorchis monteiroae* photographed in cultivation. The inset photograph of a mature plant was taken in situ.

December. *Cyrtorchis guillaumetii* is only recorded from two countries, Sierra Leone and Ivory Coast and is thus endemic to West Africa.

Cyrtorchis henriquesiana is easily recognized by its imbricate linear-shaped and acicular leaves. Inflorescences are short with less than 0.8 inch (2.5 cm) long, usually 2–8 flowered. The species closely resembles *Cyrtorchis aschersonii* vegetatively but the latter has wider V-shaped leaves and a quite different viscidium belonging to sect. *Cyrtorchis*. It occurs in rainforests, in secondary forests and in cocoa plantations at 220–1,935 feet (67–590 m) elevation, in sunny to medium-shade locations. The flowering peak is observed in August. *Cyrtorchis henriquesiana* occurs in six countries extending from Ghana to Democratic Republic of the Congo and is thus endemic to West Central Africa.

Cyrtorchis injoloensis is characterized by its inflorescence loose at the base but dense toward the apex and the spaced longer bract covering the pedicel and ovary. Flowers are of about $\frac{3}{8}$ – $\frac{1}{2}$ inch (1–1.4 cm) apart, 14–20 flowered. This taxon is widely spread in primary forests and forest remnants, ranging between 98 and 3,937 feet (30 and 1,200 m) elevation. Flowering peaks are observed in July and September. *Cyrtorchis injoloensis* occurs in four countries extending from Gabon to Tanzania and is thus widely distributed in sub-Saharan Africa.

Cyrtorchis monteiroae with its long pendent stems and broad dark green oblanceolate and spaced leaves, with characteristic undulated margins, is the largest species of section *Homocolleticon*. Inflorescences are loose, long and pendent up to about 14½ inches (37 cm) long, with 5–32 spaced flowers. This species can be vegetatively confused with *Cyrtorchis chailluana*, which has a somewhat larger flower with the longest spur of the whole genus. *Cyrtorchis monteiroae* is an epiphytic species in evergreen forests, near rivers or lakes ranging between 164–3,999 feet (50–1,219 m) elevation. Flowering peaks are observed in September and October. *Cyrtorchis monteiroae* occurs in 14 countries extending from Sierra Leone to Angola. Its distribution thus extends from Western to Eastern Africa.

Cyrtorchis ringens is characterized by imbricated nonfleshy but coriaceous slender leaves with equally bilobed apex, up to 3½ inches (9 cm) long, dense inflorescences and small depressed bracts. Given the great morphological variations observed on herbarium and



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living specimens associated to *Cyrtcs. ringens*, additional morphometric and molecular studies are needed to accurately clarify the delimitation of this taxon. It can be found in evergreen forests, high river forests, submontane or riverside, between 23 and 8,530 feet (7 and 2,600 m) elevation. Flowering peaks are observed in September and December. *Cyrtorchis ringens* occurs in 20 countries extending from Senegal to Zimbabwe and is thus widely distributed in sub-Saharan Africa.

Cyrtorchis submontana was described in 2016. This taxon resembles *Cyrtcs. guillaumetii* and *Cyrtcs. brownii* but differs by having thinner leaves, fewer flowers and less curved and shorter inflorescences. Plants of *Cyrtcs.*



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submontana are restricted to submontane vegetation in evergreen moist forests on mossy branches, and in saxicolous forests around inselbergs ranging from 1,804 to 3,937 feet (550 to 1,200 m). Flowering peak is observed in June. *Cyrtorchis submontana* occurs in three countries from Cameroon, Equatorial Guinea (Rio Muni) to Republic of the Congo and is thus endemic to Central Africa.

Species of *Cyrtorchis* Section *Cyrtorchis*
Cyrtorchis arcuata is a very variable species initially divided into four subspecies (subsp. *arcuata*, subsp. *whytei*, subsp. *variabilis* and subsp. *leonensis*) by Summerhayes (1960). This complex was later revised and reduced into two subspecies (*Cyrtorchis arcuata* subsp. *arcuata* and *Cyrtorchis arcuata* subsp. *whytei*) that shows clear discriminant characteristics. These two subspecies have in common fleshy nonimbricate, oblong shaped leaves and spaced, ovate to broadly ovate bract with acuminate apex. *Cyrtorchis arcuata* subsp. *arcuata* is characterized by the straight or incurved spur of 1.2–2 inches (3–5.5cm) long, 5–15 flowered. Members of this taxon



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are commonly found on the trunks and large branches of large trees (Perez-Vera 2003) in various vegetation types (forest, savanna). The second subspecies, *Cyrtorchis arcuata* subsp. *whytei*, has a sigmoid spur of 2–3 inches (5.8–8.5 cm) long and are 6–8 flowered. The length of spur is likely approaching that of *Cyrtcs. chailluana*, but the latter has the longest spur of the genus up to 6 inches (16 cm) long and spaced leaves with undulated margin rather than imbricate leaves with flat margins of *Cyrtcs. arcuata*. They are usually found as epiphytes in more open vegetation such as forest galleries, swampy area and sclerophyllous scrub on lava (Geerinck 1992). Flowering peak is observed in September. *Cyrtorchis arcuata* occurs in 27 countries extending from Senegal to South Africa and is thus widely distributed in sub-Saharan Africa.

Cyrtorchis aschersonii is easily identifiable among the species of the section by its linear V-shaped leaves of 0.8–1.4 cm wide. The inflorescences are erect; 5–11 flowered with sigmoid or curved spur, with slender acute apex. This species is epiphytic in mature, high forests, on trunks and branches of large trees, between 459 and 5,594 feet (140 and 1,705 m) elevation. Flowering peak is observed in August. *Cyrtorchis aschersonii* occurs in nine countries extending from Sierra Leone to Democratic Republic of the Congo and is thus widespread from Western to Central Africa.

Cyrtorchis chailluana is a pendulous epiphyte with a long stem. The peculiarity of this showy species is the large attractive white sweetly scented flowers that have the longest spur of all *Cyrtorchis* species, up to 6 inches (16 cm) long. The species is found in rainforest between 98 and 4,363 feet (30 and 1,330 m) elevation. Flowering peak is observed in August and September. *Cyrtorchis chailluana* occurs in 15 countries extending from Guinea to Uganda and is thus widely distributed in sub-Saharan Africa.

Cyrtorchis hamata is characterized by the straight or slightly S-shaped spur of $\frac{3}{4}$ –1½ inches (2.7–4.3 cm) long with a hooked up apex. The taxon is an epiphyte in high semideciduous forest and in secondary vegetation between 656 and 2,132 feet (200 and 650 m) elevation. Flowering peak is observed in August. *Cyrtorchis hamata* occurs in six countries extending from Ivory Coast to Gabon and is thus distributed from Western to Central Africa.

Cyrtorchis letouzeyi was described in 2001. It is characterized by fleshy dark-



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green colored leaves and particularly by the pendulous spur of 1.9–3½ inches (5.7–9 cm) long with rolled up or twisted apex. This attractive species is usually found from forest–savanna transition to dense humid rain forest, between 722 and 2,401 feet (220 and 732 m) elevation. Flowering peak is observed in June and July. *Cyrtorchis letouzeyi* is only recorded from three countries: Cameroon, Central African Republic and Gabon. It is thus endemic to Central Africa.

Cyrtorchis neglecta is characterized by dense inflorescences, 4–12 flowered, as long as or slightly shorter than the

[11] *Cyrtorchis ringens* photographed in cultivation. The inset is a close-up of a single inflorescence.

[12] *Cyrtorchis submontana* taken in situ. Note the diminutive stature of the plant (inset).

[13] *Cyrtorchis arcuata* subsp. *whytei* taken in shadehouse cultivation.

[14] *Cyrtorchis arcuata* subsp. *arcuata* taken in shadehouse cultivation.

[15] *Cyrtorchis aschersonii* in cultivation. Note the relative flower size (inset).

subtending leaves, unlike *Cyrtcs. seretii*. Bract are usually spaced, $\frac{1}{2}$ – $1\frac{1}{2}$ inches (0.6–1.5 cm) apart. Members of this species are found in gallery forests, open forests or shrublands between 2,001 and 5,498 feet (610 and 1,676 m) elevation. Flowering peak is observed in March. *Cyrtorchis neglecta* occurs in five countries extending from Democratic Republic of the Congo to Zambia and is thus widely distributed in sub-Saharan Africa.

Cyrtorchis seretii is characterized by fleshy and imbricate leaves, with flattened margins. Inflorescences are shorter than the subtending leaves, 7–9 flowered. Bracts are subimbricate, $\frac{1}{4}$ – $\frac{1}{2}$ inch (1.2–1.6 cm). Individuals of this species are found in woodlands between 1,443 and 4,921 feet (440 and 1,500 m) elevation. Flowering peaks are observed in March and August. *Cyrtorchis seretii* occurs in five countries extending from Ethiopia to Zambia and is thus widely distributed in sub-Saharan Africa.

Growing *Cyrtorchis* Species in Tropical Africa

Since *Cyrtorchis* are mostly epiphytic species, they are usually cultivated on woody substrate from tropical rainforest trees. Medium to deep shade and high humidity are essential for their cultivation. They are very sensitive to dry atmosphere, and the leaves soon start to look wilted. Watering must thus be frequent throughout the year, although somewhat less just after flowering. Flowering mostly occurs during the long rainy season (June to October in Cameroon). An effective way to grow most species of *Cyrtorchis* is by mounting them on vertical sticks, branches or woody bark that provides a good substrate for species with a pendent habit and numerous thick long roots on which the stem can be tied until it attaches itself by the roots. Plaques of wood or wooden rafts, mounted pieces of bark or a basket or pot of free-draining compost offers yet other surfaces on which other erect-stemmed plants species grow.

Next, we aim to continue our exploration of this fascinating Angraecoid genus by elucidating the pollination ecology of some Central African *Cyrtorchis* species. The genus is composed of species with complex floral structure that may involve interesting sphingophilous (long-tongued hawk moth) syndromes. These results from pollination studies will be presented in a future paper.

Acknowledgments

The senior author thanks the American Orchid Society and the National Science Foundation for support in the form of a



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research fellowship for Laura Azandi.

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