

MARK CHASE AND
MAARTEN CHRISTENHUSZ

THE BOOK OF ORCHIDS

A LIFE-SIZE GUIDE TO SIX
HUNDRED SPECIES FROM
AROUND THE WORLD

FOREWORD BY TOM MIRENDA



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FOREWORD
TOM MIRENDA

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FOREWORD

Orchids have given me an exceptional amount of pleasure over the years. For decades, it has been my mission to share that joy. Taking part in the creation of this book is the culmination of that desire to nurture and spread appreciation for what I believe to be the most extraordinary family of plants. Unquestionably lovely, orchids are far beyond being just beautiful. They are seemingly endless in their diversity, perpetually compelling and astonishingly well adapted to a mind-boggling array of ecological niches and evolutionary partners. A geologically old family, members of the Orchidaceae have colonized the far reaches of our planet save those most inhospitable: extreme poles, high mountain peaks, the most desolate deserts and, of course, the deep waters of our lakes, rivers, and oceans.

Having evolved to occur in such a wide variety of habitats, as well as perfecting the ability to interact with and exploit myriad creatures as symbionts, orchids are the ideal plant family to teach us about biodiversity and illustrate its importance. The remarkable structures and colors of each and every orchid species convey a story about their ecology, evolution, and survival strategy. Once analyzed and unlocked, these stories give us powerful insight into the processes that have shaped our world for millennia and, hopefully, inspire us to conserve that which took millennia to create.

Masters of deception and manipulation, orchids are famous for lying and cheating their way to their many evolutionary successes. Exploring the manner in which they co-opt pre-existing behaviors of a bewildering cohort of pollinators of lilliputian dimensions is not only outstandingly instructive, but is just plain fun to contemplate. Even the venerable Charles Darwin referred to orchids as ‘Splendid Sport’ and maintained a passion



for them throughout his lifetime. It is undeniable that orchids have gripped the psyches of many humans. They have even, in recent years, become the most sold and cultivated type of ornamental plant. Their beauty alone does not explain this phenomenon.

Many theories exist as to why orchids are so alluring to us. It is thought that their zygomorphic (bilaterally symmetrical) flower structure influences us to see orchid flowers similarly to the way we see faces, attributing to them some ‘personality’ in addition to their beauty. Some find the lip of certain orchids to be reminiscent of human anatomical parts that we normally keep covered, lending them a subliminal or feral attraction. Others simply find the combination of color, form, grace, and fragrance most appealing, yet not all orchids have traditionally attractive versions of these attributes. Some of the most compelling orchids are rank-smelling, muddy in coloration, and borne on clunky plants. Nothing adequately explains why people become so wildly obsessive about orchids. Ultimately, they are simply provocative creatures that manage to elicit strong reactions from pollinator and person alike.

In this ambitious book, we invite you to journey with us around the world and see orchids for the marvels of nature they truly are. It is our hope that the images and stories within will inspire appreciation and stewardship as well as give great pleasure to all, young and old, who choose to embark on the rewarding study of orchidology.

Tom Mirenda
Orchid Collection Specialist
SMITHSONIAN INSTITUTION, WASHINGTON D.C.

RIGHT *Bulbophyllum lobbii*, a widespread species in the Asian tropics and a member of one of the largest orchid genera.



INTRODUCTION

The orchid family, Orchidaceae, embraces 26,000 species in 749 genera and is one of the two largest families of flowering plants, or angiosperms—a broad group that includes herbs, trees, shrubs, and vines. The other large family is that of the daisies and lettuce, Asteraceae. Estimates of family size vary, depending on how the number of species is calculated, and which is the larger of the two is a hotly debated topic among botanists. Many people have a vague idea of what an orchid is, but it is likely that most would not recognize all the species included in this book as orchids. So, what is an orchid?

Orchids are divided into five subfamilies, Apostasioideae, Vanilloideae, Cypripedioideae, Epidendroideae, and Orchidoideae. This subdivision is based on DNA studies and morphology and reflects major differences in vegetative features and especially in the way orchid flowers are constructed. The five subfamilies have been recognized in the past as separate families by some botanists based on these distinctive characteristics, and the only characteristic they all share is that of how orchid embryos develop, from a structure called a protocorm, which is a small ball of cells without roots, stems, or leaves.

To develop into a mature orchid plant, a protocorm has to be successfully infected by a fungus, from which the developing orchid seedling obtains initially all the food (in the form of sugars) and minerals it needs to grow. As they start their life, orchids can be thought of as parasites on fungi. However, most but not all orchids as adults go on to develop roots and leaves, and produce their own food through photosynthesis. At a much later stage the continuing relationship of an orchid plant with the fungus

can become mutually beneficial. In nature, the orchid exchanges sugars produced by its photosynthesis for minerals found more effectively by the fungus. In cultivation, the need of an orchid protocorm for a fungal partner can be replaced by manufactured sources of food and minerals, and many orchids are grown commercially using germination media with added sugars and minerals.

THE COLUMN

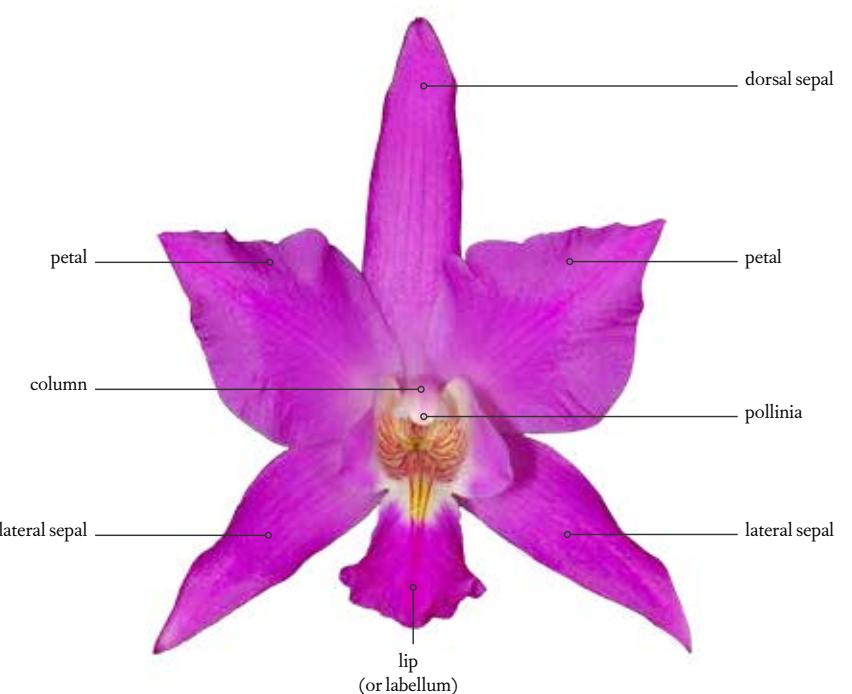
The other major trait that most botanists use to recognize an orchid is a structure called the gynostemium, or column, produced by the fusion of male (stamen) and female (stigma) parts in the flower. All but one of the five subfamilies share this feature. The exception is the subfamily Apostasioideae, consisting of only 14 species in two genera, *Apostasia* and *Neuwiedia*, which all lack complete fusion of the male and female parts.

In subfamily Cypripedioideae—which consists of five genera, *Cypripedium*, *Mexipedium*, *Paphiopedilum*, *Phragmipedium*, and *Selenipedium*, and 169 species, known as the slipper orchids—there are two stamens (the pollen-bearing structure of a flower), whereas only one occurs in the other three subfamilies—Vanilloideae (14 genera and 247 species), Orchidoideae (200 genera and around 3,630 species), and Epidendroideae (535 genera and around 22,000 species). Their single stamen is fused to three fused stigmas with a single female receptive region.

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BELOW Mexican species *Laelia gouldiana*, labeled to show the floral parts that make up a typical orchid flower.

THE PARTS OF AN ORCHID FLOWER





ABOVE *Epidendrum wallisii*, a species from Central and South America that is pollinated by butterflies searching for nectar.

therefore, a highly exact sequence of events, leading to fertilization of the thousands of developing orchid embryos in the carpel, or ovary, with just a single visit of a pollinator, provided that it has previously visited another flower of that same orchid species to pick up pollinia.

THE LIP

In most orchids the female receptive surface, or stigma, is a cavity on the side of the column that faces the other highly distinctive orchid structure: a modified petal (one of three) that is termed the labellum, or lip. This serves variously as a landing platform, a flag to attract the pollinator, or—playing an important part in various forms of deceit that orchids use to fool pollinators—a mimic of something the pollinator wants, such as nectar, pollen, a mate, or a place to lay its eggs.

There are many orchids that appear not to have a lip. A good example is the genus *Thelymitra* from Australia, where the member species are called sun orchids. Rather than a lip, the flowers of these plants have three sepals, which are initially a set of protective leaflike structures (that in many orchids also become colorful) and three similar petals (also colorful leaflike organs). Such similarity of all three petals, though, is the exception among orchids, most of which develop a highly modified lip.

The column's characteristically fused structure, shared by 99.95 percent of all orchids, is responsible for the remarkable event where a pollinator, such as a bee, wasp, or moth, is maneuvered into doing exactly what the orchid wants. This allows the pollen of the orchid, usually in the form of thousands of grains bound into a solid ball, or pollinium, to be placed on the animal in a precise manner and then, due to the usual close proximity of the stigma and anther (the part of the stamen holding the pollen), be precisely removed from that spot. Pollination in orchids is,

Although it has long been known that orchids can control the appearance of the lip in isolation from the other showy parts of their flowers—the two remaining petals and three sepals—it was not clear until recently how the lip was controlled from a genetic or developmental perspective. In nearly all other plants that have been studied in this regard, the three petals are controlled by the same floral genes, and by and large they all three do the same thing and look the same. Think, for example, of a lily or a tulip, in which the three petals are identical. In orchids, there has been a duplication of the floral genes, and one of the duplicated copies is expressed just in the lip, making it possible for this petal—the lip—to look different and be involved in pollinator manipulation apart from the other two petals, in which the gene is not expressed. This more complicated set of genetic controls has made the flowers of orchids among the most complex in the plant world and undoubtedly is a major reason why their flowers are adapted for pollination by such a large number of animals.

DISTINGUISHING FEATURES

The combination of column, lip, and pollinia—the first unique to orchids, the others not unique but unusual among plants—makes it possible for botanists to recognize plants as orchids despite their capacity to look decidedly un-orchidlike. In biological terms, this amalgam of features has enabled orchids to become evolutionarily explosive, leading to the 26,000 species alive today.

Species numbers in the largest genera, *Epidendrum*, *Bulbophyllum*, *Dendrobium*, and *Lepanthes*, run into the thousands. No book could include all of them, so we have concentrated on illustrating 600 orchid species, carefully chosen to display the wide range of orchid diversity and to cover all areas of the globe where the plants are found. They are presented in the five subfamilies, appearing alphabetically by Latin name within tribes (and subtribes where appropriate).

BELOW *Epidendrum medusae* grows high in the Andes and is pollinated by moths attracted by its elaborate fringed lip.



APOSTASIOIDEAE, VANILLOIDEAE & CYPRIPEDIOIDEAE

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These three subfamilies account for few of the great number of orchid species, but they do contribute much variety in terms of vegetative and floral diversity. The smallest subfamily is Apostasioideae, its two genera and 14 species entirely confined to the tropics of Asia, where they are rarely recognized as orchids, lacking the usual fusion of the male and female parts of the flower. This has caused some botanists to consider them to be primitive orchids, although, in fact, other than their lack of fusion, Apostasioideae species are highly modified and unlike what we would imagine to be a primitive orchid. The 247 species in the 14 genera of Vanilloideae on the other hand have flowers that look like orchids but are vegetatively unlike an orchid, being tropical vines and small leafy and leafless plants, mostly herbs, of the temperate zones. The slipper orchids, subfamily Cypripedioideae (five genera, 169 species), are both tropical and north temperate species. They differ mostly in their retention of two anthers, although these are completely fused to the female parts, making them otherwise true orchids. Cypripedioideae species are mostly herbaceous plants, although a few resemble bamboos and can grow to a height of 20 feet (6 m).



SUBFAMILY	Vanilloideae
TRIBE	Pogonieae
NATIVE RANGE	Southeastern United States (New Jersey to Florida, eastern Tennessee, and Kentucky)
HABITAT	Pine barrens, bogs, wet meadows, stream courses
TYPE AND PLACEMENT	Terrrestrial
CONSERVATION STATUS	Threatened or endangered
FLOWERING TIME	April to June (spring)

SUBFAMILY	Vanilloideae
TRIBE	Pogonieae
NATIVE RANGE	Michigan through Ontario to New England, south to Tennessee, Georgia, and South Carolina
HABITAT	Semi-open, mesic forests of eastern North America
TYPE AND PLACEMENT	Terrrestrial
CONSERVATION STATUS	Threatened
FLOWERING TIME	April to May (spring)

FLOWER SIZE
4½ in (11.4 cm)

PLANT SIZE
Stem up to 24 in (61 cm),
leaves up to 6 in (15 cm)

CLEISTESIOPSIS DIVARICATA
ROSEBUD ORCHID
(LINNAEUS) PANSARIN & F. BARROS, 2008

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The fragrant, vanilla-scented Rosebud Orchid can be found in wetland areas of southeastern North America. The slender, long-stemmed plant typically bears one showy flower, subtended by a leafy bract that is usually longer than the ovary. Bees gather nectar from a pair of glands at the labellum base. Underground, the plant has a mass of thick roots attached to a rhizome and no tuber.

Cleistes, on which the genus name is based, comes from the Greek word for “closed,” referring to the petals and lip, which form a tube, concealing the column. This makes the flower appear unopened, like a bud—hence its common name. The other part of the genus name, *-opsis*, refers to the plant’s similarity to the large Neotropical genus *Cleistes*, in which it was previously included until DNA studies demonstrated that it should be segregated.

Actual size

The flower of the Rosebud Orchid has long, acuminate, usually maroon sepals and petals of soft rose pink, the latter never opening fully. The petals and long-keeled labellum, which is also pink with darker markings, form a long tunnel-like tube.

ISOTRIA MEDEOLOIDES **SMALL WHORLED POGONIA**

(PURSH) RAFINESQUE, 1838

FLOWER SIZE
1½ in (3.8 cm)

PLANT SIZE
Stem up to 12 in (30 cm),
with whorl of leaves just
below the flower

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Considered to be the rarest orchid east of the Mississippi River, this species is found in temperate woodlands, where its ecology is tied deeply to the trees around it. The species name derives from the Small Whorled Pogonia’s superficial resemblance to the plant *Medeola virginiana*, or Indian cucumber, which grows in similar habitats. The plant structure, unusual for an orchid, consists of a hollow stem with five or six blade-like leaves arranged in a whorl at its apex just below a single flower, although two flowers occasionally occur. Underground there is a mass of roots and no tuber.

Unlike its showier sister species, *Isotria verticillata*, *I. medeoloides* is sparse, often solitary, or found in small colonies. Like many woodland terrestrials, this species has been known to disappear or retreat underground for years at a time, making population studies difficult.



Actual size

The flower of the Small Whorled Pogonia has pale green sepals and petals and a whitish lip. The flowers do not open fully and are often short lived.





SUBFAMILY	Vanilloideae
TRIBE	Pogonieae
NATIVE RANGE	Eastern North America, from Canada to Florida and west to Minnesota
HABITAT	Wet meadows, bogs, stream sides, often occurring in poorly drained roadside ditches
TYPE AND PLACEMENT	Terrestrial
CONSERVATION STATUS	Threatened or endangered
FLOWERING TIME	Early spring in south to midsummer in northern part of range

SUBFAMILY	Vanilloideae
TRIBE	Vanilleae
NATIVE RANGE	Southeastern China, Korea, Japan, and the Ryukyu Islands, at 3,300–4,300 ft (1,000–1,300 m)
HABITAT	Shaded woods
TYPE AND PLACEMENT	Terrrestrial, mycoheterotrophic on wood-decaying fungi
CONSERVATION STATUS	Not assessed, but locally frequent
FLOWERING TIME	May to July (spring)

FLOWER SIZE
1½–2 in (3.8–5 cm)

PLANT SIZE
6–10 in (15–25 cm), including inflorescence

POGONIA OPHIOGLOSSOIDES
ROSE POGONIA
(LINNAEUS) KER GAWLER, 1816

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A slender, semi-aquatic plant, often occurring in bogs and beside streams, the pretty Rose Pogonia can be locally abundant, often proliferating into lush, multi-growth colonies. Preferring to grow where there is easily available, pure water, this species is scarce in years with sparse rainfall but will rebound in wet periods. The short-lived, mostly pale pink flowers can vary in color and intensity and probably use their darker fringed labellum with yellowish filamentous crests to attract pollinators. This open-jawed appearance explains the plant's alternative common names, Adder's Mouth or Snake Mouth.

Underground, there is a mass of roots but no tuber.

Pogonias grow in dappled light, usually in moist sphagnum moss, and can produce massive colonies. The genus name comes from the Greek word *pogon*, meaning beard, which refers to the hairy labellum.

Actual size

The flower of the Rose Pogonia is usually pale pink with a darker lip, fringed with purplish striations, and a yellow crest. Flowers appear singly on a stem, though up to three have been reported on vigorous plants.

CYRTOSIA SEPTENTRIONALIS

NORTHERN BANANA ORCHID

(REICHENBACH FILS) GARAY, 1986

The leafless Northern Banana Orchid lives underground until it flowers. Seedlings parasitize wood-decaying fungi (*Armillaria* species) and fulfill their carbon needs from this fungus, on which the plant is dependent for its entire life. The flowers do not produce nectar or scent, so it is difficult to imagine why insects or other animals might visit them. However, studies have shown that these flowers are actively self-pollinating, and every flower sets seed. Bright red, banana-like fruits grow from the pollinated flowers and are distributed by rodents and birds.

The genus name *Cyrtosia* is derived from the Greek *kyrtos*, meaning curved, which refers to the plant's curved column, and *septentrionalis* is the Latin word for "northern." In Japan, the fruits have been used to treat urinary disease, gonorrhea, and dandruff.



FLOWER SIZE
1½ in (4 cm)

PLANT SIZE
Vegetative parts underground, flowering stems up to 36 in (91 cm)



Actual size

The flower of the Northern Banana Orchid is orange brown and held in clusters. Sepals are warty outside and the petals are thinner and shorter. The lip is cup-shaped with a fringed edge. The column is strongly curved with two lateral, toothed wings and capped by two mealy pollinia, or pollen masses.

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SUBFAMILY	Vanilloideae
TRIBE	Vanilleae
NATIVE RANGE	Tropical South America, at 330–2,950 ft (100–900 m)
HABITAT	Open places in rain forests and savanna
TYPE AND PLACEMENT	Terrrestrial
CONSERVATION STATUS	Not assessed
FLOWERING TIME	All year

SUBFAMILY	Vanilloideae
TRIBE	Vanilleae
NATIVE RANGE	New Caledonia
HABITAT	Open, sunny savannas
TYPE AND PLACEMENT	Terrrestrial
CONSERVATION STATUS	Not threatened
FLOWERING TIME	Spring

FLOWER SIZE
4–5 in (10–12 cm)PLANT SIZE
30–75 × 10–15 in
(76–190 cm),
76–191 × 25–38 in
(193–485 × 64–97 cm),
including inflorescence

EPISTEPIUM SCLEROHYLLUM
**LEATHER-LEAFED
CROWN ORCHID**

LINDLEY, 1840

This large, ground-dwelling orchid produces erect stems covered with leathery, rigid, ovate leaves, while underground there is a branching horizontal rhizome with many tough roots. The inflorescences are terminal and have small floral bracts with many flowers that open successively, two to three at a time. At the top of the ovary the flowers are inserted into a scalloped ridge. This crown-like structure is the basis of the genus name (Greek, *epi-*, “upon,” and *stephanos*, “crown”). The plant is a member of the same tribe as the genus *Vanilla*, to which it is closely related.

The showy flowers have a classical orchid shape (like species of the *Cattleya* genus), which indicates that they are probably pollinated by bees. In spite of their fantastically beautiful flowers, these orchids have never been successfully cultivated.

The flower of the Leather-leaved Crown Orchid has three relatively narrow pink sepals and two broader petals. The massive pink lip is wrapped around the column and has yellow and white nectar guide markings with a cluster of long hairs near its middle.

Actual size



ERIAKIS RIGIDA
MAQUIS ORCHID

REICHENBACH FILS, 1876

The Maquis Orchid is endemic to the remote Pacific archipelago of New Caledonia, a place free from typical cataclysms for plants, such as seasonal cold. New Caledonia preserves some of the most ancient flora on Earth. The orchid produces a tough wiry stem with leaves along its length and up to a dozen flowers at the top.

Growing in full sun, the buds and inflorescence are covered with minute white hairs. The plants have adapted to grow in the maquis, a vegetation on nutrient-poor soil laden with heavy metals that would be toxic to many other plants. The lip bears a row of sharp, hinged, inward-pointing scales that make it difficult for a pollinating insect to retreat, encouraging it to position itself to best carry the plant’s friable pollen.

The flower of the Maquis Orchid is fleshy and short-lived. They are usually borne two at a time on a successively flowered inflorescence, and are white or pale pink, with a tubular reddish purple lip.

Actual size

FLOWER SIZE
1½–2 in (3–5 cm)PLANT SIZE
2–3 ft (60–92 cm) tall,
including flowers



SUBFAMILY	Vanilloideae
TRIBE	Vanilleae
NATIVE RANGE	Northern and eastern Australia (Queensland, New South Wales)
HABITAT	Sclerophyll forest in full sun, scrambling over eucalyptus logs, tree stumps, and decaying wood, at 165–1,640 ft (50–500 m)
TYPE AND PLACEMENT	Terrestrial vine, mycoheterotrophic
CONSERVATION STATUS	Not assessed
FLOWERING TIME	September to December (spring to early summer)

FLOWER SIZE
½ in (1.3 cm)

PLANT SIZE
Up to 20 ft (6 m) long, leafless

ERYTHRORCHIS CASSYTHOIDES
BLACK BOOTLACE ORCHID
(A. CUNNINGHAM EX LINDLEY) GARAY, 1986

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SUBFAMILY	Vanilloideae
TRIBE	Vanilleae
NATIVE RANGE	Tropical Southeast Asia and Malesia, from Hainan Island to New Guinea, from sea level to 5,600 ft (1,700 m)
HABITAT	Decaying tree stumps, often in treefall gaps or along streams in sunny but damp locations
TYPE AND PLACEMENT	Terrestrial and climbing, mycoheterotrophic
CONSERVATION STATUS	Not assessed, but locally frequent
FLOWERING TIME	April to June

FLOWER SIZE
1⅓ in (3 cm)

PLANT SIZE
Climbing trees up to 66 ft (20 m) tall

GALEOLA NUDIFOLIA
LEAFLESS HELMET VINE

LOUREIRO, 1790

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The flower of the Black Bootlace Orchid has three creamy, spreading sepals and two similar spreading, creamy-white petals. The lip is also creamy and tubular, curved around the column with an irregularly notched or lobed margin.

The Black Bootlace Orchid is mycoheterotrophic, which means it lacks chlorophyll and instead takes all its nutrients from a fungus that it parasitizes. It has slender, brown, climbing branches, not unlike Devil's Twine, a parasitic vine of the *Cassytha* genus—hence the scientific name. The common name comes from the strap-like branches, which resemble shoelaces.

The plant stems are held in place by thick, fleshy roots, and the highly branched inflorescence bears many scented flowers that attract small bees for pollination. The flowers closely resemble those of the *Vanilla* genus, to which the species is related, along with other chlorophyll-free genera, such as *Galeola*. Plants are reported to be short-lived and more vigorous and frequent in places where there is rotting timber.

The tip of the column of the Leafless Helmet Vine has a pair of projecting appendages that resemble a small helmet, called *galeole* in Greek, which gives the genus its scientific name. This large vining orchid lacks chlorophyll and climbs with its reddish stems and roots over rotting tree trunks, where it parasitizes the wood-decaying fungus that provides its carbon and nutrients. The vibrant flowers are most likely pollinated by small bees, but no specific observations on pollination have been made.

The winged seeds of the *Galeola* species are much bigger than those of most orchids, which are generally dustlike. The wings help to disperse the seeds across dense rain forest habitats, where there is little wind to help them drift to new, suitable locations. A related Japanese species, *Galeola septentrionalis*, becomes a weed in log beds used to cultivate shiitake mushrooms.

The flower of the Leafless Helmet Vine is fleshy and has free, spreading sepals and thinner, similarly sized petals. The lip is fleshy, round, and cup-shaped with a margin turned inward. The column is strongly curved forward, bears a pair of projections, and has two pollinia.



Actual size



Actual size



SUBFAMILY	Vanilloideae
TRIBE	Vanilleae
NATIVE RANGE	Southeast Asia, peninsular Malaysia, western Java, Taiwan, Philippines, New Guinea
HABITAT	Dark humid forests, at 985–5,250 ft (300–1,600 m)
TYPE AND PLACEMENT	Terrrestrial
CONSERVATION STATUS	Unknown
FLOWERING TIME	March to June (spring)

FLOWER SIZE
¾ in (1.6 cm)PLANT SIZE
Vegetative parts
underground, flowering
stems up to 20 in (51 cm)

LECANORCHIS JAVANICA BASIN ORCHID

BLUME, 1856

44

This leafless plant lives on fungi for all its life and only emerges from the soil when flowering. The flower is surrounded by a cup-shaped structure that persists on top of the ovary, hence the common name of Basin Orchid and the genus name derived from the Greek *lecanē*, meaning a pot.

The flowers open only slightly, are not showy, and lack a scent. They may, therefore, be mostly self-pollinating, although the lips bear long hairs that could be an indication of fly pollination. However, very little is known about the ecological interactions of this plant.



The flower of the Basin Orchid has three greenish yellow sepals and greenish yellow, oblong petals. The three-lobed lip is white or light yellow, with a hairy middle lobe irregularly notched at the margin. The column is hairless and bears semicircular wings at the tip.

Actual size

SUBFAMILY	Vanilloideae
TRIBE	Vanilleae
NATIVE RANGE	Seychelles (islands of Mahé, Praslin, Silhouette, and Félicité)
HABITAT	Granite outcrops and other dry open areas, from sea level to 1,300 ft (400 m)
TYPE AND PLACEMENT	Climbing on rocks and trees
CONSERVATION STATUS	Least concern
FLOWERING TIME	December to February (wet season)

VANILLA PHALAENOPSIS SEYCHELLES VANILLA

REICHENBACH FILS EX VAN HOUTTE, 1867

FLOWER SIZE
3½ in (8 cm)PLANT SIZE
Stems grow to around
18 ft (5.5 m) long

45

One of the most beautiful species of the genus *Vanilla*, this leafless orchid has climbing green, succulent stems with which it scrambles over rocks and trees, supported by aerial roots. It flowers after heavy rains but only on plants that have grown taller than their support and have pendent branches on which the inflorescences are formed. Up to three fragrant flowers are open at the same time, giving an impressive display.

Even though its distribution is restricted to the granitic Seychelles, the species is relatively common there. It is similar to *Vanilla aphylla*, found in Southeast Asia and Madagascar, which has a lilac instead of orange lip. The green fruits do not produce the aromatic compounds typical of commercial *V planifolia*.



Actual size

The flower of the Seychelles Vanilla is pure white. The oblong sepals are spreading, and the two petals are of the same length, but with wavy margins. The lip is entire and folded back at the margin, with an apricot-colored center.



SUBFAMILY	Vanilloideae
TRIBE	Vanilleae
NATIVE RANGE	Mexico (but widely cultivated and naturalized elsewhere in the tropics)
HABITAT	Lowland tropical forests
TYPE AND PLACEMENT	Terrestrial, but climbs trees
CONSERVATION STATUS	Not threatened
FLOWERING TIME	Throughout the year

FLOWER SIZE
2½ in (6.4 cm)PLANT SIZE
20 ft (6 m) or more

VANILLA ORCHID

JACKSON EX ANDREWS, 1808

46

The most commercially important orchid, *Vanilla* is cultivated in tropical places around the world for its “beans,” which, when fermented and dried, produce the popular flavoring. The *Vanilla* genus occurs on five continents, with more than a hundred species, and is one of only five vining orchid genera, which need the support of trees to grow to their full potential. The vines can grow to great lengths.

Short-lived flowers with tubular lips are produced successively on axial racemes. They are pollinated by a wasp in their natural range in Mexico, but pollination has to be done by hand in plantations in places such as Madagascar, Réunion, and Tahiti, where the plants are cultivated in large numbers. This one species provides 95 percent of the world’s commercially produced vanilla pods.



Actual size

The flower of the Vanilla Orchid is usually yellow or greenish, with similarly colored sepals, petals, and tubular keeled lip. Although flowers last a single day, the plants bloom frequently and successively over a long period.

SUBFAMILY	Cypripedioideae
TRIBE AND SUBTRIBE	Not applicable
NATIVE RANGE	Temperate northern Europe and Asia, from the British Isles to Korea and Japan
HABITAT	Temperate woodlands and scrub, at up to 6,600 ft (2,000 m)
TYPE AND PLACEMENT	Terrestrial
CONSERVATION STATUS	Widespread, although endangered in places
FLOWERING TIME	April to June (spring)

CYPRIPEDIUM CALCEOLUS YELLOW LADY’S SLIPPER

LINNAEUS, 1753

FLOWER SIZE
2–3 in (5–8 cm)PLANT SIZE
15–30 in (38–76 cm),
including flowers

47

The Yellow Lady’s Slipper has a vast native range over expansive areas of the northern hemisphere. Some have considered the North American species *Cypripedium parviflorum* to be the same or merely a varietal form of this beautiful orchid, but it is now known to be a distinct species. It thrives on damp substrate in limestone-rich areas, which may be why the species is amenable to cultivation. Despite the plant’s widespread distribution, poaching and urban sprawl threaten some populations.

In the species name, *calceolus* (Latin) means “little shoe,” and it is the slipper-like shape of the plant’s lip that has inspired both the scientific and common names. The pouch acts as an insect trap, waylaying hapless pollinators, usually bees, but with no reward for their services. They are released covered with the pollen.



The flower of the Yellow Lady’s Slipper varies but generally has yellow to brown sepals and petals, with a brilliant-yellow pouch-shaped lip. Usually solitary flowers appear at the apex of a pubescent stem and are subtended by a leaflike bract.

Actual size



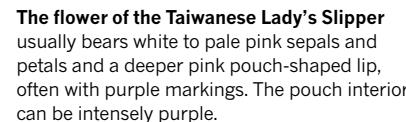
SUBFAMILY	Cypripedioideae
TRIBE AND SUBTRIBE	Not applicable
NATIVE RANGE	Central mountains of Taiwan
HABITAT	Beside streams and in moist riparian woodlands
TYPE AND PLACEMENT	Terrrestrial
CONSERVATION STATUS	Endangered
FLOWERING TIME	April to May

SUBFAMILY	Cypripedioideae
TRIBE AND SUBTRIBE	Not applicable
NATIVE RANGE	Eastern and central North America
HABITAT	Bog edges and moist temperate woodlands
TYPE AND PLACEMENT	Terrrestrial
CONSERVATION STATUS	Threatened by poaching
FLOWERING TIME	May to June

FLOWER SIZE
3½–4 in (9–10 cm)

PLANT SIZE
Basal leaves up to 8 in (20 cm) tall; inflorescence up to 24 in (61 cm) tall, including flower

CYPRIPEDIUM FORMOSANUM
TAIWANESE LADY'S SLIPPER
HAYATA, 1916



The flower of the Taiwanese Lady's Slipper usually bears white to pale pink sepals and petals and a deeper pink pouch-shaped lip, often with purple markings. The pouch interior can be intensely purple.

With paired and pleated basal leaves that resemble a frilled, Elizabethan collar, this is one of the most distinctive of the lady's slipper orchids. Prettier and more diminutive than its coarser, more widely distributed sister species *Cypripedium japonicum*, the Taiwanese Lady's Slipper can form massive clumps of more than a hundred blooming stems on an individual plant. A hairy stem supports a single, remarkable flower (rarely two). White or pink-blushed segments are the background for the purplish speckled pouch lip, with an often heart-shaped front opening through which the pollinating bees force themselves. Underground it has a mass of thick roots with no tuber.

It is a hardy, temperate plant, with exceptional ornamental appeal, which is easy to propagate. The highly endemic and localized wild populations, however, are becoming increasingly rare due to collection pressure.



CYPRIPEDIUM REGINAE SHOWY LADY'S SLIPPER

WALTER, 1788

FLOWER SIZE
4–4½ in (10–11 cm)

PLANT SIZE
15–40 in (38–102 cm) tall, including flowers



The Showy Lady's Slipper is revered and admired for its stately size and spectacular blooms. Taller and larger-flowered than many species of this genus, it is difficult to miss in the wild when in full show. Like all others in its subfamily, the plant has a colorful pouch that acts as a trap, forcing the bees to exit by one route, where they pick up the pollen. Bees approach the flower expecting the colorful blossoms to be sources of nectar, only to find no reward. Underground, these plants have a mass of thick roots but no tubers.

Because of its exceptional beauty and hardiness, the species is often poached from the wild for use in gardens. Such dug up plants rarely survive, but plants grown from seed in nurseries have a much improved success rate.

The flower of the Showy Lady's Slipper generally has white sepals and petals with a large, inflated rose pink (rarely white) lip. Flowers are usually subtended by a leafy bract.





SUBFAMILY	Cypripedioideae
TRIBE AND SUBTRIBE	Not applicable
NATIVE RANGE	Oaxaca, Mexico
HABITAT	Seasonally arid limestone outcrops
TYPE AND PLACEMENT	Terrestrial or lithophyte
CONSERVATION STATUS	Endangered
FLOWERING TIME	Usually September (fall)

FLOWER SIZE
¾–1 in (2–2.5 cm)PLANT SIZE
2–4 in (5–10 cm),
excluding inflorescence

MEXICAN LADY'S SLIPPER

(SOTO ARENAS, SALAZAR & HÁGSATER) V. A. ALBERT & M. W. CHASE, 1992



Actual size

Slipper orchid enthusiasts were amazed at the discovery of this succulent miniature species in 1985. Shielded from direct sunlight by the rocky terrain, the original collection site in southern Mexico yielded a mere seven plants. This site was later badly burned during a dry year, and no further plants have been found there (although a second locality is now known). The Greek genus and species names refer to the orchid's country of origin and its xeric, or dry, habitat. There is, in fact, reasonably plentiful water during much of the year where *Mexipedium xerophyticum* grows but also a three-month period of extreme dryness in midwinter.

The species spreads easily due to production of horizontal shoots, called stolons. The plants can produce several blooms on their successive flowering inflorescences.



The flower of the Mexican Lady's Slipper is tiny, white to pale pink, with some pink in its central staminode. The petals are scythe-shaped and the flower also bears a miniature pinkish white pouch.

SUBFAMILY	Cypripedioideae
TRIBE AND SUBTRIBE	Not applicable
NATIVE RANGE	Southern India (Kerala)
HABITAT	Exposed grassland in rock crevasses
TYPE AND PLACEMENT	Terrestrial on rocks
CONSERVATION STATUS	Probably extinct in the wild
FLOWERING TIME	March to April (spring)

FLOWER SIZE
3 in (7.5 cm)PLANT SIZE
8–14 × 10–20 in
(20–36 × 25–51 cm),
excluding inflorescence

DRURY'S SLIPPER ORCHID

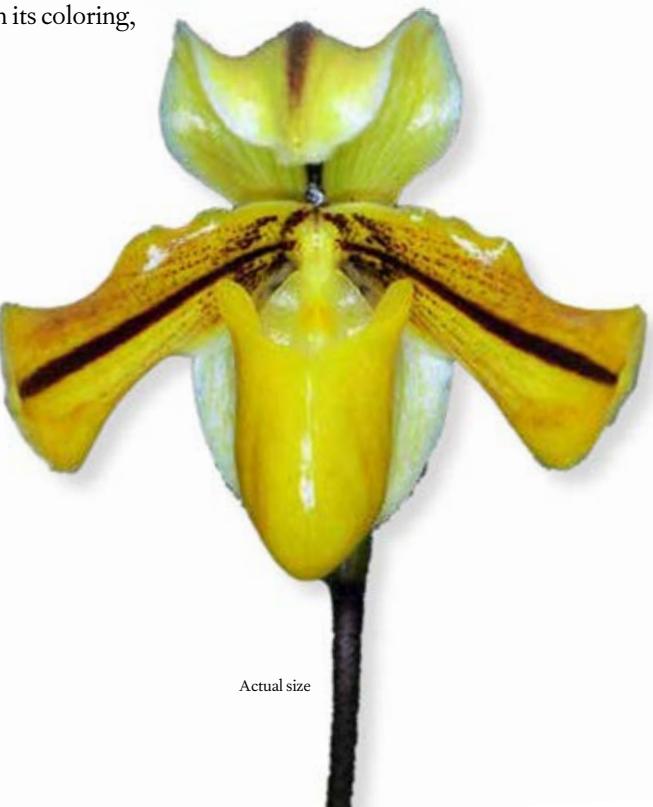
(BEDDOME) STEIN, 1892



Colonel Drury, a member of the British military in India, recorded this orchid in 1856, and it was subsequently named for him. From a fan of green, leathery leaves without any markings, its solitary flower emerges at the top of a purple, hairy stem with a green sheath subtended by a hairy bract. The plant is one of the few species of *Paphiopedilum* with a rhizome that creeps along or just below the surface of the substrate. There are no underground tubers in members of this subfamily.

Drury's Slipper Orchid has not recently been collected and is thought to be extinct in the wild. It persists in cultivation, where it is popular for its beautiful flowers. The pollination of the species is unknown, although, given its coloring, it might be pollinated by bees.

The flower of Drury's Slipper Orchid is mostly yellow and has two lateral sepals fused and placed behind the slipper-shaped lip. The dorsal sepal arches over the lip and has a brown stripe and a white margin. The two spreading petals have a brown stripe and spots.



Actual size



SUBFAMILY	Cypripedioideae
TRIBE AND SUBTRIBE	Not applicable
NATIVE RANGE	Southeastern Yunnan province (China), southeastern Laos, and northern Vietnam
HABITAT	Primary, broad-leaved, permanently humid cloud forest, at 2,950–6,200 ft (900–1,900 m)
TYPE AND PLACEMENT	Terrestrial, usually in shady leaf-litter pockets on silicate soil or on granite cliffs
CONSERVATION STATUS	Unrated
FLOWERING TIME	September to December (fall to early winter)

SUBFAMILY	Cypripedioideae
TRIBE AND SUBTRIBE	Not applicable
NATIVE RANGE	Northern Vietnam to southwestern China, including western and northern Guangxi, southeastern Yunnan, and western Guizhou Provinces
HABITAT	Limestone cliffs and crevices, at 1,200–5,250 ft (360–1,600 m)
TYPE AND PLACEMENT	Terrestrial, or lithophyte growing on steep rocky slopes
CONSERVATION STATUS	Endangered due to overcollection
FLOWERING TIME	April to May (spring)

FLOWER SIZE
3½ in (8 cm)PLANT SIZE
12–20 × 14–30 in
(31–51 × 36–76 cm),
including inflorescence

PAPHIOPEDILUM GRATRIXIANUM GRATRIX'S SLIPPER ORCHID

ROLFE, 1905

First described in 1905 from a plant collected by Wilhelm Micholitz (1854–1932) in Laos and exhibited in the UK by Messrs. Sanders' nursery, Gratrix's Slipper Orchid was named for Manchester industrialist and hobbyist orchid grower Samuel Gratrix. The plants produce fans of leaves from which single-flowered, purple stems grow. The leaves are slightly purple-spotted below, near their base, and have a shallowly notched or three-toothed tip. There are no underground tubers.

Pollination of the species has not been studied, but its floral morphology, especially the spotting on the dorsal sepal, probably indicates pollination involving deceit by mimicking a brood site for flies (tricking them into laying their eggs and falling into the lip). The only way out of this trap is to climb up the rear side of the lip and out near its base, where the pollen and stigma are located.



Actual size

The flower of Gratrix's Slipper Orchid has the two lateral sepals fused behind the cup-shaped lip. The dorsal sepal is elaborately spotted, recurved at the base, and held above the lip. The petals are reddish, recurved, and slightly hairy along their margins.

PAPHIOPEDILUM MICRANTHUM TROPICAL PINK LADY'S SLIPPER

TANG & F. T. WANG, 1951

Collectors have coveted *Paphiopedilum micranthum*, one of the most ornamental of the slipper orchids, since its discovery in 1951. It is a member of the section *Parvisepalum*, a group notable for reduced sepals but large, colorful petals and lip. Thought to be described from an immature flowered specimen, the species name *micranthum* (Greek meaning “tiny flower”) seems mismatched to the large, stunning bloom borne on upright stems, with its enormous bowl-shaped lip.

The tough, leathery foliage is exotically patterned with dark green and white, suffused with purple in blotches that cover the undersides of the leaves. Several color forms have been described, and its striking good looks have made it a popular parent for innumerable hybrids. Winter temperatures often approach freezing in its natural habitats, which induces spring flowering.



The flower of the Tropical Pink Lady's Slipper is usually pink or white with reddish veins on the petals, sometimes with a yellow or golden base. The rounded, bowl-shaped lip is usually pink or white, often with pale purple suffusion.

Actual size



SUBFAMILY	Cypripedioideae
TRIBE AND SUBTRIBE	Not applicable
NATIVE RANGE	Rain forests around Mount Kinabalu in northern Borneo, at 1,640–3,950 ft (500–1,200 m)
HABITAT	Steep serpentine cliffs near streams or seeps
TYPE AND PLACEMENT	Terrestrial
CONSERVATION STATUS	Endangered due to poaching
FLOWERING TIME	April to May (spring)

SUBFAMILY	Cypripedioideae
TRIBE AND SUBTRIBE	Not applicable
NATIVE RANGE	Southern Mexico through Central America, Venezuela, Colombia, Ecuador, and Peru
HABITAT	Grassy rocky slopes near streams and seeps
TYPE AND PLACEMENT	Terrestrial on cliffs, steep embankments, and seeps; reported as occasionally epiphytic in Central America
CONSERVATION STATUS	Not threatened
FLOWERING TIME	Throughout the year, but more likely winter to spring

54

FLOWER SIZE
6–10 in (15–25 cm)

PLANT SIZE
10–15 × 12–20 in
(25–38 × 30–51 cm),
excluding inflorescence

PAPHIOPEDILUM ROTHSCHILDIANUM
ROTHSCHILD'S
SLIPPER ORCHID
(REICHENBACH FILS) STEIN, 1892

Often referred to as the “king of orchids,” this impressive multi-floral species was named for Ferdinand James von Rothschild (1839–98), a member of the Rothschild banking family and a supporter of horticultural science. The flower’s large size and strong colors have made it a coveted collector’s item and an outstanding parent of hybrids. Known from only a few sites on Mount Kinabalu, it has often been close to extinction several times due to overzealous collectors.

The outstretched petals have an array of fine hairs and spots that lure flies to these flowers. They try to lay their eggs on the staminode, a sterile stamen, but instead fall into the traplike pouch and pick up a mass of pollen as they exit through the top part of the lip.

The flower of Rothschild's Slipper Orchid has cream-colored sepals and petals, overlaid with bold mahogany stripes and spots. The color of the pouch-shaped, forward-jutting lip varies from light reddish brown to deep maroon red.

Actual size



PHRAGMIPEDIUM CAUDATUM
LONG-TAILED
SLIPPER ORCHID

(LINDLEY) ROLFE, 1896

FLOWER SIZE
Up to 30 in (75 cm)

PLANT SIZE
12–28 × 20–36 in
(30–71 × 51–91 cm),
excluding inflorescence

55

Petals of exceptional length are what particularly distinguish the Long-tailed Slipper Orchid, one of about six or so slipper orchid species displaying this improbable yet fascinating floral trait. The petals continue elongating until they touch a hard surface, twisting and dangling in the breeze. They produce a bad-smelling scent that helps attract the plant’s pollinators.

The flowers are pollinated by syrphid hoverflies searching for brood sites. The spots encircling the pouch rim are thought to resemble small aphids or other insects that might be consumed by newly hatched syrphid larvae. As on all other slipper orchids, the lip rim is slippery, and the insects fall inside the pouch and then exit the flowers at the top of the lip, where they contact the pollen (and stigma on subsequent visits).



The flower of the Long-tailed Slipper Orchid is variable but generally displays pale shades of tawny brown, tan, and green. The pendent and twisting petals are often darker greenish brown, and the lip often bears a reticulate pattern.

Actual size

