Magnolias of Colombia

RICHARD B. FIGLAR and MARCELA SERNA GONZÁLEZ write about some of the spectacular species endemic to South America.

Introduction (history)

The first description of a *Magnolia* species in Colombia began with the priest (and self-taught botanist) Juan María Céspedes, who had made extensive plant collections, that were unfortunately destroyed by a fire at his residence and herbarium near Bogotá in 1840. This herbarium had included a proposed *Santanderia* type collection. Luckily, Céspedes's written descriptions had survived the fire. Shortly after Céspedes death, another botanist, José G. Triana was reviewing Dr Céspedes's description of the *Santanderia* collection and immediately recognized it as a *Magnolia* (at that time as genus *Talauma*) and promptly named it *Talauma cespedesii* (Triana & Planchon, 1862).

For the next 108 years there would be only two more magnolia discoveries in Colombia, *Magnolia striatifolia* (1969) and *Magnolia colombiana* (1970), both made by an American forest botanist Elbert L. Little. Why this lack of magnolia collections? There were many reasons including the large size of magnolias which made it difficult to collect (let alone identify) specimen material from the high forest canopy; the difficulty in navigating steep sometimes unforgiving landforms of the Andean tropical forest; sheer size and extent of forests that needed to be explored throughout Colombia; etc. (the list goes on).

Then around that same timeframe (1960s–1970s), Gustavo Lozano-Contreras, a remarkable botanist and 1965 graduate from Universidad Nacional de Colombia, began to seriously undertake a comprehensive study *Colombian Magnolias* (in *ca.* 1972). Lozano had evidently been encouraged by Jorge Hernández Camacho, a famous thinker, scientist, and professor at the Faculty of Natural Sciences of the National University (Forero pers. comm.). Thus, for much of the rest of his life Lozano dedicated himself to conducting an exhaustive search for magnolias throughout the country, beginning with the areas where previously described Magnoliaceae species had been collected and then expanding to other places wherever there appeared to be evidence (i.e. similar habitats and/or associated flora) of the possible existence of Magnoliaceae individuals. He also cleverly learned the vernacular (common) names used by indigenous people for magnolias such as Almanegra, Copachí, Molinillo, Cucharillo and Hojarasco. Such information later proved to be enormously useful in enlisting the help of indigenous people in locating many more new species (Lozano, 1983).

By 1994 Lozano had described and authored 28 *Magnolia* species (under the former Magnoliaceae genera *Talauma* and *Dugandiodendron*), most of which were either rare or sparsely distributed across this vast country of Colombia, an astonishing achievement. He also published *Flora de Colombia*

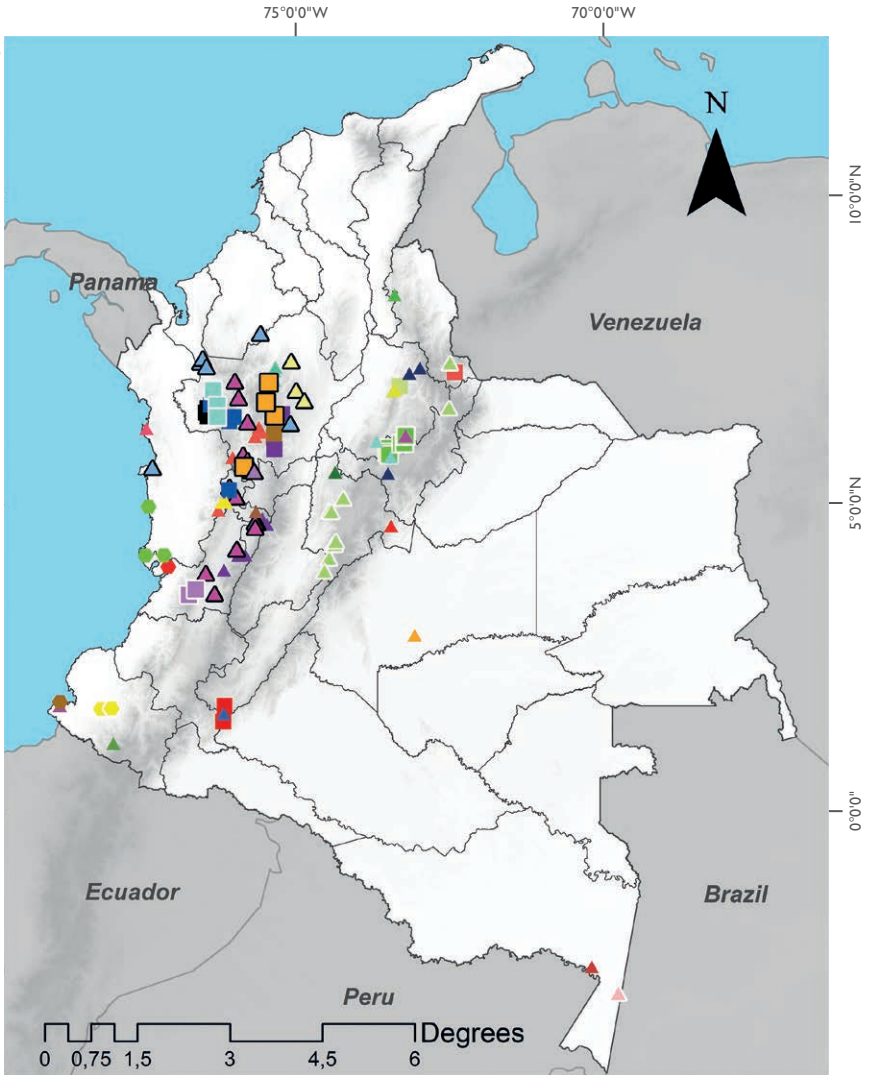

Figure 1

Vol. 1 Magnoliaceae in 1983 which included descriptions of 24 species native to Colombia, all endemic excepting *Magnolia striatifolia* and *M. sambuensis*; and he published *Dugandiodendron and Talauma in the Neotropics* in 1994 which included 14 species of genus *Dugandiodendron* and 31 species of genus *Talauma*. Lozano is also credited with the discovery of *Trigonobalanus excelsa* (Fagaceae) as well as several other taxa from Andean and tropical dry forests (Lozano, 1994). Sadly, Dr Lozano-Contreras died suddenly in July 2000.

LEGEND TO FIGURE 1

Magnolia Section	⬡ Chocotalauma	□ Splendentes	△ Talauma
Species			
△ *M. jardinensis*	*M. betuliensis*	*M. caricifragans*	*M. narinensis*
△ *M. sambuensis*	*M. cararensis*	*M. cespedesii*	*M. neilli*
△ *M. silvioi*	*M. colombiana*	*M. chocoensis*	*M. polyhypsophylla*
△ *M. hernandezii*	*M. coronata*	*M. espinalii*	*M. resupinatifola*
□ *M. yarumalensis*	*M. frontinoensis*	*M. georgii*	*M. rimachii*
⬡ *M. calimaensis*	*M. guatapensis*	*M. gilbertoi*	*M. santanderiana*
⬡ *M. calophylla*	*M. lenticellata*	*M. gloriensis*	*M. venezuelensis*
⬡ *M. neomagnifolia*	*M. mahechae*	*M. henaoi*	*M. virolinensis*
⬡ *M. striatifolia*	*M. urraoensis*	*M. katiorum*	*M. wolfii*
□ *M. argyrotricha*	△ *M. arcabucoana*	△ *M. mindoensis*	

In March 2001 the Alexander von Humboldt Biological Resources Research Institute along with 16 other botanical, environmental and research institutions selected Magnoliaceae as one of the two plant groups to pilot Colombia's 'National Strategy for Plant Conservation'.

This initiative stimulated and empowered organizations and individuals from public and private institutions to develop (and participate in) programmes for conserving (and searching for) magnolias (Samper & García, 2001). So far 39 species of *Magnolia* have been described from Colombia, with 33 of those being endemic.

Habitat and distribution

Fossil records of ancestral magnolias indicate that *Magnolia* likely originated in the Upper Cretaceous approximately 90 million years ago in North America, at high latitudes (45–60 °N) and low altitudes. During the exceptionally warm Eocene, magnolias spread eastward, migrating first to Europe and then to Asia. With the cooling of the Middle Cenozoic, they moved to mid-latitudes (30–45 °N) and finally became extinct in Europe and southern Siberia, thus dividing the formerly circumboreal distribution into two: Asia and North America (Nooteboom, 2012). According to Lozano (1983), Magnoliaceae in North America possibly migrated to South America during the Miocene, while others have suggested that this migration happened much later during the Pliocene when the Isthmus of Panama joined North and South America. Whatever the case, the Andes elevations offered favorable conditions—cloud forests and climates similar to those of the late Mesozoic—as refugia for the migrating and evolutive floras (Lozano, 1983).

The majority of Colombia's magnolias (28 of the 39 species) are distributed

in the warm to cool cloud forests of the western, central and eastern Andean mountain ranges at elevations ranging from *ca.* 1,000 to 2,600 m a.s.l. (see Figure 1, p. 74). The climate of this 'magnolia zone' varies very little throughout the year (i.e. isothermal), with an average daily mean temperature of about 24 °C and *ca.* 2,000 mm rainfall at 1,000 m elevations, to about 14 °C and *ca.* 1,000 mm precipitation at elevations of 2600 m a.s.l. There are no pronounced dry seasons while slightly more rain falls during April and May and again in October to November (Lozano, 1983).

Of the 11 remaining species, nine are sparsely distributed in the hot tropical rainforests from 0 to *ca.* 500 m a.s.l. of the Pacific region (includes Chocó and the Magdalena River Valley), while the other two species are found at similarly low elevations in Amazon region in the southeastern part of the country. The climate for the Chocó and Amazon regions is also isothermal with average daily mean temperatures year-round of about 24 °C (to 27 °C in Chocó) and annual rainfall of 2,500 mm or more, especially in Chocó (Figure 1, p. 74).

The Colombian magnolias—general description

Shrub-like to (mostly) large trees 8 to 40 m tall with truck diameters to 1 m. Leaves evergreen, variously large, thickly coriaceous or chartaceous, adaxially glabrous, abaxially glabrous or pubescent, elliptical to broadly obovate, ovate or orbicular, 11–40 cm long × 6–29 cm wide; stipules free from the petiole, or partially to mostly 100% adnate to the petiole. Flowers terminal, fragrant, white to creamy yellow, generally with 3 outer sepals and 7–10 petals, protogynous (flowers opening into the ♀ phase on day-1, then after petals close, re-open again into the ♂ phase *ca.* 24 hours later on day-2); stamens numerous, caducous when ripe, arranged spirally along the androphore, terminating in a short (acute or rounded) tip or in a long filiform appendage of 5–12 mm long. Fruits vary from small ellipsoidal 'cones' with few carpels (26 spp.) to large globose shaped fruits of up to 16 cm in diameter consisting of *ca.* 100–222 carpels (13 spp.); fruit pericarp thickness varies from *ca.* 1 cm in small elliptic fruits to up to 4 cm thick in the large globose fruits; dehiscence is circumscissile in which the dorsal pericarp is shed, either individually from each carpel or in irregular masses of fused dorsal pericarp of the ripe fruits. Each fertile carpel contains 1–2 seeds which are covered with red sarcotesta. Due to the isothermal climate, flowers and fruits are produced more or less continuously throughout the year.

The most recent taxonomical treatment (Wang *et al*., 2020) places the Colombian magnolias into just two groups, section *Splendentes* and section *Talauma,* while a third group, subsection *Chocotalauma* (Pérez *et al*., 2016), has tentatively been treated as a synonym of section *Talauma* due mainly to a lack of sufficient taxon sampling for phylogenetic analysis (Wang *et al*., 2020). While respecting that position, we maintain the three groups in the following morphological key to the Colombian magnolias:

Key to the *Magnolia* sections of Colombia

Magnolia sect. ***Splendentes*** (Dandy ex Vázquez) Brittonia 46. (1994). *Magnolia* subsect. *Dugandiodendron* (Lozano) Figlar & Noot., Blumea 49. (2004). *Dugandiodendron* Lozano, Caldasia 11. (1975).

- Stipules free from the petiole.
- Stamen connective apex is extended into a long (5–12 mm) filiform appendage which becomes embedded in the gynoecium. During the initiation of the male phase, the stamens absciss from the androphore while their filiform tips remain firmly embedded in the gynoecium as pollen is shed.
- Flowers open into ♀ and ♂ phases in the morning (Serna *et al*., 2021).
- Fruits ellipsoidal.

11 species in Colombia, distributed in the cool cloud-forest elevations of all three Andean ranges.

Magnolia sect. ***Talauma*** (Juss.) Baill., Adansonia 7 (1866).*Magnolia* subsect. *Talauma* (Juss.) Figlar & Noot. Blumea 49 (2004)

- Stipules adnate to the petiole for *ca.* 50–100% its length.
- Stamen connective apex terminates abruptly without a filiform appendage.
- Flowers open into ♀ and ♂ phase in the evening (Serna-González *et al*., 2021).
- Fruits ellipsoidal or globose.

24 species in Colombia, distributed mostly in the warm to cool cloud forest elevations of all three Andean ranges with a few spp. extending into the hot tropical rainforests of the Pacific (Chocó) and Amazonian regions.

Magnolia subsect. ***Chocotalauma*** Vázquez, Pérez & Arroyo, Phytotaxa 286. (2016)

- Stipules shortly adnate to the base of the petiole for c. up to 30% its length.
- Stamen connective apex terminates abruptly without a filiform appendage.
- Flowers open into the ♀ and ♂ phase in the evening. (Figlar, 2019; Calderón, pers. comm.).
- Fruits globose.

Four species in Colombia, distributed in the hot tropical rainforests of the Pacific (Chocó) region.

Five exemplary magnolia species

Since it would be impractical to provide descriptions for all 39 species, we selected these five species based on a combination of attributes, i.e. large size of fruits, attractive or large leaves, rarity or other interesting aspects, while also considering ways in which they are typical for the each of the two sections. All

five species are represented at the botanical gardens of Bogotá and Medellín where one can also find accessions of many more Colombian *Magnolia* species. [Unfortunately, we weren't able to include a subsection *Chocotalauma* species because of a lack of photographs for these difficult to access species.].

Magnolia yarumalensis (Sect. *Splendentes*)
Common names: Almanegra (black soul), Boñigo, Gallinazo Morado (black vulture), all of which allude to the dark colour of the heartwood. Because dark-coloured heartwood is common to many Colombian *Magnolia* spp., especially those of Sect. Splendentes, the *Red book of planta of Colombia* (Calderón et. al., 2007) refers to it as 'Almanegra de Yarumal' since this species was discovered in the municipality of Yarumal (northern Antioquia Province).

Magnolia yarumalensis is best known for the striking beauty of its shiny dark green orbicular leaves which are not only large (15–25 cm in diameter) but also of exceptional substance. The glossy adaxial leaf surfaces contrast appealingly with their pale undersides which are covered with a soft yellowish pubescence. Stipules are free from the petiole. The white flowers are fairly large, up to 15 cm in diameter when fully open. Flowers are produced more or less throughout the year, thus relatively few are in bloom at any particular time. The small ellipsoidal fruits contain *ca.* 11–18 carpels (Serna *et al*., 2021). Although in the wild it is a tall straight-boled canopy tree to 30 m tall, in cultivation it forms an upright tree with a rounded or conical crown.

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Magnolia yarumalensis inhabits two disjunct areas of the cool Andean cloud forests (1,800–2,800 m a.s.l.); the first area is located in the central mountains of northern Antioquia province (mainly between Anorí and Barbosa), while the other is found in the western mountains (from Ciudad Bolivar to Jardín) in southwestern Antioquia and northernmost Risaralda province.

Unfortunately, *M. yarumalensis* has already been overexploited in its native

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Opposite, Marcela Serna with *Magnolia yarumalensis* with its large orbicular leaves and flower.
Opposite, **bottom**, a close-up of the filiform (thread-like) stamen connective appendage with their apices embedded in the gynoecium.

Right, Richard B. Figlar and *Magnolia yarumalensis* in cultivation at El Refugio.

habitats, not only because its long straight trunks make it desirable for logging, but also because of the demand for its high quality wood which is used in homebuilding (roofs and flooring). Currently, harvesting is severely restricted since it is protected under red list category EN (i.e. very high risk of extinction in the wild). Although in the past *M. yarumalensis* formed nearly pure stands, known as 'almanegrals', today only very small populations can be found in the now highly fragmented forests. Natural regeneration appears to be low, in part, because of low seed viability (Restrepo, 2021).

Young cultivated trees have been established in natural reserves such as El Centello (Medellín Botanical Garden), Guanacas [Antioquia Province] and El Refugio [Valle del Cauca Province] as well as in private gardens located above 2,000 m a.s.l. Although *M. yarumalensis* is still new to cultivation its many ornamental assets, large orbiculate leaves, attractive rounded-conical crown, large flowers which open in the daytime, should make this an ideal candidate for cultivation throughout Colombia, especially in cities, such as Bogotá, which are of similar elevations to those occupied by *M. yarumalensis.*

Magnolia jardinensis (Sect. *Talauma*)
Common names: Gallinazo blanco (white vulture), Copachí, Centello. In the *Red book of plants of Colombia* (Calderón et. al., 2007) the vernacular

name Magnolio de Jardín is given since *M. jardinensis* was discovered in the municipality of Jardín in southwestern Antioquia Province.

Magnolia jardinensis is a medium to large tree of up to 25 m tall, with an upright trunk and rounded crown. The large elliptic leaves (15–34 cm long × 11–21 cm wide) are adaxially glabrous while the undersides are covered with persistent golden pubescence. This same attractive golden pubescence covers young shoots, leaf petioles, stipules and flower-bud bracts as well. Stipules are adnate to 75% of the petiole. The fragrant creamy-white to pale yellow flowers of up to 10 cm in diameter are somewhat elusive since they open in the evening. The small ellipsoidal fruits contain *ca.* 8–12 carpels with each containing 1 or 2 seeds.

Distributed from 1,900 to 2,800 m a.s.l. in the Andean forests of the central mountains, *M. jardinensis* is only known from one locality, the eponymous municipality of Jardín. Since its fine cream-coloured wood has long been appreciated by local wood craftsmen, populations of *M. jardinensis* have decreased markedly as a consequence of logging. This situation has been further exacerbated due to forest fragmentation and changes in land use such that by 2016 fewer than 50 mature trees remain (Rivers *et al*., 2016). Needless to say, this species is listed as critically endangered (CR). Recent studies suggest that several reproductive problems are present in *M. jardinensis,* including flower-bud abortion, insect predation of reproductive structures and pollen germination limitations, all of which hinder the formation of fruits and thus, seed production; but seeds do show high viability, including high germination rates after one month of refrigerated stratification (Serna *et al*., 2021).

Interestingly, in some parts of Jardín, individuals of *M. jardinensis* and *M. yarumalensis* occur together in the same habitats (Figlar, 2015; Serna *et al*., 2021). However, despite their close proximity, natural hybrids between the two species have never been found, most likely because flower anthesis in *M. jardinensis* occurs in the evening while anthesis occurs in the early morning in *M. yarumalensis*. Insect visitors (including pollinators) were found to be different as well, with the ones visiting *M. jardinensis* being nocturnal while those visiting *M. yarumalensis* were active in the daytime (Serna *et al*., 2021).

Because *M. jardinensis* has only recently been discovered (Serna *et al*., 2009), it is almost unknown in cultivation. Cultivated specimens can be found in the town square at Jardín and at Medellín Botanical Garden.

Magnolia hernandezii (Sect. *Talauma*)
Common names: Copachí, guanábano de monte (mountain soursop), molinillo. The *Red book of plants of Colombia* (Calderón et. al., 2007) refers to it as Molinillo del Río Cauca since its Andean habitats border both sides of Cauca River valley in Antioquia province.

Magnolia hernandezii forms a rather stout upright tree to 20 m tall with a trunk to 60 cm in diameter. Its coriaceous, ovate to ovate-elliptic, very large

Magnolia hernandezii at Bogotá Botanical Garden with Gustavo Morales, the garden's former Scientific Director. The leaves on this specimen measured a huge 43 cm long × 26 cm wide.

leaves (up to 43 cm long × 26 cm wide) are dark green and lustrous adaxially, while pale green and slightly pubescent/glabrescent abaxially. Stipules are adnate to 100% of the petiole. The beauty of the leaves is further enhanced by the boldly impressed midrib and tertiary veins on the adaxial surfaces. Its evening-blooming, creamy-white flowers are also fairly large, measuring up

Opposite, **top left**, a view up the trunk of *Magnolia hernandezii* and **top right**, the ripe fruit of the same *Magnolia hernandezii* photographed here in the wild.

to 20 cm in diameter; while fruits are of the large globose type (11.5–15 cm long × 9–15 cm wide) with each fruit containing from 176–222 carpels. Thus, hypothetically, it is possible that a single fertile fruit could contain as many as 352–444 seeds. In cultivation it quickly develops an attractive rounded crown sometimes close enough to the ground to permit easy access to flowers and fruits. *Magnolia hernandezii* inhabits humid cloud-forests elevations between 1700–2600 m a.s.l. with probably the largest populations occurring along both

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Above, **left**, an example of a huge dehisced fruit (L) and ripe fruit (R) of *Magnolia hernandezii* with **above**, **right**, a fresh dehiscing fruit with one piece of pericarp partially attached.

western and central Andean slopes of the Cauca River valley from the southern part of Valle del Cauca province to northern parts Antioquia province.

Indigenous people have long utilized the large, woody, post-dehiscent fruit receptacles (i.e. fruit 'cores') as culinary tools, called *molinillos*, to mix ingredients in the preparation of frothy beverages, especially chocolate drinks (Calderón et. al., 2007). Of course, this causes no harm to the trees, but overharvesting by lumber companies has led to significant declines in

populations as well as habitat reduction and / or fragmentation. Consequently, this species is classified as endangered (EN). Nevertheless, there has been some positive news; seed viability and seedling production has proved reliable for *M. hernandezii*. This has led to its propagation in private sector nurseries, which could eventually increase its availability for reforestation and *ex-situ* cultivation in Colombia. Thriving trees can be found at botanical gardens of Bogotá, Calarcá and Medellín as well as in some private gardens.

Magnolia silvioi (Sect. *Talauma*)

Common names: Fruto de molinillo, Guanábano de monte (Wild soursoup), guanabanillo (relative of soursoup). In the *Red book of plants of Colombia* (Calderón et. al., 2007), its preferred name was Guanábano de monte.

Cultivated trees of *M. silvioi* are conspicuously attractive due to their upright trunks and near-perfectly shaped conical crowns. Even its shiny dark green leaves stand out from afar because of their consistent shape and orderly placement on the branches. These thick coriaceous leaves are moderate in size (11–26 cm long × 7–12 cm wide) and entirely glabrous. Stipules are adnate to 100% of the petiole. The elusive evening-blooming flowers are creamy-white and large, to 20 cm in diameter, while its globose fruits are massive and heavy (16 cm long × 12 cm wide). These fruits also have the thickest carpel wall (pericarp), to 4 cm thick, of any Colombian magnolia species.

Magnolia silvioi is found not only along the lower slopes of the central mountains (up to 1,550 m a.s.l.) of the eastern and northeastern parts of

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Above, **left**, *Magnolia silvioi* fruits just starting to dehisce (note the thick pericarp, which can be up to 4 cm thick, and the thickest of any Colombian magnolia species).
Above, **right**, shows *Magnolia silvioi* fruits 'before' and 'after' dehiscing.

Antioquia province, but also in the adjacent tropical lowland forests where it becomes a very large canopy tree to 35 m tall. According to Dr Lozano (1983) it was formerly an abundant species occurring in nearly homogeneous stands. However, recent searches of its habitats reveal that *M. silvioi* has become so rare that is often unknown by the local inhabitants. This is in large part due to significant changes in land use whereby much of the dense tropical rainforests that had formerly existed were felled to make room for cattle ranching,

Magnolia silvioi has a reputation as a desirable street tree with orderly rounded crown and well-held leaves. This tree was photographed in a public space in the city of Medellín.

mining, roads and sugarcane production. An endangered species (EN), its remaining populations are small and fragmented, and thus restricted to just a few localities in Antioquia province. Fortunately, its fruits produce abundant quantities of high viability seed, which has facilitated its propagation and sapling production for small-scale reforestation projects. It has also established a presence as a desirable and increasingly used urban tree for public spaces in cities such as Medellín.

Magnolia sambuensis (Sect. *Talauma*)

Common names: Almanegra, chagará (Atrato river, Chocó province), guacharaco (probably this name is associated to the Cracidae Ortalis columbiana whose local name is Guacharaca), laurel guanábano (Urabá region from Antioquia province), micróphono (Córdoba province), cobre, guanábano de monte (mountain soursop), molinillo. The *Red book of plants of Colombia* (Calderón et. al., 2007) refer to it as 'Molinillo guanábano' (soursop molinillo). *Magnolia sambuensis* is among the tallest growing of Colombia's magnolias with wild individuals reaching heights of 40 m. Morphologically it is very similar to *Magnolia silvioi*, since both species have glabrous glossy leaves, stipules adnate to 100% of the petiole, conical crowns and straight boles, as well as flowers of a similar size and color. However, *M. sambuensis* is distinguished from *M. silvioi* and other Colombian magnolias by the colourful red/pink

A *molinillo* (culinary utensil) made from a fruit 'core' of *Magnolia resupinatifolia*, a globose-fruited species of Section Talauma that is closely related to *Magnolia sambuensis* but has smaller flowers and pubescent flower buds.

young (juvenile) foliage, which is produced periodically throughout the year (see photos on page 25 and overleaf). This occasional display of vivid colour makes *M. sambuensis* especially desirable for ornamental horticulture. As with the two previous species, *M. sambuensis* produces enormous ovoid-globose fruits which reportedly measure up to 22 cm long × 11 cm wide. Thus, it's not surprising that *M. sambuensis* is also widely known by the vernacular name of molinillo because its large woody fruit cores are used to make frothers for mixing chocolate drinks.

A species of the low elevation, hot tropical rainforests, *M. sambuensis* is distributed in the northern part of the Pacific (Chocó) coast and adjacent

Magnolia sambuensis in the campus grounds of CES University, Medellín.

Large fluted truck of *Magnolia sambuensis* in the dense tropical Chocó forest near Mutatá in northwestern Antioquia.

Urabá region (between a Mutatá and Chigorodó municipalities) in northern Antioquia province. Unfortunately, its populations have been severely reduced due to increasing exploitation for its wood along with conversion of habitats to agriculture, cattle pastures, etc. Although some trees survive land use changes, seedling recruitment is nearly impossible (Serna-González & Urrego-Giraldo, 2016). *M. sambuensis* is currently classified as Near Threatened (NT). Fortunately, its fruits produce large numbers of viable seeds that are easy to propagate and as a result, saplings have adapted well in reforestation projects as well as in urban spaces. Some of these young trees have been distributed to Medellín Botanic Garden as well as to other public gardens in Colombia.

Epilogue

As inconceivable as it seems, there is no evidence in the literature of any *ex-situ* cultivation of Colombian *Magnolia* species outside of Colombia and the neotropics. Even within species-rich Colombia, with its 39 *Magnolia* species (only China, Vietnam and possibly Mexico have more), the species that one is most likely to encounter in cities and other urban settings in Colombia, is still the ubiquitous *Magnolia grandiflora* of southeastern North America. However, this is beginning to change with the growing number of *ex-situ* propagation programs underway as a result of conservation initiatives. Although the resultant seedlings are mainly directed toward reforestation efforts in severely degraded magnolia habitats, some will undoubtedly be utilized in urban settings not only for their ornamental attributes, but as living symbols, for promoting greater public awareness of the necessity to protect and conserve

these national treasures. In the meantime, the search for more new *Magnolia* species in Colombia continues.

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