


Anthurium gallardoae and *Xanthosoma isabellianum* (Araceae), two new species from coastal Ecuador

XAVIER CORNEJO¹ & TOM CROAT²

¹ Herbario GUAY, Departamento de Botánica, Facultad de Ciencias Naturales, Universidad de Guayaquil, Av. Raúl Gómez Lince s.n. y Av. Juan Tanka Marengo (campus Mapasingue), P.O. Box 09-01-10634, Guayaquil, Ecuador.

✉ xcornejoguay@gmail.com;  <http://orcid.org/0000-0002-4081-4047>

² P. A. Schulze Curator, Missouri Botanical Garden, P.O. Box 299, St. Louis, MO 63166.

✉ Thomas.Croat@mobot.org;  <https://orcid.org/0000-0003-2588-7499>

Abstract

Anthurium gallardoae and *Xanthosoma isabellianum*, two new species of Araceae endemic to coastal Ecuador, both originally collected sterile in Manabí and Guayas provinces, respectively, and kept in cultivation until flowering at home in the city Guayaquil are here formally described and illustrated.

Resumen

Anthurium gallardoae y *Xanthosoma isabelliae*, dos nuevas especies de Araceae endémicas de la costa de Ecuador, ambas colectadas estériles en las provincias Manabí y Guayas, respectivamente, y conservadas en cultivo hasta que florecieron en casa en la ciudad de Guayaquil, son aquí formalmente descritas e ilustradas.

Keywords: Alismatales, Ecuador, *ex situ* conservation, ornamental

Introduction

Araceae is a subcosmopolitan family comprised by 144 genera and 3750 species broadly distributed in tropical and subtropical habitats in Old and New World (Boyce & Croat 2020, Ortiz *et al.* 2019), among those *Anthurium* Schott (1829: 828) is the most diverse genus comprising 1000 species in the Neotropics (Croat 1983, Carlsen & Croat 2013). In Ecuador, the members of this family occur from sea level to 3500 m, mostly in moist to wet forests, and occasionally in “garúa” influenced seasonal dry forests (Croat 1999, Cornejo obs. pers. in the field). The number of individuals and species is higher in tropical to montane forests and decrease over 2000 m (Croat 1999, Leimbeck & Balslev 2001, Cornejo obs. pers. in the field). The higher diversity and endemism of Araceae is recorded on the northwestern Andean slopes, in the Amazonian lowlands the diversity is high, but the endemism is low (Leimbeck *et al.* 2004, Croat *et al.* 2011). Although the Araceae apparently have been collected nearly throughout the country (Delgado, 2011), the discovery of a number of new species from the field in recent years (Croat *et al.* 2017, Delannay *et al.* 2019) is evidence that collection efforts are still not sufficient. The main gaps persist isolated on northwestern, central-western, and southwestern Ecuador (Delgado 2011). In central-western Ecuador the apparent absence or very poor representation of Araceae in most cases is most likely a response to deforestation and the conversion of natural vegetation and habitats to agricultural lands, or the fact that the very dry or xerophytic ecosystems do not allow numerous species of Araceae to occur, or owing to the absence of field research (Dodson & Gentry 1991, Cornejo obs. pers. in the field). The two new species of Araceae presented in this paper occur in the central-western Ecuador gap. In the country, the most diverse genus in the family is *Anthurium*, it is represented by c. 300 species, of which, more than half are endemic (Croat *et al.* 2011, 2015). Most of those occur in wet forests, and few taxa are both epiphytic or terrestrial in seasonally dry forests, as it is the case of *A. sparreorum* Croat (1991: 732), an occasional large terrestrial and epiphytic herb in the

lowlands of Manabí and that also occurs in moist and wet forests. The epiphytic *A. aromoense* Croat in Croat *et al.* (2013: 36) is restricted to the cordillera Chongón Colonche and surrounding areas in the provinces of Santa Elena and Manabí, and the new species described here as *A. gallardoae* Cornejo & Croat *sp. nov.* was collected near El Aromo, in the province of Manabí. The second novelty is a *Xanthosoma* Schott (1832: 19), a genus which is centered on western South America with a total of 126 species from that region. Among those, a surprising number of species, 94 in all, have been described as new to science in recent years (Croat *et al.* 2017, Delannay *et al.* 2019). However, in the province of Guayas in central-western Ecuador there are only seven species of *Xanthosoma* which have been found, those are *X. daulense* Croat & Delannay in Croat *et al.* (2017:152), *X. diazii* Croat & Delannay in Croat *et al.* (2017: 164), *X. dodsonii* Croat in Croat *et al.* (2017: 168), *X. eggersii* (Engler 1905: 136) Engler (1920: 56), *X. guayaquilense* Delannay *et al.* (2019: 158), *X. perssonii* Delannay *et al.* (2019: 160), and *X. isabellinum* Cornejo & Croat *sp. nov.*, the latter is an understory low herb found at the base of Cerro Cimalón in the Reserva Ecológica Manglares Churute, in the province of Guayas. Both novelties were collected sterile and kept in cultivation until flowering at first author's home in the city of Guayaquil. Since deforestation is a steady process on coastal Ecuador, one that is triggered by a high birth rate coupled by poverty, mainly in rural areas (Dodson & Gentry 1991), and because the authorities seem to have no control over the socio-economic and cultural aspects that generate deforestation in the country (Cornejo obs. pers. in the field), *ex situ* cultivation is regarded as a significant strategy for taxonomical discoveries in several groups of plants. It also plays an important role in the conservation of endangered native species in groups like the Araceae, since they are easily cultivated, propagated and distributed.

Material & Methods

All relevant specimens in the herbaria COL, GUAY, MO, NY, QCA, and QCNE have been studied, the acronyms of the herbaria follow Thiers (2021). Measurements are from cultivated and herbarium specimens. The botanical terms used in the description of species follow Jackson (1991). The new species of *Anthurium* was initially found as an sterile specimen in the type locality in 2014, and believed to be the also locally endemic *Anthurium aromoense* that is known only by the type, the new species was collected to be kept in cultivation at the greenhouse of Faculty of Natural Sciences, University of Guayaquil and later, for several years it was kept as an ornamental at the herbarium GUAY. As during the covid-19 pandemic the University was closed for several months and expecting that greenhouse and herbarium plants could die, several native and endemic cultivated species were transferred at first author's home for a proper care, including the new species. There, *Anthurium gallardoae* flowered for first time, six years since it was collected, flowering from August to September 2020. The flowering revealed the particular structure of inflorescences that proved it was a taxonomic novelty. The new species of *Xanthosoma* Schott presented here is an understory low herb found sterile in 2019 at the base of Cerro Cimalón in the Reserva Ecológica Manglares Churute, in the province of Guayas, because of the relatively small size the plant was collected and also cultivated, flowering simultaneously with the aforementioned species; both are formally described here. The classification of Ecuador's Vegetation follows MAE (2013). The conservation status for each species follows the IUCN's (2017) categories and criteria.

Results

The new species of *Anthurium* is a member of the section *Digitinervium* Sodiro (1903: 54) characterized by its epiphytic habit, short, thick internodes, persistent intact cataphylls, deeply and sharply sulcate petioles, broadly ovate coriaceous blades with subtruncate leaf bases and narrowly rounded-emarginate apices, drying grayish dark brown above and medium reddish brown below as well as by the green reflexed spathe and the cylindroid-tapered green spadix with early emergent pistils (Croat *et al.* 2013).

The new species of *Xanthosoma* is a member of group *Chamaexanthosoma* Croat, *et al.* (2017: 28) and it is characterized by the tuberous stem, elongate erect petioles bearing patent to divergent blades, those triangular-subhastate, and solitary inflorescences with a green spathe tube and a white pistillate spadix.

For morphological differences from closely related taxa see the discussion under each species.

Taxonomy

Anthurium gallardoe Cornejo & Croat, *sp. nov.* (Fig. 1)

Anthurium gallardoe is a new species similar to *A. aramoense* but differs by the inflorescences with peduncles shorter, 34–35 cm long, spadix shorter and narrower, 4.0–4.5 × 0.6–0.8 cm, spathe broader, 3.5–4.5 cm width, and leaf blades smaller, 15.0–30.5 × 10.5–18.5 cm, with 6–8 pairs of primary lateral veins (versus inflorescences with longer peduncles, ca. 67 cm long, spadix longer and thicker, ca. 19.8 × 1.5 cm, spathe narrower, ca. 1.5 cm width, and leaf blades larger, ca. 39.8 × 26.5 cm, with 11 primary lateral veins in *A. aramoense*).

Type:—ECUADOR. Manabí: El Aromo environs, ca. 01°03'S, 80°49'W, ca. 200 m, very dry tropical forest, Mar 2014 (st), flowered in cultivation in Guayaquil, ca. 6 m, 02°07'S, 79°54'W, 7 Aug–6 Sep 2020 (fl), X. Cornejo, M. Gallardo, V. Solórzano 9335 (holotype GUAY!, mounted material and spirit collection).

Epiphytic and facultatively terrestrial, internodes very short, 2.5 cm diam., with abundant adventitious roots; cataphylls lanceolate to narrowly lanceolate, 5–16 cm long, weakly acuminate at apex, drying brown, persisting intact. *Leaves* erect and suberect with petioles 21–37 × 0.7–0.8 cm, drying dark brown, C-shaped, narrowly V-sulcate adaxially with the margins drying bluntly acute; geniculum 1.7–2.5 cm long, light-brown to light-green, slightly swollen; blades stiffly coriaceous, 15.0–30.5 × 10.5–18.5 cm, widest in the lower third, 1.5 to 2 times longer than wide, 0.9 to 0.5 times longer than petiole, narrowly rounded and weakly emarginate at the apex, truncate-broadly rounded at the base, weakly glossy above, matte beneath, margin somewhat rolled under; midrib drying faintly raised in valley, yellowish-green above, narrowly rounded, finely ribbed, yellowish-green below; primary lateral veins 6–8 pairs, scalariform, arising from the midrib and basal veins at 30–50° angles, deeply sunken above with edges raised, finely, narrowly raised, irregularly ridged, darker below with usually a single somewhat irregular interprimary vein between; tertiary veins few; basal veins 3 pairs, concolorous, slightly raised in valley above, prominently raised, rounded below, inner pair forming the collective veins, middle pair reaching the margin at halfway to upper 1/3 of blade, outer pair reaching the margin at the lower 1/5 of blade; upper surface drying semiglossy upon magnification, aerolate-ridged, grayish dark-brown; lower surface drying semiglossy upon magnification, with scattered pustules and large glandular punctations, medium reddish brown. *Inflorescence* 38–39 cm long with peduncles 34–35 × 0.4–0.5 cm long; *spathe* lanceolate, light-green, suffused pink and twisted at distal half, longitudinally nerved, beneath glossy, the nerves prominent (dry), 7.7–9.5 cm × 3.5–4.5 cm, reflexed, somewhat twisted at lower half, subpendular; *spadix* green, cylindroid, 4.0–4.5 × 0.6–0.8 cm, on peduncle 0.5–0.6 × 0.4 cm; flowers ca. 6 visible per spiral, ca. 3.0–3.5 mm long and wide, tepals smooth upon drying, inner margins nearly straight with edges upward. *Infructescences* not seen.

Discussion:—*Anthurium gallardoe* is a new species similar to *A. aramoense* but differs by the characters written in the diagnosis. *Anthurium gallardoe* may also be confused with the more common *Anthurium ovatifolium* Engler (1898: 437) which differs by having blades which are proportionately broader, often about as broad as long with basal veins more elliptic and with many more primary lateral veins with 16–20 closely spaced, frequently quilted primary lateral veins; *Anthurium occidentale* Sodiro (1906: 29), differing by having longer petioles (40–45 cm long), longer geniculum (3–3.5 cm long), proportionately narrower blades 2 times longer than broad, a shorter peduncle (20 cm long) and a much longer and thicker spadix (12–15 cm long by 2 cm diam.); and *Anthurium pachyspathum* Krause (1940: 39), which occurs in the Amazon basin and differing by having proportionately narrower leaf blades (40 × 17 and 2.3 time longer than wide and a much longer peduncle (50–55 cm long).

Eponymy:—The epithet “gallardoe” refers to type co-collector, the Ecuadorian biologist Margarita Gallardo.

Habitat and distribution:—*Anthurium gallardoe* is endemic to coastal Ecuador, known only from the very dry forests of environs of El Aromo, in the province of Manabí.

Phenology and cultivation:—*Anthurium gallardoe* can be planted in a pot under shade and live well for years at the interior of an office or home. Therefore, due to the relatively medium size and attractive appearance, cloning this species to be propagated as an ornamental is suggested.

Conservation status:—The low number of individuals estimated in less than 100 found in the original disturbed habitat that is threaten by deforestation lead us to regard *Anthurium gallardoe* as Endangered EN B1 ab(iii) (IUCN 2017).

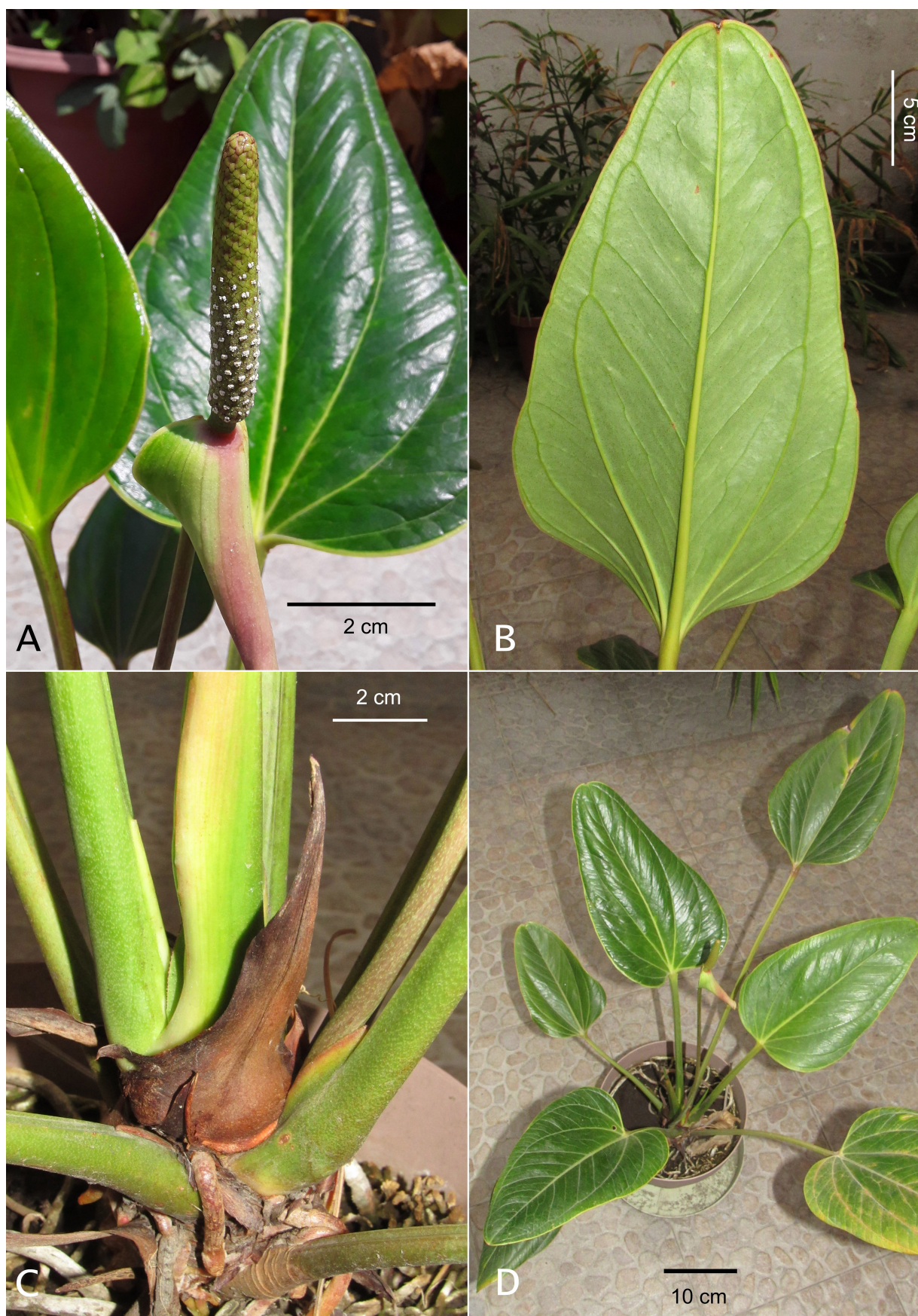


FIGURE 1. *Anthurium gallardoae*. A. Spadix, spathe and adaxial view of leaf blades (bottom). B. Leaf blade beneath. C. A persistent brown cataphyll and base of petioles. D. Cultivated plant.

***Xanthosoma isabellatum* Cornejo & Croat, sp. nov. (Fig. 2)**

Xanthosoma isabellatum is a new species similar to *Xanthosoma guayaquilense*, an allopatric species that is also endemic to coastal Ecuador, but *X. isabellatum* differs by its blades patent to divergent 0–40°, 0.5 times as long as petiole, anterior lobe broadly acute, the blade glabrous above, and inflorescences with staminate portion 5.0–6.5 cm long and sterile portion fully covered by staminodia, 2.8–3.5 cm long, instead of leaf blades suberect, 45–80°, 0.3–0.4 times as long as petiole, anterior lobe narrowly acute, the blade shortly white-pilose above, and inflorescences with staminate portion 8–10 cm long and sterile portion fully covered by staminodia, 4–5 cm long of *X. guayaquilense*. In addition, there are also significant differences on the phenology and biological cycles of both species (see discussion).

Type:—ECUADOR. Guayas: Reserva Ecológica Manglares Churute, base del Cerro Cimalón, ca. 02°25'S, 79°35'W, ca. 50 m, tropical dry to moist forest, Jan 2019 (st), flowered in cultivation in Guayaquil, 02°07'46"S, 79°54'25"W, ca. 6 m, 7 Aug–6 Sep 2020 (fl), *X. Cornejo 9336* (holotype GUAY!, mounted material and spirit collection).

Moderately small tuberous herb to 0.6 m tall; *tuber* depressed-globose, drying 2–3 cm diam. *Bracts* narrowly lanceolate, membranous, the outer 1-costate, to 15 × 2 cm, purplish; the inner 2-costate, slightly shorter than the outer bract, greenish-white. *Leaves* with petioles 30–50 cm long, purplish, drying dark brown, 1 cm diam. near the base, 4–5 mm diam. midway, 3–4 mm diam. near the apex; blades 0–40° patent to divergent, triangular-subhastate, 18–25 cm long, 17–20 cm wide, 0.5 times as long as petiole, broadest across the posterior lobes, drying thin, brownish green above, light grayish green below, the margins sinuate; anterior lobe 13–16 cm long, broadly acute, nearly straight to slightly convex and sinuate on the margins; posterior lobes 7–10 cm long, 3–5 cm wide, subhastate, slightly overlapping at the base, dark green and almost matte above, moderately paler and semiglossy below; upper surface glabrous; midrib strongly raised below, prominent, slightly lighter than the blade; primary lateral veins 2 pairs, raised and concolorous below; basal veins 2 pairs, 1st pair free to base, 2nd basioscopic; posterior rib not naked, branching before reaching the tip of the posterior lobe. *Inflorescences* 1 per axil, erect; peduncle 23–40 × 0.5–0.8 cm, pale green, glossy when fresh; *spathe* 13–16 cm long, tube green, matte and longitudinally weakly veined without, dark-purple or burgundy to greenish with dark-purple veins within, 3.5–5.0 × 1.7–2.2 cm when fresh, 3.5 × 1.0 cm when dry; blade creamish-white to white on both sides, 7.7–10.0 cm long when fresh, 7–8 cm when dry; *spadix* 10.3–12.5 cm long, staminate portion 5.0–6.5 × 0.8–1.0 cm and white when fresh, 4–5 × ca. 0.7 cm when dry, sterile portion fully covered by staminodia, 2.8–3.5 cm long, 3–5 mm diam. in the middle, white, the lower part with thickened staminodia 5–9 mm long when fresh, pinkish or sometimes greenish-white; pistillate portion 1.5–2.0 × 0.8–1.0 cm and yellowish to yellow when fresh, 1.5 × ca. 0.7 cm when dry. *Infructescences* not seen.

Discussion:—*Xanthosoma isabellatum* is among the smaller species in the genus. This new species is most closely related to *Xanthosoma guayaquilense*, an allopatric species that is also endemic to coastal Ecuador, but *X. isabellatum* morphologically differs by the characters written in the diagnosis. In addition, there are also significant differences on the phenology and biological cycles of both species, *Xanthosoma isabellatum* at least in cultivation (because the phenology has not been observed in a natural habitat) is evergreen during the whole year and can produce inflorescences during the dry and rainy seasons, meanwhile *X. guayaquilense* in nature and in cultivation produce leaves and inflorescences only for few months, from ending December or January to Apr, that strictly is during the rainy season, being the whole plant fully deciduous, apparently absent, and remaining only the underground tubers during the dry season (Cornejo, pers. obs. in Delannay *et al.* 2019).

Etymology:—The species is named after my daughter Isabella Cornejo, she aids caring several cultivated native plants at home including *X. isabellatum* among those.

Habitat and distribution:—*Xanthosoma isabellatum* is an endemic at ca. 50 m, in a conserved Tropical dry to moist forest life zone at the Reserva Ecológica Manglares Churute, province of Guayas, coastal Ecuador.

Phenology and cultivation:—Flowering during the dry season from August to September, and during the rainy season from December to February. Among native species, *Xanthosoma isabellatum* is one of the few herbs that can be cultivated as an ornamental under shade in tropical warm cities as Guayaquil. *Xanthosoma isabellatum* is easy to reproduce by propagules or vegetative seedlings, and has produced inflorescences several times, however, similar to *X. guayaquilense*, the flowers of *X. isabellatum* are not pollinated and do not produce fruits, most likely due to the absence of native pollinators in urban areas of Guayaquil. Therefore, efforts for conservation of these endangered species must consider the vegetative propagation and cultivation as ornamental plants.

Conservation status:—The less than 100 individuals found in the original habitat that is thereathened by selective cutting and occasionally fires during the dry season led us to regard *Xanthosoma isabellatum* as Endangered EN B1 ab(iii) (IUCN 2017).



FIGURE 2. *Xanthosoma isabellum*. A. Cultivated plant. B. Inflorescence and two leaves. C. Inflorescence at anthesis. D. Longitudinally sectioned inflorescence displaying the purple interior of lower spathe, pistillate flowers, and sterile portion fully covered by staminodia.

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