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Passiflora boenderi (Passifloraceae), a New Egg-Mimic Passionflower from Costa Rica

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ABSTRACT. *Passiflora boenderi,* a new species of Passifloraceae endemic to Costa Rica, is described and illustrated. It is assigned to section *Decaloba* DC. in the species group that includes *P. gilbertiana* J. M. MacDougal and *P. ornithoura* Masters. This rare small-flowered species is notable for its intensely colorful and variegated leaves, with rows of conspicuous golden egg mimics.

Key words: Costa Rica, egg mimic, *Passiflora,* Passifloraceae.

For more than a century, a collection of a Costa Rican passionflower with bilobed purple-tinged leaves with yellow stripes and dots has hidden in herbaria under different names. Only after plants of this taxon were collected alive and then cultivated have we been able to study the fresh flowers and see that it is an undescribed species, perfectly morphologically distinct. While close relatives in section *Decaloba* have similar variegated leaves, this new species is most dramatic, with leaves dark green above and purple or red-purple beneath, with light yellow stripes along the two major lateral veins and conspicuous bright golden spots in two lines. It is a choice plant for ornamental cultivation for its foliage, but is a local endemic in primary rain forest in central Costa Rica and is of conservation concern.

Passiflora boenderi J. M. MacDougal, sp. nov. TYPE: U.S.A. Florida: Broward Co., Coconut Creek, cultivated at Butterfly World, Ltd., 1992–2002, type specimens collected Nov. 2001, *R. Boender 361,* grown from plants collected 19 May 1992 in Costa Rica. Alajuela: W of main road San Ramón to Bajo Rodríguez, between Río Cataratas and Río San Lorenzo on side rd. to Colonia Palmareña, "near dead volcano," ca. 1 km N of Finca Santa Cecilia, 10°13′43″N, 84°33′34″W, 800 m (holotype, CR; isotypes, BM, CAS, INB, GOET, K, MEXU, MO, TEX). Figures 1, 2.

Species scandens ad *Passifloram* sectionem *Decalobam* pertinens. Folia petiolo eglanduloso; lamina supra vittata, infra purpurata vel atrovinosa, biloba; lobis lateralibus acutis vel acuminatis, interdum rotundatis, lobo centrali obsoleto, angulo inter lobos laterales 14–62°, marginibus integris, nectariis aureis. Flos parvus, petalis 3–6 mm longis; coronae filamentis biseriatis, exterioribus luteolis 3.5–5.5 mm longis; operculo plicato; androgynophoro 2.9–4 mm longo; semina (7 vel) 8 ad 10-sulcata.

Vine 1.5–5 m, minutely puberulent throughout at the cernuous shoot tip, glabrescent below; stems ± terete, striate. Stipules 1.7–3.5 × 0.2–0.3 mm, linear-triangular, subfalcate; petioles 1.2–3.8 cm, eglandular; leaf blades 4–12(–17) cm long in outline, 4.0–8.0(–9.5) cm wide, 2.4–7(–9.0) cm along central vein, lateral veins 4.0–8(–9.2) cm, entire, glabrous or glabrescent except margins minutely lightly strigillose and sometimes with a few trichomes on the larger veins abaxially, variegated adaxially with light yellow along the three major veins, especially on lateral lobes, (often deep) purple or red-purple abaxially, truncate elliptic to obovate to widely obovate (to very widely obovate) in general outline, bilobed ⅖–½(–⅔) their length, the lateral lobes triangular to lanceolate, acute to acuminate, the very apex sometimes rounded, the central lobe absent or nearly so, sometimes represented by a mucronate cusp less than 5 mm long, the angle between the lateral lobes (14–)23–50(–62)° (juvenile plants with leaves less deeply lobed), the ratio of lateral to central lobe length 1.7–2.3(–2.5); laminar nectaries (5 to)8 to 13(to 16), borne between the main veins, appearing bright yellow or yellow-orange adaxially, and yellow-orange with purple border abaxially, the larger leaves often with a single nectary proximal (exmedial) to each lateral vein at base of lamina; prophyll of vegetative bud 1, lanceolate to narrowly triangular. Peduncles (1)2 per node, 1–3 cm, uniflorous; bracts 3, 1–2.8 × 0.1–0.15 mm, linear-triangular, usually early necrotic and stramineous. Flowers light yellow-green, the corona yellowish with purple or purple-red basally and/or distally; flowers with little or no detectable odor, borne sub-horizontally at anthesis; floral stipe (3.5–)4.0–7.0 mm (6.5–9 mm in fruit); hypanthium 5.5–7 mm diam.; sepals 7.0–11(–14) × 3.0–5.0 mm, triangular-oblong to narrowly ovate-

Figure 1. Leaves of *Passiflora boenderi* (clone of type material, *Boender 361*). Egg-mimic laminar nectaries can be seen as round light spots on the leaves.

Figure 2. Flower of *Passiflora boenderi* with inner coronal series well expressed (clone of type material, *Boender 361*).

triangular, obtuse to rounded, with no apical or subapical horn, light yellow-green outside, slightly paler light yellow-green or green-yellow inside, at anthesis reflexed (to wrapped under hypanthium); petals (2.7–)3.0–6.0 × 2.0–3.0 mm, triangular-oblong to broadly triangular-oblong, broadly obtuse, strongly reflexed at anthesis, sometimes erose apically, very pale green (green-white) to pale yellow-green; coronal filaments 2-seriate, the outer coronal filaments (31 to)35 to 43 (samples N = 10), 3.5–5.5 mm long, at base narrow and greenish suffused with light purple or red-purple, or dull purple whole proximal half, conspicuously geniculate near middle, conspicuously thicker and dull to light yellow in middle or distal half, sometimes also purple or purple-brown distally, but always with yellow or pale yellow at least in middle, at anthesis the outer corona forming a shallow bowl or saucer with a strongly spreading and reflexed edge, the filament tips pointing downward, the anther-corona clearance 2.5–3.5 mm; inner coronal series inconspicuous, few to many, ca. 7 to 39 per flower, 1.0–1.8 mm, capillary, clavate to capitellate, dull light purplish with yellow head; operculum 2.0 mm, plicate, pale greenish, flushed pale violet or red-purple below the white apex; androgynophore 2.9–4.0 mm long, pale green basally, suffused purplish or red-purple proximally, the free portions of the staminal filaments 2.6–3.5 mm long, red-purple or green suffused with pale purple; anthers 2.0–2.3 mm long, purple-edged, the pollen yellow; ovary 1.5–2.0 × 1.3–1.5 mm, widely (to very widely) ellipsoid, bright green, minutely puberulent in all specimens seen except one where the ovary is glabrous (*Endres 70*); styles 4–5 mm long including stigmas, green and unmarked, or with a faint overall flush of purple, the stigmas 1.5–2 mm diam. Fruit 11–21 × 10–20 mm, (ellipsoid) widely ellipsoid to subglobose, estipitate, purple-black with glaucous bloom, the mesocarp light green to white; arils 7–8 mm long, transparent white to very pale transparent orange, gelatinous, sweet, not or only slightly fruity, nearly odorless; seeds 3.5–4.2 × (2.4–)2.7–3.0 × 1.4–1.7 mm, transversely sulcate with (7)8 to 10 sulci, the intervening ridges strongly sculptured and verrucose, the funiculus conspicuous and white on fresh seed; seeds per fruit 24 to 67 (N = 10); germination epigeal.

Ecology. *Passiflora boenderi* is known from only two sites in the Caribbean drainage of central Costa Rica at 725–800 m elevation. These are nearly identical habitats at the elevational transition of very wet to pluvial premontane forest. At both sites nearly all trees and branches are festooned with bryophytes, and the ground is often saturated and muddy. The vines are found growing up and into small trees on steep slopes, and on large shrubs at forest edges. Narrowly endemic species such as this passionflower, restricted to very small ranges, are typically in danger of extirpation by habitat conversion, and are therefore of special conservation concern. At the field site of the collection of the type clones, *P. boenderi* was associated with or near *P. ambigua* Hemsley, *P. lobata* (Killip) J. M. MacDougal, *P. guatemalensis* S. Watson, *P. costaricensis* Killip, *P. vitifolia* Kunth, and *P. oerstedii* Masters (R. Boender, pers. comm.). At the Cariblanco site I found *P. capsularis* L. and *P. lobata*.

Phenology. Flowering plants have been collected in January, April, and August through November.

This new species was first collected more than 125 years ago by A. R. Endres and was cited by Hemsley (1880: 481) as "*Passiflora, sp.* (*P. capsularis* [L.] *aff.*)." The specimens are without exact locality. One of Endres's known collecting sites is Quebrada Verde near San Ramón, very close to the type locality. We now know it from two localities, but it is rare at both. Larry Gilbert's 1978 collection was the second discovery of the species, and was brought into cultivation for a short while but perished before studies could be made of it. Despite repeated searches by botanists, the species was not found again until 1984. In 1991 Andrés Vega found it near San Ramón, took cuttings, and reared the butterfly *Heliconius cydno* from eggs and larvae on the plant. He guided Ron Boender there the next

year and assisted getting more living material, some of which ultimately furnished the type specimens. Clones of the type collection of *P. boenderi* were introduced to horticulture in late 1992 and had spread to Europe by 1995. The collection number of the type clones has been cited variously as *Boender 361*, *BW361*, and *BW92-361*. Several recent popular books on passionflowers have included this species under a nomen nudum, and color photographs can be seen in Vanderplank (1996: 61; 2000: 60–61), Klock (1996: 105–106), and Ulmer and Ulmer (1997: 110).

Passiflora boenderi is assigned to subgenus *Decaloba* (DC.) Reichenbach sect. *Decaloba* DC. on the basis of its plicate operculum, cernuous shoot tips, transverse testal sculpturing, and position of laminar nectaries. It is part of the species group that includes *P. ornithoura*, *P. gilbertiana*, *P. apetala* Killip, *P. jorullensis* HBK, *P. mexicana* Jussieu, and *P. affinis* Engelmann. Most similar is an undescribed relative of *P. ornithoura* from the mountains of Chiapas and Guatemala represented by *Matuda 3971*. That can have remarkably similar leaves, but *P. boenderi* differs by its longer outer corona (3.5–5.5 mm vs. 1.8–3 mm), a slightly shorter androgynophore (2.9–4.0 mm vs. 3.4–4.9 mm), and a usually pubescent ovary versus an always glabrous ovary. The bilobed variegated leaves of *P. boenderi* can be similar also to *P. gilbertiana* and *P. apetala*, which both grow in Costa Rica. *Passiflora boenderi* can be distinguished from *P. gilbertiana* by its shorter androgynophore (3–4 mm vs. 6.2–9 mm), its shorter outer corona (3.5–5.5 mm vs. 5–7 mm) that is strongly dilated proximally (vs. filiform), and its habitat (elevations of 725–800 m vs. 1600–2300 m). From *P. apetala* it may be recognized by its often longer outer corona (3.5–5.5 mm vs. 2–5 mm) that is strongly dilated proximally (vs. filiform), its longer petals (2.7–6 mm vs. absent or to 2.5 mm), a usually pubescent ovary vs. always glabrous ovary, and its habitat (elevations of 725–800 m vs. 1280–3270 m). The angles between the leaves' lateral lobes are usually wider in *P. apetala* and narrower in *P. gilbertiana*, but there is overlap.

The inner corona was variably expressed in the flowers of the six individuals I examined closely, varying from 7 to almost 40. This is similar to the variable expression of the inner corona in its very close relative, *P. gilbertiana*, where their number can vary greatly even on one plant (MacDougal, 1989). The conspicuous bright golden laminar nectaries closely resemble *Heliconius* butterfly eggs (Gilbert, 1982), and I consider this species to have one of the most conspicuous cases of egg-mimicry known (pers. obs.).

Fruit and aril observations were made by the author from ten fresh fruits produced in cultivation by Ron Boender through manual cross-pollination of several individuals of the type material.

Etymology. This species is named for Ronald Boender, founder of the Passiflora Society International, and also president for many years. As prime mover of that society, since 1989 Ron has brought together several hundreds of persons interested in the genus *Passiflora*, both amateurs and professionals. He established a seed bank, living collections database, newsletter, and annual national and international meetings. In this way, he has set the foundation for a forum that has truly benefited science and the diffusion of knowledge of this plant group. In Coconut Creek, Florida, he maintains the world's largest collection of germplasm of Passifloraceae. Additionally, Ron brought this new species into horticulture for closer study, unselfishly spread it widely, and hounded me for more than a year with carefully collected evidence that it was new. Through his studies and educational presentation of both butterflies and their host plants, he continues to champion and support numerous conservation activities in North, Central, and South America.

Paratypes. COSTA RICA. Locality unknown: 2500 ft., "Costa Rica," [anno 1867–1875], *Endres 70* (BM, K). **Alajuela:** along Río Sarapiquí near La Virgen de Socorro near Cariblanco, Apr. 1978, *L. E. Gilbert s.n.* (TEX); camino Colonia Virgen del Socorro, Cariblanco de Sarapiquí, 4 Jan. 2000, *Kay & Vega 196* (MO); cuttings of *Boender 361* from Costa Rica cultivated 1992–2002 at MO Climatron® greenhouse, 8 Sep. 1993, *MacDougal 4697* (CR, MO); rd. to La Virgen de Socorro from Rte. 9, near small cascade along the rd. on E side of the Río Sarapiquí, ca. 10°15.4′N, 84°10.3′W, 29 Aug. 1994, *D. Smith 1186* (DUKE); Sarapiquí, Cariblanco, camino a Virgen del Socorro, 8 Oct. 1992, *A. Vega s.n.* (CR, USJ).

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