



Govenia polychroma, a new species of Orchidaceae from Veracruz, Mexico

GERARDO A. SALAZAR¹, ADRIÁN FERNÁNDEZ-DÍAZ², CARLOS RENÉ HUERTA-ALVÍZAR³, ROLANDO JIMÉNEZ-MACHORRO⁴, LIDIA I. CABRERA¹ & H. DAVID JIMENO-SEVILLA⁵

¹Departamento de Botánica, Instituto de Biología, Universidad Nacional Autónoma de México, Apartado Postal 70-367, 04510 Mexico City, Mexico; e-mail: gasc@ib.unam.mx

²Asociación Orizabeña de Orquideología, Poniente 5 No. 306-A, 94300 Orizaba, Veracruz, Mexico

³Calle 4, Ave. 5 s.n., Centro, La Patrona, 94955 Amatlán de los Reyes, Veracruz, Mexico

⁴Herbario AMO, Montañas Calizas 490, Lomas de Chapultepec, 11000 Mexico City, Mexico

⁵Herbario, Campus Zongolica, Instituto Tecnológico Superior de Zongolica, Km 4, Carretera a La Compañía s/n, Tepetitlanapa, 95005 Zongolica, Veracruz, Mexico

Abstract

Govenia polychroma, a new orchid species from central Veracruz, Mexico is described and illustrated. It is similar to *G. matudae*, *G. praecox* and *G. rubellilabia* in the relatively small flowers, two leaves and globose corms, but differs from all previously described species in the purplish-magenta petals with yellow apices and the strongly conduplicate, narrowly channeled column foot. Due to its small geographical range (less than 1 km²) and the small number of both populations (two) and individuals (14), the new species is considered as endangered.

Key words: Cloud forest, extinction risk, taxonomy.

Introduction

Neotropical genus *Govenia* Lindley (1830–40: 153) consists of ca. 24 species of geophytic orchids belonging in subfamily Epidendroideae, tribe Epidendreae, subtribe Calypsoinae (Chase *et al.* 2015; Freudenstein & Chase 2015), and characterized by underground thickened stems ('corms') or rhizomes and plicate, deciduous leaves (García-Cruz & Sosa 2005; Freudenstein *et al.* 2005). Flowers are arranged in a raceme, relatively showy, often delicately fragrant during daytime hours, resupinate, and the dorsal sepal forms with the petals a hood over the column. The labellum is shortly clawed, versatile and the column is arcuate, bearing a prominent auricle at each side of the stigma and extending at base into a distinct column foot. Several authors have assumed that flowers of *Govenia* are pollinated by bumblebees (García-Cruz & Sosa 2005; Meisel *et al.* 2014). However, a study on the reproductive biology of *G. utriculata* (Swartz 1788: 119) Lindley (1839: Misc. 47) conducted in southeastern Brazil by Pansarin (2014) recorded pollination by syrphid flies, which are deceived by the dark spots of the labellum that mimic pollen clusters. Examination of fresh flowers of several Mexican, Caribbean and Andean species confirmed that there is no nectar or other obvious reward for pollinators, which suggests that pollination by a similar sort of deceit might be present in all the species of the genus (Salazar 2009; G.A. Salazar, pers. obs.).

Govenia has not been revised, although several works have discussed the confusing taxonomy of its Mexican representatives (Dressler 1965; Greenwood 1981) or clarified particular species (e.g. Greenwood 1992a, b). García-Cruz & Sosa (2005) assessed monophyly and internal relationships in *Govenia* using morphological characters, corroborating the existence of three main clades that correspond with morphological groups first recognized intuitively by Greenwood (1981). During the last few decades, several new species of *Govenia* from Mexico, Central- and South America have been proposed (e.g. Greenwood 1993; Salazar & Greenwood 1993; Greenwood & Soto Arenas 2003; Dressler 2002; García-Cruz & Sosa 2006; Szlachetko & Kolanowska 2014). Recent exploration of cloud forest remnants in central Veracruz, Mexico led to the discovery of an additional, undescribed species of *Govenia*, which is described and illustrated here.

Material and methods

The morphological description was prepared from live flowering plants, one of which was subsequently pressed to serve as the holotype. Photographs were taken with a digital camera (Nikon D7000, Nikon Corporation, Tokyo, Japan) provided with a 60 mm AF Micro Nikkor lens (Nikon). Additional data for comparison with other species were taken from specimens deposited in the herbaria studied (mainly AMES, AMO, CHAPA, CORU, ENCB, FCME, GH, HGOM, K, MEXU, M, MO, SERO, SPLM, XAL and ZON) and the literature.

Taxonomy

Govenia polychroma Salazar, Fernández-Díaz & Huerta-Alvizar, *sp. nov.* (Figs. 1, 2).

Type:—MEXICO. Veracruz: municipio Naranja, El Rincón de Axalpa, cloud forest, 887 m elev., collected 30 August 2015, pressed in cultivation 5 October 2016, *Fernández-Díaz & Huerta-Alvizar 37* (holotype: MEXU! isotypes: AMO! XAL!).

Diagnosis: Differing from other species of *Govenia* in the purplish-magenta petals with yellow apices and strongly conduplicate column foot, such that the rounded, convex inner sides of the latter are in close proximity to each other instead of leaving a wide channel between them.

Terrestrial *herb* 65–80 cm in height including the inflorescence. *Roots* several (up to 12 in our specimens), arising from the basal nodes of the corms, simple, terete, densely pubescent, to ca. 23 cm long, 2–3 mm in diameter. *Corms* paired, one produced the previous year and another during the current growth season, obliquely globose, somewhat compressed laterally, with 2–3 blunt basal protuberances, formed by ca. 5 internodes of which the middle one is the largest, blunt at apex, to 4.5 cm long and wide, the previous year's one devoid of sheaths but provided with fine fibers, the new one covered by the bases of the petioles and the external sheaths; sheaths dull greyish green suffused with dark purplish-red, the lowermost 3 semi-clasping, rounded, 2.0–4.5 cm long, the uppermost one cylindrical, subquadrate in transverse section but lacking definite angles, apex rounded, to 9.5 cm long and 2 cm in diameter. *Leaves* two, fully expanded at flowering time, petiolate; petioles dull green densely suffused with dark purple, sharply quadrate in transverse section, the angles distinctly keeled, 10–11 cm long, ca. 1 cm in diameter; leaf blades elliptic, sub-opposite, ascending-arcuate, plicate, shortly acuminate, bright grass-green on upper surface, opaque medium green with three yellowish keels on the main veins on the underside, 22–25 cm long, 9.5–12.0 cm wide near the middle. *Inflorescence* 40–65 cm long from the apex of uppermost basal sheath; scape purplish-red with the distal part of each internode apple-green, provided with two distant, tubular, adpressed, scarious, dark brown sheaths 4–6 cm long; raceme 16–19 cm long, producing ca. 20–40 successive flowers, several of them open at the same time, rachis apple-green with its proximal portion purplish-red. *Floral bracts* pale yellowish, turning at least partially scarious and dark brown at anthesis, narrowly elliptic, acute, 6–19 mm long. *Flowers* resupinate, relatively small for the genus (perianth aperture ca. 16 mm), loosely spaced, without a perceivable odour in the afternoon. *Ovary* magenta with green base, slightly arching, somewhat twisted at base, 6-costate, 20–34 mm long, ca. 2 mm in diameter. *Dorsal sepal* arcuate, concave, linear-lanceolate, obtuse-rounded, pale yellow with two magenta stripes on the proximal one-half externally, 13.5 mm long, 3.7 mm wide. *Lateral sepals* pale yellow with a magenta marginal stripe near the base, spreading, slightly concave, disposed on the same plane and somewhat convergent, falcate, obtuse-rounded, 10 mm long, 3 mm wide. *Petals* purplish magenta with yellow apices and darker purple veins, arcuate, recurved at apex, obliquely oblanceolate-falcate, acute, 12.5 mm long, 4.8 mm wide. *Labellum* pale yellow with several brownish irregular spots near the base outside, the inner surface suffused with brown below the middle, the suffusion extending distally into two narrow, curved bands each ending in a dark reddish-brown dot, with three additional dark brown dots at apex; the five dark spots are visible also on the lower surface through the labellum tissue; blade arcuate, versatile, mostly ovate, obtuse-rounded and apiculate, 9.0 mm long, 5.5 mm wide, shortly clawed at base; claw yellow, cuneate, ca. 1 mm long; proximal one-half of labellum minutely papillose, provided with two lunate prominences on the inner surface which correspond with cavities on the outer surface. *Column* 8.5 mm long, ca. 2.5 mm wide, arcuate, ventrally concave-channelled, white with the margins and the ventral surface with elongate brownish-red spots, provided with a round, broad auricle at each side of the stigma, base projected into a short but distinct column foot which is strongly conduplicate, such that the rounded, convex inner sides are in close proximity to each other instead of leaving a wide channel between them; externally the sides of the column foot are concave. *Anther* deep yellow, semi-globose, shortly

rostrate, ca. 2 mm long, 1.5 mm wide. *Pollinarium* formed by a transversely elliptic, whitish viscidium, a short tegular, white stipe and four yellow, obliquely ovoid pollinia, these dorsiventrally juxtaposed in two pairs and joined to the stipe by short, yellowish granular caudicles. *Rostellum* a transverse, blunt blade. *Capsule* not seen.

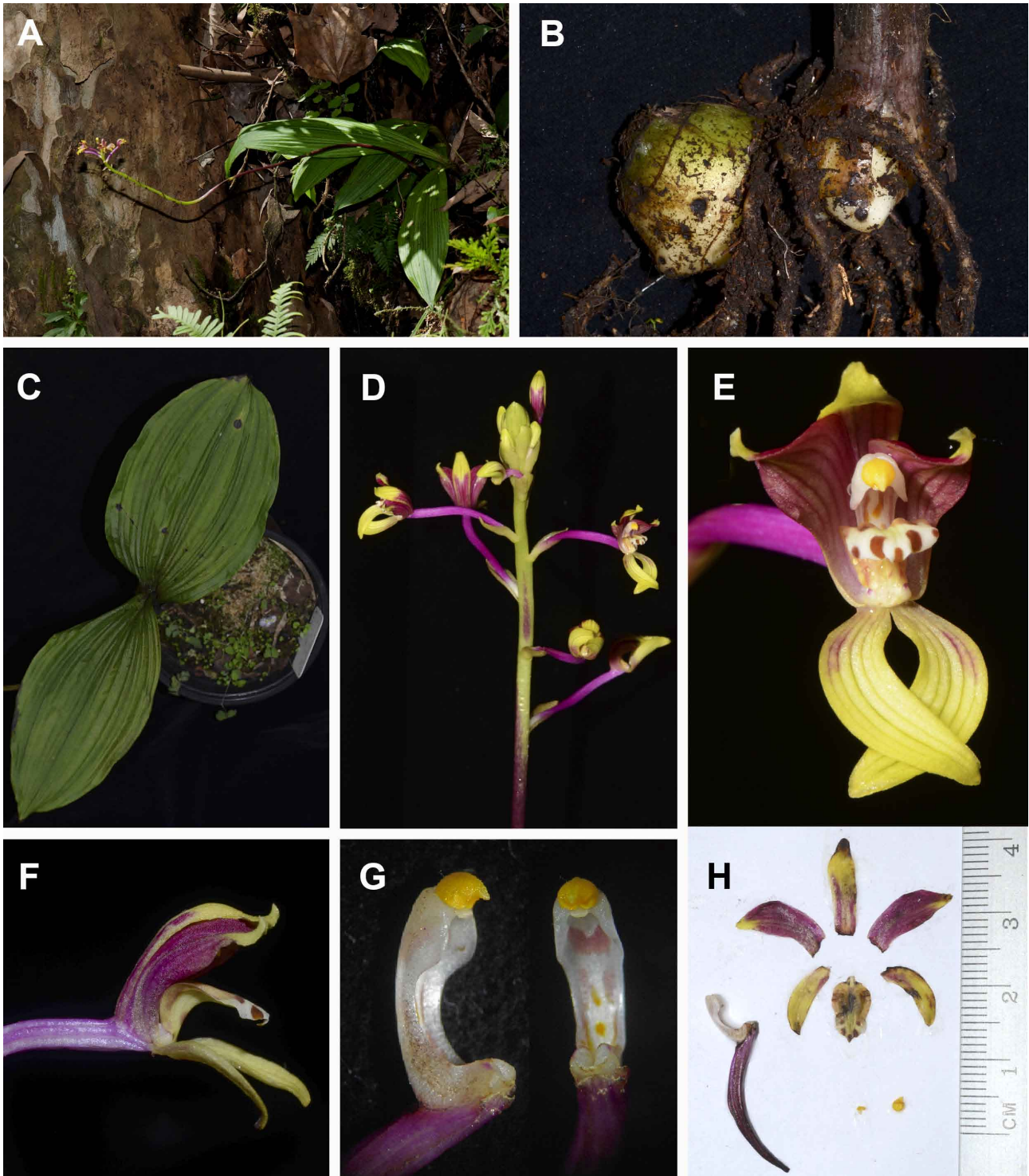


Figure 1. *Govenia polychroma*. A. Flowering plant *in situ* at Reserva del Bicentenario, Zongolica, Veracruz (Roldan-Hernández & Jimeno-Sevilla 483). B–H, various views of a cultivated plant from El Rincón de Axalpa, Naranjal, Veracruz (Fernández-Díaz & Huerta-Alvizar 37). B. Base of plant from side showing the corms from the previous (left) and current year's growth (right). C. Leaf blades from above. D. Inflorescence. E. Flower from front. F. Flower from side. G. Column from side (left) and front (right). H. Dissection of a flower with a ruler in centimetres for scale. Photographers: A = David Jimeno-Sevilla; B, C, F–H = Gerardo A. Salazar; D, E = Rolando Jiménez-Machorro.

Phenology:—Flowering recorded from late August to early October.

Etymology:—From Greek *polychromous*, many-colored, in reference to the distinctive colour of the flowers in contrasting tones of yellow, magenta, purplish-magenta, white, and brown.

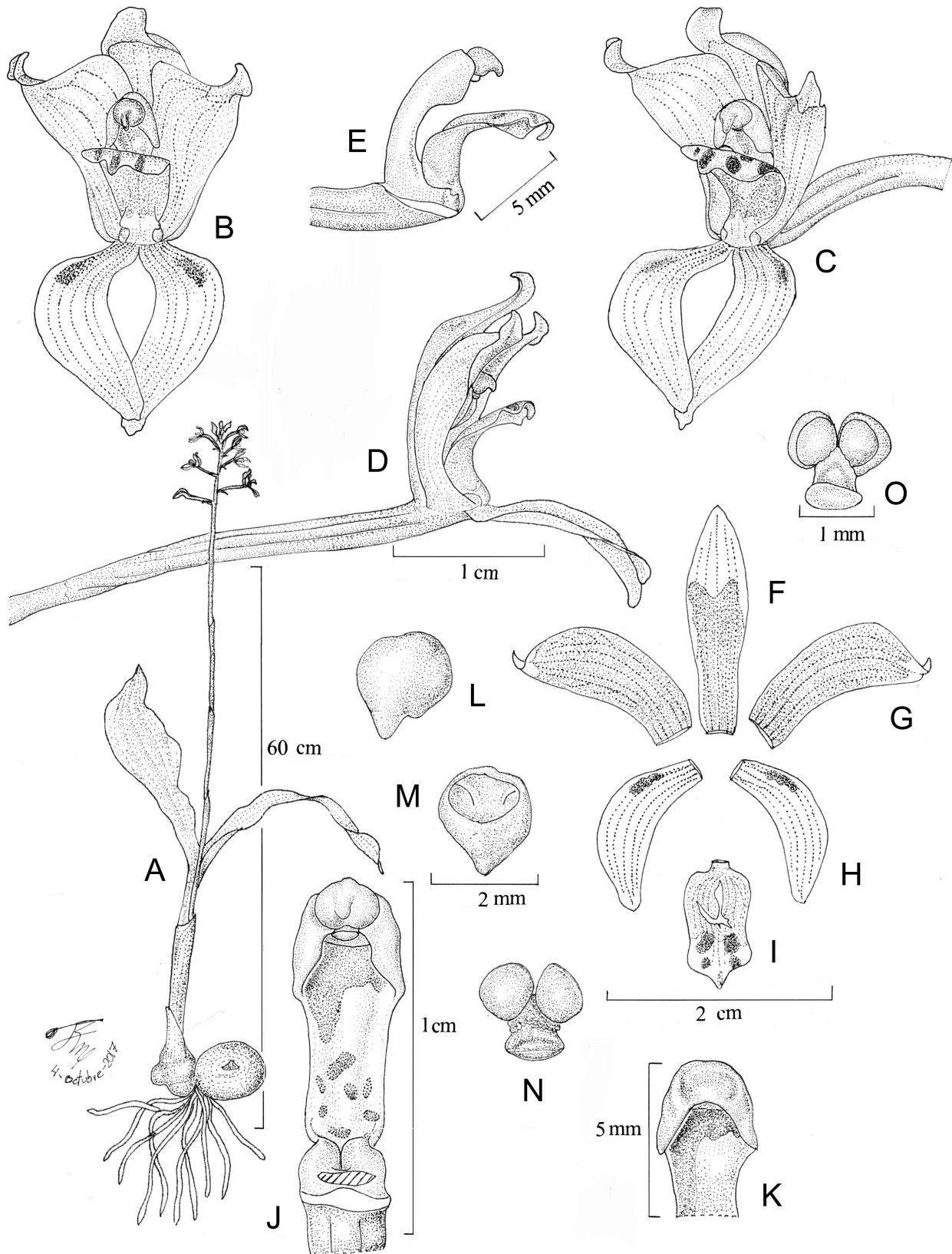


Figure 2. *Govenia polychroma*. A. Flowering plant. B. Flower from front. C. Flower in oblique view. D. Flower from side. E. Flower with sepals and petals excised showing the labellum and column from side. F. Dorsal sepal. G. Petal. H. Lateral sepal. I. Labellum. J. Column from front prior to removal of anther cap and pollinarium. K. Column apex from front after removal of anther cap and pollinarium. L. Anther from above. M. Anther from below. N. Pollinarium from front. O. Pollinarium from back. Drawn with camera lucida by Rolando Jiménez-Machorro from Fernández-Díaz & Huerta-Alvizar 37.

Distribution and habitat:—Known only from two locations distant from one another about 16 km in a straight line in central Veracruz, Mexico. Terrestrial in leaf mould in cloud forest, from 850 to 1350 m elevation. At the type locality, the population consisted of 11 individuals growing near the base of a 20 m high rock wall, which probably confers some protection from habitat disturbance, growing alongside *Ceratozamia mexicana* Brogniart (1846: 8), *Piper auritum* Kunth (1816: 54), *Peperomia* Ruiz & Pavón (1794: plate 8) spp., *Selaginella* Palisot de Beauvois (1805: 101) sp., and trees of *Inga* Miller (1754: *Inga*) sp., *Fraxinus* Linnaeus (1753: 1057) sp. and *Persea* Miller (1754: *Persea*) sp., surrounded by patches of secondary-growth forest and adjacent to an abandoned coffee plantation. The other known population consisted of three plants growing on a riverside bank with riparian vegetation, in which *Platanus mexicana* Moricand (1833–1846: 39–40, t. 26), *Trema micrantha* (Linnaeus 1759: 937) Blume (1856: 58), *Rhamnus pompana* Johnston & Johnston (1978: 38–41, t. 5, 13) and *Liquidambar styraciflua* Linnaeus (1753: 999) are the most conspicuous tree species, with *Piper amalago* Linnaeus (1753: 29), *Xanthosoma* Schott in Schott & Endlicher (1832: 19) sp., *Pavonia schiedena* Steudel (1841: 279) and *Selaginella stellata* Spring (1838: 194) in the understory.

Conservation status:—So far, only 14 individuals have been located, 11 of these at the type locality (Axalpa) growing next to a coffee plantation and under no legal protection. Three further plants were found at Reserva del Bicentenario, a *bona fide* 63 hectare reserve under the care of the Instituto Tecnológico Superior de Zongolica. Habitat modification or destruction in the form of clearing of natural vegetation for coffee cultivation and riverbank overflow are potential threats to the Axalpa and Zongolica populations, respectively. According to the MER-Plantas (the official method for assessing risk of extinction for plants in the Mexican law; SEMARNAT 2010), this species qualifies as Endangered because its area of distribution is ≤ 1 km² and the total number of individuals is ≤ 500 . Likewise, according to the IUCN Red List Categories and Criteria (IUCN 2012) this species should be considered as Critically Endangered since its estimated area of occupancy is < 10 km² and severely fragmented (criteria B2(a)). We were unable to find additional specimens attributable to this species either during our numerous field trips in central Veracruz and adjacent states or in the herbaria studied. Both its showily coloured flowers and extreme rarity in nature make it a priority target for *ex-situ* propagation.

Taxonomic notes:—*Govenia polychroma* differs from other two-leaved, small-flowered species of *Govenia* in the elongate, sparsely-flowered raceme and the unique colouration pattern of its flowers: bright magenta ovary, yellow sepals with 1–2 external magenta stripes, dark purplish-magenta petals with yellow apices, and yellowish-white labellum with three apical, dark purplish-brown dots and two additional dots at the end of the brown proximal suffusion on the inner surface. An additional distinctive feature is the ventral channel of the column, which is nearly completely closed by the strongly conduplicate column foot, which has approximate, convex internal margins and externally concave sides. *Govenia praecox* Salazar & Greenwood (1993: 113–120), which also occurs in the cloud forests of central Veracruz, differs in flowering before the leaf blades are expanded, its dense, subcapitate raceme, yellow sepals internally suffused with red, pale yellow petals internally barred transversely with reddish-orange and wide column foot channel (Salazar & Greenwood 1993). Another species from similar habitats in central Veracruz, *G. mutica* Reichenbach (1852: 856), is distinguished at a glance by its condensed raceme and white flowers with proportionately longer, narrower floral segments (cf. Hamer 1974). Costa Rican *G. viaria* Dressler (2002: 26) differs from *G. polychroma* in its more oblique corms, short, dense raceme, pale yellow flowers with the petals barred internally, and anther bearing a subulate beak (Dressler 2002). On the other hand, *G. rubellilabia* García-Cruz in García-Cruz & Sosa (2006: 259–263), from the Sierra Madre of Chiapas, is distinguished from *G. polychroma* by the shorter raceme with fewer (8–13) flowers and the reddish labellum rounded at apex and lacking dark spots (García-Cruz & Sosa 2006), whereas *G. matudae* Greenwood & Soto Arenas (2003: t. 590) differs in the reddish, obtuse labellum, yellow petals with reddish-orange suffusion and transverse purple bars on the distal one-third. The main differences between the new species and the aforementioned small-flowered members of *Govenia* are indicated in Table 1.

Govenia polychroma seems to fit in the ‘Superba group’ initially proposed by Greenwood (1981) and subsequently recovered in the morphology-based phylogenetic analysis of García-Cruz & Sosa (2005). This group includes other small-flowered species with shortly rostrate anther and predominantly yellow flowers. However, its phylogenetic position, and the overall relationships in the genus, will benefit from independent assessment using DNA sequence data. Some such work is currently in course (G. A. Salazar & L. I. Cabrera, unpubl. res.) and will eventually permit contrast of the molecular trees with the morphology-based hypotheses.

Additional specimen examined:—MEXICO. Veracruz: municipio Zongolica, arroyo La Compañía, Reserva del Bicentenario, 1314 m elev., 4 September 2014, Roldán-Hernández & Jimeno-Sevilla 483 (ZON!).

TABLE 1. Comparison of *Govenia polychroma* with other small-flowered species from Mexico and Central America.

Feature	<i>G. polychroma</i>	<i>G. praecox</i>	<i>G. viaria</i>	<i>G. rubellilabia</i>	<i>G. matudae</i>
Leaves at flowering time	Fully expanded	Not yet expanded	Fully expanded	Fully expanded	Fully expanded
Arrangement of flowers in raceme	Lax	Dense	Dense	Lax	Dense
Number of flowers	20–40	10–40	20–30	8–13	20–40
Petal colouration	Solid purplish-magenta with darker longitudinal veins and yellow apex	Yellow with transverse red bars	Yellow with red-brown suffusion, transverse red-brown bars on inner surface	Greenish-yellow with reddish suffusion and dark irregular, sparse spots on inner surface	Yellow with reddish-orange suffusion, transverse purplish bars on distal inner one-third
Labellum colouration	Pale yellow with pale brown suffusion on the proximal one-half of the upper surface, the suffused part ending in two purplish brown dots, three additional reddish-brown dots near the apex on the upper surface	Pale yellow with pale brown suffusion on the proximal 3/4 and 3–5 dark brown dots near the apex on the upper surface	Red-brown with 5 dark marginal/apical dots on upper surface	Reddish, upper surface whitish with darker veins, without dark dots	Brownish with darker veins and three marginal/apical dark reddish-brown dots on upper surface
Labellum apex	Apiculate	Subacute, sometimes apiculate	Abruptly apiculate	Rounded	Broadly obtuse, minutely apiculate

Acknowledgements

The authors thank the heads and staff of AMES, AMO, CHAPA, CORU, ENCB, FCME, GH, HGOM, K, MEXU, M, MO, SERO, SPLM, XAL and ZON for courtesies extended while studying the collections in their charge, and Cássio van den Berg and an anonymous reviewer for useful suggestions to an earlier version of the manuscript.

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