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PASSIFLORA MICROSTIPULA, A NEW SPECIES OF PASSIFLORACEAE FROM SOUTHEAST MEXICO

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Abstract: *Passiflora microstipula* was originally collected as seed in 1978 at the Los Tuxtlas biological station, Veracruz, Mexico. When plants grown from these seeds flowered in cultivation the next year, it was immediately clear that this species represented a completely new group within *Passiflora*. *P. microstipula* exhibits unusual characteristics such as tendril-borne flowers and conspicuously winged seeds. Observations of this species in cultivation revealed that significant morphological changes occur as development proceeds from a seedling to reproductively mature lianas. Morphology and ecology are discussed with regard to the species' likely taxonomic placement within the genus.

Keywords: Passifloraceae, *Passiflora*, Gagapache, *Eueides lineata*, Oaxaca, Veracruz, Mexico.

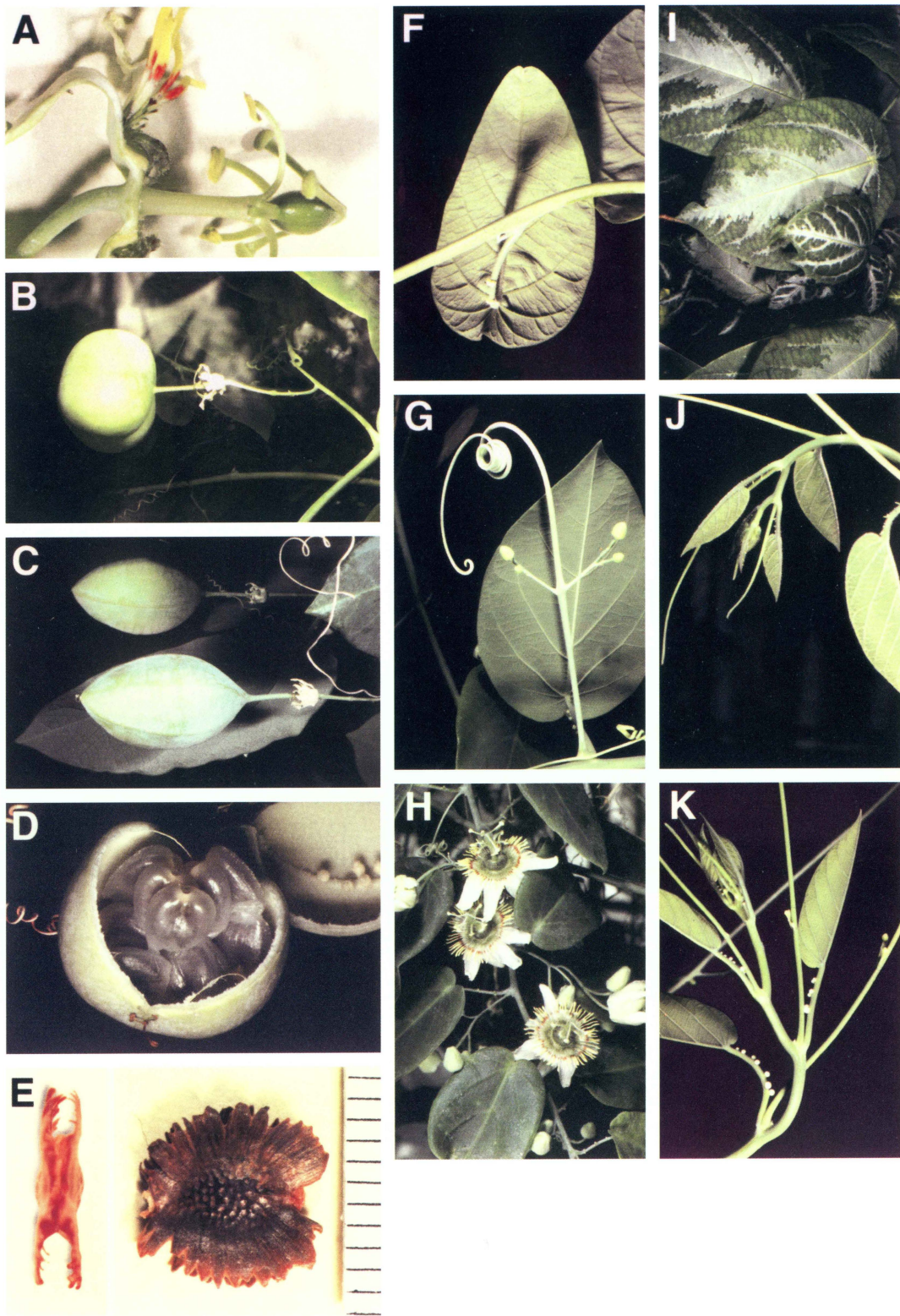
P. microstipula L. Gilbert & J. MacDougal, sp. nov.—(Fig. 1, cover).

TYPE: UNITED STATES. Texas: Travis Co., Cultivated at The University of Texas at Austin, 1978–2000, *L.E. Gilbert 9271*, 1979 specimens grown from seeds collected 13–16 Jul 1978 in Mexico, Veracruz, Estación Biológica Los Tuxtlas, (seed Gilbert 7828), (HOLOTYPE, MEXU!; ISOTYPES, MO!, TEX!, UPCB!, XAL!).

Passiflora subgeneris *Deidamioides* referenti. *P. eueidipabulum* Knapp et Mallet proxime accedenti, sed ab hac foliis ovatis, acuminatis, glabris, non pelatis, differt.

Medium-sized woody VINE to canopy liana, 6–15 m, appearing glabrous or puberulent; (basal portions of axillary branches and associated leaves usually sparsely puberulent with straight, glandular trichomes; seedlings and youngest juveniles puberulent). STEMS terete, glaucous, with posture of shoot tip cernuous. STIPULES 0.2–0.4 mm, triangular to narrowly triangular, pale, inconspicuous, deciduous. LEAVES alternate, petioles 4–8(–10 mm long)—6–8 glandular mostly on the distal $\frac{2}{3}$, the nectaries 1–2 \times 1.5–2.5 mm at fertile nodes, larger proximally on the petiole, broadly obconic,

subsessile, directed laterally, conspicuously white or ivory colored, (nectaries 0.5–1 \times 0.9–1.5 mm in submature plants, narrower in juveniles), laminas 9–14 cm \times 5.5–8 cm, ovate to ovate-elliptic, cordate basally with the two sides of the sinus sometimes slightly overlapping, abruptly acuminate to acute (to obtuse) at apex, variegated with a band of white along the midvein in seedlings and juveniles; bearing submarginal, inconspicuous, sessile, nectary glands 1–5 mm from margin. Prophylls of vegetative bud 2, 3-toothed to 3-cleft. INFLORESCENCE 2–4-flowered (once to twice branched), with ca. 0.5–5(–7) cm to first branch, the pedicels ca. 1.2–2.5 cm, the tendril a prolongation of the central axis of the inflorescence; BRACTS 1–2(–3) \times 0.2–0.5 mm, narrowly oblong-triangular to narrowly lanceolate, scattered distal to the floral stipe. FLOWERS oriented well above the horizontal to nearly vertical, with a sweet fragrance faintly like wilted rose petals, open most of the day, the corolla, white, reflexed at anthesis, the corona light to bright yellow distally, banded reddish near the middle (fig. 1A); FLORAL STIPE 13–26 mm (to 35 or more in fruit); hypanthium ca. 11 mm in diameter. SEPALS 17–24 \times 7–9.5 mm, triangular-oblong to narrowly ovate-oblong, rounded, with no



apical projection, the inner ones with hyaline margins and slightly cucullate. PETALS 18–25 × 10–14 mm, ovate-oblong to oblong-ovate, rounded, sometimes cucullate; CORONAL FILAMENTS in 2–3(–4) series, the outermost ca. 9–13 mm long, spreading, laterally compressed, not geniculate or with compound curves, light green basally, banded reddish purple to dark red near the middle as 1–2 bands, light to bright yellow distally or on the distal third, the next (1–) 2(–3) series 1.5–6 mm long (1–2 series in petal sectors, 2–3 series in sepal sectors), capillary, almost erect, banded with purplish red, distally clavate and minutely setose or sparsely pilosulous; operculum 3.5–4 mm, membranous, plicate, suberect, apically fimbriate and setose, mottled with purplish red; nectar ring (raised annulus) absent. LIMEN 3–4 mm in diameter, its raised edge less than 1 mm high, with annular depression on top, pale to light yellowish green, not marked; STAMINAL FILAMENTS connate 8–12 mm along androgynophore, pale yellowish green, not marked, the free portions 7–9 mm long, uniformly green; ANTHERS 3.0–3.9 mm long, held with their axes parallel to the filament, not marked with purple; POLLEN 6-colporate, yellow. OVARY 5 × 3 mm, on gynophore ca. 1–1.5 mm long, ellipsoid, subtriangular in cross-section, medium green, usually minutely puberulent with straight, capitellate, glandular trichomes; styles 10–12.5 mm long including stigmas, sometimes sparsely puberulent at least near base, yellowish green, not marked, the stigmas 2–2.3 mm in diameter, often notice-

ably bilobed. FRUIT (fig. 1B–D) ca. 6–8(–4) × 4–5.5 cm, ovoid and apically conical to oblate and apically flat, light yellowish-green to greenish-yellow, with a faint vanilla odor, the stipe 15–18 mm; arils sweet, translucent, very pale yellow, juicy; SEEDS (fig. 1E) 7.5–11 × 7–9.5 mm × 2 mm, strongly compressed, the faces obscurely reticulate with 20–40 central pits, surrounded by large striate wings with erose margins, ca. 60 seeds per fruit; germination epigeal.

COMMON NAME: “Gagapache” (also used in southern Veracruz for several other passion vines with large fruits).

CHROMOSOME NUMBER: $n = 9$.

ECOLOGY: *Eueides lineata* Salvin and Goodman, a heliconiine butterfly, is the only herbivore identified from this *Passiflora*. Unidentified flea beetles, a species of the coreid bug genus *Anisocelis*, and a dioptid moth, genus *Josia*, are other associates noted during brief field observations in Veracruz in July, 1978.

HABITAT AND DISTRIBUTION: *Passiflora microstipula* is a medium vine or canopy liana found in very humid tropical forests at low elevations (20–350 m). Known only from a few localities, it appears to be distributed from Veracruz to Oaxaca, Mexico.

REPRESENTATIVE SPECIMENS EXAMINED: UNITED STATES, **Texas**: Travis Co.: cultivated at The University of Texas at Austin, from seeds of *Gilbert* 7828, green-

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FIG. 1. Photographs taken by L.E. Gilbert of *P. microstipula* Gilbert 9271 (Veracruz clone) and *Gilbert* 8018 (Oaxaca clone) in cultivation at The University of Texas at Austin, except as noted. A. Cross section of flower. B. Fruit of Veracruz clone. C. Fruit of Oaxaca clone. D. Ripe fruit and seeds of Veracruz clone. E. End and side views of winged seed (Veracruz clone) next to mm scale. F. Peltate leaf of *P. eueidipabulum* (Osa Peninsula, Costa Rica). G. Inflorescence and mature leaf (Veracruz clone). H. Flowers. I. Juvenile foliage of Veracruz population in the field with apocynaceous ground cover that it resembles. J. Juvenile shoot tip (Veracruz clone). K. Mature shoot tip (Veracruz clone).

house accession number 9271 Sept. 1979, (Holotype MEXU, Isotypes at MO, TEX, UFPR, XAL) *Escobar 1590* (TEX), from seeds of *Lau s.n. in Dec 1986, 1987–2000*, greenhouse accession number 8018 *Gilbert* (TEX); cultivated at Missouri Botanical Garden from seeds of *Lau s.n. in Dec 1986, 1988–2000, MacDougal 3012* (MO); MEXICO. **Oaxaca:** Distr. Tuxtepec, near Temascal, Dec 1986, *Lau s.n.* (MO); “Presa Temascal” Miguel Alemán 8 km al W de Nueva Patria, 50 m, 2 Jul 1982, *R. Torres 739* (DUKE, MEXU). **Veracruz:** Mpio. Santiago Tuxtla, Estación Biológica Los Tuxtlas, near Catemaco, 13–16 Jul 1978, *Gilbert 7817* (TEX); Mpio. Santiago Tuxtla, Loma Quemada, 350 m, *Ventura 14026* (ENCB); Mpio. Catemaco, 2 km al NO de La Palma por el camino LaPalma–Agua Dulce, 15 May 1973, *Villegas H. 134* (F, XAL).

Juveniles of *Passiflora microstipula* are a common element of secondary vegetation near Estación de Biología Los Tuxtlas. Only after seeds from a fruit on the forest floor were reared to maturity at The University of Texas at Austin, Texas was the connection made between these sterile younger plants and the morphologically distinct adults. As it develops from seedling, to immature (pre-reproductive) to mature (reproductive) status, a *P. microstipula* plant undergoes substantial morphological changes. The leaves are pubescent, heart-shaped and variegated as a juvenile (fig. 1I). However, as the plant matures, these are replaced by more elongate, glabrous, *Philodendron*-like leaves that have little or no variegation (fig. 1G–H). Petiolar nectaries shift from small, green and filiform on the young plant (fig. 1J) to conspicuous, ivory-colored and globose (butterfly egg mimics?) on a mature vine (fig. 1K). The same transition in nectary morphology occurs in the related *P. eueidipabulum*, which has peltate leaves (fig. 1F). Most remarkably, it is only following this transition to the globose nectary glands, signaling mature leaf morphology, that floral meristems make an appear-

ance on the tendrils (fig. 1G). Occasionally the number of styles can fluctuate between 3 and 4 on the same individual and 4-parted fruit are sometimes seen as a minor variation, as in many species of *Passiflora*. In the greenhouses, this species never set fruit by autogamy, and scores of manual self-pollinations also failed.

Notably, there is dramatic variation in fruit shape that is highly correlated with geographic locality. The populations in Veracruz have fruits which are oblate with flat apices (fig. 1B) while the Oaxacan populations are much more elongate and tapered at the apices (fig. 1C). Although the mechanism of dispersal has not been observed for *P. microstipula*, the fruit shape and sweet, transparent arils (fig. 1D), and fruit which remain green and hang prominently after ripening are consistent with dispersal by frugivorous bats.

Passiflora microstipula has a relationship with heliconiine butterflies that has led to the discovery of a related species. *Heliconius* and most related genera exclusively use *Passiflora* for larval hosts. Many species that are locally confined to one or a few species of *Passiflora* will utilize closely related species elsewhere in their range. *Passiflora microstipula* has now been in cultivation with *Heliconius* butterflies for 22 years in the laboratory with virtually no eggs or larvae of these insects ever found on this species. However, Mallet and Longino (1982) discovered *Eueides lineata* utilizing *P. microstipula* in Veracruz in 1979. Remarkably, *E. lineata* led the same workers to a defoliated vine in the cloud forests of the Osa Peninsula in Costa Rica which proved to be a second undescribed species very close to *P. microstipula*. When this Osa species was propagated from cuttings and grown to maturity by L.E.G. at Sirena Biological Station, it was clear that it was a related but also undescribed species, later described as *P. eueidipabulum* Knapp & Mallet from a flowering individual collected in Panama.

The presence of flowers on the tendril

is unusual in *Passiflora*, and is considered a primitive state. Only 5% of the more than 500 species possess this. *P. microstipula* did not key to any of Killip's (1938) subgenera for *Passiflora* and clearly represented an interesting problem of higher taxonomic affinity in the genus. A chromosome number of $n = 9$ is consistent with species placement in subgenus *Passiflora*. The size and shape of the chromosomes, however, were more characteristic of subgenus *Decaloba* (DC.) Rchb. (Snow and MacDougal 1993). We are initially placing it within subgenus *Dedamnioides* (Harms) Killip but the combination of characters possessed by this species is unusual and it may represent a new subgenus of *Passiflora*. Recently, two additional undescribed members of this species group have been found in Central American collections from Guatemala, Belize, and Honduras, further emphasizing that a striking and singular group of plants can remain unknown even in well-collected areas largely because flowers and fruits are produced in the forest canopy. The description of a new section or subgenus and a key to the four species within it will be addressed in a subsequent publication.

Over its years in cultivation, attempts have been made to cross *P. microstipula* with other *Passiflora* species which bear flowers on tendrils. While crosses with *P. arbelaezii* Uribe and *P. deidamnioides* Harms failed, those with the undescribed species in this group from Belize have produced healthy F1 seedlings (L. Gilbert personal obs.).

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