Two New Species of Passiflora (Passifloraceae) From Panama, with Comments on Their Natural History

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Source: *Annals of the Missouri Botanical Garden*, Vol. 71, No. 4 (1984), pp. 1068-1074
Published by: Missouri Botanical Garden Press
Stable URL: http://www.jstor.org/stable/2399243

TWO NEW SPECIES OF *PASSIFLORA* (PASSIFLORACEAE) FROM PANAMA, WITH COMMENTS ON THEIR NATURAL HISTORY[1]

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ABSTRACT

Passiflora macdougaliana and **P. eueidipabulum** are described from middle elevation wet habitats, bringing the number of species of Passifloraceae in Panama to 34. Both these species are of uncertain affinities in the genus *Passiflora.* One of the species is a new host plant record for the heliconiine butterfly *Eueides lineata,* and is also found in the peculiar low cloud forest on the Osa Peninsula in Costa Rica. The occurrence of new and unusual species in middle elevation Atlantic slope forests and the urgency of collecting in these forests are briefly discussed.

Passiflora macdougaliana S. Knapp & Mallet, sp. nov. TYPE: Panama. Colón: along the Río Guanche about 1 km from the Portobelo Highway, 0–50 m, 9°30′N, 79°40′W, 11 Apr. 1982, *Knapp, Mallet & Huft 4587* (holotype, MO; duplicates to be distributed). Figures 1 and 3a.

Frutex scandens. *Caulis* teres glaucus. *Stipulae* lineares falcatae caducae. *Folia* alterna ovata insuper nitida subter glauca, apicibus acutis retusis, basibus acutis. *Flores* ad nodos solitaria, bracteis triangularibus spadiceis. *Calycis* tubus conicus. *Sepala* anguste triangularia alba carnosa, apicibus obtusis, aestivatione quincunciali, marginibus expositis glandulosis. *Petala* anguste triangularia alba, apicibus obtusis. *Coronae filamenta* 10-seriata alba, 8 extimis filamentosis corrugatis, 2 intimis erectis rigidis brevibus. *Operculum* plicatum. *Ovarium* ellipticum glabrum nitide viride albo maculatum.

Huge woody canopy liana, young stems round and glabrous; new growth erect and glaucous; stipules linear, 1.5–2 mm long, falcate, very early deciduous. Leaves coriaceous with petioles ca. 25 mm long, biglandular just beyond the middle; the glands raised hemispheres ca. 2 mm wide; blades ovate, ca. 135 mm long, 80 mm wide, 5-veined from the base; apex acute with a tiny notch, base cuneate; upper leaf surface shining, lower surface glaucous with prominent green venation, laminar nectaries absent. Flowers solitary at each node, erect, sweetly fragrant; pedicel ca. 45 mm long, joint ca. 25 mm from the base; tendrils present on new growth, but early deciduous; floral bracts 3, scattered from the joint to 10 mm below the joint, deltoid, ca. 1 mm long, 1 mm wide at the base, pale brown; buds green, shining, coriaceous, aestivation quincuncial, with 5 lenticular glands evenly spaced about the bud ca. 5 mm from top of the calyx tube; calyx tube ca. 13 mm wide, 5 mm deep; sepals thick and fleshy, ca. 30 mm long, 10–15 mm wide, narrowly triangular, apex obtuse, white adaxially, green and shining abaxially; with 5 raised circular glands 1 mm diam. on sepal margins outermost in bud, 5 mm from sepal base (2 sepals with 2 glands, 1 with 1 gland, and 2 with no glands); petals ca. 35 mm long, 15 mm wide, narrowly triangular, apex obtuse, white; coronal rows 10, densely packed, grading into one another, all rows white fading to cream at base, the outer rows 1 mm diam. at base tapering to crumpled zigzag tips; the outermost 5 coronal rows ca. 35 mm long, filamentous; the next 2 rows ca. 7 mm long

[1] We thank Bob Dressler, Dave Roubik, and Bob Schmalzel for very enjoyable field companionship and often for transport to collecting localities in times of vehicle trouble. Thanks to Bente Starcke King for the illustrations. Larry Gilbert read a first draft of this paper and discussed passifloras. The personnel of the Servicio de Parques Nacionales (Costa Rica) allowed us to roam freely in Corcovado National Park on the Osa Peninsula. RE.NA.RE. allowed us the same freedom to collect in Panama. We are especially grateful to John MacDougal, who patiently answered our many queries about *Passiflora* systematics. James Mallet was supported in Panama by the Educational Outreach Fund of the Smithsonian Tropical Research Institute and in Costa Rica by National Geographic Grant #2212-80 and NSF grant DEB 79-06033 to L. E. Gilbert. Sandra Knapp was supported in Panama by NSF grant DEB 79-22192 to W. G. D'Arcy of the Missouri Botanical Garden and in Costa Rica by an Organization for Tropical Studies Jessie Smith Noyes Fellowship and a Sigma Xi Grant-in-Aid for Research. The support of these institutions is most gratefully acknowledged.

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ANN. MISSOURI BOT. GARD. 71: 1068–1074. 1984.

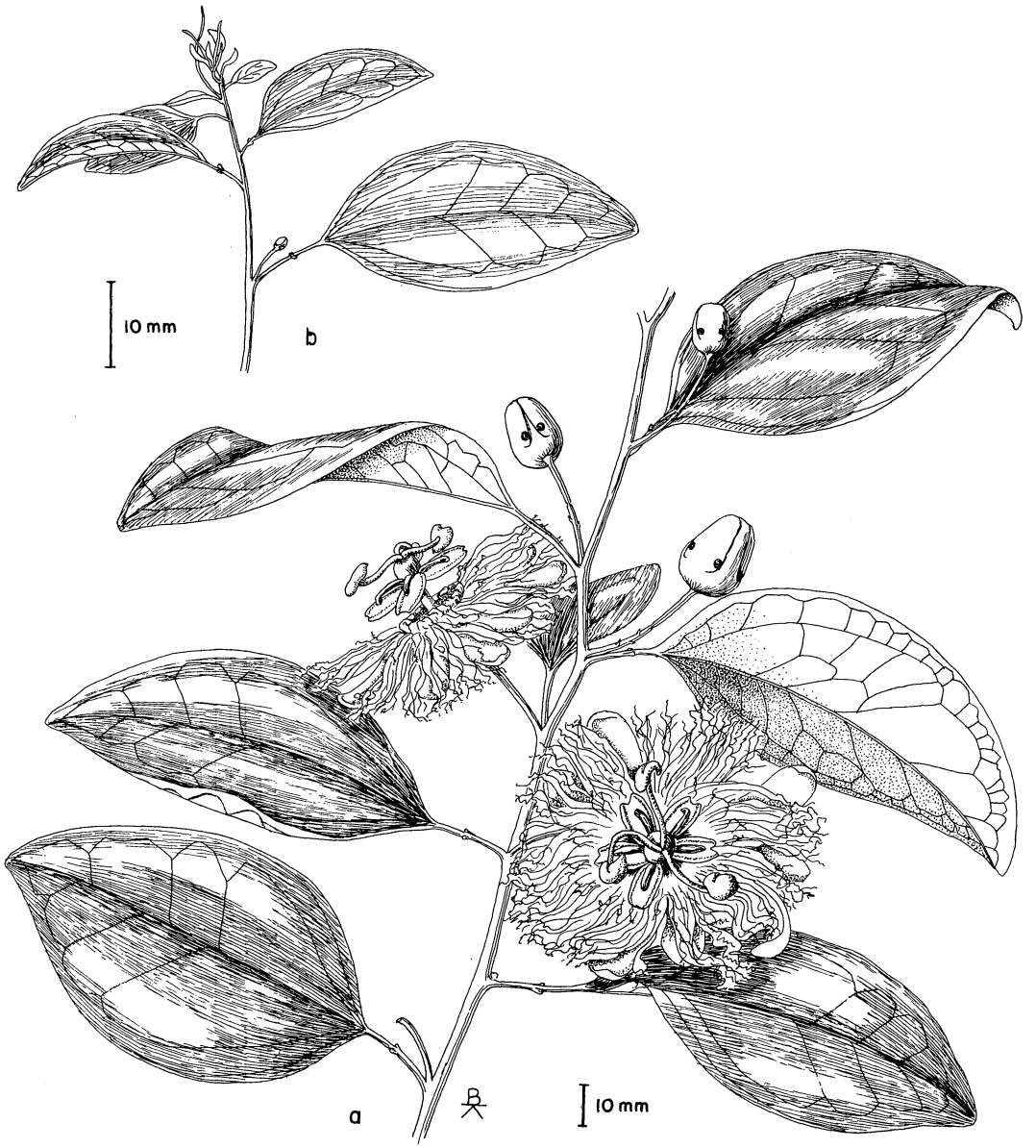

FIGURE 1. *Passiflora macdougaliana.*—a. Habit.—b. New growth (from *Knapp, Mallet & Huft 4587*).

followed by a filamentous row ca. 3 mm long; innermost 2 coronal rows 2 mm long, stiff and upright; operculum plicate, ca. 5 mm long, white, the upper surface incurved and covering the limen; floral nectary arising just inside the base of the operculum, nectar secreting area a trough ca. 4 mm deep, 2 mm wide, lined with a yellow pad; limen red, arising from inner edge of the trough, 1 mm high, covered by the tip of the operculum; androgynophore ca. 7 mm long from base to filament origin, white, from above slightly asymmetric; stamens 5, filaments ca. 7 mm long, green, anthers ca. 13 mm long, 6 mm wide, greenish yellow; style branches 3, ca. 15 mm long, 1 mm wide, white; stigmas discoid, revolute, ca. 7 mm wide, 5 mm long, creamy green; ovary ellipsoid, ca. 7 mm long, 6 mm diam., pale green with whitish specks, glabrous and shining. Fruit unknown.

Passiflora macdougaliana is a large canopy vine in mature forest. It appears to flower only when

at the very tops of trees and therefore is very difficult to collect. This species is fairly common on Santa Rita Ridge, Colón province, judging from the number of individuals encountered as fallen leaves and flowers on the forest floor.

This species has unclear affinities; it possesses a hodgepodge of characters of a number of Killip's (1938) subgenera. The glands on the sepals suggest *P. variolata* Poepp. & Endl. in subgenus *Distephana* and *P. ernestii* Harms in subgenus *Adenosepala* (subgenera sensu Killip, 1938). In having a single flower at each node and a many ranked corona, *P. macdougaliana* is similar to many species in subgenus *Passiflora* (incl. *Granadilla*). The hemispherical petiolar glands suggest subgenus *Astrophea* or *Passiflora*. The plicate operculum is suggestive of subgenus *Plectostemma* or series *Kermesinae* of subgenus *Passiflora*. One peculiar group of Killip's subgenus *Plectostemma, P. obovata* Killip (section *Mayapathanthus*), is quite similar to *P. macdougaliana* in its leaf morphology, coriaceous buds, erect new growth, and scar-like petiolar glands, but differs in having the flowers paired at each node and in having fewer coronal rows.

The species is named in honor of John MacDougal of Duke University, a student of *Passiflora* systematics, who has been most kind and patient with our many queries about *Passiflora*, and who has stimulated our interest in this fascinating genus.

Additional specimens examined. PANAMA. COLÓN: Santa Rita Ridge, 20 km from the Transisthmian Highway, 300–500 m, 9°25′N, 79°37′W, 22 May 1982, *Knapp & Schmalzel 5278* (MO, duplicates to be distributed).

Passiflora eueidipabulum S. Knapp & Mallet, sp. nov. TYPE: Panama. Colón: Santa Rita Ridge Road 7 km from the Transisthmian Highway, 200 m, 9°22′N, 79°40′W, 21 May 1982, *Knapp & Schmalzel 5256* (holotype, MO; duplicates to be distributed). Figures 2 and 3b.

Scandens suffrutescens. *Caulis* teres glaucus. *Stipulae* minutae setaceae. *Folia* alterna peltata ovata subter glauca, apicibus acutis, basibus obtusis. *Pedunculi* irregulariter dichotomi cirrhiferi, bracteis caducis. *Calycis* tubus valde brevis. *Sepala* triangularia. *Petala* triangularia undulata. *Coronae filamenta* 3-seriata, extimis complanatis, intimis filiformibus inaequalibus. *Operculum* plicatum ad marginem irregulariter fimbriatum. *Ovarium* ellipticum molliter albopubescens. *Semina* ferruginea, foveolata, 4-alata.

Woody vine, about 2 cm thick at base, new growth recurved in a gentle acute angle, juvenile shoots softly pubescent with unicellular or uniseriate distally glandular trichomes ca. 0.1 mm long; stems round, smooth and waxy; stipules minute, setaceous; ca. 1 mm long, 0.25 mm wide at base, yellowish green or glaucous white. Leaves peltate, petiole 45–80 mm long, petiolar glands 4–6, in 2 or 3 subopposite pairs; blades ovate, 100–180 mm long, 50–125 mm wide, petiole inserted 12–20 mm from basal margin on the midrib; base rounded, sometimes slightly cordate, apex acute, apiculate; leaves prominently reticulate veined, glabrous above, papillose beneath, long white papillose on the veins, with a few scattered unicellular or uniseriate distally glandular trichomes on leaves of juvenile shoots, laminar nectaries present at junctions of some veins below, 10–15. Flowers borne in pairs on the tendrils, 15–30 (or more) mm from the base; pedicels ca. 52 mm long, joint 42 mm from base; floral bracts 3, scattered above and below the joint; if above larger, lanceolate, to 15 mm long and 5 mm wide, apex blunt; buds soft white puberulent; flowers sweetly fragrant; calyx tube ca. 15 mm wide, 2 mm deep, convex at point of pedicel insertion; sepals white with a green central stripe abaxially, ca. 25 mm long, 16 mm wide at base, broadly triangular, apex obtuse; petals white, very thin and delicate, ca. 25 mm long, 15 mm wide at base, broadly triangular, apex obtuse; margins of petals undulate and nearly transparent; coronal rows 3, outer row ca. 15 mm long, linear and laterally compressed, basal 5 mm mottled olive green and maroon, terminal 10 mm bright lemon yellow; second coronal row 4–5 mm long, grading into the third, mottled olive green and maroon, clavate, the clubs bristly; third (inner) coronal row 2–3 mm long, clavate, the clubs bristly, mottled olive green and maroon; operculum also mottled olive green and maroon, plicate, 5 mm long, round and covering the limen, semi-circular in cross section; margin of operculum irregularly fimbriate and bristly, olive green; floral nectary ca. 2 mm wide, 1 mm deep; limen deep maroon, recurved, 2 mm long, 1 mm wide at base; androgynophore ca. 12 mm from base to point of filament origin, pale glaucous green; stamens 5, filaments ca. 8 mm long, green, anthers ca. 6 mm long, 2 mm wide, pale green, pollen bright yellow; style branches 3, puberulent, ca. 8 mm long, stigmas green, discoid and revolute; ovary ellipsoidal, 5 mm long, pale green with soft white pubescence. Fruit ovoid, ca. 70

FIGURE 2. *Passiflora eueidipabulum.*—a. Habit.—b. New growth (from *Knapp & Schmalzel 5256*).

mm long, 50 mm wide, light yellow-green. Seeds rusty brown, narrowly elliptic lenticular, alate; body of seed ca. 10 mm long, 3.5 mm wide, minutely pitted; wings 4, a pair on each of the long axes, ca. 5 mm long, each pair ca. 2 mm apart on narrow edge of seed, striate, margins irregularly laciniate (fruit and seed description from *Antonio 1792*).

Passiflora eueidipabulum is vegetatively very distinctive. The large peltate leaves, minute stipules, and tendril-bearing peduncles make this

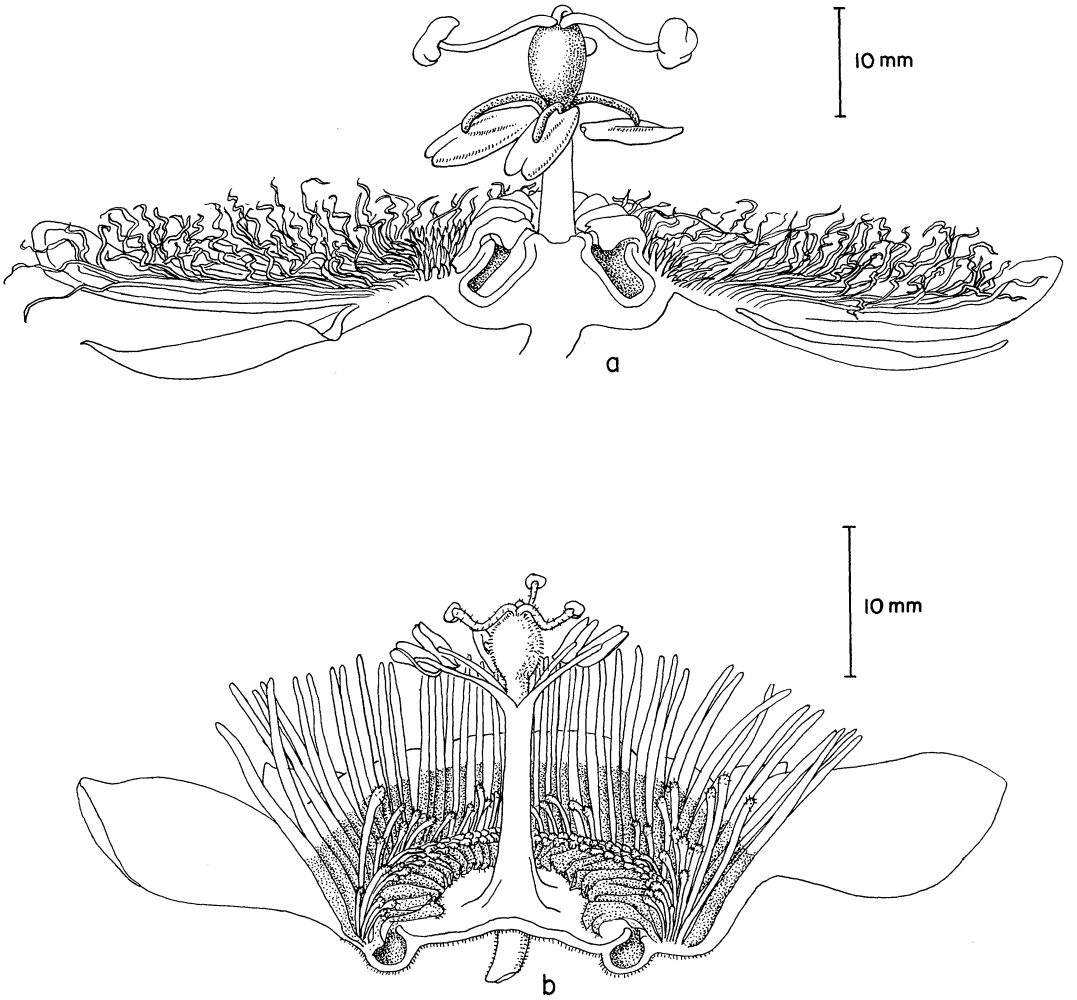

FIGURE 3.—a. Cross section of the flower of *Passiflora macdougaliana* (from *Knapp, Mallet & Hufi 4587*).—b. Cross section of the flower of *Passiflora eueidipabulum* (from *Knapp & Schmalzel 5256*).

species immediately recognizable in the field. Only one other Panamanian *Passiflora* species, *P. gracillima* Killip (incorrectly equated with *P. tryphostemmatoides* Harms in Woodson & Schery, 1958), has flowers always borne on the tendrils. *Passiflora eueidipabulum* is easily distinguished from *P. gracillima* by its much larger flowers, larger peltate leaves, plicate operculum, and prominent petiolar glands. *Passiflora eueidipabulum* morphologically resembles *P. deidamioides* Harms, a rare species from southeastern Brazil. The two species both have plicate opercula and flowers borne on the tendrils, but their leaf morphologies are quite distinct (see Killip, 1938 for description). The relationships of *P. eueidipabulum* within the genus are unclear. We therefore hesitate to assign this species to one of Killip's subgenera until character combinations and relationships in the genus are carefully re-analyzed.

Passiflora eueidipabulum is very closely related to another new species from lowland forest in Veracruz province, Mexico (to be described by L. E. Gilbert of the University of Texas, Austin, in prep.). These two taxa are remarkably similar, but differ in certain key features. The leaves of the Mexican species are not peltate, and do not have the pronounced glaucous cast of those of *P. eueidipabulum*. The flower buds of the Mexican species are completely glabrous, while those of *P. eueidipabulum* are soft white puberulent. The flowers of *P. eueidipabulum* are

shallower and more flattened in aspect, a feature not readily apparent on the herbarium sheet, but quite obvious in live specimens. The Mexican species has a peculiar juvenile morphology (Gilbert, in prep.), which is lacking in *P. eueidipabulum*. The winged seeds are an unusual and distinctive feature of both species.

Passiflora eueidipabulum is the species predicted by Mallet and Longino (1982) to occur in southern Central America. This prediction was made on the basis of the distribution of a butterfly species, *Eueides lineata* Salvin & Godman, whose host plant was found to be the above mentioned Mexican *Passiflora* (Mallet & Longino, 1982). In lower Central America, *E. lineata* was present in three of the five areas where *P. eueidipabulum* was seen: in the low cloud forest on the Osa Peninsula (Costa Rica), at Río Blanco del Norte (Coclé, Panama), and on the slopes of the Santa Rita Ridge (Colón, Panama). On the Osa Peninsula we found eggs of a *Eueides* species on the leaves, but were unable to rear these to adulthood. In Coclé province, all stages of *E. lineata* were found in abundance on the old and new growth of *P. eueidipabulum*. It is satisfying to report that the solution to a puzzle in butterfly biology has led to a botanical discovery.

This elusive species is named in honor of the butterfly, *Eueides lineata,* which led us to the plant. The larvae of *E. lineata* feed on the leaves of *P. eueidipabulum* (eueides—after the butterfly, meaning beautiful; and pabulum—fodder).

Two of the following additional specimens are both sterile, but we are certain they represent individuals of *P. eueidipabulum*; the leaf morphology is unmistakable. We have also seen, but not collected, sterile individuals of this species in another locality in Panama and in one locality in Costa Rica. The species was discovered in the peculiar low cloud forest on the Osa Peninsula of Costa Rica (8°30′N, 83°27′W) by Mr. J. Longino in 1980. *Passiflora eueidipabulum* also occurs along the Río Guanche (9°30′N, 79°40′W) in Colón province on the Atlantic coast of Panama. We have seen this *Passiflora* only in degraded forest and second growth. The large size of the type specimen is perhaps indicative of its canopy position in undisturbed forest.

Additional specimens examined. PANAMA. COCLÉ: sawmill above El Copé, 1,000 m, 8°40′N, 80°36′W, 13 Feb. 1982, *Knapp & Dressler 3440* (MO); near Caño Sucio, just W of Río Blanco del Norte, 500 m, 8°44′N, 81°40′W, 21 Feb. 1982, *Knapp & Dressler 3765* (MO). COLÓN: Cerro Santa Rita ca. 6 mi. from Transisthmian Highway, 800–900 ft., 13 Sept. 1979, *Antonio 1792* (MO) (in fruit).

Both of the new species described here owe their discovery to our specialized interest in *Passiflora* and its host specific herbivores, heliconiine butterflies (Gilbert, 1975; Benson et al., 1976). There are 34 described species of Passifloraceae from Panama (Woodson & Schery, 1958; Gentry, 1975), but we have found at least another eight species there. In some cases we have encountered only sterile plants, and in many cases the material may represent range extensions of South American species. Ecologists and zoologists working in the tropics should take special caution when identifying plants important to their work. Even in areas and countries well collected by general collectors (e.g., Panama), many species remain to be discovered. Those unfamiliar with plant identification may tend to force species to conform to what botanists have already described or recorded for the area. This can lead to gross misidentifications, as has been pointed out by Gilbert (1982). Sterile material in many groups such as the Passifloraceae is nearly as useful as flowering material, and is usually identifiable by someone familiar with the group in the study area. Regional or complete keys to sterile material would be of great use to ecologists or others who use systematic botany as a tool.

Both *P. macdougaliana* and *P. eueidipabulum* are found in very wet habitats and in low cloud forests, which generally occur on ridges below 1,000 m that are often covered in clouds and mist. In both Central and South America Gentry (1976, 1978, 1982) has shown that the wetter the region, the richer it is in both plant species and plant families. Extremely wet regions, such as the Chocó of Colombia, also appear to be rich in endemic and unusual species (Gentry, 1982). In Panama and Costa Rica wet forests are located all along the Atlantic slope, and in Costa Rica the isolated Pacific slope Osa Peninsula also receives high rainfall. The mid elevation ridges of these areas usually do not have a pronounced dry season and are similar to low cloud forest areas such as Santa Rita Ridge and Cerro Jefe. The endemic flora (Lewis, 1971) of low cloud forest areas in Panama is probably not restricted to any given summit or ridge, but is instead scattered throughout lower Central America in similar habitats. *Passiflora eueidipabulum* and *Passiflora macdougaliana* are both found in one such "endemic" area, Santa Rita Ridge, but also occur

on the lower Atlantic slopes of this ridge. The isolated mountain ridges of the central Osa Peninsula merit distinction as a westward extension of the low cloud forest habitat. This area has been poorly collected (but see specimens of Knapp and Mallet at CR and BH), but we suspect it will have floristic affinities with the Atlantic slope of Panama. The forest is physiognomically similar to that on the Santa Rita Ridge. That new and unusual species are being found in these mid elevation wet forests emphasizes the importance of collecting in less accessible habitats. These interesting habitats should be visited repeatedly with an emphasis on the collection of unusual taxa, particularly seasonal bloomers and high canopy plants. *Passiflora macdougaliana,* for example, was found in an extremely popular collecting area in north central Panama. This more thorough collecting approach will undoubtedly result in range extensions of "endemic" taxa and additions to a rich and already relatively well known flora.

LITERATURE CITED

BENSON, W. W., K. S. BROWN, JR. & L. E. GILBERT. 1976. Coevolution of plants and herbivores: passion flower butterflies. Evolution 29: 659–680.

GENTRY, A. H. 1975. Additional Panamanian Passifloraceae. Ann. Missouri Bot. Gard. 63: 341–345.

———. 1976. Bignoniaceae of southern Central America: distribution and ecological specificity. Biotropica 8: 117–131.

———. 1978. Floristic knowledge and needs in Pacific Tropical America. Brittonia 30: 134–153.

———. 1982. Phytogeographic patterns as evidence for a Chocó refuge. Pp. 112–136 *in* G. T. Prance (editor), Biological Diversification in the Tropics. Columbia Univ. Press, New York.

GILBERT, L. E. 1975. Ecological consequences of a coevolved mutualism between butterflies and plants. Pp. 210–240 *in* L. E. Gilbert & P. H. Raven (editors), Coevolution of Animals and Plants. Univ. of Texas Press, Austin.

———. 1982. Oviposition by two *Heliconius* species: comments on a paper by Dr. A. Young. New York Entomol. Soc. 90: 115–116.

KILLIP, E. P. 1938. The American species of Passifloraceae. Publ. Field Mus. Nat. Hist., Bot. Ser. 19: 3–613.

LEWIS, W. H. 1971. High floristic endemism in low cloud forests of Panama. Biotropica 3: 76–80.

MALLET, J. L. B. & J. T. LONGINO. 1982. Hostplant records and descriptions of juvenile stages for two rare species of *Eueides* (Nymphalidae). J. Lep. Soc. 36: 136–144.

WOODSON, R. E. & R. W. SCHERY, JR. 1958. Passifloraceae. *In* "Flora of Panama." Ann. Missouri Bot. Gard. 45: 1–25.