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A New Species and Subspecies of *Galvezia*  
(Scrophulariaceae) from the Galápagos Islands\*

By

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During January and February, 1967, the writer, assisted by Dr. Duncan M. Porter, collected vascular plants in the Galápagos Islands. This field work was done as part of the program of research under National Science Foundation grant GB-5254, administered by the California Academy of Sciences.

On 29 January 1967, the writer and Dr. Porter had walked inland approximately 2 kilometers from Caleta Tagus (Tagus Cove) on Isla Isabela (Albemarle Island), toward the foot of the prominent peak slightly north of east from Caleta Tagus. On the northeasterly side of a lava ridge we found several rounded shrubs that were notable owing to their deep green, sub-fleshy leaves and their waxy white flowers borne on short lateral twigs near the tips of the arcuately curving main branches. The plants obviously belonged in the Scrophulariaceae, but we were uncertain about their generic relationship.

Study of the specimens after our return to the United States showed that the shrubs represented an undescribed species of *Galvezia* Dombey.

***Galvezia leucantha* species novum,<sup>1</sup>**

(Figures a-i, k, l.)

Frutex 1-1.5 m. altus latusque, ramis gracilibus arcuatis ramulosis, ramulinis congestis 3-6 cm. longis; cortex ramorum brunneus laevis, lenticellis minutis ellipticis 0.2-0.4 mm. longis; folia opposita vel alternata; petioli 4-10 mm. longi minute alati glabri vel sparsim puberuli; laminae foliorum ellipticae vel elliptico-ovatae 8-15 (20) mm. latae, 2-5 cm. longae glabrae crassiusculae integrae, nervaturis pinnatis inconspicuis, foliis ramulinorum parvulis vulgo 4-10 mm. longis; flores numerosi albi axillaribus solitariis, pedicellis gracilibus 8-12 mm. longis glabris, sepalis paene discretis lanceolatis vel lanceolato-ovatis 4-6 mm. longis

\* The Charles Darwin Research Foundation Contribution no. 73.

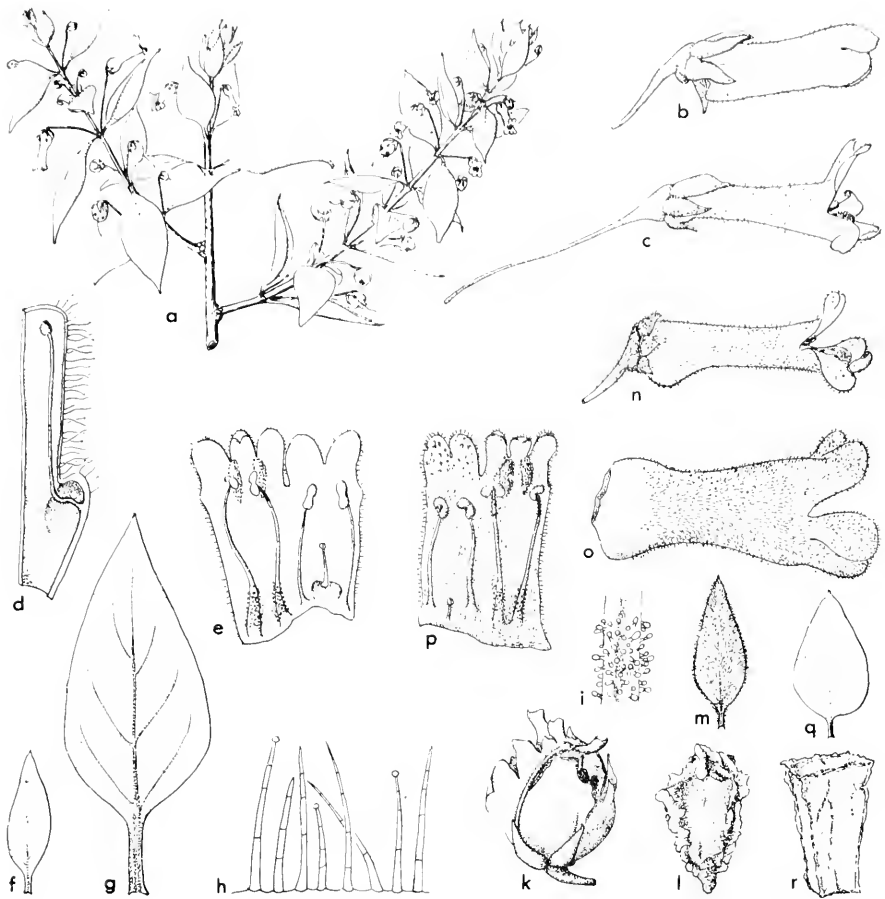
<sup>1</sup> The kindness of Dr. Rimo Bacigalupi in suggesting the specific epithet, meaning, "white-flowered," is appreciated greatly.

glabris; corolla ceraceo-alba aliquantum personata, tubo 8–10 mm. longo puberulo externo, labio supero bilobato 5–6 mm. longo, labio inferiore trilobato plicis palatorum dense papillatis circa 2 mm. longis; stamina fertiles didynami 4 imo corolla tubo inserta, paribus staminorum brevibus circa 6 mm. longis lobii superioris opposita inserta, filamentis gracilibus laevis, paribus staminorum longioribus circa 8–9 mm. longis sub sinum lobis labii inferioris affixa faucem corollae aequantem, filamentis prope basem plus minusve dilatatis papillatisque; stamen sterile circa 2 mm. longus in fovea lunari vadoso imo corolla tubo sub sinu labii superioris inserta; stylus gracilis 2–3 mm. longus saepe ad maturitatem fructus persistens; stigma capitatum plus minusve bilobatum; capsula late ovoidea vel globosa 5–6 mm. longa glabra; semina numerosa atrata 0.7–0.8 mm. longa ad apicem rotundata raro truncata ad basem acuta irregulariter cristata.

TYPE. Eastern side of ridge near foot of Tagus Cove Mountain, northeast of Caleta Tagus (Tagus Cove), about 1.5 to 2 kilometers from the beach, altitude about 95 meters, Isla Isabela, Islas Galápagos, Ecuador, 29 January 1967, *Ira L. Wiggins* and *Duncan M. Porter* 247 (holotype, CAS).

Rounded, somewhat straggly, much-branched shrubs 1–1.5 m. tall and about as wide, the branches often arcuately curved and bearing numerous, rather crowded lateral twigs 3–6 cm. long that bear leaves much smaller than those on the main branches; bark on older twigs and branches dull brownish tan, with many small, elliptic, darker brown lenticels 0.2–0.4 mm. long, the surface glabrous and smooth, neither exfoliating nor shining; main leaves on larger branches elliptic to elliptic-ovate, acute at the apex, rounded to obtuse at the base, 8–15 (20) mm. wide, 2–5 cm. long, glabrous, rather thick and firm, dark green, margins entire, nerves pinnate and inconspicuous (leaves arranged alternately and in opposite pairs often occurring on the same branch); petioles 4–10 mm. long, faintly winged toward juncture with the blade, glabrous or bearing a few widely scattered, simple, spreading, minute hairs; leaves on lateral twigs narrower in relation to width and much smaller than those on main branches, often only 1.5–2.5 mm. wide, 4–10 mm. long, narrowly acute at both ends; flowers borne singly in axils of reduced leaves on lateral twigs; pedicels very slender, 8–12 mm. long at anthesis, to 22 mm. long in fruit, abruptly bent downward from base of calyx cup; calyx lobes unequal, connate only at base, free through most of their length, 4–6 mm. long, lanceolate to lance-ovate, the adaxial pair the longest, the abaxial one the shortest, all glabrous throughout, a marked groove between the cup of calyx and each sepal; corolla waxy white, in bud the adaxial lip outermost, central lobe of the lower lip innermost and overlapped by the two lateral lobes of that lip, outer surfaces of both tube and lips moderately puberulent with straight, spreading, minute hairs, about one-third of these gland-tipped, the rest non-glandular and pointed at the tip; corolla 10–12 mm. long at anthesis, the throat only slightly ampliate, the tube 8–10 mm. long, upper lip 5–6 mm. long, nearly straight but turned backward at an angle of about 60 to 70 degrees,





FIGURES a-i, k, l. *Galvezia leucantha* subsp. *leucantha*. Figure a, habit of flowering branch,  $\times \frac{1}{2}$ ; figure b, bud just before anthesis,  $\times 2.5$ ; figure c, flower at anthesis,  $\times 2.5$ ; figure d, part of base of corolla showing pit and insertion of abortive stamen,  $\times 12$ ; figure e, corolla split and laid open to show relationship of stamens and corolla lobes,  $\times 2.5$ ; figures f, g, representative leaves,  $\times 1$ ; figure h, epidermal hairs from outside of corolla tube,  $\times 50$ ; figure i, segment of basal part of stamen filament with glandular hairs,  $\times 25$ ; figure k, mature ruptured capsule,  $\times 3$ ; figure l, seed, with irregular cristate ridges,  $\times 25$ .

FIGURE m. *Galvezia leucantha* subsp. *pubescens*. Average leaf  $\times 1$ .

FIGURES n-f. *Galvezia fruticosa*. Figures n, o, flower and corolla of *G. fruticosa*,  $\times 2.5$ ; figure p, corolla split and laid open to show relationships among stamens, corolla tube, and lobes,  $\times 2.5$ ; figure q, average leaf,  $\times 1$ ; figure r, seed, with truncate apex and base,  $\times 25$ .

sinus between lobes of upper lip extending about to middle of lip; lower lip 3-lobed, the sinuses between the lobes about as deep as the sinus of the upper lip, the central lobe somewhat cucullate, an ellipsoidal palatal fold extending

inward about 2–2.5 mm. from the orifice of the throat just below each sinus of the lower lip, these folds closely beset with stout, short, 1–3-celled gland-tipped hairs or papillae; functional stamens 4, didynamous, a fifth non-functional stamen opposite the sinus in the upper lip and inserted in a shallow, lunate pit about 2 mm. above the base of the corolla tube; filaments of functional stamens slender, those of the shorter pair inserted opposite the lobes of the upper lip near base of the corolla tube, smooth, devoid of hairs or papillae, the longer pair inserted opposite the sinuses between the central and lateral lobes of the lower lip near base of corolla tube, slightly dilated on the lower 2–3 mm. and bearing numerous small papillae like those on the palatal folds over the dilated portion, otherwise smooth and glabrous, barely exceeding the corolla tube so anthers of the longer pair of stamens usually exerted about one-half their length; styles filiform, 2–3 mm. long, persistent until maturity of the fruit; stigma capitate or faintly bilobed; capsule broadly ovoid to subglobose, 5–6 mm. long, glabrous, dehiscing by irregular, subterminal pores, the apices usually pointing downward owing to the sharp bend at the tip of the pedicels; seeds numerous, dull black, 0.7–0.8 mm. long, rounded, obtuse, or very rarely truncate at the apex, acute or rarely rounded-obtuse at the base, with 3 to 5 rather smooth faces flanked by irregular, slightly sinuous, cristate ridges running from base to apex, the faces sometimes bearing minute conical papillae, the cristate ridges either black or dark gray.

The most striking feature differentiating this species from those heretofore placed in *Galvezia* is the waxy white corolla. All species of *Galvezia* described previously have deep red corollas, none of the shades within their range even approaching pink or white. Were albino flowers known to occur sporadically among the species of *Galvezia* occurring in southern California, northwestern Mexico, or in Ecuador and Peru, one might consider the Galápagos population a variant of a mainland species, if this character alone were used to separate the island plants from those of the mainland. But the Galápagos specimens from Isla Isabela possess several additional characters that clearly separate them from their nearest relative on the mainland, *G. fruticosa* Gmelin. The calyx lobes of *G. leucantha* are considerably more slender, longer in relation to their width, and longer *in toto* than those of *G. fruticosa*. Whereas the calyx and pedicels of *G. fruticosa* are closely glandular-puberulent, the calyx and pedicels of *G. leucantha* are wholly glabrous (figs. a, b, and c). The posterior pair of stamens in *G. leucantha* are papillate for only 2–3 mm. just above the point of their attachment to the corolla tube but are glabrous and without papillae above this zone (fig. e). In contrast, the comparable stamens in *G. fruticosa* are papillate not only near their bases but also over about 1.5–2.5 mm. just below the anthers (fig. p).

The rudimentary sterile filament in the flowers of *G. leucantha* is inserted in a shallow, lunate pit about 1–2 mm. above the base of the corolla tube (figs. d,

e). That of flowers of *G. fruticosa* is affixed to the unmodified, pitless wall of the corolla tube (fig. p).

The pubescence on the outer surface of the corolla tube and the exterior of the lobes in *G. leucantha* is made up of two kinds of hairs—straight to slightly curved, 3–5-celled, non-glandular, pointed hairs, and about one-third as many gland-tipped hairs of about the same length (fig. h). In *G. fruticosa* the hairs are as much as twice as long as those in *G. leucantha*, are more closely crowded, and nearly all of them are gland-tipped (compare figs. b, c, and d, with figs. n and o).

General inspection suggests that the width-length ratio of the leaf blades in *G. leucantha* is lower than that in *G. fruticosa*. A small number of measurements showed this width-length ratio in *G. leucantha* to range  $\frac{1}{3}$  to  $\frac{1}{2}$ , whereas in *G. fruticosa* the ratio is about  $\frac{2}{3}$  (compare figs. f and g with fig. q). A larger sampling is needed before such ratios can be considered statistically significant.

Finally, the seeds of *G. leucantha* are obovoid in shape, nearly always with a rounded apex and acute base, with irregular, moderately sinuous cristate ridges running from base to apex, and often leaving smooth areas between the ridges (fig. l). On the other hand, the seeds of *G. fruticosa* are predominantly quadrate in cross section, with very narrow, often barely perceptible ridges along the angles and a few or none on the faces. The apex and base of seeds of *G. fruticosa* are almost always truncate (fig. r).

On 20 December 1905, Alban Stewart collected three numbers of *Galvezia* on Isla Rábida (Jervis Island). In his report (Stewart, 1911, p. 141) he referred these specimens to *G. fruticosa* Dombey, but added the note, "No flowering specimens were secured, so that the species is somewhat doubtful."

He made this statement because he had only one of the three sheets collected on Isla Rábida with him during his studies of the Galápagos flora at Harvard University. Actually two of the three sheets deposited in the herbarium of the California Academy of Sciences have flowers attached to the lateral twigs. One of these flowers was soaked until flexible, in order to examine the character of the lobing, insertion of stamens, and nature of the filaments. This flower proved to have been white when fresh, although it had darkened considerably during drying and with age. It also had the longer pair of stamens with papillae near the base but without them near the anthers, and its rudimentary stamen was inserted in the distinctive lunate pit rather than on the smooth inner wall of the corolla tube. The Isla Rábida material is definitely within the specific limits of *G. leucantha*, and is distinct from *G. fruticosa*. However, it differs from the specimens collected on Isla Isabela in that its twigs, young branches, leaves, pedicels, calyces and outer surfaces of the corolla are closely invested with glandular pubescence made up of hairs one and one-half times to twice as long as those on the outer corolla surface of *G. leucantha* subsp. *leucantha*. Inter-island differentiation has occurred owing to the operation of influences not yet known.

This differentiation makes advisable the subspecific recognition of the Isla Rábida plants.

***Galvezia leucantha* Wiggins subsp. *pubescens* varietas novum.**

(Figure m.)

A subsp. *leucantha* foliis ramulis calycibus et tubo corolla dense glanduloso-puberulis differt.

TYPE. Occasional near the shore and from 500–950 feet, Jervis Island (Isla Rábida), 20 December 1905, *Stewart 3441* (holotype CAS).

The specimens from Isla Rábida differ from our collection from Isla Isabela in the characters mentioned above. Further, the single flower soaked up during the study of the material had larger, and more numerous stipitate glands on the inner surface of the upper lip of the corolla than was shown on any of the flowers from the Isla Isabela collection. This characteristic was not included in the diagnosis because of the small sampling made, and the presence of a few scattered glands of similar type on an occasional flower in the Isla Isabela material.

SPECIMENS EXAMINED. Isla Rábida—occasional near the shore and from 500–950 feet, *Stewart 3440* (CAS, GH), *3441*, *3443* (CAS).

I believe that there is a significant relationship between the evolution of a species with white flowers within the generic framework of a plant that in all other areas has red flowers, and the absence of hummingbirds in the habitat of the white-flowered population in contrast to the presence of hummingbirds in all parts of the range of the red-flowered species that occupy the mainland habitats. No hummingbird has been observed in the Galápagos Islands and their absence no doubt is attributable to the 500 miles of open sea between the Galápagos Islands and the nearest point on the mainland of South America. The hummingbirds, which are active only during daylight hours, are important pollinating agents among the species of *Galvezia* growing on the mainland of South America as well as among the species native in the southwestern United States and adjacent Mexico. In the Galápagos Islands the night-flying moths and butterflies have filled the chief niche as pollinating agents for the majority of the flowers with tubular corollas. These moths fly between dusk and dawn. Thus the Galápagos representatives of *Galvezia* grow in an environment in which there is little or no evolutionary pressure toward brightly colored flowers, and where the emphasis is upon flowers that are readily visible to night-flying insects when light intensity is very low. Under such conditions, it seems logical for plants to evolve flowers whose corollas are white or pale yellow and to rarely produce those with red or deep blue blossoms.

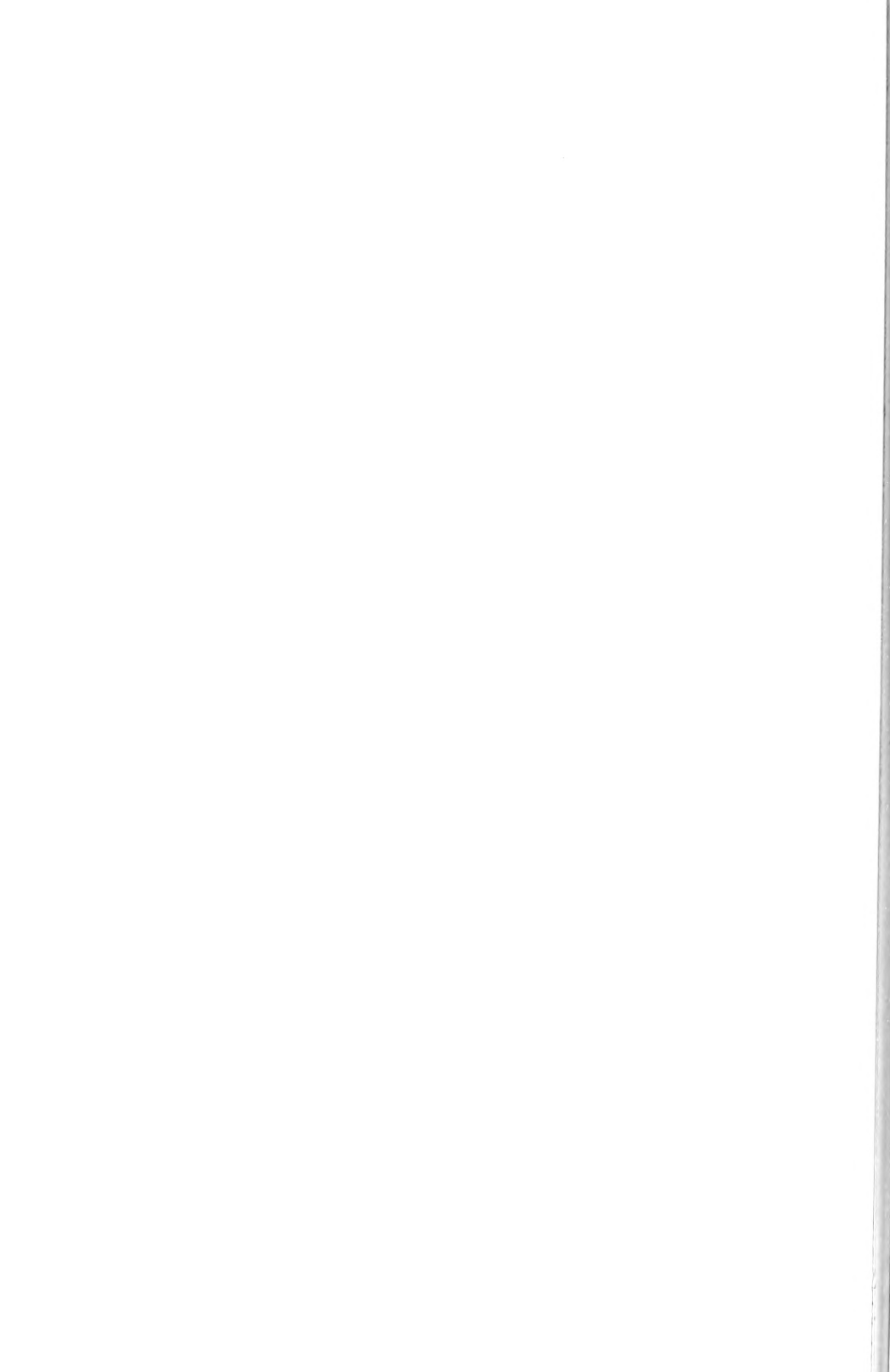
A hasty check of the flowering plants that had become established in the Galápagos Islands prior to the arrival of modern man shows that few of them had red or blue flowers. Many have cream, pale yellow, golden yellow, or white flowers. Only a few (*e.g.*, *Cuphea*, *Sesuvium*, *Salvia*) had pale lavender to pink

corollas. An extensive study of the relationships among the plants and their insect visitors in the Galápagos Islands might be highly productive.

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