A Study of the Tribe Gesnerieae, with a Revision of *Gesneria* (Gesneriaceae: Gesnerioideae)

LAURENCE E. SKOG

SMITHSONIAN CONTRIBUTIONS TO BOTANY • NUMBER 29

SERIAL PUBLICATIONS OF THE SMITHSONIAN INSTITUTION

The emphasis upon publications as a means of diffusing knowledge was expressed by the first Secretary of the Smithsonian Institution. In his formal plan for the Institution, Joseph Henry articulated a program that included the following statement: "It is proposed to publish a series of reports, giving an account of the new discoveries in science, and of the changes made from year to year in all branches of knowledge." This keynote of basic research has been adhered to over the years in the issuance of thousands of titles in serial publications under the Smithsonian imprint, commencing with *Smithsonian Contributions to Knowledge* in 1848 and continuing with the following active series:

Smithsonian Annals of Flight
Smithsonian Contributions to Anthropology
Smithsonian Contributions to Astrophysics
Smithsonian Contributions to Botany
Smithsonian Contributions to the Earth Sciences
Smithsonian Contributions to Paleobiology
Smithsonian Contributions to Zoology
Smithsonian Studies in History and Technology

In these series, the Institution publishes original articles and monographs dealing with the research and collections of its several museums and offices and of professional colleagues at other institutions of learning. These papers report newly acquired facts, synoptic interpretations of data, or original theory in specialized fields. These publications are distributed by mailing lists to libraries, laboratories, and other interested institutions and specialists throughout the world. Individual copies may be obtained from the Smithsonian Institution Press as long as stocks are available.

S. Dillon Ripley
Secretary
Smithsonian Institution

A Study of the Tribe Gesnerieae, with a Revision of *Gesneria* (Gesneriaceae: Gesnerioideae)

Laurence E. Skog

SMITHSONIAN INSTITUTION PRESS
City of Washington
1976

ABSTRACT

Skog, Laurence E. A Study of the Tribe Gesnerieae, with a Revision of *Gesneria* (Gesneriaceae: Gesnerioideae). *Smithsonian Contributions to Botany,* number 29, 182 pages, 86 figures, 9 tables, 1976.—A study is made of the tribe Gesnerieae of the family Gesneriaceae from the West Indies, giving information on history, anatomy and morphology, pollination and dispersal, and hybridization in the tribe. The tribe comprises 67 species in 3 genera: *Rhytidophyllum, Gesneria,* and *Pheidonocarpa.* The last genus is described as new, with a new species combination, *Pheidonocarpa corymbosa* (Swartz) L. Skog, and 2 subspecies. A revision of *Gesneria* Linnaeus is presented based on field and herbarium studies. *Gesneria* is divided into 9 sections, 46 species (a new species, *Gesneria onychocalyx* L. Skog, is described), 12 subspecies, and 11 varieties. The taxonomic portion includes keys, synonymies, descriptions, typifications, distributions, and ecology, as well as distribution maps and illustrations of the taxa. Also enumerated in Appendix 1 are many species names once included in *Gesnera* or *Gesneria,* but which have been transferred to other genera. Two new combinations are made in this portion of the text: *Rhytidophyllum cumanense* (Hanstein) L. Skog and *Rhytidophyllum onacaense* (Rusby) L. Skog.

Official publication date is handstamped in a limited number of initial copies and is recorded in the Institution's annual report, *Smithsonian Year.* SI Press number 6053. Series cover design: Leaf clearing from the Katsura tree *Cercidiphyllum japonicum* Siebold and Zuccarini.

Library of Congress Cataloging in Publication Data
Skog, Laurence E. 1943–
A study of the tribe Gesnerieae, with a revision of Gesneria (Gesneriaceae: Gesnerioideae)
(Smithsonian contributions to Botany ; no. 29)
Bibliography: p.
Includes index.
Supt. of Docs. no.: SI 1.29:29
1. Gesneria. 2. Rhytidophyllum. 3. Pheidonocarpa. 4. Botany—West Indies. I. Title. II. Title: Gesnerieae, with a revision of Gesneria (Gesneriaceae: Gesnerioideae). III. Series: Smithsonian Institution. Smithsonian contributions to Botany ; no. 29.
QK1.S2747 no. 29 [QK495.G4] 581'.08s [583'.81] 75-61934

Contents

	Page
Introduction	1
Historical Review	2
Morphology and Anatomy	6
Pollination and Seed Dispersal	26
Hybridization and Cytology	33
Systematic Treatment	36
Tribe Gesnerieae	36
Key to the Genera in Tribe Gesnerieae	39
Pheidonocarpa	40
Gesneria	43
Key to the Sections of *Gesneria*	45
Section 1. *Pentarhaphia*	46
Key to the Species of Section *Pentarhaphia*	46
Section 2. *Stenochonanthe*	80
Section 3. *Lachnoblaste*	85
Section 4. *Myrmekianthe*	86
Section 5. *Gesneria*	90
Key to the Species of Section *Gesneria*	91
Section 6. *Physcophyllon*	100
Key to the Species of Section *Physcophyllon*	101
Section 7. *Dittanthera*	121
Key to the Species of Section *Dittanthera*	123
Section 8. *Duchartrea*	137
Section 9. *Chorisanthera*	145
Key to the Species of Section *Chorisanthera*	145
Appendix 1: Excluded Species	158
Appendix 2: Numerical List of Taxa	165
Appendix 3: List of Exsiccatae	166
Literature Cited	171
Index	176

A Study of the Tribe Gesnerieae, with a Revision of *Gesneria* (Gesneriaceae: Gesnerioideae)

Laurence E. Skog

Introduction

The Gesneriaceae, a member of the Scrophulariales in the classification system of Cronquist (1968), are found in tropical and subtropical regions of the world, but rarely occur wild in temperate zones. The family is composed of about 120 genera and about 1800 species; two subfamilies are recognized, separated by Burtt (1962) on the characters of seedlings into the anisocotylous Cyrtandroideae, primarily Old World, and the isocotylous Gesnerioideae in the New World. The latter subfamily has been tentatively divided into five tribes by Wiehler (1970) using characters of epidermal cell sinuation, node vasculature, shape of the vascular crescent in the petiole, and leaf arrangement. The tribe Gesnerieae, one of the five tribes maintained by Wiehler in the Gesnerioideae, is apparently restricted geographically to the West Indies and a few localities in northern South America. It is restricted morphologically and anatomically by the occurrence of alternate leaves in most of the members of the tribe, by having the vascular trace of the petiole invaginated or cylindrical (Wiehler, 1970), by the fruticose or arborescent habit, an inferior or subinferior ovary, and by having a chromosome number of n = 7, 14, or 28.

The taxonomy of all known members of the Gesnerieae has not been attempted since the treatments by Hanstein from 1854 to 1865. Because exploration of the American tropics in the last one hundred years has revealed many species new to science, a study of this group of flowering plants is long overdue. In the study of the systematics of Gesnerieae, perhaps the most difficult problem is generic delimitation, a problem found in other groups in the American Gesneriaceae (Burtt, 1956; Moore and Lee, 1968). The factors above and those following led to the choice of the Gesnerieae as a taxon for investigation: (1) the possibility of unusual pollination mechanisms in the tribe; and (2) the availability of material of many species of the genera included in the Gesnerieae among the living collections of Gesneriaceae at Cornell University and elsewhere.

In the study of the tribe Gesnerieae and the genus *Gesneria* presented here, three avenues of research were explored: (1) a morphological and anatomical approach to discover or elucidate floral and vegetative characters, using living material where possible to supplement herbarium specimens; (2) a comparison of chromosome analysis with the results of hybridization to suggest the genetic bases for morphological characters; and (3) field studies and investigation of possible pollination mechanisms, which may reveal the interaction of the species of the Gesnerieae with the environment and how the interaction influences speciation and evolution within the group.

Acknowledgments.—A substantial part of the

Laurence E. Skog, Department of Botany, National Museum of Natural History, Smithsonian Institution, Washington, D. C. 20560.

work presented here was undertaken at Cornell University and was submitted as a thesis in partial fulfillment for the degree of Doctor of Philosophy (Skog, 1972c).

I greatly appreciate the advice and assistance of the members of my special committee at Cornell University: H. E. Moore, Jr., Chairman, for his special knowledge of the Gesneriaceae; H. P. Banks, for help in problems of morphology and anatomy; and G. C. Eickwort, for advice on pollination mechanisms.

Financial assistance from three sources permitted research in new areas: Horticulture Interchange Fellowship of the Garden Club of America, the English-Speaking Union, and Fison's Horticulture, Ltd., allowed research at the Royal Botanic Garden, Edinburgh, during 1968–1969; National Science Foundation Grants GB-6277 and GB-8766, to H. E. Moore, Jr., principal investigator, provided support from 1969 to 1972 and permitted a collecting trip to the West Indies in 1970; and a gift from the American Gloxinia and Gesneriad Society to the L. H. Bailey Hortorium supported the use of a scanning electron microscope to study pollen and seeds.

I also am indebted to the curators of the 46 herbaria who allowed me to study their collections, to J. Wurdack and W. Dress for checking the Latin descriptions, to B. L. Burtt for offering his time and aid during my study in Edinburgh, to H. Robinson for reading the manuscript, and gratitude most of all to my wife, Judith E. Skog, for her understanding support and help.

Historical Review

Charles Plumier, a French missionary, botanist, and explorer of the West Indies, published in 1703 a work about the plants of the islands he visited. In this work, Plumier named for the Swiss naturalist Conrad Gesner a group of plants he called *Gesnera*. Included were three species: *Gesnera humilis, flore flavescente; Gesnera arborescens, amplo flore fimbriato & maculoso;* and *Gesnera amplo digitalis folio tomentoso.* Presented here is a review of the history of Plumier's name *Gesnera* to the present-day genera in the Gesnerieae.

During his sojourn on the island of Hispaniola in 1693, Plumier observed, drew, and described some of the plants he published in 1703. His drawings and descriptions were never published in full, although at least three sets of Plumier's drawings were distributed after his death. One set was made in 1733 by Claude Aubriet for Herman Boerhaave. After the death of Boerhaave, the Aubriet copies went to Johannes Burman, who later used the drawings in preparation of Plumier's *Plantarum Americanarum Fasciculus Primus* (-*Decimus*), which he edited (1755–1760). Plumier's original manuscript and 5081 drawings are now at the Bibliothèque Centrale of the Muséum National d'Histoire Naturelle at Paris, whence copies were obtained to clarify the descriptions of Linnaeus. The Aubriet copies are now in the University Library at Groningen, Netherlands, and other sets of copies are in the Herbarium Library of the Royal Botanic Gardens, Kew, and at the Department of Botany, British Museum (Natural History), London. *Gesneria humilis, G. tomentosa* (=*Rhytidophyllum tomentosum* (Linnaeus) Martius [in part]), and *Craniolaria fruticosa* (=*Gesneria fruticosa* (Linnaeus) O. Kuntze), described by Linnaeus in 1753, were based on Plumier's account in the *Nova Plantarum Americanarum Genera,* as was the genus *Gesneria* in Linnaeus' *Genera Plantarum.*

Another naturalist and explorer, Hans Sloane, a contemporary of Plumier, visited British islands of the West Indies in 1687–1689. He collected specimens that were also used by Linnaeus as bases for his names. One of the phrase names Sloane published in 1696 and 1707 was *Digitalis folio oblongo serrato, ad foliorum alas florida* later included in Linnaeus' concept of *Gesneria tomentosa.* Another of Sloane's polynomials, *Rapunculo affinis anomala vasculifera, folio oblongo, serrato, flore coccineo tubuloso, semine minuto, oblongo, luteo,* for a plant from Jamaica, was the basis for *Gesneria acaulis,* published by Linnaeus in 1759.

With the publications by Olof Swartz in 1788 and 1797–1806, nine additional species names were joined to *Gesneria.*

By the second decade of the nineteenth century the genus *Gesneria* had become a repository for many gesneriaceous species from the New World, placed there by authors who inflated the generic limits set by Linnaeus to include plants from South and Central America with those of the West Indies.

John Lindley was the first to try to sort out the plants included in *Gesneria* into more than one

genus. In 1827 (under pl. 1110) he wrote in Edward's *Botanical Register:*

> The genus *Gesneria,* as it at present stands, contains an assemblage of plants differing so much among each other, both in habit and parts of fructification, that it is probable a careful investigation of the species will lead to the establishment of more than one new genus.

Unfortunately, Lindley proceeded to select red, tubular-flowered Brazilian species to be the "most legitimate representatives of the genus" *Gesneria,* discarding Linnaeus' concept of the genus and erected two new genera, *Pentarhaphia* (*"Pentaraphia"*) and *Codonophora,* for the species of Swartz and Linnaeus. *Pentarhaphia* was typified by *P. longiflora* Lindley, an illegitimate renaming of *Gesneria ventricosa* Swartz, in allusion to its long tubular corolla. Into *Codonophora* he placed two distinct plants: *Gesneria prasinata* Ker-Gawler, renamed *Codonophora grandiflora* Lindley, and *Gesneria tomentosa* Linnaeus, which became *Codonophora lanceolata* Lindley. Neither species of *Codonophora* was selected as the type-species by Lindley, which caused *Codonophora* to be ignored and shifted as a generic synonym from one genus to another, depending on the disposition of the species. The problem was resolved by Hanstein (1854), who removed *Gesneria tomentosa* to *Rhytidophyllum,* thus lectotypifying *Codonophora* on *G. prasinata* (Morton & Denham, 1972). *Gesneria prasinata* is actually a species of the older genus *Paliavana* Vandelli, of which *Codonophora* Lindley is a generic synonym.

While agreeing with Lindley that a large complex of species was assigned to *Gesneria* Linnaeus, Martius (1829) disregarded Lindley's generic names and chose three of his own. He established *Gesnera* (using the spelling of Plumier but excluding the latter's species as well as those of Linnaeus and Swartz) for a group of species including *Codonophora lanceolata* and most of *Gesneria* sensu Lindley. Martius disregarded *Pentarhaphia* Lindley because the name did not honor Conrad Gesner as Plumier had intended. In place of *Pentarhaphia,* Martius named a new genus, *Conradia,* to include *Gesneria humilis* Linnaeus and *Gesneria craniolaria, G. scabra, G. ventricosa, G. exserta, G. calycina,* and *G. pumila* of Swartz. *Conradia,* as well as being illegitimate when named by Martius, was also a later homonym of another generic name, *Conradia* Rafinesque, published in 1825. *Conradia* was subsequently chosen illegitimately as a generic name by two later authors: Nuttall (1834) and Kufferath (1914).

Other species included earlier in the genus *Gesneria* Linnaeus—*G. tomentosa* L. and *G. grandis* Swartz—were placed in a new genus *Rhytidophyllum* by Martius, which also included a new species *R. berteroanum.*

During the sixty years following the description of the new genera *Gesnera, Conradia,* and *Rhytidophyllum* by Martius, many additional species of Gesneriaceae from the New World were named. During this time, however, new genera also were described, which absorbed many of the species included in *Gesnera* Martius. Thus, by 1890, the concept of *Gesnera* had nearly disappeared except for the occasional usage in horticulture and in popular journals. Appendix 1, a list of excluded species, gives names that have been included in *Gesnera* Martius (*Gesneria* of auct., non Linnaeus) and *Gesneria* Linnaeus, which now best reside elsewhere.

Authors following Martius at first accepted his disposition of the species. George Don (1838: 650–651) divided the species that Martius had included in *Conradia* into three sections distinguished by the relative exsertion of the stamens and coherence of the anthers:

> Sect. I. *Synanthera.* . . . Stamens enclosed. Anthers all connected into a round head.
>
> Sect. II. *Dittanthera.* . . . Stamens exserted; anthers connected by pairs.
>
> Sect. III. *Chorisanthera.* . . . Stamens a little exserted; anthers distinct. Fruit like those of the other species.

Don (1838) also erected the tribe Gesnerieae, but included in it many genera later transferred to other tribes. His subtribe Conradieae is now equivalent to the present tribe Gesnerieae.

Shortly after the publication by Don of Gesnerieae, Endlicher (1836–1850) described Eugesnereae, roughly synonymous with Gesnerieae G. Don. Eugesnereae described by Hanstein in 1854 refers to a group of plants distinct from those included by Endlicher.

A. P. de Candolle (1839) adopted the name Gesnerieae G. Don, but with a slightly different circumscription. However, de Candolle accepted the sectional alignments of Don and named two new species, *Conradia pedunculosa* (=*Gesneria pedunculosa* (A. P. de Candolle) Fritsch) and *C.*

cuneifolia (=*Gesneria cuneifolia* (A. P. de Candolle) Fritsch), based on plants collected in Puerto Rico by Sessé and Mociño. He also renamed *Gesneria acaulis* Linnaeus as *Conradia sloanei* A. P. de Candolle.

In 1846, Decaisne wrote a monograph of the genus *Pentarhaphia,* adopting Lindley's generic name for the section *Dittanthera* G. Don, which, according to de Candolle, included shrubs with flowers having stamens exserted and the anthers coherent in pairs. Decaisne (1846:98) placed 15 species into *Pentarhaphia* by erecting new species and splitting others, such as *Gesneria ventricosa* Swartz, because the "même nom spécifique était assigné à des plantes complétement distinctes par la forme et la couleur des fleurs." He also included the description of a new genus, *Duchartrea,* based on collections from Cuba by Linden.

The separation of the shrubby species of *Gesneria* Linnaeus into *Pentarhaphia* Lindley by Decaisne thus forced other authors to consider the remaining species as belonging to *Conradia,* a practice followed for forty years. The assignment of the species in this manner appears to have caused many botanists to be confused about the generic limits. W. Hooker (1851:pl. 874) wrote following his description of *Conradia neglecta* (=*Gesneria pumila* subsp. *neglecta* (W. Hooker) L. Skog): "This plant belongs, I presume, to the true *Conradiae,* not to the first division or groupe [sic] in De Candolle, which constitutes the genus *Pentaraphia* of Dr. Lindley; but the distinguishing characters of which I by no means understand."

Decaisne (in Herincq, 1848) described another new genus, *Herincquia,* in which was placed a species he believed had been assigned incorrectly. He wrote that the species did not belong in *Gesneria,* where it had been described in October 1846 as *Gesneria libanensis* by Morren, or in *Rhytidophyllum,* in which it had been described in December 1846 as *R. floribundum* by Lemaire. Evidently, Hanstein was not aware of Decaisne's genus *Herincquia,* for he published in 1854 another new generic name based on the same species, *Ophianthe libanensis* (Linden ex Morren) Hanstein.

In *Centralamericas Gesneraceer,* published in 1858 and reprinted in 1861 by Anders Ørsted, two new genera were split off from the *Conradia-Pentarhaphia* complex. Section *Chorisanthera* of G. Don was raised to generic rank for the species resembling *Gesneria pumila,* plants with very short stems and campanulate corollas. Ørsted apparently described the new genus based on the description of *Conradia pumila* (Swartz) Martius in G. Don's 1838 publication. Included in the genus were three species: *Chorisanthera pumila* (Swartz) Ørsted; *C. hispida* (Bentham) Ørsted, transferred from *Conradia;* and *C. tenera* Ørsted, described from an Ørsted collection ostensibly from Costa Rica, but which so resembles *Gesneria pumila* Swartz from the description that one is led to believe that Ørsted collected *Gesneria pumila* during his 1845 sojourn in Jamaica and then accidentally mixed this material with plants from Costa Rica. There is no known type-specimen of *Chorisanthera tenera* in the Ørsted herbarium at Copenhagen (C) or elsewhere. Ørsted apparently did not realize that the name *Chorisanthera* had been used in the generic sense in the Gesneriaceae by Herincq in 1852. Herincq's use of *Chorisanthera* for some cultivated plants of uncertain origin is not valid because he did not provide a generic description, and he cited an earlier name as a synonym under the species (Skog, in press).

Another genus circumscribed by Ørsted, *Codonoraphia,* was to include the species of *Pentarhaphia* with campanulate corollas, restricting *Pentarhaphia* to those species with a narrowed tubular corolla. The six combinations Ørsted made in *Codonoraphia* have not been recognized by many authors nor picked up by the editors of *Index Kewensis.*

Ørsted (1858) also proposed new tribal and subtribal names. Part of his tribe Rhytidophylleae subtribe Eurhytidophylleae is now assignable to the present-day concept of Gesnerieae.

Grisebach maintained *Conradia* and *Pentarhaphia* in his works (1860–1862, 1866) dealing with the collections of Charles Wright from Cuba. But in his *Flora of the British West Indian Islands,* published 1859–1864, Grisebach described another genus, *Vaupellia,* for a single species formerly placed in *Gesneria* by Swartz and *Conradia* by Martius, *Vaupellia calycina* (Swartz) Grisebach.

Hanstein (1854–1865) was the first author to treat all of the species in *Conradia* and *Pentarhapia,* as well as in the restricted genera *Duchartrea, Herincquia, Ophianthe,* and *Choris-*

anthera as members of one genus. In his monumental study of the Gesneriaceae, Hanstein (1865: 292–305) submerged all of the names under *Pentarhaphia* Lindley, which he divided into four unnamed sections, and a group of "Species inter Pentarhaphiam et Rhytidophyllum dubiae." The sections were defined on the basis of the presence or absence of costae on the calyx (or more correctly, floral tube) and on the shape of the corolla:

Sectio 1. Calyx vix costatus, Corolla elongata-tubulosa. Annulus quinquelobus.

Sectio 2. Calyx costatus. Corolla tubulosa. Annulus integer.

Sectio 3. Calyx costatus. Corolla oblique subcampanulata v. cyathomorpha.

Sectio 4. Calyx non costatus. Corolla oblique cyathomorpha.

Bentham (1876) in his treatment of the Gesneriaceae followed Hanstein in combining the complex into one genus. Although Bentham realized that the generic name *Gesneria* Linnaeus was an older name, he (1876:1005) wrote: "Nomen Linneanum *Gesneriae* stricto jure prioritatis ad hoc genus retinendum foret, sed nomen *Gesnerae*, Mart., ab omnibus botanicis et hortulanis ad genus Brasilianum addictum, hodie non nisi maximo incommodo mutaretur."

Bentham (p. 1005) proceeded to divide the genus *Pentarhaphia* into five sections in the manner of Hanstein, but supplied names to these sections:

1. *Eupentarhaphia*. Frutices glabri, ramosi, resinosi. Pedunculi axillares, elongati, 1-flori v. 3-chotome -flori. Corolla incurvo-tubulosa, parum ventricosa. Stamina exserta.

This section was based on the concept of *Pentarhaphia* used by Grisebach, but for plants mostly from Cuba.

2. *Duchartrea*. Frutex glaber, rigidus. Pedunculi axillares, elongati, apice ∞-flori. Calyces ecostati, insigniter verrucoso-rugosi.

This section was based on the genus *Duchartrea* Decaisne.

3. *Codonoraphia*. Frutex glaber. Pedunculi axillares, elongati, 1-flori. Corolla late campanulata, staminibus exsertis.

Section *Codonoraphia* was based on Ørsted's genus of the same name.

4. *Vaupellia*. Habitus fere Synantherae. Corolla et stamina *Codonoraphiae*. Calycis limbus amplus, lobis latis base connatis.

Vaupellia calycina (Swartz) Grisebach was the basis for this section.

5. *Synanthera*, Don. Caulis humilis, simplex v. decumbens, subramosus, rarius elongatus. Pedicelli breves, fasciculati, rarius elongati 1-flori. Corolla tubulosa rarius campanulata v. ventricosa, staminibus inclusis v. corollam non superantibus.

This section comprised most of the species known at that time. The concept of the section *Synanthera* equals *Conradia* Martius as used by Grisebach in *Flora of the British West Indian Islands* (1859–1864) and included *Ophianthe* Hanstein and *Herincquia* Decaisne (misspelled *Henrincquia* by Bentham). *Chorisanthera* Ørsted was included in *Pentarhaphia*, but not placed in a particular section. Bentham (1876) also described a new subtribe, Pentarhaphieae, equivalent to the present tribe Gesnerieae.

Otto Kuntze (1891:473) criticized Bentham's decision to maintain *Gesnera* Martius and *Pentarhaphia* Lindley:

BHgp. [Bentham in Bentham & Hooker's *Genera Plantarum*] sind sich darüber auch klar gewesen, stellten aber den rechtmässigen Namen aus Bequemlichkeit nicht wieder her, liessen also *Gesnera* Martius gelten, während sie doch inconsequenterweise den früher (cfr. DC. prodr.) ebenso gebräuchlichen Namen *Conradia* Martius durch den von Lindley gegebenen *Pentaraphia* ersetzen.

Kuntze (1891) resurrected *Gesneria* Linnaeus, but preferred the spelling *Gesnera* as proposed by Plumier. Under *Gesnera* Linnaeus he submerged *Pentarhaphia* Lindley, *Conradia* Martius, and even included *Rhytidophyllum* Martius. *Rhytidophyllum* Martius was embraced because Kuntze (1891:473) believed and wrote: "Die letzteren 2 Gattungen [*Conradia* Martius and *Rhytidophyllum* Martius] sind so schwach getrennt, dass BHgp. [Bentham in Bentham & Hooker's *Genera Plantarum*] selbst meinen, es sei besser, sie zu vereinigen." Kuntze listed and transferred many names to *Gesnera* Linnaeus.

Three years later, in 1894, Fritsch completed the account of the Gesneriaceae for Engler & Prantl's *Die natürlichen Pflanzenfamilien*. He used the name *Gesneria* Linnaeus, but excluded from it *Rhytidophyllum*, which Fritsch considered a distinct genus. His comments (1894:184) provide a good summary of the state of the tribe Gesnerieae at his time:

Die ganze Gruppe der *Gesnerieae* ist, namentlich in Bezug auf die Ausbildung der Bl. [Blüte], sehr formenreich, und es sind daher mehrere Gattungen innerhalb derselben unterschieden worden. Die beste derselben ist die Gattung *Rhytidophyllum,* welche auch habituell gut charakterisiert ist; die übrigen müssen, so auffallend sie in typischen Arten sind, wegen der zahlreichen Mittel formen als Sectionen von *Gesneria* aufgefasst werden.

Fritsch divided *Gesneria* into five sections following Bentham (1876). His "Section I" was called *Pentarhaphia,* differing slightly from Bentham's *Eupentarhaphia,* and Fritsch's fifth section was *Conradia,* apparently rejecting the earlier and validly published sectional names *Synanthera* and *Chorisanthera* of G. Don (1838).

The tribe Gesnerieae was again erected by Fritsch (1894), although he does not attribute the name to G. Don, who proposed it in 1838. Fritsch's circumscription of the tribe included only *Gesneria* Linnaeus and *Rhytidophyllum* Martius.

In January of 1900, there appeared the first mention of *Gesneria* by Ignatz Urban, who in the next 30 years was to describe more new species of *Gesneria* than any other botanist. In the second volume of Urban's *Symbolae Antillanae* (1901), the chapter entitled "Enumeratio Gesneriacearum" contained an account of all the species known at that time to grow in West Indies. Urban did not divide the genus into sections, but in his enumeration and discussion of the species he followed the sequence set by Bentham (1876) and Fritsch (1894). Urban described several new species based on collections of Fuertes, Harris, Shafer, and others in subsequent volumes of *Symbolae Antillanae* (1898–1928).

Beginning in 1914, Urban began a collaboration with Erik Ekman, the Swedish plant collector who made extensive collections on the islands of Cuba and Hispaniola.

Urban based many new species of *Gesneria* on Ekman collections. Fortunately for later students of West Indian botany, the Ekman collections selected as holotypes were deposited in the Naturhistoriska Riksmuseum in Stockholm instead of at Berlin. Because much of the herbarium at Berlin was destroyed during the Second World War, many of Urban's names typified by collections at Berlin must now be interpreted on the basis of other material.

The most recent works were papers by C. V. Morton (1957a, 1957b), who wrote the account of Gesneriaceae for the *Flora de Cuba;* Alain Liogier, who described a number of new species of *Gesneria* from the Dominican Republic (1968, 1971a, 1971b, 1973); Wiehler (1971), who transferred species from Cuba and Jamaica formerly in *Heppiella* to *Gesneria;* and Skog (1972a), who published new species of *Gesneria* from Haiti and Jamaica. The species transferred by Wiehler in the writer's opinion represent a distinct genus *Pheidonocarpa,* described later.

Throughout the history of the tribe Gesnerieae, most of the works have been taxonomic. Papers dealing with anatomy and morphology (e.g., Sachs, 1915) have included some details of the plants in this tribe. Cytological results have been reported in many papers by Lee (1962, 1964, 1966a, 1966b, 1968) and others. Pollination studies by Vogel (1969a, 1969b) have revealed new mechanisms possible in the tribe. An elaboration of these topics will follow later in this paper.

Morphology and Anatomy

The morphology and anatomy of the tribe Gesnerieae have been examined by several investigators. Wiehler (1970) dealt with many of the characters in comparing the tribes of the subfamily Gesnerioideae. Sachs (1915) investigated systematically the leaf anatomy of many members of the Gesnerieae in her report on the subfamily. The anatomical works by Solereder (1908) and Metcalfe and Chalk (1950) included characters useful in defining taxa.

Some aspects of the morphology and anatomy of the tribe Gesnerieae, primarily the genus *Gesneria,* examined in the field and in the laboratory, are considered in an attempt to relate and interpret the anatomy and morphology to the systematics of the group.

Observations

Habit and Habitat.—Plants in the tribe Gesnerieae are perennial, producing flushes of growth and flowers at various times of the year. Depending on the species, plants can be (1) acaulescent herbs, e.g., *Gesneria reticulata* (Figure 1*g*), *G. pumila* subsp. *neglecta* (Figure 1*e*); (2) suffruticose with short erect or decumbent woody stems, e.g.,

Pheidonocarpa corymbosa (Figure 1*d*); (3) tall spreading shrubs, e.g., *G. alpina;* or (4) arborescent up to 10 m tall, e.g., *Rhytidophyllum grande.* The stems may or may not branch from axillary buds, resulting in a columnar growth in unbranched species, e.g., *Rhytidophyllum grande* (Figure 1*c*), *Gesneria viridiflora* subsp. *quisqueyana.* The taller species—*Gesneria exserta, G. calycosa,* among others—frequently branch at ground level. Acaulescent herbs occur often on ledges in cliff faces; these same species when growing on sloping banks or cliff faces become pendent or decumbent, e.g., *G. citrina.*

The habitats of the species may affect the gross morphology, particularly height, size and shape of leaves, and size and color of flower in a single population. Populations of two species, *G. humilis* (Figure 1*a*) and *G. pauciflora,* growing in open exposed, drier areas, appear morphologically similar to those frequently inundated for short periods of time in streams swollen by tropical rains; the latter populations are characterized by apparently stunted stems, reduced leaves and inflorescences. They may be functional xerophytes.

Roots.—Fibrous roots, which may become quite large and woody with age, are found in all species of this tribe. Adventitious roots may be formed from nodes on intact plants growing in the very humid atmosphere of a greenhouse or on stream banks or in the spray of waterfalls—e.g., *G. humilis, G. reticulata, G. pauciflora, G. viridiflora* subsp. *quisqueyana.* The acaulescent species and those with short stems develop roots from cuttings in a short time. The taller species—e.g., *G. calycosa, G. exserta, Rhytidophyllum tomentosum*—do not root easily from green cuttings. Even when dusted with rooting hormone, two to four months may be required before a callus forms and roots appear.

Stems.—All members of the tribe have woody stems, at least at the base of the plant. The bark on older stems is rugose, verrucose, or smooth. Lenticels are commonly very elongated and erumpent. The sapwood is green to white, or occasionally pink; the heartwood and pith are usually pink to red. The red color is probably due to the presence of 3-desoxyanthocyanidins found also in the leaves and flowers of most members of the subfamily Gesnerioideae (Harborne, 1966). In *Gesneria* three types of 3-desoxyanthocyanidins have been identified: gesnerin and luteolinidin 5-glucoside in *Gesneria cuneifolia* and pelargonidin 3-rutinoside in *G. ventricosa* (Harborne, 1966). The pith of young stems is composed of thin-walled parenchyma cells usually containing chloroplasts. Here, too, are found crystals, which may be calcium oxalate. Sachs (1915) stated that, until the time of her studies, raphides were unknown in the Gesneriaceae; she found them subsequently in many genera. The needle-shaped raphides are found in nearly all the species of *Gesneria* investigated. One exception is *G. pauciflora,* which has prismatic styloid crystals like those common in *Rhytidophyllum* and *Pheidonocarpa.*

The stems of *Gesneria ventricosa* (as *Pentarhaphia longiflora*—Solereder, 1908) and *Rhytidophyllum tomentosum* (Pomrencke, 1892) show the following characters: (1) the wood with vascular rays of varying widths; (2) vessels of different diameters with the maximum between 0.03 and 0.108 mm; (3) vessel perforations simple, walls with bordered pits; (4) lumina of the vessel elements septate; (5) cork cells with thin walls; (6) outer portion of the primary cortex collenchymatous; (7) outer phloem with groups of elongated and pitted, yellow-walled, sclerenchymatous cells resembling sclereids; and (8) the phloem strengthened by layers of suberized cells formed externally to the phloem from the primary cortical parenchyma. Douliot (1889) found that the cork develops internally to the sclerenchyma of the outer phloem in *Gesneria* (as *Pentarhaphia*) and *Rhytidophyllum plumerianum.* Metcalfe and Chalk (1950) report that vessels are formed in groups of four or more cells and produce a radial pattern.

The investigation of nodal anatomy by Wiehler (1970) has shown that nodes in the members of the tribe Gesnerieae are unilacunar with one trace leading to the leaf. A reexamination showed this to be true.

Leaves.—The dorsiventral leaves are spirally arranged in a 2/5 phyllotaxy in all members of the tribe, except for an aberrant form of *G. fruticosa* (L. H. Bailey Hortorium, Cornell University accession number G-1035) grown from seed in the greenhouse. These latter plants have the leaves arranged in an opposite decussate pattern, rather than alternate. Comparison of the nodal structure of the aberrant form of *G. fruticosa* (Figure 2*b*) with that of *Pheidonocarpa corymbosa* was one of


b
d
f
g
h
i
j

the points of evidence used by Wiehler (1971) to unite this latter taxon, formerly in the South American genus *Heppiella,* with *Gesneria.* Siblings of the aberrant plant, however, have alternate leaves (R. Katzenberger, in litt.), although specimens of the seed parent show an opposite arrangement (*Talpey 71,* BH). Collections of *Gesneria fruticosa* from the same locality in the Dominican Republic by Ekman in 1929 (*Ekman H11334*) show examples of opposite leaves. Efforts to locate the plants in the wild in 1970 failed to turn up the aberrant form. All other collections of *G. fruticosa* observed in the wild or as specimens from many herbaria have alternate leaves (Figures 2*a,* 75*a*).

The alternate arrangement of leaves in *Gesneria* and *Rhytidophyllum* is not common among other members of the Gesneriaceae. In other genera of the family where the arrangement is found, it is believed that alternate leaves are the result of reduction of one of the pairs of opposite leaves (Fritsch, 1893–4) based on the occurrence of an intermediate stage in which the opposite leaves are unequal. Since leaves of *Gesneria* and *Rhytidophyllum* are occasionally approximate in slowly growing plants, an alternative suggestion may be that the alternate leaf arrangement is due to successive plastochrons of unequal duration in periods of rapid growth (Esau, 1965). Even though the arrangement of leaves in the aberrant *Gesneria fruticosa* appear opposite, a transverse section at the node (Figure 2*b*) shows the leaves in not exactly the same stage of development. If *Pheidonocarpa corymbosa* is truly a member of this tribe, as I believe, it may considered more primitive in leaf arrangement than *Gesneria* or *Rhytidophyllum.*

FIGURE 1.—*a,* Habitat and presumed type locality of *Gesneria humilis* at Fond de Baudin, Haiti (arrow = plants at water level); *b,* habitat of *Rhytidophyllum leucomallon* in Haiti; *c,* habitat of *R. grande* in Jamaica (peduncles ca 0.5 m long); *d,* habitat of *Pheidonocarpa corymbosa* in Jamaica; *e,* habit of *Gesneria pumila* subsp. *neglecta,* G-875; *f,* habitat of *G. pedicellaris* on limestone cliff face in the Dominican Republic (arrow indicates horizontally oriented flower); *g,* habitat of *G. reticulata* near waterfall in Puerto Rico; *h,* flower of *G. fruticosa,* G-1035 (scale line = 1 cm); *i,* inflorescences of *G. pedunculosa* (scale line = 5 cm); *j,* flowers of putative natural hybrid and presumed parent species (scale line = 1 cm); top, *G. acaulis,* G-876; middle, putative natural hybrid of *G. acaulis* and *Rhytidophyllum tomentosum,* G-1371; bottom, *R. tomentosum,* G-841.

Stipules have never been reported in any members of the Gesneriaceae. Cronquist (1968) wrote that the Gesneriaceae as others in the Scrophulariales "uniformly lack stipules." Stipule-like structures, however, are evident on many plants of *Rhytidophyllum,* and have been discussed by Weber (1973). These "pseudo-stipules" or "vaginalen Öhrchen" in the sense of Weberling appear in *Rhytidophyllum tomentosum* as reniform or auriculate flaps of tissue on the stem at each side of the petiole base or, in some examples in *R. auriculatum,* as lobes laterally adnate to the petiole and resembling segments of a compound leaf.

The development of the "pseudo-stipules" can be observed on *Rhytidophyllum auriculatum* in the greenhouse. A series of leaves borne on one axis shows the following stages (Figure 3): a petiolate leaf lacking stipules, a leaf with a narrowly decurrent base, an auriculate leaf decurrent on one side of the petiole, and a leaf with "pseudo-stipules" and a petiole. Apparently the

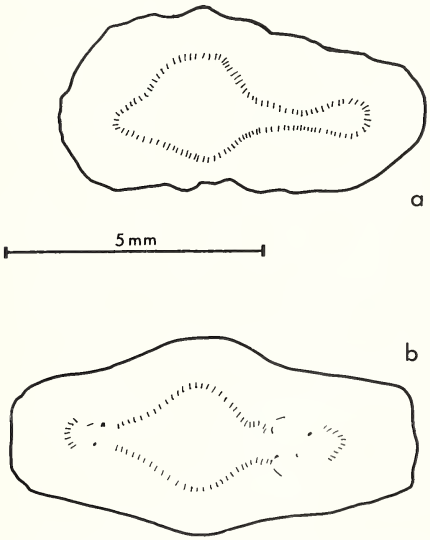

FIGURE 2.—Nodes of *Gesneria fruticosa: a,* plant G-1379, indicating usual alternate leaf arrangement; *b,* plant G-1035, showing aberrant opposite leaf arrangement (after Wiehler, 1970, 1971).

"pseudo-stipules" are remnants of the auriculate leaf, which has regained a definite petiole by loss of the decurrent leaf margins. "Pseudo-stipules" may appear seasonally in response to differing ecological conditions or growth rates. In any one species, however, not all populations show the stipule-like structures.

In *Gesneria* no such elaborate structures as "pseudo-stipules" have been found, but ridges may be present in some species, which may continue up the stem for a short distance from the petiole base (e.g., *G. humilis*), or protuberances may be present on the stem at either side of the petiole bases (e.g., *G. calycosa*). In *Pheidonocarpa* the opposite leaves appear to be joined across the stem by an interpetiolar ridge that develops during maturation of the stem.

Howard (1959, 1962) considered the vascular anatomy of the petiole to be important as a taxonomic character in many groups. The vascular trace in the petioles of *Gesneria* and *Rhytidophyllum* has been shown to be a ring or a nearly closed U in cross section (Wiehler, 1970). Wiehler concluded that specific differences may be found if all species were investigated. Attempts to duplicate his results showed that the tribe has a distinctive petiolar trace pattern; however, the structure of the trace may vary somewhat among the leaves of a single plant depending on age or arrangement on the plant and may not be completely reliable as a specific character.

Of the surface characters of leaf blades, the most obvious are the texture and the pubescence. In

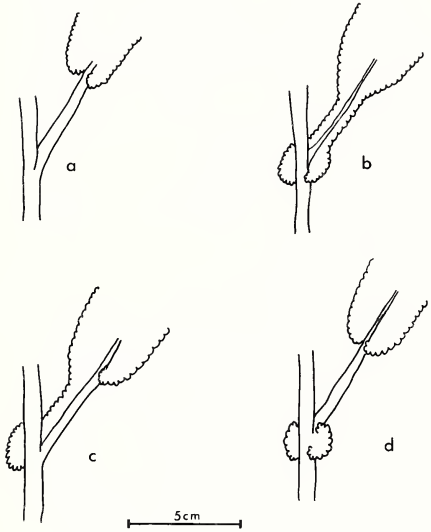

FIGURE 3.—Leaf bases from one plant of *Rhytidophyllum auriculatum: a,* petiolate leaf lacking "pseudo-stipules"; *b,* auriculate leaf with decurrent base; *c,* auriculate leaf with decurrent base on one side of petiole only; *d,* petiolate leaf with "pseudo-stipules."

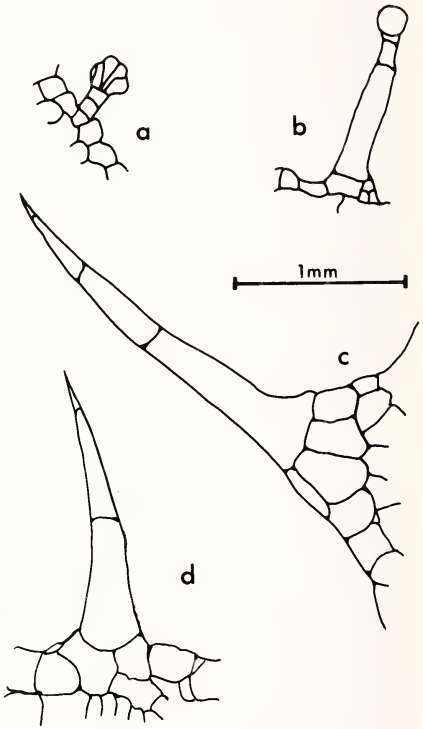

FIGURE 4.—Trichomes of *Rhytidophyllum: a,b,* glandular, *R. auriculatum; c,* glandular, *R. tomentosum; d,* nonglandular, *R. tomentosum.*

Gesneria the adaxial surface is plane, smooth or scabrous, glossy or dull with a thin or thick cuticle, occasionally with large bullae and scattered trichomes. Leaves of *Rhytidophyllum* are areolate; each areole bears a single trichome or a group of trichomes, except in *R. berteroanum* in which the areolae are usually glabrescent.

The trichomes on the leaves, similar to those found on the stems and inflorescences, are of two types: glandular and nonglandular. The glandular trichomes are of three forms. The first (Figure 4*a*) is short-stalked and at the apex bears cells that have divided anticlinally to the stalk cell into two or more cells ("fächerförmig," Sachs, 1915). These glandular hairs probably produce the abundant resinous secretions at the apices of stems and branches. The second type of glandular trichome is a uniseriate hair of two or more cells with a spherical yellow gland at the apex (Figure 4*b*), found occasionally along the leaf midveins or on the corolla of many species usually in a ciliate row at the margins of the limbs or scattered at the mouth of the tube. Glandular hairs of a third type were illustrated by Wiehler (1970). These trichomes produce mucilage, giving the sticky character to the leaf and stem surfaces in *Rhytidophyllum*. The glands are in a column of two or more cells, with a pointed thick-walled apical cell (Figure 4*d*).

Nonglandular trichomes are similar in form to the third type of glandular trichome but arise from a basal ring of large epidermal cells (Figure 4*c*). The basal cells often contain deposits of calcium carbonate or calcium silicate (Sachs, 1915), the former detected by evolution of gas bubbles when a weak solution of hydrochloric acid is applied to the leaf. The mineral-impregnated epidermal cells remain after the trichome is lost and give the surface a scabrous or asperate texture as in *Gesneria shaferi* subsp. *depressa*. The stalk cells may continue to divide during ontogeny and produce up to thirty cells in a uniseriate column. These usually colorless cells appear white and matted, giving an arachnoid appearance to the surface of leaves of *Rhytidophyllum acuñae, R. lanatum, R. leucomallon,* and *R. tomentosum*. The matted trichomes may decrease water loss (Cutter, 1969).

All types of trichomes appear to contain chloroplasts, at least when immature. The presence of chloroplasts, except in guard cells, is an unusual character for epidermal cells (Esau, 1960). Trichomes often contain anthocyanin as well, giving a reddish or purplish color as in some plants of *Rhytidophyllum leucomallon*.

Another useful feature of surface morphology is the undulation of the anticlinal walls of epidermal cells. Since the undulation is apparently a genetically determined trait, its characters may have taxonomic value (Linsbauer, 1930). Wiehler (1970) pointed out that the absence or presence and degree of sinuation follows closely the traditional generic lines between *Gesneria* and *Rhytidophyllum*. He reports that sixteen species of *Gesneria* show no sinuation of the abaxial cell walls, four show shallow undulation. All species of *Rhytidophyllum* have deep undulations of the cell wall, except for four species which have no sinuation. Examination of some species not available to Wiehler gave results that compare favorably with his results (examples of nonundulating epidermal cell walls can be seen in Figure 5).

Stomata, found only on the abaxial surface of leaves, are of the cruciferous or anisocytic type (Esau, 1965) with three or four epidermal cells subsidiary to the guard cells. Arrangement of stomata in groups has been discussed by Sachs (1915), illustrated by Wiehler (1970), and found to vary according to species. Some species not available to Wiehler are illustrated in Figure 5. *Gesneria harrisii* (Figure 5*b*) and *G. humilis* (Figure 5*f*) show tendencies toward grouping of stomata; the other illustrated species appear to have stomata well spaced.

Stomata in *Gesneria* are usually on a level with surrounding epidermal cells, but those in *Rhytidophyllum* and *Pheidonocarpa* are elevated to the apex of substomatal domes (Figure 6) outside the spongy parenchyma. Among the examined species of *Gesneria,* only *G. acaulis, G. christii, G. pedicellaris,* and *G. pedunculosa* show slight developments of the stomatal domes; these species also tend to have bullate leaves. There may also be a correlation between the development of the stomatal domes and the areolate abaxial surface in *Rhytidophyllum*.

The correlation between the presence of the stomatal domes and the tomentose surface of the leaves of *Rhytidophyllum* was noted by Wiehler (1970). Haberlandt (1914) suggests that raised

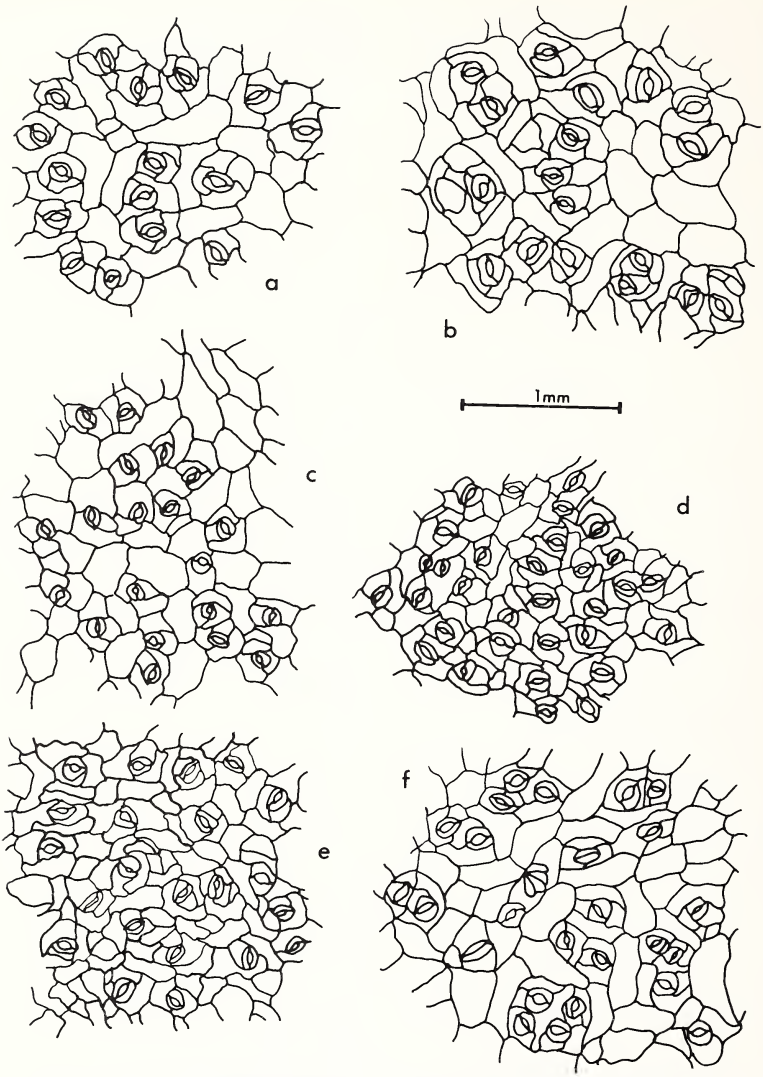

FIGURE 5.—Abaxial leaf epidermis in species of *Gesneria: a, G. clandestina; b, G. harrisii; c, G. ventricosa* (from Dominica); *d, G. haitiensis; e, G. fruticosa; f, G. humilis* (from Haiti).

stomata usually occur in plants growing in shady habitats, and because the stomata are elevated, transpiration probably increases due to a freer flow of air over and around the stomata. Biebl and Germ (1950) also suggest this reason for the presence of stomatal domes in plants in humid environments. Since *Rhytidophyllum* grows in dry exposed areas on banks (Figure 1*b*) or in clearings, this reasoning is unlikely. It is likely, though, that because of the dense trichome covering of these plants, the microclimate at the leaf surface is humid, and the stomata, raised on stomatal domes, may allow more efficient transpiration in the microclimate.

The internal anatomy of the laminae of members of this tribe has not been studied since the investigations published in 1915 by Sachs. An attempt has been made to examine some of the species she studied as well as others not available to her.

The adaxial epidermis appears one-cell thick in investigated species of *Rhytidophyllum auriculatum, R. berteroanum, R. leucomallon, R. tomentosum, Gesneria acaulis, G. christii, G. citrina, G. libanensis,* and *Pheidonocarpa corymbosa. Gesneria pedicellaris,* however, a close relative of *G. acaulis* and *G. christii,* has some leaves with a uniseriate row of cells and others with two or more layers in an apparent multiple epidermis. Although detailed developmental studies have not been done to determine the true identity of the subepidermal tissues, layers of cells resembling a multiple epidermis, which may decrease water loss from the mesophyll (Cutter, 1969), are distinctive features observed in cross sections of leaves of many species of *Gesneria.* This adaxial tissue of large thin-walled water-storage cells was termed a hypodermis by Sachs (1915), but because of its dissimilarity to the mesophyll below and similarity to the epidermal layer and occasional alignment in radial rows, which may reveal the origin of the cells by periclinal divisions from the epidermis, the layers of multiple epidermis appear to have been derived from the protoderm. According to Esau (1965) the periclinal divisions that produce multiple epidermis may occur at different stages of leaf growth but usually when a leaf is several internodes below the apex. Thus, leaves taken in different stages of maturity may differ in amount of the subepidermal tissue.

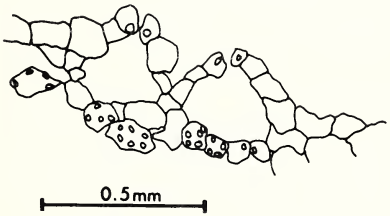

FIGURE 6.—Stomatal domes on the abaxial leaf surface of *Rhytidophyllum tomentosum.*

Light intensity may determine the relative size and number of rows of cells or layers in the mesophyll. *Gesneria exserta,* which grows in nearly full sun, has a thick palisade layer of one to three rows of elongated cells. The lower layers are more loosely joined and become more isodiametric in apparent transition to the spongy parenchyma. Spongy mesophyll cells near the lower epidermis have lateral extensions allowing contact between the cells and spaces which may allow gas exchange. *Gesneria reticulata,* a species that does poorly in full sun, has a single layer of palisade parenchyma and only one or two layers of spongy mesophyll. In this latter species, however, beneath the spongy cells is a region of abaxial multiple epidermal cells, differing from the spongy mesophyll cells in being larger and lacking chloroplasts, but like them in being bounded by air spaces.

Scattered among the cells of spongy mesophyll in *Gesneria pedicellaris,* at least, are crystals or mineral deposits as large as the cells (this observation is in contrast to Sachs' statement that large crystals do not occur in this family). These differ in shape and size from the usual calcium oxalate druses and may be calcium carbonate or calcium oxalate as found in trichomes. Other cells, particularly near the veins, contain raphides similar to those found in the pith of this species (and reported from other species by Sachs).

The minor veins in the leaf are composed of a few xylem elements subtended by phloem, all surrounded by a sclerenchymatous bundle sheath. In *Gesneria pulverulenta* the bundle sheath projects like a pillar to the base of the adaxial multiple epidermis. In *Rhytidophyllum* the minor

veins have a cortical sheath causing a prominent bulge in the leaf surface.

The vascular pattern of the midveins is similar to the patterns in petioles. Main veins of most species are U-shaped rows of xylem vessels with an abaxial layer of phloem. Within the U-shaped strand are scattered arcs or bundles of xylem vessels and abaxial phloem layers. Exceptions are found in *Gesneria viridiflora* subsp. *quisqueyana*, which has three concentric U-shaped strands with intervening layers of parenchyma, in *G. pedicellaris* with a nearly closed cylinder, and in *Rhytidophyllum* species where the vascular trace was shaped like an inverted capital omega: Ω. The cortex surrounding the vascular strands is composed of parenchyma, with scattered sclerotized cells revealing large pit-pairs. Sclerotized cells also form a large area at the apex of the main veins, and form a one- to three-celled ring around the outer margin of the vein. Layers of thick-walled cells occurred on the abaxial side of the phloem in *Rhytidophyllum auriculatum*.

Inflorescences.—Inflorescences in the tribe Gesnerieae are basically similar; those in each species can be shown to be examples of a stage in a reduction series from a compound dichasium to a single flower.

The simplest inflorescence is a single flower borne on an axis with two lateral bracts (Figure 15), all arising from a leaf axil. The most complex inflorescence is that shown in Figure 7, a compound dichasium with a terminal flower on a central axis, which bears two sets of bracts: one set at the apex of the primary peduncle in whose axils are borne lateral axes, which simulate the central axis; the other set of bracts are at the base of the terminal flower. One of the latter bracts is fertile and bears a branch system of flowers similar to

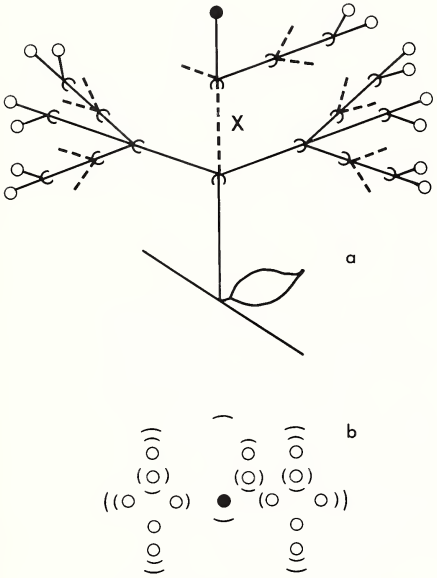

Figure 7.—*a*, Schematic drawing of inflorescence; *b*, inflorescence diagram. (Terminal flower = solid circle; lateral flowers = open circles; bracts = curved lines; internode between bracts at base of terminal flower and bracts at apex of primary peduncle = X.)

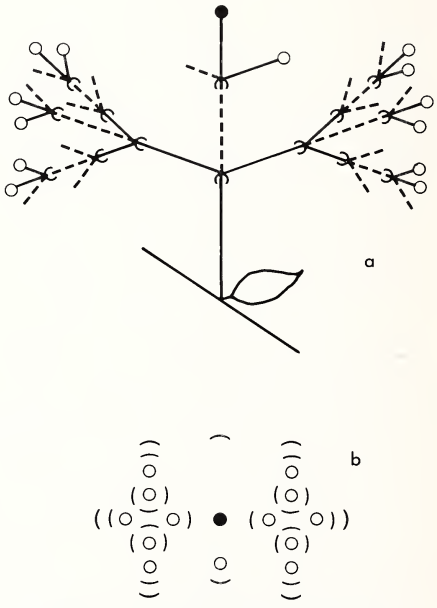

Figure 8.—*a*, Schematic drawing of inflorescence; *b*, inflorescence diagram.

that of the lower lateral branch axes. The other bract is apparently sterile, but in the putative natural hybrid between *Gesneria acaulis* and *Rhytidophyllum tomentosum* a flower is produced whose pedicel is adnate to the pedicel of the terminal flower for a distance up to 6 mm; however, this adnate flower is placed between the terminal flower and the branch system rather than on the side opposite the branch. One or both bracts at the base of the terminal flower may be lacking, or one may be adnate to the branch. The branch at the base of the terminal flower may be reduced to a simple dichasium. The internode between the bracts at the base of the terminal flower and the bracts at the apex of the primary peduncle (labeled "X" in Figure 7) is usually reduced so that a terminal flower, its bracts and branch system, as well as the lower branches appear to arise from the same point. This internode reduction is common and persistent in all stages of the series. The inflorescence just described and illustrated in Figure 7 is found in nearly all species of *Rhytidophyllum* but is known only in a variety of *Gesneria, G. scabra* var. *sphaerocarpa*.

A slight reduction is found in *Rhytidophyllum onacaense* (Figure 8). The bracts of the terminal flowers of the main and lateral axes are occasionally fertile, but bear single flowers and never branch systems at that point. Abortion of the bracts at many points is common (their presence is sometimes seen as vestigial bumps or swellings), but always a pair is present at the base of the lowest lateral axes.

From the next stage of the reduction series to the final single-flowered inflorescence, the internode "X" is lacking, as is one lateral flower in the terminal dichasium. The remaining two flowers are decussate to the lateral branch axes. The order of flowering follows the pattern one might expect in a dichasial system: the terminal flower of the central axis opens first, followed by the remaining flowers in the terminal set of bracts, then the terminal flowers of the secondary branch axes and their subsidiary flowers, then the four terminal flowers of the tertiary axes, and so on to the limit of the development of the inflorescence. In many

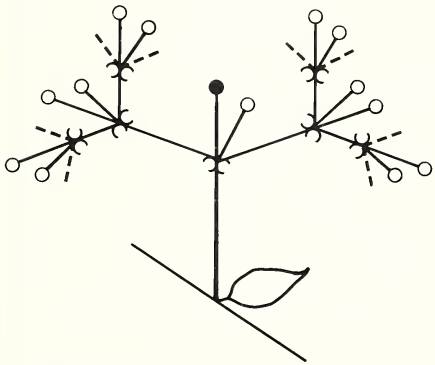

FIGURE 9.—*a*, Schematic drawing of inflorescence; *b*, inflorescence diagram.

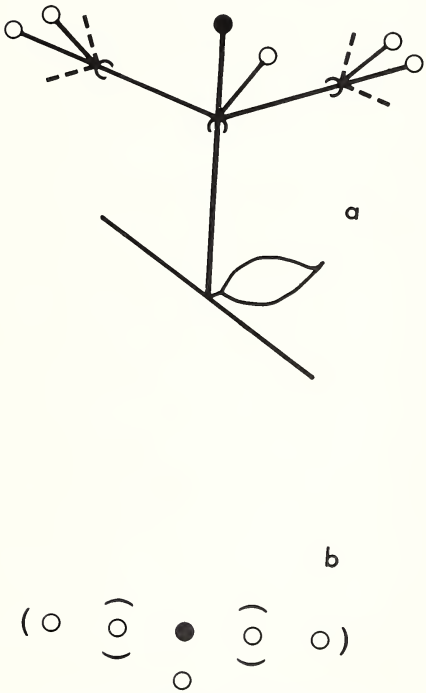

FIGURE 10.—*a*, Schematic drawing of inflorescence; *b*, inflorescence diagram.

species, particularly *Rhytidophyllum berteroanum*, the inflorescence ceases further growth and development when a flower is fertilized.

Gesneria fruticosa (Figure 9) has four bracts at the base of the terminal flower and its subsidiary flower where it joins the lateral axes. The number of bracts is reduced to two in Figure 10, the structure is found in many species, including *Gesneria acaulis, G. humilis,* and *G. viridiflora* subsp. *quisqueyana*.

By reduction of the lateral branch axes in Figure 9 to single flowers and maintenance of the four bracts, the inflorescence found in *Gesneria pedicellaris* (Figure 11) can be derived, a structure of two pairs of decussate bracts with flowers in their axils.

The inflorescence in Figure 12 could result either by reduction of lateral branch axes shown in Figure 9 to single flowers or by reduction in the number of bracts from the inflorescence shown in Figure 11. *Gesneria ventricosa* displays this type of inflorescence in the typical subspecies.

Further reduction in number of flowers is obvious in *Gesneria pedunculosa* (Figure 13) or *G. pumila* subsp. *mimuloides*. The usual number of flowers is two: the terminal flower and its subsidiary. The lateral flowers are seldom present though the bracts persist.

Reduction to a single flower is through loss of the subsidiary flower. In *Gesneria cuneifolia* (Figure 14) the reduction probably parallels and surpasses *Gesneria pedicellaris* (Figure 11). The lateral and subsidiary flowers have aborted, leaving the terminal flower with four bracts at its base.

In *Gesneria calycosa* the reduction to a single flower presumably occurs after the abortion of the bracts at the base of the terminal flower (Figure 15). The bracts that remain on the flower stalk

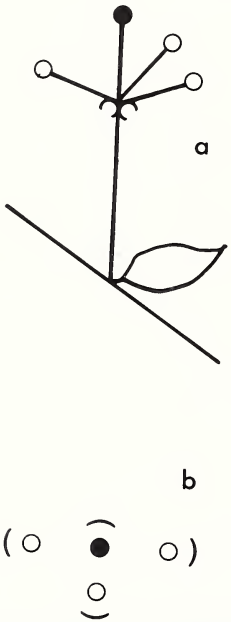

FIGURE 11.—*a*, Schematic drawing of inflorescence; *b*, inflorescence diagram.

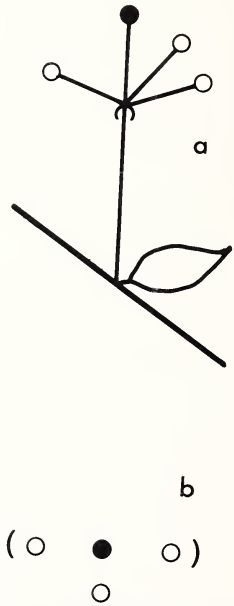

FIGURE 12.—*a*, Schematic drawing of inflorescence; *b*, inflorescence diagram.

probably subtended the lost lateral axes. This last inflorescence example may be considered most advanced in the genus, for it is usually found in those species which have the, presumably, more-recently evolved bat-pollination mechanism.

Flowers.—All species in this tribe have flowers similar in structure—i.e., a floral tube in the sense of Wilson (1974*b*) composed of the adnate bases of the calyx, corolla, and stamens fused into a cup surrounding and adnate to the inferior or half-inferior 2-carpellate unilocular ovary. Above the attachment to ovary, the flower parts making up the floral tube become distinct. The calyx has five lobes sometimes connate briefly at the base. The five petals of the corolla are fused into a tube with a five-lobed limb at the apex. Adnate, at least briefly, to the base of the corolla tube are four stamens and a staminode.

The free calyx lobes may be sulcate at base and awned above (e.g., *Gesneria onychocalyx*), flattened as in *G. pedunculosa,* or terete (e.g., *G. duchartreoides*), glabrous or pubescent, but usually green. One to three veins in each persistent lobe may become prominent in the fruit. The calyx occasionally surpasses the corolla, as in *G. calycosa,* or may be reduced to less than 1 mm long in *G. cubensis* var. *truncata.* In those species where resin is abundant on the young leaves, the calyx is also very resinous.

The shape of the corolla tube may be an adaptation to the pollination mechanism—i.e., large and campanulate in suspected bat-pollinated species (Figures 1*h–i,* 16*b–c,m,* 22), or narrow and tubular in the hummingbird-visited species (Figures 16*d–k,* 21*a*). One collection of *Rhytidophyllum auriculatum* (G–1066) bore at the same time corollas of both shapes, exhibiting a peloric trait found also in some species of *Columnea, Rechsteineria,* and *Sinningia* (H. E. Moore, pers. comm.). Green corollas, due to chloroplasts in the

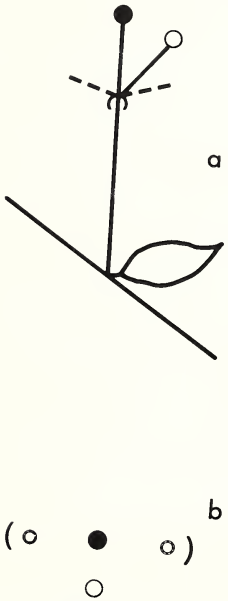

Figure 13.—*a,* Schematic drawing of inflorescence; *b,* inflorescence diagram.

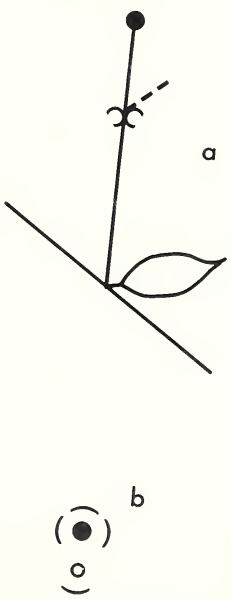

Figure 14.—*a,* Schematic drawing of inflorescence; *b,* inflorescence diagram.

mesophyll cells, are common and probably are due to nondevelopment of anthocyanins.

Protogyny and protandry both occur among the species of the Gesnerieae. The dehiscence of the anthers and the receptivity of the stigma are usually separated by a day, but environmental conditions may cause an overlap, allowing the possibility of self-pollination.

The adnation of the filaments to the base of the corolla has been used by many authors as the main distinguishing character between *Gesneria* and *Rhytidophyllum*. Unfortunately, the trait is not always definite, but seen in combination with characters of the fruit, habit, and foliage, filament adnation is still a valuable marker. Filaments are nearly straight in the tubular species and curved or geniculate in the species with campanulate corollas. Often the base of the filament is invested with pilose colorless trichomes. Filaments and anthers may be white, green, yellow, or reddish depending on the species. The filament or connective may be prolonged in some species beyond the anther; the connective appears to be quite variable and may not be as diagnostic here as it is in some species of *Codonanthe* (Moore, 1973a).

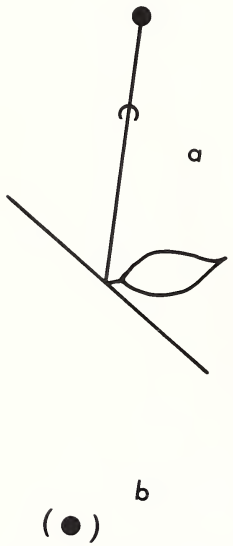

FIGURE 15.—*a*, Schematic drawing of inflorescence; *b*, inflorescence diagram.

Anthers are usually coherent in two pairs by their apices, arranged in a row of four side by side, or separate. The coherence is tenuous in some species and anthers may become free after anthesis.

Dehiscence of the anthers is longitudinal, and occurs soon after anthesis in protandrous species (e.g., *Gesneria pedunculosa*), or about a day later in the protogynous species (e.g., *G. viridiflora* subsp. *quisqueyana*).

Exsertion of the stamens seems to be a detail of the pollination mechanism and may effect a reproductive barrier that may prevent cross-pollination among sympatric species. There appears to be evidence of coevolution and adaptation in some species (see Pollination and Seed Dispersal). In *Gesneria* section *Duchartrea,* suspected as being bat pollinated, the stamens are included, e. g., *Gesneria viridiflora* subsp. *quisqueyana* (Figure 16*m*); if a bat probed the flower for nectar, pollen would be deposited on the forehead of the animal. In some species of *Gesneria* section *Dittanthera,* where the stamens are long-exserted, e.g., *G. pedunculosa* (Figure 1*i*) or *G. calycosa* (Figure 22*a*), a probing bat would receive a coating of pollen at the back of the head. In the plants believed to be pollinated by hummingbirds, a similar state exists: flowers of *Gesneria* section *Gesneria* have included stamens from which pollen may be shaken or brushed onto the top of the base of the bill of a hummingbird visitor; *Gesneria* section *Pentarhaphia* includes plants with exserted stamens from which pollen may be shaken or brushed onto the top of a bird's head (Figure 16*d*). The styles of all these plants appear to be approximately the same length as the stamens and terminate in stigmas so oriented that pollen from an animal's head may adhere to them.

Early pollen studies in the Gesneriaceae were executed using light microscopy and were devoted either to development (Goldmann, 1848) or to casual observations of surface features (Schnizlein, 1843-1870). The only critical study of the pollen morphology of the Gesneriaceae since a brief survey in 1952 by Erdtman has been the unpublished investigation by Pauline Woods at the Royal

Botanic Garden, Edinburgh. To determine if a closer look would reveal additional information, I examined 27 examples of pollen from the tribe Gesnerieae with a scanning electron microscope.

Pollen among the species of the tribe Gesnerieae is relatively uniform as seen under the scanning electron microscope. Although surface topography did display some variation among species, obvious differences in size and shape were not seen; the size limits in this group are well within the limits of the family as observed by Erdtman (1952).

Pollen grains are isopolar with a nearly circular amb, tricolpate with three mesocolpia and two truncate or rounded apocolpia, prolate; size is small to medium (18.5–27.0 μm long at the polar axis, 8.5–6.0 μm wide at the equatorial axis); sexine is usually reticulate with lumina heterobrochate or rarely homobrochate, about 1 μm across, muri about 1 μm wide, seldom nearly smooth or verrucose; colpi are long and narrow.

The exceptions to the typically reticulate sexine surface among the 27 examples investigated were found in *Gesneria scabra* var. *sphaerocarpa*, with a sexine that appeared to be nonreticulate and nearly smooth (Figure 17*f*), and in *Gesneria clandestina* (Figure 18*a*) and *G. fruticosa*, both of which had a verrucose or warty sexine. *Gesneria viridiflora* subsp. *sintenisii* (Figure 17*a*) had a rugose outer surface that appeared intermediate between the verrucose type and the typical reticulate forms. The latter three species have apparently become modified morphologically in corolla characters related to bat pollination. Perhaps the verrucose or warty surface is a modification in the pollen associated with the more recent bat pol-

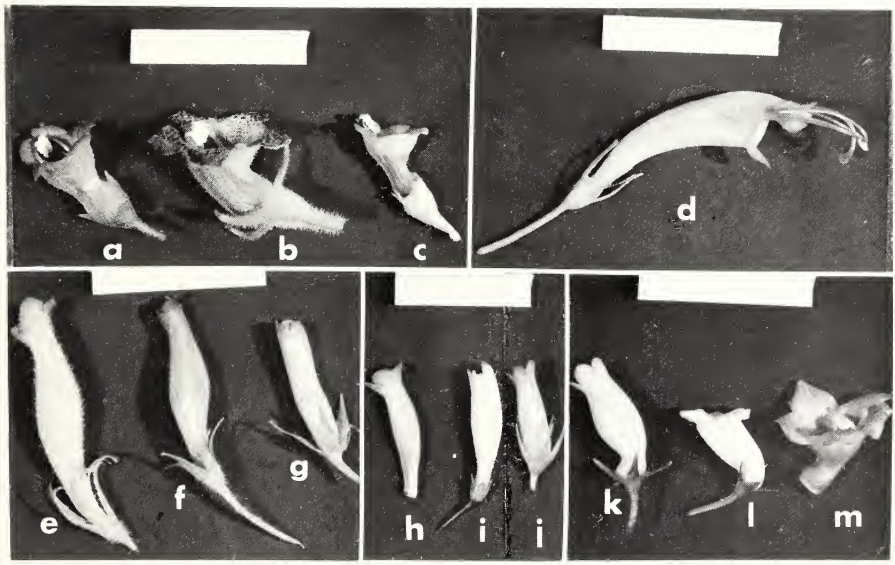

FIGURE 16.—Flowers of *Gesneria* and *Rhytidophyllum: a*, artificial intergeneric hybrid *Rhytidophyllum leucomallon* × *Gesneria pedunculosa*, G-1232; *b*, *R. auriculatum*, G-905; *c*, *R. leucomallon*, G-1010; *d*, *Gesneria ventricosa* subsp. *ventricosa*, G-940; *e*, *G. christii*, G-1008; *f*, *G. pedicellaris*, G-898; *g*, *G. acaulis* var. *glabrata*, G-876; *h*, *G. cuneifolia*, G-869; *i*, *G. citrina*, G-888; *j*, *G. pulverulenta* G-1034; *k*, *G. pauciflora*, G-769; *l*, *G. humilis*, G-1365; *m*, *G. viridiflora* subsp. *quisqueyana*, G-903.

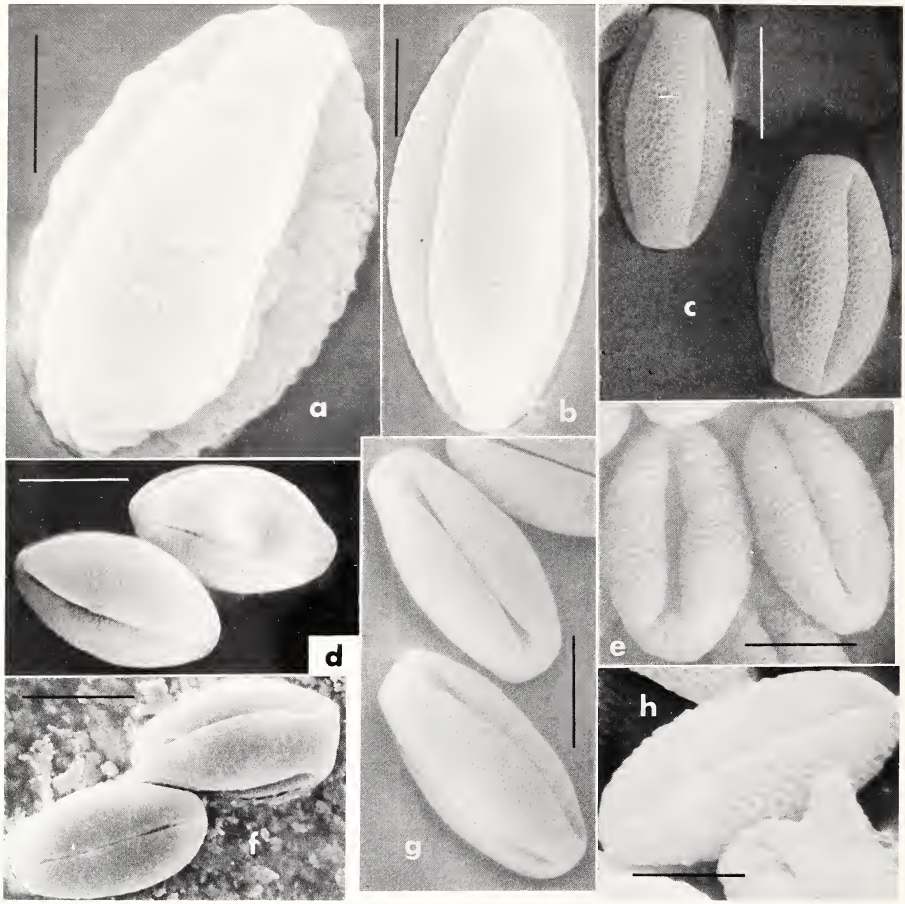

FIGURE 17.—Pollen grains of tribe Gesnerieae as seen with scanning electron microscope, scale indicated by ruled line: *a, Gesneria viridiflora* subsp. *sintenisii* (*Talpey 23*), scale = 5 μm; *b, G. pedicellaris* (G-898), scale = 5 μm; *c, G. acaulis* var. *glabrata* (G-876), scale = 10 μm; *d, G. acaulis* var. *acaulis* (G-877), scale = 10 μm; *e, Rhytidophyllum tomentosum* (G-841), scale = 10 μm; *f, Gesneria scabra* var. *sphaerocarpa* (G-881), scale = 10 μm; *g, G. ventricosa* subsp. *ventricosa* (G-940), scale = 10 μm; *h, G. humilis* (*Alain Liogier 4434*), scale = 5 μm.

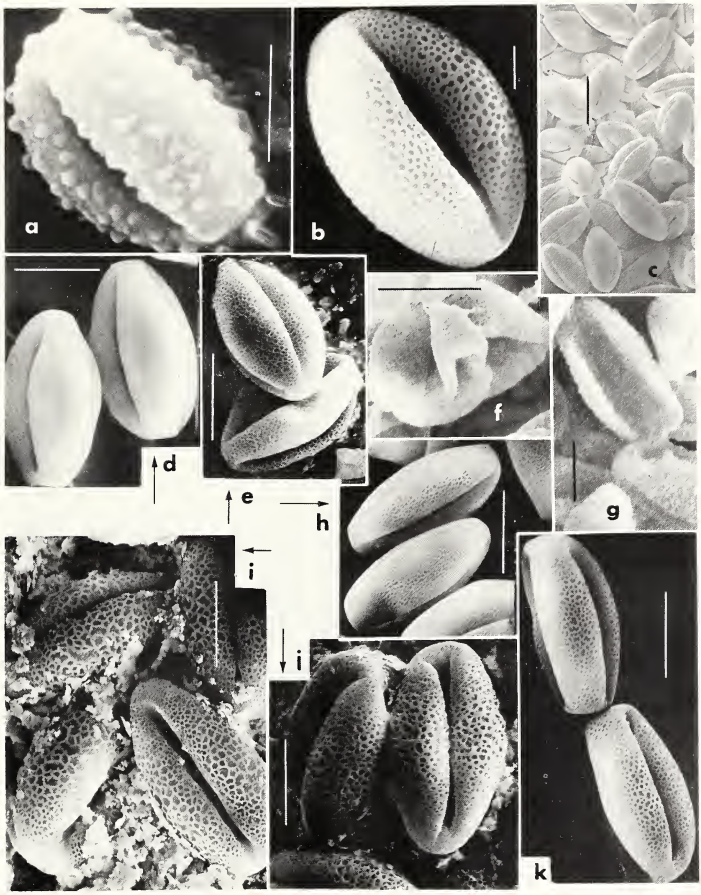

FIGURE 18.—Pollen grains of tribe Gesnerieae as seen with scanning electron microscope, scale indicated by ruled line: *a*, *Gesneria clandestina* (*Harris & Britton 10679*), scale = 10 μm; *b*, *G. viridiflora* subsp. *viridiflora* (*Clemente 5089*), scale = 2 μm; *c*, *G. pulverulenta* (G-1034), scale = 20 μm; *d*, *G. cuneifolia* (G-763), scale = 10 μm; *e*, *G. pauciflora* (G-769), scale = 10 μm; *f*, *G. humilis* (G-1365), scale = 3 μm; *g*, putative natural hybrid *Gesneria acaulis* × *Rhytidophyllum tomentosum* (G-1371), scale = 10 μm; *h*, *Pheidonocarpa corymbosa* subsp. *corymbosa* (G-1367), scale = 10 μm; *i*, *Gesneria pedunculosa* (G-767), scale = 10 μm; *j*, *G. calycosa* (G-1037), scale = 10 μm; *k*, *G. pumila* subsp. *pumila* (G-874), scale = 10 μm.

lination; warts may allow the grains to adhere to the fur of the flying mammal. Other species probably modified for bat visitation, *Rhytidophyllum tomentosum* (Figure 17*e*), *Gesneria calycosa* (Figure 18*j*), and *G. viridiflora* subsp. *viridiflora* (Figure 18*b*), have not developed this surface topography, but have grains with the reticulate surface typical for the tribe.

The startling appearance of the pollen of hybrid forms added evidence of their origin. Pollen of two natural intergeneric hybrids, *Rhytidophyllum tomentosum* × *Gesneria scabra* var. *sphaerocarpa* and *Rhytidophyllum tomentosum* × *Gesneria acaulis* var. *glabrata* (Figure 18*g*), showed distortion and general collapse of the grains. A hybrid between two species of *Gesneria, G. pedicellaris* × *G. pedunculosa,* did not show this collapse.

Pollen of *Gesneria humilis* from Haiti also showed collapse and distortion similar to the hybrids (Figure 18*f*); however, pollen from the same species from Cuba appeared to be normal (Figure 17*h*). The remainder of the pollen examined appeared to be relatively uniform in structure but differed somewhat in size.

The half-inferior to inferior bicarpellate, unilocular ovary is hemiparacarpous according to Ivanina (1965). According to Wilson (1974a) the two carpels are arranged as in the closely related Scrophulariaceae and "lie in an anterior-posterior position with relation to the floral axis and not, as stated by Hutchinson (1959), to the right and left of the floral axis." Earlier authors (e.g., Lawrence, 1951) have written that the placentation in the Gesneriaceae is parietal with placentas bearing numerous anatropous ovules. Weber (1971), however, has shown that in *Gesneria libanensis* the ovules are borne only on the surfaces of the intruded placental lamellae and not on the outside walls of the carpels. In *Pheidonocarpa corymbosa* the apex of the half-inferior ovary protrudes beyond the disc and becomes accrescent to form a beak in the fruit, an obvious character that separates this species from *Gesneria*. The disc of all species is apparently a ring of fused glands, becoming five-lobed, sinuate, or unlobed. According to Brown (1938) the disc in the Gesneriaceae is nectarial. In plants like those in the tribe Gesnerieae, Brown suggests that the inferior ovary, but not the nectariferous tissue, has been surrounded by the torus or receptable; Moore and Lee (1968) suggest the possibility that the disc in some genera may be a reduced inner whorl of stamens and call attention to the need for detailed study. However, the disc in *Gesneria* bears glandular trichomes that exude abundant nectar in many species and may testify to its nectarial origin. Wilson (1974a, 1974b), after extensive study of nectarial tissues in the Gesneriaceae, concluded that the disc "is an enation; there is no evidence that it is a modification of any preexisting cycle of floral parts."

In *Gesneria pedunculosa,* a protandrous species, the style is patent during the first day after anthesis, but becomes erect during the second day. In protogynous species, e.g., *Gesneria viridiflora* subsp. *quisqueyana,* the style is exserted while the corolla is opening and before the anthers dehisce. The papillate stigma is capitate and enlarged in *Gesneria humilis,* slightly enlarged in most species of *Rhytidophyllum,* stomatomorphic in most species of *Gesneria,* but in *Pheidonocarpa* the stigma is prominently bilobed.

Fruit.—Capsules are elongated and linear in *Gesneria calycina,* turbinate in most other species of *Gesneria,* or nearly spherical as in most species of *Rhytidophyllum*. The rostrate apex appears only in *Pheidonocarpa*.

Dehiscence occurs usually through the median radial splitting of the carpels into two or four valves from the apex. An unusual fruit referred to here as a splash cup develops in some species of *Gesneria* (see Pollination and Seed Dispersal). In *Gesneria citrina, G. cuneifolia, G. humilis,* and others the apex of the capsule splits or withers to form a round opening and exposes seeds, which may be ejected by rain or waterfall splash. In many species of *Rhytidophyllum,* the capsule is inverted during maturation allowing seeds to fall out when the fruit opens.

The veins of the floral tube surrounding the ovary in species of *Gesneria* usually enlarge to form prominent costae on the capsules; *Pheidonocarpa* and *Rhytidophyllum* species do not show this character.

Seeds.—The seeds develop from anatropous unitegmic ovules (Davis, 1966). Seeds of all specimens investigated were similar in size, averaging about 800 μm long and 250 μm wide, but ranging from 1300 μm long in *Gesneria calycosa* (Figure 19*g*) to 500 μm long in *G. pumila* subsp. *neglecta,* from

FIGURE 19.—Seeds of Gesnerieae as seen under a light microscope: *a, Gesneria heterochroa (Ekman 8741); b, G. acaulis* var. *acaulis* (G-877); *c, G. christii* (G-1008); *d, Rhytidophyllum grande (Proctor 18312); e, Gesneria acaulis* var. *glabrata* (G-876); *f, G. calycina (Proctor 22125); g, G. calycosa (Proctor 21517); h, Rhytidophyllum tomentosum* (G-841); *i, Gesneria ventricosa* subsp. *ventricosa* (G-940); *j, G. humilis* (G-1365); *k, G. cuneifolia* (G-857); *l, Rhytidophyllum grande (Proctor 16645); m, Gesneria alpina (Proctor 9616); n, G. duchartreoides (Alain Liogier & Lopez F. 7318).*

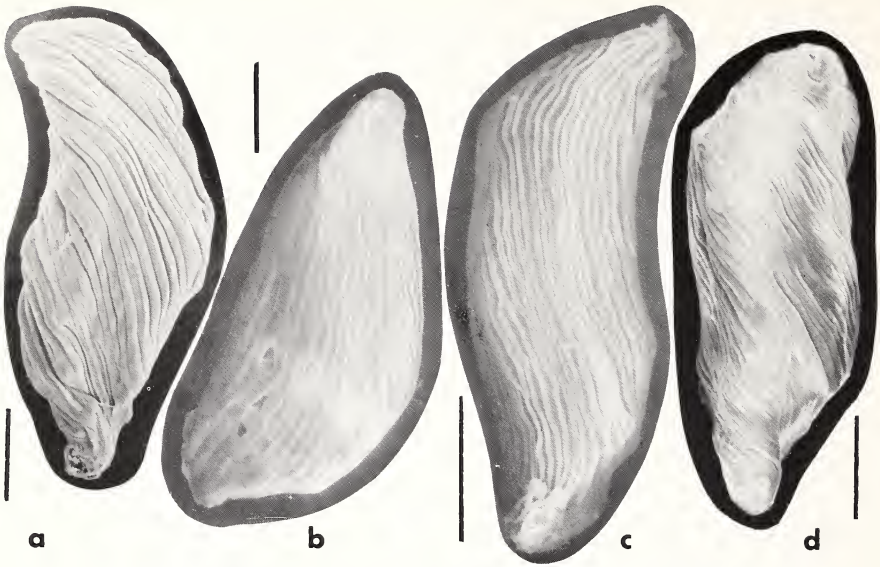

FIGURE 20.—Seeds of Gesnerieae as seen with scanning electron microscope (scale = 100 μm): *a, Gesneria christii* (G-1008); *b, G. humilis* (G-1365); *c, Rhytidophyllum tomentosum* (G-841); *d, Gesneria cuneifolia* (G-857).

450 μm wide in *G. acaulis* (Figure 19*b,e*) to 150 μm wide in *G. scabra* var. *fawcettii*.

Seeds are spindle-shaped (Figure 19*a,d,h,i,k–n*), linear (Figure 19*f–g*), rhombic (Figures 19*j*, 20*c*), or oblong (Figures 19*b–c*, 20*d*). All appear twisted or bear spiral lines, which are apparently the remnants of the cell walls of the integument. At maturity the seeds probably twist upon drying. The walls of the outer cells appear inflated in species of *Gesneria* (Figure 20*a–b,d*) but sunken and less twisted in *Rhytidophyllum* (Figure 20*c*). *Gesneria ventricosa*, however, appears intermediate in this character.

Upon germination, the seedlings are isocotylous, consistent with the division by Burtt (1962) of the Gesneriaceae into two subfamilies based on seedling characters.

Conclusions

The main purpose for examining the species of the tribe Gesnerieae was to determine whether there are differences that could distinguish the genera *Gesneria* and *Rhytidophyllum* consistently. Plants in these genera have been considered congeneric by many authors, e.g., Linneaus (1753), Baillon (1888), Kuntze (1891), and more recently a union was proposed by Wiehler (1970). In recent floras of the West Indian region (Adams, 1972; Morton, 1957b), these genera have been separated by the length of the adnation of the filaments to the corolla tube, a distinction noted by Fritsch (1894). Other characters may now be added.

Table 1 gives the characters that distinguish *Gesneria*, *Rhytidophyllum*, and *Pheidonocarpa*. Consideration of these characters and observations of the plants in the field have led to the conclusion that *Gesneria* and *Rhytidophyllum* should be maintained as separate genera. There is overlap in many characters, and no single character may distinguish all taxa in one genus from all taxa in

TABLE 1.—Comparison of characters of genera in the Gesnerieae

Character	Gesneria	Rhytidophyllum	Pheidonocarpa
Habit	acaulescent herbs subshrubs to trees	shrubs to trees	subshrubs
Habitat	usually protected	exposed marginal	exposed limestone cliffs
Crystals	raphides[a]	styloid	styloid
Leaves			
arrangement	alternate[b]	alternate	opposite, decussate
"pseudo-stipules"	absent	occasional	absent
adaxial surface	plane, smooth & nitid, scabrous, occas. bullate	areolate	scabrous
glandular muci-laginous hairs	absent	present	absent
non-glandular uniseriate hairs	few-celled	up to 30 cells arachnoid surface	few-celled
multiple epidermis	most species	absent	absent
abaxial epidermal cell wall undulation	none or shallow	usually deep[c]	none
minor veins	no cortical sheath	cortical sheath	unknown
stomatal domes	seldom[d]	always	always
stomatal 'islands'	many species	few species[e]	all species
Inflorescence	reduction series (Figures 7-15)	compound dichasium (Figures 7-8)	compound dichasium (Figure 8)
Flowers			
filament adnation	less than thickness of filament base	more than thickness of filament base	more than thickness of filament base
ovary	inferior	inferior	half-inferior
capsule shape	linear, turbinate rarely spherical	usually spherical	turbinate, long curved beak
costae	present, if not, then capsules verrucose	absent	absent or obscure
seed walls	usually inflated[f]	sunken	sunken

[a] Gesneria pauciflora has styloid crystals.

[b] Leaves of Gesneria fruticosa are opposite and decussate in one population.

[c] No cell wall undulation in Rhytidophyllum earlei, R. lomense, and R. rupincola.

[d] Slight stomatal dome development in a few species of Gesneria.

[e] Stomatal 'islands' present in Rhytidophyllum lomense and R. rupincola.

[f] Gesneria ventricosa is transitional.

the other. Evidence of their distinctness may be found also in pollen characters of intergeneric hybrids: collapse of pollen grains observed in scanning electron microscopy, and the low pollen stainability, compared to noncollapse of pollen grains in an interspecific hybrid in *Gesneria,* which has high pollen stainability.

Gesneria corymbosa and *G. mortonii* should be removed from *Gesneria,* based on field observations and laboratory investigation, also summarized in Table 1. Three solutions are suggested for the disposition of the two species: (1) reunion with *Heppiella,* disqualified for the reasons detailed by Wiehler (1971); (2) transfer to *Rhytidophyllum* with which many of the characters appear to correlate more closely than with *Gesneria,* but the species would still remain an anomalous group within that genus, and this solution is therefore rejected; (3) erection of a new genus in the tribe Gesnerieae. The chromosome number, structures of inflorescence and flowers, and leaf anatomy all point to a closer relationship to *Gesneria* and *Rhytidophyllum* than to other genera. This action, however, would destroy the traditional tribal

character of alternate leaf arrangement. Emendation of the tribal circumscription is therefore necessary to account for the addition of the new genus, *Pheidonocarpa*. This third course of action is taken herein.

Pollination and Seed Dispersal

The evolution of flowering plants has probably been largely the result of adaptive pressure toward efficient methods of dissemination of pollen and seeds. This section deals with these aspects of dissemination in the Gesnerieae, primarily in the genus *Gesneria;* (1) the pollination biology and probable coevolution of *Gesneria* species and vertebrates, and (2) seed dispersal and its primary reliance on water and winds.

Materials and Methods

To correlate the sizes and shapes of flowers to possible hummingbird and bat pollinators, measurements of suspected animal visitors were taken from specimens in the collections of Cornell University, and in the Divisions of Birds and Mammals at the National Museum of Natural History, Smithsonian Institution, Washington, D. C.

Table 2.—Measurements of hummingbirds

Species	Area of origin	Measurements	
		A	B
Anthracothorax dominicus	Dominican Republic	2.4	2.8
Anthracothorax mango	Jamaica	2.6	2.7
Anthracothorax viridis	Puerto Rico	2.7	3.2
Archilochus colubris	U. S. & West Indies	2.0	2.0
Calypte helenae	Cuba	1.1	1.3
Chlorostilbon maugaeus	Puerto Rico	1.5	1.8
Chlorostilbon ricordii	Cuba	1.7	2.0
Chlorostilbon swainsonii	Hispaniola	1.9	2.3
Cyanophaia bicolor	Dominica	1.9	2.5
Eulampis jugularis	Dominica	2.3	3.0
Glaucis hirsuta	West Indies	3.0	2.9
Mellisuga minima	Jamaica	1.2	2.0
Orthorhyncus cristatus	Lesser Antilles	1.4	1.8
Sericotes holosericeus	Lesser Antilles	2.2	2.8
Trochilus polytmus	Jamaica	2.1	3.4

A = mean length of bill in cm. B = mean width of bill at base in mm.

For hummingbirds, the following data were collected: (1) the name of the species, (2) the collection location, (3) the accession number, (4) the length of the bill measured in cm, and (5) the width of the bill (in mm) at the base. Averages of these measurements are shown in Table 2. Selected specimens were photographed for a record.

Because of the varied shape of heads among the species of bats, more extensive data were collected: (1) the species name, (2) the collection location, (3) the accession number, (4) dorsal-ventral width in mm of head at middle of eye, (5) length along dorsal rostrum from level of middle of eye to nose leaf, (6) depth in mm of nose from base of nose leaf to bottom of lower jaws, (7) width in mm across skull at center of eyes, (8) width in mm across anterior tip of nose, (9) depth in mm vertically from crown of head to lower jaws, and (10) distance in mm from tip of nose leaf to bottom of lower jaws. For comparison with corolla length and width, it was found that measurements 4 and 5 were critical. Averages of all of these measurements are shown in Table 3. Again, selected specimens were photographed.

Pollination Biology

By far the greatest part of the literature on coevolution of plants and animals has been devoted to the field of study known variously as pollination biology, pollination ecology, or anthecology. This field of study began over 200 years ago with the work of Kölreuter (1761), was expanded by Sprengel (1793), Müller (1883), and Knuth (1906-1909), but only in the last few decades has yielded information to show the effects of adaptation and selection resulting in speciation. The works by Faegri and van der Pijl (1966, 1971) summarized the recent work in pollination biology.

Current studies of pollination biology rest on a concept of coevolution or development of mutualistic relationships between flowering plants and animals. According to Baker and Hurd (1968), coevolution or reciprocal evolution among plants and animals occurs in a series of steps, a result of natural selection toward the most efficient model for reproduction in both partners. An animal that can derive food or energy from a plant with a smaller expenditure of energy than another animal

is more likely to survive to pass on its hereditary characters. Likewise, a plant that is more attractive to potential pollinators or seed dispersers is more likely to have its hereditary characters appear in the next generation. Because of their "tremendous evolutionary plasticity" and coevolution with animals, "angiosperms have attained the highest level of organization in the plant kingdom" (Takhtajan, 1969).

Since pollination by abiotic means, such as wind or water, is neither known nor suspected in *Gesneria,* only biotic pollination will be discussed. Three methods of biotic pollination are suggested and will be considered: transfer of pollen via insects, birds, or bats. Self-pollination may be important in some species and will be mentioned in relation to distribution patterns.

Flowers may have a combination of characters to attract more than one pollinator, as well as a capacity for self-pollination. Baker, Cruden & Baker (1971:1127) recently wrote: "very few plants have only one kind of visitor capable of effective pollination . . . and practically none have only one kind of visitor capable of gaining sustenance from the floral parts or the nectar." Thus, while flowers of many species of *Gesneria* may be pollinated by bats, these same flowers may be visited by hummingbirds or insects. Figure 21*b* is a photograph of a hummingbird (*Anthracothorax dominicus*) visiting *Rhytidophyllum auriculatum,* a species probably adapted for bat pollination.

Among the invertebrates, only insects may be considered as possible visitors to *Gesneria* flowers. The interactions of many plants and insects have been thoroughly studied: extensive observations are detailed in the early works by Müller (1883) and Knuth (1906-1909), and a summary discussion of coevolution of plants and insects has recently been published by Macior (1971) along with an extensive bibliography on the subject.

Insect pollinators are usually members of the orders of Coleoptera, Diptera, Hymenoptera, and Lepidoptera. The characters of the flowers attracted by insects have been listed by Faegri & van der Pijl (1966, 1971). Flowers specialized for visitation by one insect taxon are likely to be less attractive to other groups of insects, i.e., flowers attractive to bees may differ from flowers attractive to flies, butterflies, or moths.

There are no previously documented reports of insects visiting flowers of *Gesneria.* A comparison of the characteristics of *Gesneria* flowers with those of insect-pollinated flowers given by Faegri and van der Pijl (1966, 1971) shows that *Gesneria* is not likely to be pollinated by insects. The genus lacks blue or pure yellow flowers especially attractive to bees, ultra-violet reflecting nectar guides used by bees and flies to locate nectar or pollen, a strong fruity odor attractive to beetles or moths, radial erect flowers with a landing area attractive to butterflies, regular simple flowers visited by flies, and the versatile anthers of moth-pollinated flowers. The tubular or campanulate flowers discourage beetles. However, while collecting in the Dominican Republic, I saw honeybees (*Apis mellifera*) enter flowers of *Rhytidophyllum berteroanum* in the field; the honeybees that visited the flowers of this species could not be the original pollinators, for they are recent immigrants to the New World. The tubular, red flowers of *R. berteroanum* appear to be adapted to hummingbird pollination. In species of *Gesneria* with tubular, red corollas, bees may occasionally be attracted to the nectar, which is usually available in abundance. Because the anthers are positioned on the upper side of the corolla tube, as in the campanulate-flowered species, and from observations of *Apis mellifera* entering the tubular corolla

TABLE 3.—Measurements of bats

Species	Country of origin	Measurements (cm) 1	2	3	4	5	6	7
Brachyphylla cavernarum	Puerto Rico	1.3	1.2	1.0	1.5	0.9	*	*
Brachyphylla nana	Cuba	1.0	1.1	1.1	1.3	0.9	1.6	*
Brachyphylla pumila	Dominican Republic	1.2	1.0	0.3	1.3	0.8	1.8	*
Erophylla bombifrons bombifrons	Puerto Rico	0.8	0.8	0.5	0.8	0.6	1.2	0.7
Erophylla bombifrons santacristobalensis	Haiti	0.8	0.8	0.6	0.8	0.6	1.2	0.8
Erophylla sezekorni sezekorni	Cuba	0.8	0.9	0.6	0.8	0.5	1.4	*
Erophylla sezekorni syops	Jamaica	0.8	0.9	0.6	0.8	0.5	1.3	0.7
Glossophaga soricina antillarum	Jamaica	0.9	0.8	0.6	0.9	0.6	1.6	1.0
Monophyllus redmani clinedaphus	Cuba, Haiti	0.8	0.9	0.5	0.8	0.4	1.1	0.8
Monophyllus redmani portoricensis	Puerto Rico	0.6	0.8	0.4	0.8	0.4	1.0	0.7
Monophyllus redmani redmani	Jamaica	0.8	0.9	0.5	0.9	0.5	1.3	0.9
Phyllonycteris aphylla	Jamaica	(X)	1.3	1.1				
Phyllonycteris poeyi	Cuba	1.0	0.8	0.6	0.8	0.5	1.3	0.7

1 = dorsal-ventral width of head at middle of eye; 2 = length along dorsal of rostrum from level of middle of eye to nose leaf; 3 = depth of nose from base of nose leaf to bottom of lower jaws; 4 = width across skull at center of eyes; 5 = width across anterior tip of nose; 6 = depth vertically from crown of head to lower jaws; 7 = distance from tip of nose leaf to bottom of lower jaws; * = not measured; (X) = preserved specimens not available; measurements derived from skull.

of *Rhytidophyllum berteroanum* from the lower side, it appears that bees would seldom contact the anthers and stigma to transfer pollen. Therefore, bees are not likely to be important pollinators.

If insects are eliminated from the likely principal pollinators of *Gesneria,* one must search among the vertebrates to find the probable pollinators. According to Allen (1939) and Faegri and van der Pijl (1966, 1971), vertebrate pollinators are predominantly phenomena of the tropics, for only in tropical regions with their evenness of climate are blossoms available for food at all times during the year. In the neotropics, two vertebrate pollination mechanisms appear to predominate: hummingbird pollination and the more recently evolved and less well-known pollination by bats.

Pollination by birds was first described by Trelease in 1881 and was later studied by Fries (1903) and Werth (1915) among others. The work by Grant and Grant (1968) has elucidated many of the mechanisms in ornithophily.

FIGURE 21.—Hummingbirds with flowers they may visit and pollinate: *a, Anthracothorax dominicus* from the Dominican Republic with *Gesneria pedicellaris* (top), *G. christii* (middle), and *G. reticulata* (bottom); *b, Anthracothorax dominicus* visiting *Rhytidophyllum auriculatum* in the Dominican Republic (arrow indicates pollen at the base of bill; photograph by T. E. Talpey).

Ornithophilous plants are usually visited and pollinated by birds of the families Coerebidae, Nectariniidae, Meliphagidae, Drepanididae, or Trochilidae (Welty, 1963; Wallace, 1963). In the Trochilidae, the hummingbirds are highly adapted to taking nectar from flowers by their ability to hover, a visual sensitivity to red, a long bill, and a tongue modified for taking up nectar.

Characters of bird-pollinated flowers are listed in Table 4. These characters in combination serve also to exclude other possible competitors for pollen or nectar. The red color of these flowers is seen as the unifying character of hummingbird-pollinated flowers. Baker (1961:66) stated that the red color with its longer wavelengths makes the flowers more easily seen against the darker foliage at dusk or early in the morning. Grant and Grant wrote that the common red color of ornithophilous flowers is the result of mimicry or adaptive coloration. Hummingbirds appear to associate red color with large amounts of nectar. Since most insects and bats are not attracted to a bright red color (unless combined with ultraviolet) and are thus excluded from pollination, the plants are dependent upon hummingbirds for pollination.

The stages in coevolution of birds and flowers cannot be detailed with certainty, but Grant and Grant (1968:87) suggest that a preadapted "swift-like bird—tropical, insectivorous, and agile on the wing" was the probable ancestor for the nectar-feeding hummingbird. The plants have probably developed from a preadapted insect-pollinated ancestor, but since there are no known present-day exclusively insect-pollinated species of *Gesneria,* the development of hummingbird pollination must have followed one of two paths: (1) if once there were insect-pollinated species of *Gesneria,* they are now no longer extant and may have declined in response to more-effective methods of pollination; or (2) *Gesneria* as a genus evolved after the mechanism for hummingbird pollination had been established in the family.

Hummingbird pollination is well known in the Gesneriaceae (Stearn, 1969), so the possibility of hummingbird pollination should be expected in *Gesneria.* In fact, Harborne (1966) mentions a

TABLE 4.—Characters of flowers visited by hummingbirds and bats*

Flower character	Hummingbirds	Bats
Anthesis	diurnal	nocturnal or crepuscular
Color	vivid, usually red with contrasting colors	drab, white, cream to green or purple
Corolla	strong, tubular with no lip	strong single flowers with large mouths or inflorescences of small flowers
Odor	none	stale or sweet, or of ripe or decaying fruit
Nectar guides	none	none
Nectar availability	hidden in base of corolla tube or in spurs	accessible
Nectar quantity	abundant	abundant
Pollen quantity	moderate	abundant

* Compiled from Faegri & van der Pijl (1966, 1971), Baker (1961), Meeuse (1961), and Grant & Grant (1968).

report of hummingbirds visiting a *Gesneria* species. Of the 15 species of hummingbirds reported by Bond (1961) from the West Indies, 13 are selected here to be potential pollinators of *Gesneria* species. In Table 5 are listed the hummingbird species, the mean lengths of their bills, and one of the species of *Gesneria* which has a corolla tube length corresponding to the bill length. Hummingbird species are illustrated in Figures 21 and 25 with flowers of species they may visit and pollinate. The potential pollinators for some of the species will be discussed under the species. Sections *Pentarhaphia* and *Physcophyllon* in particular have the syndrome of characters found in flowers usually visited by hummingbirds. The color of the corolla tube ranges from pure red to light yellow with a red limb or greenish-white with a reddish base. The pigments of two *Gesneria* species are similar to the anthocyanidins in other bird-pollinated species in the Gesneriaceae (Harborne, 1966). The anthocyanidins in the Gesneriaceae are unique in the flowering plants and found elsewhere only in a few fern species. The corollas also differ from each other in size and shape (Figures 16*d–k*, 21*a*), but the flowers often have a horizontal orientation, which seems genetically controlled, at least in *Gesneria pedicellaris*. This species grows on vertical cliffs in the Dominican Republic. In such a habitat corollas are oriented perpendicularly to the substrate (Figure 1*f*); however, when grown in a pot in the greenhouse, the perpendicular orientation is maintained, i.e., the corollas are oriented vertically. Stamens and stigmata are usually in a position to contact the hummingbird at the upper side of the bill base or on the front of the head. Since the stigma is receptive one or two days before or after the pollen is released, there is minimal chance of self-pollination.

Since hummingbirds are strongly territorial in their habits (Stearn, 1969) and restrict their feeding to a limited area, populations of hummingbird-pollinated species of *Gesneria* may become inbred and form apparent endemic species. Hummingbirds, however, are not flower-constant; thus if more than one potentially cross-breeding population of Gesnerieae occurs within the feeding area, natural hybrids may result, e.g., *Gesneria scabra* var. *sphaerocarpa* × *Rhytidophyllum tomentosum*, and *Gesneria acaulis* var. *glabrata* × *Rhytidophyllum tomentosum* (Figure 1*j*), which have been discovered in Jamaica.

The second type of vertebrate pollination involves bats. This facet of pollination biology has been neglected until recently, perhaps because of the nocturnal habits of bats, the flowering habit of the flowers visited by bats, and the restriction of this phenomenon to tropical regions. The first suggestion that bats might be pollination agents is attributed to Moseley (1879), although the first record of bats visiting flowers was made by De La Nux in a letter to Buffon in 1772 (Baker and Harris, 1957). In the past decade many additional observations of bat pollination have been made, as well as detailed studies of mechanisms of bat pollination (Vogel, 1969a, 1969b).

Nectar- and pollen-feeding bats in the New World belong to the suborder Microchiroptera of the order Chiroptera and represent two subfamilies, Glossophaginae and Phyllonycterinae, of the family Phyllostomidae. These small mammals have heads with elongated narrow rostra and jaws that can fit into large campanulate flowers. Brush-like papillae near the tip of their extensile tongues are adapted for lapping nectar and pollen, allowing the bats to reach the nectar at the base of the corolla (Wille, 1954).

According to Allen (1939), "bats are guided by their sense of smell in finding the blossoms and are attracted by the nectar." The odor, however, may not necessarily be detectable by humans. Kaisila

TABLE 5.—Potential hummingbird pollinators (Trochilidae) and *Gesneria* species in the West Indies

Island	Hummingbird species	Mean bill length (in cm)	Gesneria species	Mean corolla tube length (in cm)
Cuba	Archilochus colubris	2.0	G. cubensis	1.8
	Chlorostilbon ricordii	1.7	G. duchartreoides	1.4
	Calypte helenae	1.1	G. humilis	1.3
Hispaniola	Anthracothorax dominicus	2.4	G. pedicellaris	2.5
	Chlorostilbon swainsonii	1.9	G. decapleura	2.2
	Mellisuga minima	1.2	G. pulverulenta	1.3
Jamaica	Anthracothorax mango	2.6	G. acaulis	2.5
	Mellisuga minima	1.2	G. scabra var. scabra	1.2
	Trochilus polytmus	2.1	G. scabra var. fawcettii	1.5
Puerto Rico	Anthracothorax dominicus	2.4	G. cuneifolia	2.5
	Anthracothorax viridis	2.7	G. cuneifolia	2.5
	Chlorostilbon maugaeus	1.5	G. citrina	1.8
	Orthorhynchus cristatus	1.4	G. citrina	1.8
	Sericotes holosericeus	2.2	G. pauciflora	2.2
Lesser Antilles	Glaucis hirsuta	3.1	G. ventricosa	2.6

(1966) reports a bat, *Rousettus aegyptiacus,* as the only visitor to the apparently odorless *Bombax malabaricum.* In flower-feeding bats the olfactory lobes of the brain are well developed; Moller (1932) has shown these organs to be far better developed in the nectar-feeding *Glossophaga* than in insectivorous bats. Some bats (e.g., *Glossophaga, Brachyphylla*) are able to hover and feed on the flower. Other bats (e.g., *Leptonycteris nivalis* in Arizona) cannot hover, but must make repeated feedings at a single flower. This they accomplish by flying up to a flower, stopping suddenly, lapping nectar and flying off to the side before falling from the flower (Cockrum and Hayward, 1962; Novick, 1969).

Chiropterophilous flowers display a syndrome of characters distinctly different from those of flowers visited by insects and hummingbirds (see Table 4).

Preadaptation of flowers and bats for coevolution was discussed by Vogel (1969a, 1969b), who inferred that flowers adapted for bat pollination were present before the bats. Unless one accepts preadaptation, one can assume that plants adapted for bat pollination evolved from a bird-pollinated ancestor simultaneously with the flower-feeding bats. The bats probably evolved from insect-feeding forms. Grant and Grant (1968:94) wrote that bat pollination may have emerged because hummingbird pollination in some tropical regions reached a saturation point "conducive to the emergence of a new derivative pollination system."

The idea of bat pollination in *Gesneria* was first proposed in 1969 by Vogel for *G. viridiflora* and *G. calycosa.* Although Vogel presented no definite proof, he based his hypothesis on flower structure and color. The species of *Gesneria* suspected of being bat pollinated display the characters listed in Table 4. The flowers are similar to *Kigelia,* a member of the Bignoniaceae, which has been observed to be pollinated by bats in the Old World (Harris and Baker, 1958; Meeuse, 1961). The flowers are campanulate (Figures 1*h*; 16*b,c,m*; 22*a,b*), borne on long erect or pendent peduncles, e.g., *Rhytidophyllum grande* (Figure 1*c*) or *Gesneria pedunculosa* (Figure 1*i*). No floral odor is apparent, but the resin produced by *Gesneria* sometimes has a fruity odor which may act as the attractant. Abundant nectar nearly fills the drab-colored to green corolla. The stamens and stigma appear oriented to touch the top of the head, rostrum, or nose leaf of the animal (Figure 22*a,b*). Much more pollen is produced by these species than by those pollinated by birds. One or two anthers of *Gesneria calycosa* (probably bat pollinated) contain as much pollen as about 50 anthers of *G.*

acaulis (probably hummingbird pollinated). The stigma is enlarged and may make greater contact with the bat's head.

The habit of a bat-pollinated plant is usually fruticose or arborescent, bringing the flowers high above the ground where bats commonly fly. Reports of flower-feeding bats, *Monophyllus redmani*, being observed to "settle on walls low down" (Osburn, 1865) or caught in ground-level nets (Tamsitt, 1967) suggest that some bats are able to visit flowers at or near ground level. *Gesneria pumila* and other species of short stature commonly grow on rock ledges, making the plants as accessible to flying mammals as those with a taller habit.

Eighteen species and subspecies of flower-feeding bats are known from the West Indies (Hall and Kelson, 1959; Schwartz and Jones, 1967; McNab, 1971); from these, fifteen may be potential pollinators for *Gesneria* species. In Table 6 there are listed potential bat pollinators from each of the islands, critical measurements of bat heads, and species of *Gesneria* which have corollas corresponding to the size and shape of the bat head. Two species of bats are illustrated in Figure 22*a,b*.

FIGURE 22.—Bats with flowers they may visit and pollinate: *a*, specimen of *Brachyphylla cavernarum* posed with *Gesneria calycosa* to show relative size of bat's head and flower (note contact of anthers with top of bat's head); *b*, specimen of *Glossophaga soricina antillarum* posed with *Rhytidophyllum tomentosum* (arrow points to contact of nose leaf with anthers).

All of the major islands of the Greater Antilles have species of *Gesneria* that could be bat pollinated. Of the four largest islands, Jamaica has the largest number of these forms, as well as the largest number of extant bat species. This fact may reflect the opinion of Koopman and Williams (1951) that Jamaica was "a way station on the road to invasion of the West Indies" and that in the Greater Antilles bat pollination may have developed first in Jamaica and spread to the other islands by land bridges in the geologic past. In a later article, Koopman (1958) suggests that the poorer total representation of bats in the Greater Antilles, as compared to the American continents and their nearby islands, is the result of a combination of water gaps and environmental restriction.

Although most of the Antilles have been above sea level since the Late Miocene-Early Pliocene (Schuchert, 1935), Walker (1968) states that the family Phyllostomidae appeared no earlier than the Pleistocene. According to Allen (1939), fossil deposits containing remains of bats in the West Indies are no older than the late Pleistocene, although fossil bats can be found in European deposits dating back to the Eocene. Some members of the flower-feeding bat genera are now known only as subfossils. Allen suggests that the disappearance of some of the taxa within the past century or more may be due to human habitation and forest destruction.

Pollen dissemination in *Gesneria* is more likely dependent on the advanced mechanisms of hummingbird and bat pollination to achieve cross-breeding within populations than upon pollination by insects. Evidence to prove this hypothesis can be found in the characters of these tropical organisms. Although evidence has been given to show the likelihood of hummingbird and bat pollination, only direct observation can prove the existence of such mechanisms.

TABLE 6.—Potential bat pollinators (Phyllostomidae) and *Gesneria* species in the West Indies

Island	Bat species and subspecies	Mean head width at eyes (in cm)	Mean rostrum length: eye to noseleaf (in cm)	Gesneria species	Corolla tube (means, in cm) Width (at mouth)	Length
Cuba	Brachyphylla nana	1.0	1.1	G. shaferi	1.0	1.1
	Erophylla sezekorni sezekorni	0.8	0.9	G. viridiflora subsp. viridiflora	1.0	1.2
	Monophyllus redmani clinedaphus	0.8	0.9	G. gloxinioides	0.8	1.3
	Phyllonycteris poeyi	1.0	0.8	G. viridiflora subsp. viridiflora	1.0	1.2
Hispaniola	Brachyphylla pumila	1.2	1.0	G. fruticosa	1.8	1.8
	Erophylla bombifrons santacristobalensis	0.8	0.8	G. viridiflora subsp. quisqueyana	1.0	1.2
	Monophyllus redmani clinedaphus	0.8	0.9	G. viridiflora subsp. quisqueyana	1.0	1.2
Jamaica	Erophylla sezekorni syops	0.8	0.9	G. pumila subsp. mimuloides	0.7	1.2
	Brachyphylla pumila	1.2	1.0	G. clandestina	2.0	2.1
	Glossophaga soricina antillarum	0.9	0.8	G. exserta	1.2	1.5
	Monophyllus redmani redmani	0.8	0.9	G. pumila subsp. neglecta	0.7	1.2
	Phyllonycteris aphylla	1.3	1.1	G. calycosa	1.4	1.8
Puerto Rico	Brachyphylla cavernarum	1.3	1.2	G. viridiflora subsp. sintenisii	1.2	1.2
	Erophylla bombifrons bombifrons	0.8	0.8	G. pedunculosa	1.0	1.5
	Monophyllus redmani portoricensis	0.6	0.8	G. pedunculosa	1.0	1.5

METHODS OF SEED DISPERSAL IN *Gesneria*

Coevolution for the dispersal of fruits and seeds has occurred among many plants and animals (Stebbins, 1971), although perhaps not to any great degree in *Gesneria*. The fruit is a dry capsule containing very small, numerous, reddish-brown to black, twisted seeds. Three methods for dispersing the seeds of *Gesneria* may be important.

1. Transport by animals. Large animals would be only incidental carriers of seeds, but invertebrates may be important. Because ants find the seeds of other members of the Gesneriaceae attractive and may aid in dissemination (Stearn, 1969), myrmecochory or dispersal by ants is suspected. Stebbins (1971) enumerated the structural modifications found in ant-dispersed species: (a) the inflorescences are near the ground. This character is common among the acaulescent species, such as *Gesneria acaulis, G. cuneifolia, G. pumila,* and others; (b) the peduncle is recurved at maturation. This arching of the peduncle places the capsule near the ground and is noticeable particularly in *Gesneria pumila* subsp. *neglecta;* (c) the capsules dehisce irregularly over a long period of time; and (d) the seeds may bear an elaiosome or fat-bearing appendage. This last structural modification is not well developed in *Gesneria,* but the funicle of the seed is occasionally enlarged or elongated (Figure 19*d,f,h*) and may be attractive to ants. Depending upon the adaptations it seems likely that for acaulescent species of *Gesneria* growing in tropical forests, myrmecochory may be a major means of dispersal. Stebbins (1971) concludes that for herbs in forests, ant dispersal is one of the most effective means of dissemination.

2. Dispersal by water. Plants of *Gesneria reticulata, G. humilis* (Figure 1*a*), and *G. pauciflora* usually grow in or near running water and often show signs of inundation. If a plant with open capsules were submerged or shaken to allow the seeds to fall on the surface of the water, the seeds might be carried downstream to a new locality. Not only seeds, but also whole plants caught in a floating mat of vegetation might be distributed

this way. Capsules of the species mentioned above dehisce so that the open fruit is oriented vertically to become a splash cup, a structure heretofore found only in a few flowering plants, e.g., *Mitella* (Saxifragaceae) and *Sagina* (Caryophyllaceae)—but analogous to the gemmae cups in *Marchantia* and to structures that function in the dissemination of spores in the Nidulariales or bird's nest fungi. During heavy rains or near waterfalls, drops of water may fall into the capsule with such force as to eject the seeds, a phenomenon called "rain-ballists" by van der Pijl (1969). In the splash of a waterfall in the Dominican Republic, I observed plants of *Gesneria reticulata* with this type of dispersal mechanism operating. One plant had within its open capsules seedlings that had germinated in the humid atmosphere and were being washed out of the capsule by the spray of the waterfall and carried downstream.

3. Dispersal by wind. This method is especially important for those species that grow on dry cliffs or at forest margins. The dry capsules dehisce from the apex and often invert during maturation to spill out the seeds like a salt shaker, the "censer-mechanism" (van der Pijl, 1969). The capsules have enlarged ribs or costae that catch currents of air to shake the capsules, sifting out the seeds. The wide persistent sepals also may catch air currents. A wind strong enough to move the capsule would likely carry the seeds as "wind-ballists" for some distance from the parent plant.

The wind-dispersal method may explain in part long-distance distribution of species in the tribe Gesnerieae. Such dispersal over a wide geographic range is not common; only a few species range over more than one island: i.e., *Gesneria reticulata* (Puerto Rico, Hispaniola, and Cuba); *Gesneria humilis* (Hispaniola and Cuba); *Rhytidophyllum tomentosum* (Cuba and Jamaica); *Rhytidophyllum auriculatum* (Puerto Rico and Hispaniola). There are, in addition, a number of groups of closely related species distributed among the islands: e.g., *Gesneria christii* in Haiti, *G. acaulis* in Jamaica, and *G. purpurascens* in Cuba; *G. pumila* in Jamaica and *G. shaferi* subsp. *depressa* in Cuba; *G. pedicellaris* in the Dominican Republic and *G. libanensis* in Cuba.

These distributions may be explained in either of two different ways: (1) The plants we see today may be relicts of a more extensive range in the geologic past. This seems unlikely, for the species appear to be relatively young in geologic time and undergoing relatively rapid evolution. (2) The range existing at the present time may be due to transport by air currents in recent times by tropical storms or hurricanes. Stebbins (1971) states, "the incidence of strong winds is erratic and unpredictable, so that they may or may not occur when seeds are ripe and ready to be transported. Furthermore, the direction of winds is variable and they tend to scatter seeds over a large territory, including both favorable and unfavorable habitats." Hurricanes occur in the West Indies with annual regularity and their tracks are usually in a northwesterly direction. Stebbins also notes that if the fruit and seeds are very small, long distances can be covered from the parent plant. And such is the case in the Gesnerieae. The small seeds of *Gesneria reticulata,* for example, could possibly travel the air currents of a tropical storm from Puerto Rico to Hispaniola and then to Cuba.

Long-distance transport of seeds by wind may occur more frequently than we realize, but the results are not evident due to the limited success of the immigrant plants whose environmental requirements are not being met in the new habitats. According to Ashton (1969), "In the tropics . . ., ground herbs appear little adapted to environmental, at least edaphic, variation, though isolation of small morphologically distinct populations is common in many groups, as the Gesneriaceae."

Of the three dispersal mechanisms suggested—transport by animals, water, and wind—the first two are likely means for short-distance dispersal, but the third method is the only one feasible for long-distance distribution. Wind dispersal, if coupled with a possible capacity for self-pollination and environmental adaptation, may account for the distribution of some of the species of *Gesneria.*

Hybridization and Cytology

Cytology reveals chromosomal characters within the cell, while hybrid studies may reveal genetic relationships not apparent in the parent species or may identify barriers that prevent hybrid production. Cytological studies in the Gesnerieae will be reviewed in relation to hybridization experiments, and mechanisms will be suggested that may account for evolution in the tribe.

Materials and Methods

Living plants for study were obtained from many sources and added to the collection of Gesneriaceae already in cultivation in the greenhouses of the L. H. Bailey Hortorium: (1) seeds and cuttings were obtained during a plant collecting trip to the West Indies in 1970; (2) cuttings were received from the living collections at the Royal Botanic Garden, Edinburgh, Scotland; the Royal Botanic Gardens, Kew, England; Fairchild Tropical Garden, Miami, Florida; and from the U.S. National Arboretum, Washington, D.C.; (3) seeds and plants were obtained from the seed fund and members of the American Gloxinia and Gesneriad Society. Voucher specimens of materials are filed in the herbarium of the L. H. Bailey Hortorium, Cornell University.

Environmental factors play a large role in the success of species and hybrids in the greenhouse or in nature. To attempt to find the ideal conditions or to simulate the natural conditions, a variety of temperature, substrate, and humidity regimes was tried. Plants were grown in the greenhouse at the L. H. Bailey Hortorium in each of two temperature ranges (55–70°, 65–75°). A few plants were also grown in a greenhouse at Guterman Bioclimatic Laboratories of Cornell University where they received a higher light intensity and lower humidity. The standard substrate was "Cornell Epiphytic Mix" formulated by R. Mott (1972). Because many of the species in the wild grow on calcareous soil, calcium nitrate and chelated iron were added occasionally to the substrate (Skog, 1972b).

Crosses were made in the greenhouse using fresh pollen or stored pollen prepared in the method recommended by Clayberg (1964). Pollen viability was tested by staining a small quantity of fresh pollen on a slide with either cotton blue in lactophenol or acetocarmine. (The latter stain used by R. E. Lee proved to be more reliable.) One thousand grains were counted to determine percent stainability.

Seeds developed in two to five months. Because of the suspected poor viability of hybrid seed, germination was attempted soon after dehiscence of the capsule.

Results of Hybridization Experiments

Artificial hybrids can be obtained with relative ease in the Gesnerieae under cultivation. Apparently active isolation mechanisms prevent widespread hybridization in the wild. Putative natural hybrids do occur, however, in rare instances. Two natural hybrids have been collected in Jamaica and brought into cultivation (*Gesneria scabra* var. *sphaerocarpa* × *Rhytidophyllum tomentosum* and *Gesneria acaulis* var. *glabrata* × *Rhytidophyllum tomentosum*). The latter hybrid has been collected in a few different localities in Jamaica and was considered a distinct species in *Gesneria* by Adams (1972).

In the greenhouse I attempted about 240 crosses, including intergeneric crosses between *Gesneria* and *Rhytidophyllum,* interspecific crosses within each genus, backcrosses of the hybrids to the parents, reciprocal crosses by alternating pollen and seed parents, and crosses between hybrids. Only 12 crosses resulted in viable seed, producing plants that survive today. These plants were added to the stock of hybrids produced by Wiehler, Katzenberger, and others already in cultivation in the greenhouses at Cornell University. Twenty-nine hybrid forms are now known. The most recent crosses have not yet flowered; statements made about morphology are derived from the few that have flowered. Crosses attempted and results obtained are listed in Tables 7 and 8.

In general, interspecific hybrids at the F_1 stage are intermediate in morphology between parents; however, intergeneric crosses reveal the following:

1. Crosses between plants with campanulate corollas and those with nearly cylindric corollas result in hybrids with nearly cylindric corollas (Figure 1*j*), implying that genes for the nearly cylindric corolla dominate. Crosses between two species with campanulate corollas, e.g., *Gesneria fruticosa* × *Rhytidophyllum tomentosum* yield forms with a campanulate corolla but intermediate in color and vestiture.

2. Offspring are, in general, more vigorous in growth, taller, and more erect than either parent. During the extended flowering season more flowers are produced. Hybrids, however, appear to be more sensitive to some environmental stresses than the parents, suggesting inherent hybrid weakness.

3. Leaf shapes of intergeneric hybrids tend to

TABLE 7.—Hybrids and parentage

Hybrid G-number	Seed Parent G-number	Seed Parent name	Pollen Parent G-number	Pollen Parent name
1240	876	Gesneria acaulis var. glabrata	940	Gesneria ventricosa subsp. ventricosa
1230	876	G. acaulis var. glabrata	908	Rhytidophyllum auriculatum
1238	877	G. acaulis var. acaulis	940	G. ventricosa subsp. ventricosa
1237	888	G. citrina	876	G. acaulis var. glabrata
1236	888	G. citrina	767	G. pedunculosa
1235	888	G. citrina	940	G. ventricosa subsp. ventricosa
1241	857	G. cuneifolia	940	G. ventricosa subsp. ventricosa
1249	897	G. reticulata	908	R. auriculatum
1239	898	G. pedicellaris	767	G. pedunculosa
1245	898	G. pedicellaris	942	G. viridiflora subsp. quisqueyana
1231	898	G. pedicellaris	883	R. grande
1406	767	G. pedunculosa	1037	G. calycosa
1405	767	G. pedunculosa	940	G. ventricosa subsp. ventricosa
1233	767	G. pedunculosa	765	R. auriculatum
1418	767	G. pedunculosa	1257	R. berteroanum
1421	767	G. pedunculosa	883	R. grande
1420	1034	G. pulverulenta	1226	G. pedicellaris
1036*		G. scabra var. sphaerocarpa		R. tomentosum
1402	1256	Rhytidophyllum auriculatum	1257	R. berteroanum
1404	1256	R. auriculatum	1260	R. auriculatum
1419	1257	R. berteroanum	767	G. pedunculosa
1403	1257	R. berteroanum	905	R. auriculatum
1398	1257	R. berteroanum	841	R. tomentosum
1232	1010	R. leucomallon	767	G. pedunculosa
1234	1010	R. leucomallon	883	R. grande
1401	841	R. tomentosum	767	G. pedunculosa
1399	1381	R. tomentosum	1256	R. auriculatum
1371*		R. tomentosum		G. acaulis
1384#		R. tomentosum		G. fruticosa

* = putative natural hybrid.
# = cross made by R. Katzenberger.

TABLE 8.—Unsuccessful crosses

Potential seed parent, G-number*	Potential pollen parents, G-number*
763	767, 1037
767	784, 841, 1034
769	767, 841, 1034, 1037 (2), 1256, 1257, 1381
784	767, 1037, 1257
841	940, 1036, 1037, 1256, 1257
857	767, 881
869	767, 1037
876	767, 841, 883, 1037, 1256 (2), 1361, 1381
877	841
881	767, 841, 1256
883	841, 876, 1034, 1037, 1256, 1257, 1381
888	1037, 1381
897	1381
898	1034 (2), 1037, 1245, 1256, 1381
903	940, 1037
905	767, 883, 940, 1037 (2)
907	1037
908	1257, 1260
940	767, 841, 883
942	903
1008	1037
1034	767 (2), 769, 883, 897 (2), 940, 1037 (2), 1256, 1257 (2), 1260, 1365, 1380
1036	841, 1037, 1257, 1260
1037	767, 841 (2), 876, 883, 903, 905, 1257, 1268
1066	841, 903, 905
1226	767 (2), 841, 881 (2), 940, 1037 (2)
1231	841
1235	767, 1256
1236	767
1238	841
1239	767, 1256
1240	876, 940
1244	767
1245	767, 898
1249	897, 1037, 1260
1256	767 (2), 769, 841, 883, 1034, 1037, 1260
1257	767, 876, 883 (2), 903, 940, 1034, 1037, 1256, 1365, 1381
1260	767, 940, 1037, 1256
1268	841 (2), 1037, 1257
1360	841
1361	767, 1037
1365	765, 767 (2), 769 (2), 784, 841, 876 (2), 883, 897, 940, 1034 (4), 1036, 1037 (3), 1226, 1256, 1257
1381	767, 841, 876, 940, 1034, 1037, 1260

* Refer to Table 9 for species name of G-number.
() = number of attempts more than one.

resemble more those of the *Rhytidophyllum* parent, i.e., narrowly lanceolate, very elongated, areolate with prominent veins.

4. The numerous inflorescences far exceed in length the subtending leaves, a common trait in *Rhytidophyllum*.

5. Internodes are elongated even more than the normally elongate internodes in *Rhytidophyllum*, but are less hirsute and with the erumpent lenticels found in *Gesneria*.

6. Pollen stainability, a test for viability and fertility, is very low, from less than 1 percent (*Gesneria acaulis* var. *glabrata* × *Rhytidophyllum tomentosum*) to 35 percent (*Gesneria scabra* var. *sphaerocarpa* × *Rhytidophyllum tomentosum*). Pollen stainability in interspecific hybrids ranges from 0–66 percent.

At the present time neither backcrosses to parents nor crosses between hybrids have produced seeds, suggesting that low-pollen viability or chromosomal anomalies may prevent fertilization. In vegetative morphology, reciprocal crosses appear similar; none have yet flowered. Crosses with *Gesneria humilis* or *Pheidonocarpa corymbosa* as either the pollen or seed parent have failed.

Discussion of Cytology and Hybridization

Until 1969 a haploid number of 14 chromosomes was believed to be the base number in the Gesnerieae; however, Nevling (1969) reported a count of $n = 7$ in a plant of *Gesneria viridiflora* subsp. *sintenisii*. This report leads one to suspect that seven chromosomes in each gamete is the basic number and that those plants with a haploid number of 14 are tetraploids.

Polyploids are considered rare in the American members of the Gesneriaceae (Wiehler, 1972); only 18 tetraploids have been determined from 193 species in 37 genera. In flowering plants as a group, however, polyploidy is believed to occur in 30–35 percent of the species (Stebbins, 1950) or up to 43 percent (Grant, 1963).

The first chromosome count of a plant in the

Gesnerieae was made in 1956 by Eberle, who demonstrated that in *Gesneria tomentosa* L. (=*Rhytidophyllum tomentosum*) $n = 14$. Since then chromosome counts of many species have been determined by R. E. Lee (1964, 1966a, 1966b, 1968). The only other number differing from $n = 14$ was $n = 28$ in a collection of *Gesneria cuneifolia*, which Lee (1964) considered a tetraploid.

Grant (1963) suggested that a haploid number of 7, 8, or 9 chromosomes is basic in angiosperms. He concluded that plants with a gametic number of 14 or more may be considered polyploids. In the Gesneriaceae, counts of $n = 8$ or $n = 9$ have been reported many times, as well as a few counts of $n = 16$ or n = 18 and others, but $n = 7$ is known at the present time only from *Gesneria viridiflora* subsp. *sintenisii*.

According to Grant (1971) the promotion of polyploidy in a group of plants results from a combination of factors: (1) the plants are "long-lived organisms usually possessing means of vegetative propagation"; (2) original speciation in the genera was accompanied by a repatterning of the genes in the chromosome; and (3) natural interspecific hybridization is a common occurrence. Plants in the Gesnerieae fit the first factor, for they are woody-stemmed plants apparently capable of surviving for many years and propagating vegetatively. The second factor is unknown in Gesneriaceae and cannot be determined without detailed knowledge of the gene patterns in chromosomes. Interspecific hybridization, however, is likely. Since only putative tetraploid artificial interspecific hybrids are known, one cannot judge the relative occurrence of natural diploid interspecific hybrids. Perhaps, these hybrids resembled one of the parents to such a degree that they were indistinguishable in the diploid condition. Possibly only after doubling of the chromosomes did the differences become evident. Interspecific diploid hybrids may have occurred with considerable frequency in the past; one can assume that if hybridization can occur at all, it should have occurred frequently relative to geologic time. If two intergeneric hybrids (which may be produced with more difficulty than hybrids between species in the same genus) can occur in our time and be seen readily, interspecific hybrids should have been readily obtainable in the past.

According to Lewis (1966), in some members of the Scrophulariaceae the diploid species tend to be self-incompatible and the natural polyploid species self-compatible. If this is also true in the Gesneriaceae and in the tribe Gesnerieae, the polyploid species may have had reproductive advantage over the diploids and because of heterosis may have been ecologically superior and able to spread to niches not open to diploid species. Stebbins (1950) writes that polyploids are well adapted for colonizing newly exposed habitats. Observation of plants in the field suggests that most *Rhytidophyllum* species and perhaps *Gesneria exserta* and *G. pedunculosa* do adapt to new areas readily.

Systematic Treatment

The tribe Gesnerieae consists of approximately 67 species in three genera, of which *Gesneria* and *Pheidonocarpa* will be treated in detail here. For completeness, however, a key is given to distinguish the genera within the tribe.

The 46 herbaria whose collections were made available to me are abbreviated as given by Holmgren and Keuken (1974), except for one not included in the sixth edition of *Index Herbariorum*, RDJ—private herbarium of Dr. José Jiménez, Santiago de los Caballeros, Dominican Republic.

Tribe GESNERIEAE

Tribe Gesnerieae, G. Don, Gen. Syst. 4:643–644, 1838.—DC., Prodr. 7:525, 1839.—Fritsch *in* Engl. & Prantl, Nat. Pflanzenfam. 4 (3b):183, 1894.

Gesnerieae subtribe Conradieae G. Don, Gen. Syst. 4:644, 1838. [Type-genus: *Conradia* Martius.]

Eugesnereae Endlicher, Gen. Pl. 721, 1839.

Gesnereae subtribe Rhytidophylleae Hanstein, Linnaea 26: 199, 204–205, 1854 [pro parte]. [Type-genus: *Rhytidophyllum* Martius.]

Rhytidophylleae Ørsted, Cent. Gesn. 10, 1858 ["Rytidophylleae"] Hanst., Mart. Fl. Bras. 8 (1):394, 1864. [Type-genus: *Rhytidophyllum* Martius.]

Gesnereae subtribe Pentarhaphieae Bentham *in* Bentham & Hooker, Gen. Pl. 2:993, 1876. [Type-genus: *Pentarhaphia* Lindley.]

Fibrous rooted, acaulescent perennial herbs, subshrubs to trees: stems woody, usually resinous.

Leaves alternate and spiral or opposite and decussate, sessile or petiolate, "pseudo-stipules"

TABLE 9.—Plants studied from living material

G-number	Taxon	Area of Origin
763	Gesneria cuneifolia	Puerto Rico
765	Rhytidophyllum auriculatum	Puerto Rico
767	G. pedunculosa	Puerto Rico
769	G. pauciflora	Puerto Rico
784	G. reticulata	Puerto Rico
841	R. tomentosum	Jamaica
857	G. cuneifolia	Puerto Rico
869	G. cuneifolia	Puerto Rico
874	G. pumila subsp. pumila	Jamaica
875	G. pumila subsp. neglecta	Jamaica
876	G. acaulis var. glabrata	Jamaica
877	G. acaulis var. acaulis	Jamaica
881	G. scabra var. sphaerocarpa	Jamaica
883	R. grande	Jamaica
888	G. citrina	Puerto Rico
897	G. reticulata	Dominican Republic
898	G. pedicellaris	Dominican Republic
901	G. exserta	Jamaica
902	G. viridiflora subsp. sintenisii	Puerto Rico
903	G. viridiflora subsp. quisqueyana	Dominican Republic
905	R. auriculatum	Dominican Republic
907	R. auriculatum	Dominican Republic
908	R. auriculatum	Dominican Republic
909	R. auriculatum	Dominican Republic
924	R. auriculatum	Haiti
940	G. ventricosa subsp. ventricosa	St. Kitts
942	G. viridiflora subsp. quisqueyana	Dominican Republic
1008	G. christii	Haiti
1010	R. leucomallon	Haiti
1034	G. pulverulenta	Dominican Republic
1035	G. fruticosa	Dominican Republic
1036	G. scabra var. sphaerocarpa X R. tomentosum	Jamaica
1037	G. calycosa	Jamaica
1066	R. auriculatum	Dominican Republic
1067	R. auriculatum	?
1226	G. pedicellaris	Dominican Republic
1230	G. acaulis var. glabrata (876) X R. auriculatum (908)	*
1231	G. pedicellaris (898) X R. grande (883)	*
1232	R. leucomallon (1010) X G. pedunculosa (767)	*
1233	G. pedunculosa (767) X R. auriculatum (765)	*
1234	R. leucomallon (1010) X R. grande (883)	*
1235	G. citrina (888) X G. ventricosa subsp. ventricosa (940)	*
1236	G. citrina (888) X G. pedunculosa (767)	*
1237	G. citrina (888) X G. acaulis (876)	*
1238	G. acaulis var. acaulis (877) X G. ventricosa subsp. ventricosa (940)	*
1239	G. pedicellaris (898) X G. pedunculosa (767)	*
1240	G. acaulis var. glabrata (876) X G. ventricosa subsp. ventricosa (940)	*
1241	G. cuneifolia (857) X G. ventricosa subsp. ventricosa (940)	*
1244	G. cuneifolia	?
1245	G. pedicellaris (898) X G. viridiflora subsp. quisqueyana (942)	*
1248	G. ventricosa subsp. ventricosa	?
1249	G. reticulata (897) X R. auriculatum (908)	*
1256	R. auriculatum	Dominican Republic
1257	R. berteroanum	Dominican Republic
1260	R. auriculatum	Dominican Republic
1265	R. auriculatum	Dominican Republic
1268	R. auriculatum	Dominican Republic
1355	R. leucomallon	?
1360	G. cuneifolia	Puerto Rico
1361	G. pauciflora	Puerto Rico
1362	G. viridiflora subsp. sintenisii	Puerto Rico
1363	G. ventricosa subsp. ventricosa	Dominica
1364	G. pedicellaris	Dominican Republic
1365	G. humilis	Haiti
1366	G. haitiensis	Haiti
1367	Pheidonocarpa corymbosa	Jamaica
1368	G. clandestina	Jamaica
1369	G. exserta	Jamaica
1370	G. harrisii	Jamaica
1371	R. tomentosum X G. acaulis	Jamaica
1372	R. auriculatum	Dominican Republic
1373	R. berteroanum	Dominican Republic
1374	G. reticulata	Dominican Republic
1375	R. auriculatum	Dominican Republic
1379	G. fruticosa	Haiti
1380	G. pumila subsp. pumila	Jamaica
1381	R. tomentosum	?
1384	R. tomentosum X G. fruticosa	cross by R. Katzenberger
1385	R. tomentosum	Jamaica
1395	G. pedicellaris	?
1398	R. berteroanum (1257) X R. tomentosum (841)	*
1399	R. tomentosum (1381) X R. auriculatum (1256)	*
1400	G. jamaicensis	Jamaica
1401	R. tomentosum (841) X G. pedunculosa (767)	*
1402	R. auriculatum (1256) X R. berteroanum (1257)	*
1403	R. berteroanum (1257) X R. auriculatum (905)	*
1404	R. auriculatum (1256) X R. auriculatum (1260)	*
1405	G. pedunculosa (767) X G. ventricosa subsp. ventricosa (940)	*
1406	G. pedunculosa (767) X G. calycosa (1037)	*
1418	G. pedunculosa (767) X R. berteroanum (1257)	*
1419	R. berteroanum (1257) X G. pedunculosa (767)	*
1420	G. pulverulenta (1034) X G. pedicellaris (1226)	*
1421	G. pedunculosa (767) X R. grande (883)	*
1453	G. viridiflora subsp. quisqueyana	?
1454	G. pumila subsp. pumila	?
1476	R. auriculatum	Dominican Republic

* = hybrid of greenhouse origin. ? = plant obtained from horticultural source, locality unknown.

SPECIES IN ALPHABETICAL ORDER WITH G-NUMBERS; HYBRIDS FOLLOWING

Gesneria acaulis var. acaulis 877
G. acaulis var. glabrata 876
G. calycosa 1037
G. christii 1008
G. citrina 888
G. clandestina 1368
G. cuneifolia 763, 857, 869, 1244, 1360
G. exserta 901, 1369
G. fruticosa 1035, 1379
G. haitiensis 1366
G. harrisii 1370
G. humilis 1365
G. jamaicensis 1400
G. pauciflora 769, 1361
G. pedicellaris 898, 1226, 1364, 1395
G. pedunculosa 767
G. pulverulenta 1034
G. pumila subsp. neglecta 875
G. pumila subsp. pumila 874, 1380, 1454
G. reticulata 784, 897, 1374
G. scabra var. sphaerocarpa 881
G. ventricosa subsp. ventricosa 940, 1248, 1363
G. viridiflora subsp. quisqueyana 903, 942, 1453
G. viridiflora subsp. sintenisii 902, 1362
Pheidonocarpa corymbosa 1367
Rhytidophyllum auriculatum 765, 905, 907, 908, 909, 924, 1066, 1067, 1256 1260, 1265, 1268, 1372, 1375, 1476
R. berteroanum 1257, 1373
R. grande 883
R. leucomallon 1010, 1355
R. tomentosum 841, 1381, 1385
G. acaulis var. glabrata (876) X G. ventricosa subsp. ventricosa (940) 1240
G. acaulis var. glabrata (876) X R. auriculatum (908) 1230
G. acaulis var. acaulis (877) X G. ventricosa subsp. ventricosa (940) 1238
G. citrina (888) X G. acaulis var. glabrata (876) 1237
G. citrina (888) X G. pedunculosa (767) 1236
G. citrina (888) X G. ventricosa subsp. ventricosa (940) 1235
G. cuneifolia (857) X G. ventricosa subsp. ventricosa (940) 1241
G. pedicellaris (898) X G. pedunculosa (767) 1239
G. pedicellaris (898) X G. viridiflora subsp. quisqueyana (942) 1245
G. pedicellaris (898) X R. grande (883) 1231
G. pedunculosa (767) X G. ventricosa subsp. ventricosa (940) 1405
G. pedunculosa (767) X R. auriculatum (765) 1233
G. pedunculosa (767) X R. berteroanum (1257) 1418
G. pedunculosa (767) X R. grande (883) 1421
G. reticulata (897) X R. auriculatum (908) 1249
G. pulverulenta (1034) X G. pedicellaris (1226) 1420
G. scabra var. sphaerocarpa X R. tomentosum 1036
R. auriculatum (1256) X R. auriculatum (1260) 1404
R. auriculatum (1256) X R. berteroanum (1257) 1402
R. berteroanum (1257) X G. pedunculosa (767) 1419
R. berteroanum (1257) X R. auriculatum (905) 1403
R. leucomallon (1010) X G. pedunculosa (767) 1232
R. leucomallon (1010) X R. grande (883) 1234
R. tomentosum (841) X G. pedunculosa (767) 1401
R. tomentosum (1381) X R. auriculatum (1256) 1399
R. tomentosum X G. acaulis 1371
R. tomentosum X G. fruticosa 1384

occasionally present; petioles with a trace nearly cylindrical or U-shaped in cross section; blades dorsiventral, usually with a multiple epidermis.

Inflorescences modified compound dichasia or reduced to single flowers: peduncles elongated beyond the leaves or shorter; floral tube of fused bases of sepals, petals and stamens adnate to the inferior or subinferior ovary, turbinate to subspherical; calyx with 5 lobes free or briefly united or rarely connate for about half their length above the ovary; corolla tube cylindrical to campanulate, red, orange, yellow, brown, green, or white; fertile stamens usually 4, rarely 5, staminode usually 1, all adnate to the base of the corolla tube; ovary of 2 carpels, uniloculate, ovules numerous, each with a single integument, disc annular, often 5-lobed.

Capsule linear, obconic, turbinate or subglobose, slightly raised apically, or rostrate and rostrum exceeding the length of the floral tube, capsule opening by 2 or 4 valves; seeds numerous, fusiform, rhombic or linear.

Type-Genus.—*Gesneria* Linnaeus.

Chromosome Number.—$n = 7$, 14, or 28.

The concept of the tribe Gesnerieae has varied since its circumscription by George Don in 1838. Only after the circumscription by Fritsch in 1894, based on the characters of leaf arrangement, ovary position, and disc shape, was the tribe delimited to include *Gesneria* and *Rhytidophyllum* alone. In 1971, Wiehler transferred two species formerly in *Heppiella* to *Gesneria,* thereby including plants with opposite decussate leaves within the limits of the tribe. Since the two species appear to be more closely related to *Gesneria* and *Rhytidophyllum* than to any other genus or tribe, the limits of the Gesnerieae have been redefined.

The tribe Gesnerieae is here composed of three genera whose limits are determined by characters of habit, flowers, fruit, and foliage. Parallel evolution and adaptations to environment in all three genera may give the appearance of closer relationship than is real in nature. The corolla, in particular, has apparently become adapted to pollinating agents, presumably bats and hummingbirds. Parallel adaptation to the same pollinating organisms has resulted in corollas of similar morphology within the three genera.

Pheidonocarpa displays many morphological and anatomical features similar to *Gesneria* and *Rhytidophyllum* and has a gametic chromosome number ($n = 14$) common to many species of the other two genera. The genus, however, can be distinguished from *Gesneria* and *Rhytidophyllum* by its consistently opposite and decussate leaves and by its rostrate fruit. *Pheidonocarpa* resembles *Rhytidophyllum* in its compound dichasial inflorescence, but probably did not evolve from that genus but from an ancestral stock of opposite- and decussate-leaved plants which had developed, like species of *Gesneria* and *Rhytidophyllum,* a chromosome number of $n = 14$.

Gesneria and *Rhytidophyllum* appear closely related in floral characters, sometimes occupying similar niches and possibly utilizing the same pollinators. The genera cannot be distinguished as separate units by any single factor, but by a complex of correlated characters, primarily those related to reproduction, but reinforced by vegetative factors. *Gesneria* and *Rhytidophyllum* have traditionally been distinguished by the relative length of adnation of the filaments to the corolla tube; this trait does not hold in every case, but when correlated with foliage and fruit characters may determine the generic standing of a plant in these genera.

The natural habitats of *Rhytidophyllum, Gesneria,* and *Pheidonocarpa* may give clues to distinguish the genera. In the field, *Rhytidophyllum* species usually occupy marginal land at roadsides (Figure 1*b*), waste places, cliffs, and forest margins where the plants are exposed to full sun and wind. *Rhytidophyllum tomentosum* in Jamaica, *R. auriculatum* in the Dominican Republic, and *R. leucomallon* in Haiti (Figure 1*b*) could be called weeds or pioneer plants, for they occupy newly exposed soil often to the exclusion of other plants. Species of *Gesneria* are usually restricted to more protected locations along streams or waterfalls, on ledges or clefts in cliffs or banks, or grow in damp forests as understory shrubs. Species which grow in clearings and/or roadsides and are exposed to full sun are located in damp soil or produce many branches from the base whose shade may maintain a lower temperature at the soil level. *Gesneria citrina,* which grows in Puerto Rico on barren limestone cliffs, has long roots that penetrate into the porous substrate and has dead leaves that persist and may protect the stem from the sun.

The origin and evolution of the Gesnerieae is unknown. One may suggest an origin in northern

South America from a woody-stemmed, fibrous-rooted, opposite-leaved, hummingbird-pollinated ancestral line, perhaps similar to *Pheidonocarpa*. One probable early derivative in South America, *Gesneria onacaensis* Rusby (=*Rhytidophyllum*), displays many of the primitive characters mentioned above. From such a form two evolutionary lines may have developed in the directions of *Gesneria* and *Rhytidophyllum*. *Pheidonocarpa* may have maintained characters similar to the ancestors of the tribe. The spread of the ancestral plants from northern South America may have occurred via the routes and mechanisms discussed under Pollination and Seed Dispersal.

The close contact between the genera in their similar niches allows one to suspect occasional interchange of genes, through chance cross-pollination and fertilization and possibly rare back-crosses between parents and hybrid offspring. The possible interchange of genes is apparent in section *Duchartrea* of *Gesneria*. Members of this section resemble to a large degree a few species of *Rhytidophyllum* (*R. grande* (Swartz) Mart., *R. bicolor* Urban, etc.). Either convergent evolution is operating among these species or section *Duchartrea* may be more closely related to *Rhytidophyllum* than other sections in *Gesneria*.

Rhytidophyllum, consisting of about 20 species, inhabits the islands of Cuba, Jamaica, Hispaniola, Puerto Rico, and Grenada in the West Indies, and in northern South America, the countries of Colombia and Venezuela. The genus can be divided into two large groups on the basis of corolla shape, paralleling the primary division in *Gesneria*. *Rhytidophyllum* will not be treated further here.

The species included in the Gesnerieae are considered herein as biological species in the sense of Solbrig (1970:112), "a group of interbreeding populations reproductively isolated from any other such groups of populations." The species may also be distinguished morphologically by a series of correlated characters from any other species.

Reproductive isolation is the criterion for biological species. Species of *Gesneria* may hybridize in nature, but probably because of post-fertilization isolation mechanisms, the hybrids seldom develop and persist, allowing the species to remain distinctive in "their ecological and evolutionary roles" (Grant, 1971). Mechanisms for isolation that appear to be operating in *Gesneria* include some of those given by Banks (1970) and Solbrig (1970): (1) geographical separation, (2) ecological separation, (3) pollen incompatibility, (4) structural differences in flowers requiring specific pollinators, (5) different flowering times, (6) gametic incompatibility, (7) hybrid sterility, (8) hybrid weakness, and (9) lack of hybrid establishment.

The criterion for distinguishing subspecies within the species has been the presence of morphological variants appearing in two or more geographically distinct populations.

Some species of *Gesneria* have been divided into varieties because the plants are less morphologically distinct or geographically isolated than those taxa considered subspecies in other species.

Key to the Genera in Tribe Gesnerieae

1. Capsule rostrate, the rostrum curved, equaling or exceeding the length of the floral tube; leaves opposite and decussate, bases of petioles joined across the stem; Cuba and Jamaica ..... ***Pheidonocarpa,*** new genus
1. Capsule not beaked, if raised then the free portion not equaling or exceeding the floral tube; leaves alternate, rarely approximate, or appearing so on young or slowly growing branches, exceptionally opposite, but then petiole bases not joined across the stem.
   2. Costae absent on the capsule; capsule villous, seldom verrucose or glabrous (but sometimes glabrescent in age) and rarely with sepals over 1.2 cm long; filaments adnate to the base of the corolla tube for a distance greater than the basal thickness of the filament, except in *Rhytidophyllum cumanense;* leaves areolate, tomentose-hirsute, or rarely glabrescent, but then the corolla tubular and red ..... ***Rhytidophyllum***
   2. Costae present on the capsule, or the capsule verrucose or glabrous, but not villous unless the sepals are over 1.2 cm long (*Gesneria gloxinioides*); filaments adnate to the base of the corolla tube for a distance no greater than the basal thickness of the filament; leaves glabrous or scabrous to pilose, smooth, plane or rarely bullate ..... ***Gesneria***

Pheidonocarpa L. Skog, new genus

Gesneriae L. et *Rhytidophyllo* Mart. affinis, foliis oppositis decussatis et capsulis rostratis, rostro curvo tubum floralem aequante vel excedente differt.

Plants terrestrial, perennial, suffruticose, fibrous-rooted: stems woody, erect or decumbent.

Leaves opposite, decussate: petioles short, bases of opposite leaves joined across the stem, vascular trace an "invaginated crescent" (fide Wiehler); blades somewhat rigid, scabrous.

Inflorescences axillary, each a compound dichasium: peduncles much exceeding the subtending leaves; flowers numerous, protandrous, zygomorphic; floral tube turbinate, pilose; calyx lobes 5, briefly connate at base; corolla tube ventricose, limb 5-lobed; stamens 4, filaments adnate to base of corolla tube, but free above, anthers coherent or free, exserted at anthesis; ovary half-inferior, disc annular, 5-lobed.

Capsule turbinate, pilose, dry, splitting into two valves from the curved rostrate apex; seeds numerous, minute, fusiform, striated.

Type-Species.—*Pheidonocarpa corymbosa* (Swartz) L. Skog.

Discussion.—Until now the tribe Gesnerieae has included only the two closely related genera, *Gesneria* Linnaeus and *Rhytidophyllum* Martius, which are similar in having leaves arranged alternately, roots fibrous, ovaries inferior, chromosome numbers of usually $n = 14$, and being limited to the Caribbean region and northern South America.

In 1788, Olof Swartz described among his new species of *Gesneria* a new plant from Jamaica, *Gesneria corymbosa,* later transferred by Urban (1901) to *Heppiella* Regel. In 1957, C. V. Morton described from Cuba another species, *Heppiella cubensis.* All other species of *Heppiella* are known only from South America where their apparent center of distribution is from Colombia to Ecuador. Recognizing the apparent disjunct distribution, Wiehler (1971) removed *Heppiella corymbosa* and *H. cubensis* from the rest of *Heppiella,* citing as additional reasons: (1) the lack of scaly-rhizomes as are found in the South American species of *Heppiella;* (2) a chromosome number of $n = 14$ (Lee, 1966), unknown in the tribe Achimeneae where other species of *Heppiella* reside; (3) the stomata of abaxial leaf surfaces are grouped into "islands," also unknown in other members of the tribe Achimeneae; and (4) the vasculature pattern of the petiole differs from other species of *Heppiella.*

Wiehler, however, transferred the two West Indian species to *Gesneria,* citing as evidence (in addition to the similar chromosome number, petiole vascular pattern, stomatal arrangement, and fibrous roots) the occurrence of apparently opposite, decussate leaves on a single plant of a species of *Gesneria* in cultivation. I concur with Wiehler's decision to exclude the West Indian *Heppiella* species from the continental species. But his decision to unite the plants with *Gesneria* cannot be accepted, particularly on the basis of the leaf arrangement.

Truly opposite and decussate leaves are not known for any species of *Gesneria* or *Rhytidophyllum,* except for the apparently aberrant form examined by Wiehler. This phenomenon is discussed under "Morphology and Anatomy."

Other characters besides leaf arrangement that distinguish species of *Gesneria* from *Pheidonocarpa* are listed in Table 1, but notably the most important are the differences in crystal types, inflorescence form, ovary position, and length of capsule beak.

Because of the similarities of the West Indian species formerly in *Heppiella* to the members of the tribe Gesnerieae, the concept of the tribe has been emended to include plants with opposite decussate leaves and flowers with half-inferior ovaries, but these species are retained in a separate genus within the Gesnerieae.

The name *Pheidonocarpa* is derived from the Greek *pheidon* (= oilcan) + *karpos* (= fruit), alluding to the shape of the fruit.

Only one species of *Pheidonocarpa* with two subspecies is known.

1. *Pheidonocarpa corymbosa* (Swartz) L. Skog, new combination

Subshrubs: stems and branches to 60 cm long, 2–6 mm in diameter, bark reddish and pubescent, pilose to arachnoid when young, becoming gray and glabrescent with age, internodes 0.6–4.0 cm long, apex somewhat resinous, nodes swollen, developing interpetiolar ridges.

Leaves opposite: petioles sulcate to terete, sub-

sessile or to 11 mm long, 1–2 mm across, reddish to green, pubescent with glandular or eglandular 1- to many-celled hairs; blades ovate to elliptic, 3.6–8.7 cm long, 1.6–4.7 cm wide, base subcordate, truncate to acute, margin serrate to crenate-dentate, apex acute, adaxial surface grayish green, scabrous from calcium-containing cells in the bases of the hairs, abaxial surface lighter green, pubescent with short dense trichomes, with some glandular trichomes on veins, veins prominent, stomata in distinct groups.

Inflorescences of many flowers, in a somewhat condensed compound dichasium: peduncles terete, 10.8–35.0 cm long, red, pubescent; bracts at the apex of the peduncles, lanceolate, 2–4 mm long, ca 1 mm wide, green, pubescent; pedicels 0.4–1.6 cm long; floral tube turbinate, 1–2 mm long, 1–3 mm in diameter, reddish, glandular-pubescent; calyx lobes spreading, triangular, connate at base for less than 1 mm, 1–4 mm long, green to reddish and pubescent with glandular and eglandular trichomes outside, green and pubescent inside, veins not evident; corolla tube curved, ventricose, slightly gibbous at base, 1.4–2.1 cm long, 2–4 mm wide at base, outside dark red-orange to yellow, pubescent, glandular, inside reddish, glabrous, limb bilabiate, lobes 5, 2–7 mm long, 2.5–5.0 mm wide, reddish or yellow with darker reddish lines, glabrous except for sparse glandular hairs at mouth; stamens 4, exserted about 2 mm beyond corolla mouth, filaments to 2.2 cm long, yellow, sparsely pubescent near base, glabrescent toward apex, anthers oblong, 1.0–4.5 mm long, 1–2 mm wide, coherent or free, connective reddish; ovary apex pilose, style puberulent, red, stigma bilobed.

Capsule turbinate, 7–9 mm long, 3–6 mm in diameter, reddish, becoming gray, costae visible near base, if at all.

The habitats of the two subspecies are apparently very similar. Each is restricted to nearly perpendicular limestone cliffs of a river gorge. The

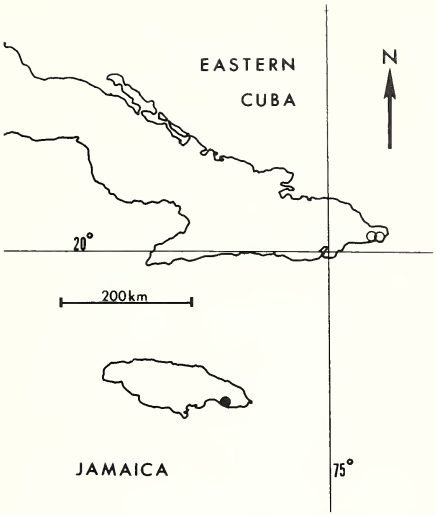

FIGURE 23.—Distribution of *Pheidoncarpa corymbosa* in Jamaica and Cuba. (*P. c.* subsp. *corymbosa* = solid circles; *P. c.* subsp. *cubensis* = open circles.)

primary pollinator of each subspecies is probably a hummingbird. The flowers display some of the characteristics of flowers pollinated by hummingbirds with red corolla tubes oriented horizontally. A pollinator must have a bill that nearly equals or is greater than the length of the corolla tube (1.4–2.1 cm) to reach the nectar at the base of the tube. In Jamaica, possible pollinators are *Mellisuga minima* (Figure 25), *Anthracothorax mango,* and *Trochilus polytmus,* whose bills have a mean length of 1.2, 2.6, and 2.1 cm, respectively (from specimens measured at CU and US). The shape of the head and bill of *Trochilus polytmus* more closely approximates the shape and size of the corolla of *P. corymbosa* subsp. *corymbosa,* and is

Key to the Subspecies of *Pheidonocarpa corymbosa*

1. Calyx lobes to 2 mm long, narrowly triangular; anthers 1–2 mm long, usually coherent in 2 pairs; peduncles 10.8–13.9 cm long, 1–3 times as long as the subtending leaf; Jamaica ..... 1a. subsp. ***corymbosa***

1. Calyx lobes to 4 mm long, broadly triangular; anthers to 4.5 mm long, usually free; peduncles 18–35 cm long, 4 or more times as long as the subtending leaf; Cuba ..... 1b. subsp. ***cubensis,*** new combination and rank

FIGURE 24.—Representative specimen of *Pheidonocarpa corymbosa* (Swartz) L. Skog, subsp. *corymbosa* from Jamaica *(Proctor 10205,* F).

presumed the pollinator. This bird is known from the range of the plants.

1a. *Pheidonocarpa corymbosa* subsp. *corymbosa*

Gesneria corymbosa Swartz, Prodr. 89, 1788.—Sw., Fl. Ind. Occid. 2:1022, 1800.—DC., Prodr. 7:528, 1839.

Pentarhapia ?corymbosa (Swartz) Hanstein, Linnaea 34:307, 1865.

Heppiella corymbosa (Swartz) Urban, Symb. Ant. 2:368, 1901.—Adams, Fl. Pl. Jamaica 682, 1972.

Young stems and branches pubescent to pilose with whitish hairs.

Leaf margin serrate.

Peduncles 10.8–13.9 cm long; pedicels 0.4–1.4 cm long; calyx lobes narrowly triangular, to 2 mm long; upper lobes of the corolla limb 4–5 mm long, ca 2.5 mm wide, lateral lobes ca 3 mm long, ca 3.5 mm wide, lower lobe ca 2 mm long, 3 mm wide, margin erose to dentate; anthers 1–2 mm long, connective often dark red, usually coherent in 2 pairs, pollen grains isopolar, prolate, size small, 18.5–20.0 μm long at the polar axis, ca 8.5 μm long at the equatorial axis, tricolpate, apocolpia truncate to rounded, colpi narrowly attenuate, sexine uniformly heterobrochate, reticulate, lumina ca 0.25 μm across (Figure 18*h*).

TYPE-COLLECTION.—"India occid.: Jamaica," *O. Swartz sn* (S, holotype).

CHROMOSOME NUMBER.—$n = 14$ (Lee, 1966a).

DISTRIBUTION AND ECOLOGY.—*Pheidonocarpa corymbosa* subsp. *corymbosa* has been found only in the gorge of the Cane River in eastern Jamaica (Figure 23), where it grows on shaded limestone cliffs (Figure 1*d*) from 80 to 150 m elevation. Flowering occurs throughout the year.

SPECIMENS EXAMINED.—JAMAICA. PARISH OF ST. ANDREW: Cane River Gorge, ca 400 ft, 28 April 1960, *C. Adams 6967* (UCWI); 100 m, 12 July 1962, *F. Fosberg 42635* (US); 400 ft, 12 July 1907, *W. Harris 9621* (BM 2 sheets, C, F, K, NY 2 sheets, UCWI, US); 250 ft, 18 December 1907, *W. Harris 10053* (BM 2 sheets, C, F, K, NY, UCWI, US); 100 ft, 9 November 1912, *W. Harris 11427* (BM, F, NY, UCWI, US); 1 January 1916, *W. Harris 12314* (BM, F, GH, K, MO, NY, UCWI, US); no date, *B. Morley 387* (UCWI); 14 February 1948, *A. van der Porten sn* (IJ); 250–400 ft, 22 May 1955, *G. Proctor 10205* (BM, F, IJ, MO, US); 500 ft, February 1957, *E. Robertson 2996* (K, UCWI); 400 ft, 9 August 1970, *L. Skog 1620* (BH, US); 18 December 1955, *W. Stearn 3* (BM); 8 April 1956, *W. Stearn 694* (A, BH, BM); 300–500 ft, 9 March 1958, *T. Yuncker 18349* (BM, MO). LOCALITY UNKNOWN: "Gesneria aspera, Jan.," [1821], *C. Bertero sn* (AWH); "Jamaica, 1784–1786," *O. Swartz sn* (S); "India occid.: Ja-

FIGURE 25.—Flower of *Pheidonocarpa corymbosa* subsp. *corymbosa* with a preserved specimen of a possible pollinator, *Mellisuga minima.*

maica," no date, *O. Swartz sn* (S, holotype of *Gesneria corymbosa* Swartz). CULTIVATED: Cornell University, G-839, 31 March 1965, *R. Clark sn* (BH), 24 September 1965, *B. Jackson sn* (BH); Cornell University, G-1367, 11 May 1972, *L. Skog 1826* (BH).

DISCUSSION.—The typical subspecies has been collected recently from a single locality, and presumably the type also came from the gorge of the Cane River, St. Andrews Parish, Jamaica. Plants have been brought into cultivation at least twice and grown at Cornell University under accession numbers G–839 and G–1367.

1b. *Pheidonocarpa corymbosa* subsp. *cubensis* (Morton) L. Skog, new combination and rank

Heppiella cubensis Morton, Brittonia 9:21, 1957.
Gesneria mortonii Wiehler, Baileya 18:4, 1971 [non *Gesneria cubensis* (Decaisne) Baillon (1888)].

Young stems pilose to arachnoid.

Leaf margin crenate-dentate.

Peduncles 18–35 cm long; pedicels 1.1–1.6 cm long; calyx lobes broadly triangular, to 4 mm long; corolla with upper lobes 4–7 mm long, ca 4 mm wide, margin erose, lateral lobes ca 5 mm long, 5 mm wide, margin entire, basal lobe 3 mm long, ca 5 mm wide, margin entire; anthers to 4.5 mm long, usually free.

TYPE-COLLECTION.—Río Jauco, Oriente Province, Cuba, *Bro. Leon 11685* (NY, holotype (Figure 26); LS, NY, US, isotypes).

DISTRIBUTION AND ECOLOGY.—*Pheidonocarpa corymbosa* subsp. *cubensis* is known only from the Oriente Province of Cuba, where it grows on limestone cliffs from 50–300 m elevation. Flowering probably occurs throughout the year.

SPECIMENS EXAMINED.—CUBA. PROVINCE OF ORIENTE: Loma del Esparto, Cajobabo, 31 December 1959, *Alain Liogier & M. Lopez F. 7105* (US); Cueva del Toro, Caleta, east of Jauco, 200–300 m, 17 July–4 August 1924, *Bro. Leon 11812* (NY 2 sheets, US); rocky banks of Jauco River, Jauco, 17 July–4 August 1924, *Bro. Leon 11685* (NY, holotype of *Heppiella cubensis* Morton; NY, US, isotypes); dry cliffs, Jauco, May 1940, *Bros. Leon & M. Victorin 17748* (US); dry cliffs beside the Río Jauco, ca 50 m, 15–16 January 1956, *C. Morton & Alain Liogier 9154* (US).

DISCUSSION.—This taxon from Cuba (Figure 23) is included here as a subspecies of *Pheidonocarpa corymbosa* because of the similarity in habitat and morphology to the typical subspecies.

FIGURE 26.—Holotype of *Heppiella cubensis* Morton and *Pheidonocarpa corymbosa* subsp. *cubensis* (Morton) L. Skog, new combination and rank, *Leon 11685* (NY).

Gesneria Linnaeus

Gesneria Linnaeus, Gen. Pl. ed. 5, 267, 1754.—Linn. Sp. Pl. ed. 1, 612, 1753.

Pentarhaphia Lindley, Bot. Reg. 13: sub. pl. 1110, 1827 [("*Pentaraphia*"), non *Pentarrhaphis* Humboldt, Bonpland & Kunth (1816)]. [Type-species: *Pentarhaphia longiflora* Lindley (=*Gesneria ventricosa* Swartz).]

Conradia Martius, Nov. Gen. & Sp. 3:38, 1829 [nom. illeg., non Rafinesque (1825), nec Nuttall (1834), nec Kufferath (1914)]. [Type-species: *Pentarhaphia longiflora* Lindley (=*Gesneria ventricosa* Swartz), vide Morton & Denham (1972).]

Duchartrea Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:109, 1846. [Type-species: *Duchartrea viridiflora* Decaisne.]

Herincquia Decaisne ex Herincq, Rev. Hort. ser. 3, 2:322, 1848. [Type-species: *Herincquia floribunda* (Lemaire) Decaisne ex Herincq (= *Gesneria libanensis* Linden ex Morren).]

Ophianthe Hanstein, Linnaea 26:205, 1854. [Type-species: *Ophianthe libanensis* (Linden ex Morren) Hanstein.]

Chorisanthera (G. Don) Ørsted, Cent. Gesn. 35, 1858. [Type-species: *Chorisanthera pumila* (Swartz) Ørsted (=*Gesneria pumila* Swartz).]

Codonoraphia Ørsted, Cent. Gesn. 68, 1858. [Lectotype-species: *Codonoraphia calycosa* (W. Hooker) Ørsted.]

Vaupellia Grisebach, Fl. Brit. W. Ind. 460, 1862. [Type-species: *Vaupellia calycina* (Swartz) Grisebach.]

Plants fibrous-rooted, perennial, herbaceous, suffruticose with decumbent, pendent or erect stems and branches, fruticose with erect stems or with spreading basal branches to arborescent with stems to 10 m tall: bark glabrous to pilose, resin often persistent on stem, leaves and inflorescences, pith green to red, cells containing crystals; branches with internodes cylindrical or rarely flattened, nodes usually swollen, unilacunar with one trace.

Leaves dorsiventral, alternate, rarely approximate, opposite and decussate in one population of *Gesneria fruticosa,* spirally arranged in a 2/5 phyllotaxy, often crowded at branch apices: petioles, if present, terete to sulcate, green to reddish-brown, glabrous to pilose, occasionally verrucose, resinous, vascular trace a cylinder or U-shaped in transverse section; blades ovate or lanceolate to obovate, oblanceolate or suborbiculate, membranous to coriaceous, plane to bullate, base cuneate to truncate or cordate, margin entire, crenate, dentate, serrate, or lobulate, occasionally ciliate, apex retuse to caudate, adaxial surface usually dark green, glossy or dull, abaxial surface lighter green to reddish-brown, both sides glabrous to pilose or scabrous, trichomes, when present, uniseriate, glandular or nonglandular, veins pinnate, prominent at least below, arcuate at margin, epidermal cells with shallow or nonundulating walls, stomata not raised, cruciferous-type of 2 guard cells and 3 subsidiary cells, internally an adaxial multiple epidermis usually present with crystal containing cells.

Inflorescences of many flowers in a compound dichasium or in some species reduced to a single flower, shorter than or exceeding the subtending leaves: peduncles usually terete, rarely quadrangular, green to red, glabrous to pilose, occasionally verrucose, resinous; bracts 2, fertile or sterile, leaflike or reduced; pedicels similar to the peduncles, green to red, glabrous to pilose, usually resinous; flowers protandrous or protogynous; floral tube obconic, turbinate, or nearly spherical, green to reddish-brown, glabrous to villous, occasionally verrucose, resinous; calyx lobes 5 or rarely 4 or 6, distinct or briefly connate above the ovary, each lobe erect to patent, sulcate or flat, ovate to lanceolate or filiform, white, green to red or brown, glabrous, or puberulent to pilose, margin usually entire, seldom toothed; corolla tubular, cylindrical, ventricose, or infundibuliform-campanulate, white, green, red, orange, yellow to brown, glabrous to pilose, sometimes resinous and verrucose, limb 5-lobed, occasionally two-lipped, each lobe erect to reflexed; fertile stamens usually 4, with an infertile staminode, rarely 5 stamens fertile, filaments of equal length, linear, curved to geniculate at the base, adnate to corolla tube for a distance no more than the basal thickness of the filament, white, green, yellow or red, glabrous or pilose below, connective often prolonged beyond anther, anthers sagittate to oblong, usually coherent at anthesis in two pairs at their apices or in a row side by side, becoming free, 2-celled, opening by longitudinal slits, pollen isopolar, prolate, size small to medium, sexine usually reticulate, seldom smooth or verrucose; pistil 1, hemiparacarpous, ovary inferior or rarely subinferior, 2-carpelled, unilocular, apex pubescent or glabrous, ovules numerous, anatropous, integument single, disc annular or undulating surrounding the stylar base, style usually as long as the stamens or slightly longer, curved, white, green, yellow or red, glabrous to pilose, stigma stomatomorphic, clavate, capitate, or bilabiate, usually papillate.

Capsule loculicidal, turbinate or nearly spherical, dehiscent from the apex into 2 or 4 valves, or forming a splash cup, reddish-brown to gray, glabrescent, costae 5–15 or capsule verrucose and costae obscure; seeds numerous, linear, or fusiform, to rhombic or oblong, striate, twisted, tawny, red, brown or black; cotyledons 2, equal.

Lectotype-Species.—*Gesneria humilis* Linnaeus, vide Fritsch (1894), Morton & Denham (1972).

Gesneria is here divided into nine sections, distinguished by factors related to reproduction, *i.e.,* characters of flowers and fruit, supplemented by correlated vegetative characters. The sections appear to be natural groups of species sharing many characters, but also clearly related to other sections or species within *Gesneria.* Such relation-

Key to the Sections of *Gesneria*

1. Diameter of the corolla mouth less than or equal to the diameter of the middle of the tube, the tube nearly cylindrical or ventricose, or the tube narrowly funnelform expanding gradually from the base (section *Stenochonanthe*), or hypocrateriform (section *Pentarhaphia*), reddish or occasionally yellow to green 2
   2. Plants erect, shrubs or small trees, usually more than 60 cm tall 3
      3. Corolla verrucose; stem unbranched, or branched only at the base; calyx and capsule verruculose to verrucose; Cuba ..... Section 4. ***Myrmekianthe,*** new section
      3. Corolla not verrucose; stem usually much branched; calyx and capsule smooth, seldom verruculose 4
         4. Leaves lobulate; axillary buds and young branches lanate, not resinous ..... Section 3. ***Lachnoblaste,*** new section
         4. Leaves entire to dentate-serrate; buds and young branches glabrous to pilose, usually resinous 5
            5. Stamens included; corolla evenly expanded from the base; Jamaica ..... Section 2. ***Stenochonanthe,*** new section
            5. Stamens exserted and corolla ventricose or widest at the base or middle, or if stamens included, then corolla not expanded, but hypocrateriform (*Gesneria aspera, G. haitiensis*), or corolla suburceolate (*G. pulverulenta*) ..... Section 1. ***Pentarhaphia***
   2. Plants nearly stemless, often decumbent or pendent, rarely to 60 cm tall 6
      6. Inflorescences projecting beyond the subtending leaves; corolla yellow, orange, or green to white, red only in *Gesneria brachysepala;* leaves plane ..... Section 5. ***Gesneria***
      6. Inflorescences shorter than the subtending leaves; corolla usually red, seldom orange-red, rarely yellow; leaves bullate, rarely nearly plane ..... Section 6. ***Physcophyllon,*** new section
1. Diameter of the corolla mouth larger than the diameter of the middle; the tube infundibuliform-campanulate, green to yellow or brown, rarely reddish to purple 7
   7. Plants erect, shrubs or small trees well over 60 cm tall; inflorescences exceeding the subtending leaves, of one to many flowers 8
      8. Stem unbranched, unless at the base, verrucose and nearly glabrous above; stamens included; leaves coriaceous ..... Section 8. ***Duchartrea***
      8. Stem usually much-branched and smooth, sometimes pubescent, if glabrous, then obscurely if at all verruculose; stamens seldom included; leaves membranous to subcoriaceous ..... Section 7. ***Dittanthera,*** new transfer
   7. Plants nearly stemless or decumbent, rarely up to 60 cm tall; inflorescences shorter than the subtending leaves, of one to four flowers ..... Section 9. ***Chorisanthera,*** new transfer

ships can be seen between sections *Duchartrea* and *Myrmekianthe, Chorisanthera* and *Physcophyllon,* and *Pentarhaphia* and *Dittanthera.*

The genus may be divided into two large groups on the basis of corolla shape. The larger group, consisting of six sections, has tubular and nearly cylindrical or ventricose corollas. This type of corolla is believed to be adapted for hummingbird-pollination. The smaller and perhaps more advanced group, consisting of three sections, has campanulate corollas, abundant pollen, and nectar possibly attractive to bats. However, the bats have not yet been actually observed pollinating.

Evolution in the genus may have occurred in a series of reductions. An example of a more primitive species is *Gesneria ventricosa,* a species of shrubs with red, tubular, hummingbird-pollinated flowers. From such an example two major lines of evolution appear to have developed: (1) shrubs or trees with hummingbird-pollinated flowers, (2) acaulescent or short-stemmed herbs or subshrubs with hummingbird-pollinated flowers. Both of these lines may have given rise to bat-pollinated species.

Relationships among the sections will be discussed under the sections concerned, together with the relationships among the species in each section.

Gesneria, when described by Linnaeus in 1753 and 1754, was composed of two species, *G. humilis* and *G. tomentosa.* Neither species was chosen as the type-species at that time. *Gesneria tomentosa* was transferred to *Rhytidophyllum* by Martius in

1829 and selected as the lectotype species for that genus by Britton and Wilson (1925). Fritsch (1894) was apparently the first to retain *G. humilis* in *Gesneria* and refer *G. tomentosa* to *Rhytidophyllum*, thus *Gesneria humilis* Linnaeus has become the residual lectotype species for *Gesneria* (Morton and Denham, 1972).

Conradia Martius was an intentional, but unjustified, renaming of *Pentarhaphia* Lindley (Morton and Denham, 1972). According to Article 7 of ICBN a nomenclaturally superfluous name "is automatically typified by the type of the name which ought to have been adopted under the rules" (ICBN, 1972:19). Thus, the only species and type of *Pentarhaphia* when it was published, *P. longiflora* Lindley (which itself is a superfluous name for *Gesneria ventricosa* Swartz), became the type of *Conradia* rather than *Conradia humilis*, selected by later authors.

Until the present time, *Codonoraphia* Ørsted has not been typified. To stabilize the name, *Codonoraphia calycosa* (W. Hooker) Ørsted has been selected as the lectotype species.

Section 1. *Pentarhaphia* (Lindley) Fritsch

Pentarhaphia (Lindley) Fritsch *in* Engl. & Prantl, Nat. Pflanzenfam. 4(3b):184, 1894.

Pentarhaphia section *Eupentarhaphia* Bentham *in* Bentham & Hooker, Gen. Pl. 2:1005, 1876. [Type-species: *Pentarhaphia longiflora* Lindley (=*Gesneria ventricosa* (Swartz).]

Gesneria section *Conradia* (Martius) Fritsch *in* Engl. & Prantl, Nat. Pflanzenfam. 4(3b):184, 1894 [as to type, not as to description].

Small subshrubs to large shrubs: stems erect, to 4 m tall, resinous: branches erect, or often divaricate arising from base or from upper leaf axils.

Leaves lanceolate, elliptic, ovate to oblanceolate or obovate, occasionally falcate, submembranous to coriaceous, plane, glossy or dull, margin sometimes recurved.

Inflorescence 1 to 4 (-many)-flowered, shorter than, equaling or exceeding the subtending leaves, occasionally verrucose: corollas tubular, ventricose at the middle and narrowing to mouth or suburceolate or hypocrateriform, yellow, orange to red; stamens usually exserted, seldom included.

Capsules turbinate to nearly spherical, smooth, costae usually prominent, sometimes alate.

Type-Species.—*Pentarhaphia longiflora* Lindley (=*Gesneria ventricosa* Swartz).

Discussion.—Section *Pentarhaphia* comprises a large complex of species which share many similar characters. It resembles and is probably closely related to section *Stenochonanthe*. The floral structures of the plants in the two sections are very similar, as are the vegetative characters. This similar development may, however, be the result of parallel evolution and response to hummingbird pollination. A resemblance in corolla form can also be seen in some species of *Rhytidophyllum* (e.g., *R. berteroanum* Martius), but these differ in other essential characters. Ancestors of this section may have been the stock from which many of the sections evolved, but the *Pentarhaphia* line has maintained seemingly primitive characters. Members of this section are mainly concentrated on Hispaniola with a few species in Cuba, Jamaica, and the Lesser Antilles (Figures 27, 29, 36, 43, and 44).

Key to the Species of Section *Pentarhaphia*

1. Abaxial leaf surfaces, petioles, peduncles, and corollas clothed with pilose or villous trichomes, and resinous.
   2. Peduncles more than 1.8 cm long; floral tube turbinate.
      3. Corolla red, limb patent; adaxial leaf surfaces asperate; inflorescences of one flower; Haiti ..... 2. ***G. aspera***
      3. Corolla yellow, limb erect or porrect; adaxial leaf surfaces glabrescent; inflorescences of three to several flowers; Cuba ..... 7. ***G. glandulosa***
   2. Peduncles 1 cm or less long; floral tube obconic; Dominican Republic ... 15. ***G. parvifolia***
1. Abaxial leaf surfaces, petioles, peduncles, and corollas glabrous, or scarcely pubescent near petiole or peduncle base, or in petiole sulcus, but resinous.
   4. Leaves subtending the inflorescences more than twice as long as the inflorescence.
      5. Leaf margins entire, blades 3.6 cm long or less; Cuba: Province of Piñar del Río ..... 4. ***G. brevifolia***
      5. Leaf margins denticulate, serrulate, crenulate, dentate, crenate, or serrate, blades usually much more than 4 cm long, largest leaves more than 6 cm long.

6. Bark subrugose, verrucose, verruculose, or tuberculate, lenticels obvious; inflorescences usually of one flower, if more then leaf margins crenulate.
   7. Style glabrous; leaf margin crenate or dentate above middle; Jamaica ..... 9. ***G. harrisii***
   7. Style pilose; leaf margin crenulate or denticulate; Cuba.
      8. Floral tube globose, costae 10; leaves obovate, 4.4–10.0 cm long; Cuba: Province of Las Villas ..... 5. ***G. clarensis***
      8. Floral tube narrowly obconic, costae 5; leaves lanceolate, elliptic, or seldom obovate, 2.0–6.8 cm long; Cuba: Province of Oriente ..... 10. ***G. heterochroa***
6. Bark smooth, lenticels obscure; inflorescences of two or three flowers.
   9. Leaves narrowly elliptic to oblanceolate, 1.5–3.3 cm wide, denticulate above the middle; Haiti: Département de l'Ouest ..... 13. ***G. lanceolata***
   9. Leaves broadly elliptic to obovate, 3.1–7.0 cm wide, serrate above the middle; Haiti: Département du Sud ..... 14. ***G. odontophylla***

4. Leaves subtending the inflorescences less than twice as long as the inflorescences to much shorter.
   10. Corolla tube yellow or greenish-white externally above the base; stamens exserted only to limit of corolla tube.
      11. Style glabrous; bracts lacking; Jamaica ..... 9. ***G. harrisii***
      11. Style pilose; bracts present, but sometimes caducous.
         12. Capsule turbinate, ca 4 mm long; leaves 2.4–4.2 cm long, serrulate or denticulate above the middle, base narrowly acute; branches few; Haiti 11. ***G. hypoclada***
         12. Capsule narrowly obconic, to 8 mm long; leaves 2.5–11.2 cm long, margin crenate or serrate above, base obtuse, branches numerous; Cuba ..... 17c. ***G. salicifolia*** var. ***ferruginea***
   10. Corolla tube red, red-orange or rose-pink externally, if yellow, then only at the base.
      13. Corolla limb patent; inflorescences of one flower, peduncles very short with pedicels more than twice as long; Haiti ..... 8. ***G. haitiensis***
      13. Corolla limb with some lobes erect, reflexed, porrect, or spreading, but not all patent; inflorescences of one to many flowers, peduncles usually exceeding length of pedicels, if pedicels lacking, peduncles more than 1 cm long.
         14. Peduncles and pedicels together 1.3 cm long or less, not arcuate, and stamens exserted 3 mm or less; corolla tube suburceolate; Dominican Republic ..... 16. ***G. pulverulenta***
         14. Peduncles and pedicels together usually more than 2 cm long, often much longer, and peduncles usually arcuate, if shorter or not arcuate, then stamens exserted more than 4 mm at anthesis; corolla tube usually ventricose.
            15. Stamens exserted beyond corolla limb; peduncles arcuate or not.
               16. Ovary apex glabrous; corolla limb lobes erect, tube maculate inside; Cuba: Province of Oriente ..... 3. ***G. binghamii***
               16. Ovary apex tomentose to pilose; corolla limb erect to reflexed, rarely all lobes erect, tube not maculate.
                  17. Peduncles 2.0–15.9 cm long; leaves with petioles 0.5–4.5 cm long, blades 4.1–22.7 cm long; inflorescences of one to many flowers, usually two to four or many, seldom only one; bracts 0.6–1.5 cm long; Lesser Antilles ..... 18. ***G. ventricosa***
                  17. Peduncles 0.4–2.0 cm long; leaves with petioles 0.2–1.2 cm long, blades 1.1–7.0 cm long; inflorescences of usually one, rarely two or three flowers; bracts 0.1–0.5 cm long; Cuba, Hispaniola ..... 6. ***G. cubensis***
            15. Stamens included or exserted only to limit of corolla limb; peduncles arcuate.
               18. Corolla 1.0 cm long or less, ventricose at base, narrowing toward middle; inflorescences of one or rarely two flowers; Jamaica ..... 12. ***G. jamaicensis***
               18. Corolla 1.1 cm long or more, ventricose at or near the middle; inflorescences of usually more than one flower.
                  19. Leaves entire toward the base, denticulate or serrulate toward apex; corolla yellow internally; Cuba: Provinces of Oriente and Piñar del Río ..... 17. ***G. salicifolia***
                  19. Leaves sharply serrate; corolla red internally; Cuba: Province of Oriente ..... 19. ***G. wrightii***

FIGURE 27.—Distribution of *Gesneria* section *Pentarhaphia* in Hispaniola. (*G. aspera* = open triangles; *G. cubensis* var. *cubensis* = solid circles; *G. cubensis* var. *truncata* = solid squares; *G. haitiensis* = solid triangles; *G. hypoclada* = open stars within circles; *G. lanceolata* = open squares; *G. odontophylla* = solid stars; *G. parvifolia* = open stars; *G. pulverulenta* = open circles.)

2. *Gesneria aspera* Urban & Ekman

Gesneria aspera Urban & Ekman in Urban, Ark. Bot. 20A(5): 49, 1926.

Shrubs or small trees: stems woody, erect, bark when young reddish and invested with numerous reddish, few-celled patent trichomes, becoming gray-brown and glabrous, resinous at apex, internodes 0.1–1.9 cm long; branches many, 3 mm in diameter at 10 cm below apex, lenticels erumpent, nodes slightly swollen.

Leaves approximate to alternate: petioles terete near node, becoming flattened near base of blade, 1–4 mm long, ca 1 mm wide, reddish and covered by the patent glandular hairs; blades ovate to obovate, 1.5–2.4 cm long, 0.8–1.4 cm wide, stiff and coriaceous, base rounded to obtuse, margin entire near the base, becoming crenate-dentate toward the acute apex, adaxial surface bullate, light green, asperate from numerous stiff bulbous-based white hairs, lateral veins 3 to 5, slightly immersed, abaxial surface tawny except for the reddish prominent veins, pilose.

Inflorescences axillary, 1-flowered, about twice as long as the subtending leaves: peduncles 1.8–3.0 cm long, 0.3–0.4 mm in diameter, purplish-brown, pilose; bracts 2, at the base of the peduncle when young, caducous, linear, to 2 mm long, reddish, pilose; floral tube turbinate, ca 2 mm long, ca 2 mm in diameter at apex, red and pilose; calyx erect, lobes 5, barely connate at base, linear-lanceolate, 2–6 mm long, ca 1 mm wide at base, dark red, shortly and densely pilose; corolla tube hypocrateriform, 1.1–2.2 cm long, ca 0.3 cm wide at middle, outside red except orange-yellow near base, shortly and patently pilose, inside yellow with reddish lines, glabrous with prominent veins, limb patent, 7–9 mm broad, lobes orbicular, ca 5 mm long, ca 4 mm wide, upper lobes broader and slightly bifid, margin erose, glandular; stamens 4, adnate to the base of the corolla, filaments ca 15 mm long, yellowish, glabrous, anthers oblong, ca 1 mm long, coherent until anthesis, pollen yellow-white, staminode 4 mm long, lacking anther; ovary inferior, becoming half-inferior following fertilization, reddish, pilose at apex, disc annular, swollen, style ca 10 mm long, yellow, shortly pubescent, stigma clavate.

Capsule shortly turbinate, extending ca 2.5 mm above calyx attachment, 5–6 mm wide, becoming gray on drying, costae 5, slightly prominent; seeds fusiform, striated, 0.6–0.7 mm long, 0.1–0.2 mm wide, brownish.

TYPE-COLLECTION.—Massif de la Selle, Morne

Cabaio, Haiti, *E. Ekman H1550* (S, holotype, Figure 28*a*; EHH, G, IJ, K, NY, S, US, isotypes).

Distribution and Ecology.—*Gesneria aspera* has been found only in southeastern Haiti in the la Selle mountains on Morne Cabaio, where it grows in fissures in limestone cliffs at 1900–2000 m (Figure 27). Flowering specimens have been collected only in August.

Specimens Examined: HAITI. Département de l'Ouest: Massif de la Selle, Morne Cabaio, 1900–2000 m, 20 August 1924, *E. Ekman H1550* (S, holotype of *Gesneria aspera* Urban & Ekman; EHH, G, IJ, K, NY, S, US 2 sheets, isotypes).

Discussion.—*Gesneria aspera* is probably most closely allied to *G. parvifolia* from the Dominican Republic, but differs from it by the asperate leaves, one-flowered inflorescences, densely pilose investiture and the wider patent corolla limb (resembling in the last character the corollas in *Gesneria reticulata* and *G. haitiensis*). This species is known only from a single collection, perhaps because of the inaccessibility of the locality. To reach Morne Cabaio from the nearest road apparently requires ten hours travel on foot.

3. *Gesneria binghamii* Morton

Gesneria binghamii Morton, Brittonia 9:19, 1957.—Morton *in* Alain & Leon, Fl. de Cuba 4:455, 1957.
Pentarhaphia incurva Grisebach, Cat. Pl. Cub. 199, 1866.

Figure 28.—Type specimens: *a*, holotype of *Gesneria aspera* Urban, *Ekman H1550* (S); *b*, holotype of *Pentarhaphia incurva* Grisebach and *Gesneria binghamii* Morton, *Wright 3073* (GOET).

Gesneria incurva (Grisebach) Urban, Symb. Ant. 2:374, 1901 [non Bentham (1845)].

Shrubs or small trees: stems woody, erect, up to 6 m tall, slender, 2–3 mm in diameter at 10 cm below apex, bark smooth, dark red and nitid above, gray below, glabrous, resinous, lenticels elongated; branches scattered, internodes 0.8–1.8 cm long, leaf scars obvious.

Leaves alternate, scattered, not congested at branch apices: petioles sulcate, 3–10 mm long, ca 1 mm broad, reddish-brown, glabrous, glandular-resinous; blades lanceolate or elliptic, 3.6–9.9 cm long, 1.0–2.1(–4) cm wide, subcoriaceous, base acute, margin sharply dentate or serrate, apex acute or acuminate, adaxial surface smooth, dark green, glabrous, resinous along the midvein, abaxial surface smooth, green to brown, glabrous, resinous, veins prominent, reddish.

Inflorescences of single erect flowers, about 1 1/2 times the length of the subtending leaves: peduncles arcuate, terete below, subalate above, 2.9–4.8 (–9.6) cm long including pedicels, ca 1 mm in diameter, dark red, verruculose, resinous; bracts often lacking, when present, vestigial, ca 2 mm long, ca 0.25 mm wide, red, resinous; floral tube obconic, subalate, 2–3 mm long, 2.5–4 mm wide, dark red, verruculose, nitid, resinous; calyx 5-lobed, erect but becoming incurved with age, lobes connate 1–2 mm at base, lanceolate, 1.0–2.1 cm long, 1.5–3 mm wide at base, outside keeled, scarlet, glabrous, resinous, inside sulcate, scarlet, glabrous, resinous; corolla tube curved, ventricose at middle, 1.4–1.8(–2.6, fide Morton) cm long, 4–5 mm wide at base, 4–8 mm wide at middle, narrowing to ca 6 mm at throat, outside bright red-orange, glabrous, resinous, inside yellow-orange, maculate, glabrous, limb erect, 5-lobed, scarlet, margin and veins dark red, upper lobes oblong, 2–4 mm long, 2–3 mm wide, erose, glandular, lateral and basal lobes semiorbiculate, 2.0–2.5 mm long and wide, entire, glandular, mouth oblique; stamens 4, adnate to base of corolla for ca 0.5 mm, exserted ca 10 mm, filaments curved, ca 2.5 cm long, 1 mm wide at base, narrower above, reddish, sparsely glandular, anthers oblong ca 1.5 mm long, ca 0.75 mm wide, coherent in 2 pairs, staminode about 5 mm long; ovary inferior, apex glabrous, disc annular, yellow, style curved, equaling stamens in length, reddish, sparsely glandular, resinous, stigma capitate, papillate.

Capsule turbinate, 6–8 mm long, 5–8 mm wide at apex, dark red to gray, glabrous, resinous, costae 5; seeds fusiform, striate, twisted, ca 0.75 mm long, ca 0.25 mm wide, black.

Type-Collection.—San Juan de Buenavista, Cuba, *C. Wright 3073* (GOET, holotype (Figure 28*b*); BM, G, GH, K, MO, isotypes).

Distribution and Ecology.—*Gesneria binghamii* is known from the mountains of southern Oriente Province in Cuba, where it grows on rocks in woods near rivers at 300–700 m elevation (Figure 29). Flowering material of *Gesneria binghamii* has been collected in March, April, August, and October.

Specimens Examined: CUBA. Province of Oriente: Sierra Maestra, no date, *G. Bucher 10529* (NY); Sierra Maestra, headwaters of Río Manacas, San Felipe (San Juan de Buena Vista), SW of Bueycito, 1 August 1922, *E. Ekman 14705* (US), *14705b* (NY), *14706a* (S); San Juan de Buenavista, 1860–64, *C. Wright 3073* (GOET, holotype of *Pentarhaphia incurva* Grisebach; BM, G 2 sheets, GH, K, MO, P, isotypes); Fca. "Yao" al Sur de Bayamo, April 1950, *C. Bingham 7247* (US); Río Yao, 31 March 1943, *Bro. Marie Victorin 21339* (GH, LS); northern spur of Sierra Maestra, west of Río Yao, 300–700 m, 24–30 October 1941, *C. Morton & J. Acuña 3492* (BM, F, G, GH, MO, NY, S, U, US 2 sheets); Sierra Maestra, foothills on north side of La Bayamesa, ca 5 km south of San Pablo de Yao, 300 m, 16 August 1951, *G. Webster 4079* (GH). Locality Unknown: Cuba, no date, *R. de la Sagra 907* (P).

4. *Gesneria brevifolia* Urban

Gesneria brevifolia Urban, Repert. Spec. Nov. Regni Veg. 21:69, 1925.

Shrubs: stems woody, erect; bark rugose, glabrous, resinous-granulate, internodes 1–3 mm long; branches numerous, leaf scars prominent.

Leaves alternate, clustered at branch apices: petioles sulcate, 3–8 mm long, ca 1 mm wide, glabrous, resinous, blades elliptic to spathulate, 1.9–3.6 cm long, 1.5–2.3 cm wide, coriaceous, base acute, margin entire, slightly recurved, apex rotund, rarely acute or emarginate, adaxial surface plane, yellow-green to reddish-brown, glabrous, midvein impressed, abaxial surface reddish-brown, glabrous, resinous, veins darker, prominent.

Inflorescences in upper axils 1(-3)-flowered, about one-half the length of the subtending leaves: peduncles terete, 2–5 mm long; bracts 2, caducous, ca 1 mm long; pedicels terete, broader at apex,

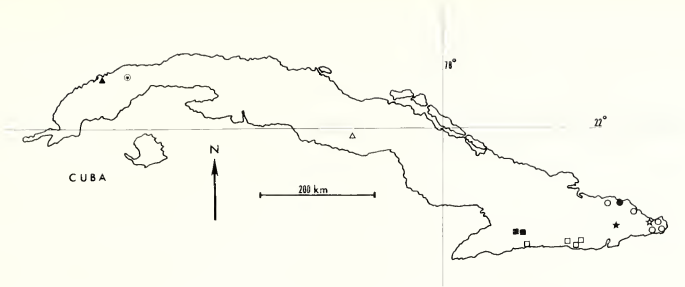

FIGURE 29.—Distribution of part of *Gesneria* section *Pentarhaphia* in Cuba. (*G. binghamii* = solid squares; *G. brevifolia* = stars within circles; *G. clarensis* = open triangles; *G. glandulosa* = open stars; *G. heterochroa* = open squares; *G. salicifolia* var. *ferruginea* = solid triangles; *G. salicifolia* var. *salicifolia* = open circles; *G. salicifolia* var. *spathulata* = solid circles; *G. wrightii* = solid stars.)

2–7 mm long, elongating to 13 mm in fruit. Flowers not seen.

Capsule turbinate or subglobose, 4–5 mm long, 3.5–4.0 mm wide, persistent calyx lobes linear from a broad base, 5–6 mm long, glabrous, costae 5; seeds not seen.

TYPE-COLLECTION.—Pan de Guajaibon, Cuba, *E. Ekman 12760* (S, holotype, Figure 30; S, isotype).

DISTRIBUTION AND ECOLOGY.—Endemic to the Province of Piñar del Río in Cuba growing in dense thickets in the mountains at elevations from 750 to 800 m (fide Ekman, Figure 29). This species has only been collected in January, but in fruit.

SPECIMENS EXAMINED: CUBA. PIÑAR DEL RÍO: Pan de Guajaibon, on the eastern top of the mountains, ca 750–800 m, 9 January 1921, *E. Ekman 12760* (S, holotype of *Gesneria brevifolia* Urban; S, isotype).

DISCUSSION.—Although this species is known only from two specimens from one locality and described without flowers, it is undoubtedly a *Gesneria,* and resembles in habit and foliage other members of this section. The habit and spathulate leaves are similar to *G. clarensis,* whose leaves and fruits are much larger. The fruits resemble those of *G. cubensis* from Oriente Province and Hispaniola (up to 7 mm long and 6 mm wide) but are smaller (4–5 mm long, 3.5–4.0 mm wide).

5. *Gesneria clarensis* Britton & Wilson

Gesneria clarensis N. Britton & P. Wilson, Mem. Torrey Bot. Club 16:109, 1920.

Tall shrubs or large trees: stems woody, bark verruculose, becoming reddish brown and resinous at apex, brown to gray and smooth below; branches 3–4 mm in diameter at 10 cm below apex, internodes 5–8 mm long, leaf scars prominent.

Leaves clustered at branch apices, alternate: petioles sulcate, 0.6–1.5 cm long, 1–2 mm wide, green or reddish-brown, glandular-resinous; blades obovate, 4.4–10.0 cm long, 2.2–4.3 cm wide, subcoriaceous, base acute, margin crenulate, apex obtuse or acute, adaxial surface smooth or rough when dry, green or reddish-brown, glabrous, veins impressed, abaxial surface reddish-brown, glandular-resinous, veins prominent.

Inflorescences from upper axils, 1 to 3-flowered, less than half the length of the subtending leaves: peduncles 1.3 cm long, ca 1 mm in diameter, terete below, subalate above, reddish, glandular-resinous; bracts 2, lanceolate, 2–3 mm long, reddish, glandular-resinous; pedicels 3–7 mm long; floral tube globose, 3–4 mm long, 3–4 mm wide, reddish-brown to yellow, glandular-resinous, 10-costate; calyx 5-lobed, erect, lobes connate at base for ca 1 mm, each linear-lanceolate, 6–8 mm long, 1–2 mm wide at base, yellowish from resin, glandular on both sides, outside midvein prominent, inside sulcate; incomplete corolla tube cylindric, slightly swollen at base, broader above, length over 1 cm long, 2–3 mm wide at base, wider above, outside and inside greenish-yellow(?) glandular-resinous, limb not seen; stamens 4, adnate to base of corolla

FIGURE 30.—Holotype of *Gesneria brevifolia* Urban, *Ekman 12760* (S).

tube, filaments curved, at least 1.5 cm long, yellowish, glabrous, anthers not seen; ovary inferior, apex pilose, disc annular, style curved, 1.8 cm long, reddish, pilose, stigma capitate, papillate.

Capsule broadly turbinate, ca 5 mm long, ca 5 mm wide, brown, costae 5 prominent and 5 obscure; seeds fusiform, striate, twisted, ca 0.75 mm long, ca 0.2 mm wide, brown.

TYPE-COLLECTION.—Sancti-Spiritus Mts, Cuba, *Bros. Leon & Clemente 6504* (NY, holotype, Figure 31*a*; NY, S, US, isotypes).

DISTRIBUTION AND ECOLOGY.—*Gesneria clarensis* is known only from the Province of Las Villas in central Cuba, where it has been collected from rocky areas at 850–900 m elevation (Figure 29). The only flowering specimen was collected in January.

LOCAL NAME.—"Canelon" (fide *Leon & Roca 7992*).

SPECIMENS EXAMINED.—CUBA. PROVINCE OF LAS VILLAS: Lomas del Banao, El Purial, on Río Banao, ca 850 m, 27 January 1923, *E. Ekman 16231* (S); Banao Hills, August 1918, *Bro. Leon 4426* (US); Sierra del Caballete, Sancti-Spiritus Mts., 1–11 August 1916, *Bros. Leon & Clemente 6504* (NY, holotype of *Gesneria clarensis* N. Britton & P. Wilson; NY, S, US, isotypes); Loma de la Gloria, Banao Mts., 900 m, *Bro. Leon & M. Roca 7992* ([30 July 1918] NY, [31 July 1918] P); Lomas de Banao, January 1920, *A. Luna 116* (NY).

DISCUSSION.—The description of the available flower parts was based on *Luna 116* (NY), the only specimen bearing flowers. The type, *Leon & Clemente 6504,* has only fruits. The color of the corolla is probably yellow-green, although it may be reddish since the style is definitely red. Stamens and style in other species of *Gesneria* are often of the same color as the corolla.

Vegetatively, *G. clarensis* resembles *G. odontophylla,* another species described without mature flowers. The leaves are of similar size and shape, and the inflorescence is 3-flowered. *G. odontophylla* from the southwestern peninsula of Hispaniola differs in being a small shrub with the young branches slender and divaricate, the leaf margin serrate, and the petioles to 3 cm long.

6. *Gesneria cubensis* (Decaisne) Baillon

Gesneria cubensis (Decaisne) Baillon, Hist. Plant. 10:60, pls. 48, 49, 1888.

Shrubs or small trees: stems woody, erect to 5 m tall, 2–4 mm in diameter at 10 cm below apex, bark smooth or slightly rugose, usually verrucose or tuberculate, brown to gray, glabrous, resinous toward apex, pulverulent below, lenticels elongated, prominent; branches mostly erect or divaricate, reddish or brown near apex, gray or brown below, internodes 0.1–12.3 cm long, leaf scars prominent.

Leaves well spaced or often conferted at branch apices, alternate: petioles sulcate on upper surface, 2–12 mm long, 0.5–1.5 mm wide, green to reddish-brown or yellow from pulverulence, usually verrucose, occasionally with glandular trichomes congested near the base; blades elliptic to obovate or oblanceolate, 1.1–7.0 cm long, 0.5–2.7 cm wide,

FIGURE 31.—Type specimens: *a*, holotype of *Gesneria clarensis* Britton & Wilson, *Leon & Clemente 6504* (NY); b, holotype of *G. truncata* Alain and *G. cubensis* var. *truncata* (Alain) L. Skog, new rank, *Howard 12283* (NY).

somewhat rigid to coriaceous, base cuneate to acute, margin entire toward the base, crenate, serrate or dentate above, occasionally recurved, apex obtuse to acuminate, adaxial surface plane, dark green or light or reddish-brown in young leaves, glabrous, nitid, rarely foveolate, veins impressed, abaxial surface reddish-brown to light green, glabrous, resinous from short glands, veins prominent, often darker or reddish.

Inflorescences from upper leaf axils, of 1–3 flowers, equaling or slightly exceeding the subtending leaves: peduncles terete, slender, curved, 0.4–2.0 cm long, ca 1 mm in diameter, darker green or reddish to brown, glabrous, glandular-resinous, usually verrucose; bracts obsolete or caducous, when present filiform or linear, 1–5 mm long, ca 1 mm wide, dark green or reddish, glabrous; pedicels terete or ribbed toward apex, 0.5–2.3 cm long, ca 1 mm in diameter, dark green, reddish to brown, glabrous; floral tube narrowly turbinate or obconic, 2.0–2.5 mm long, ca 2 mm wide, reddish or green, glabrous, resinous, 10-costate; calyx lobes much reduced or when present 5(or 6), erect or incurved, connate at apex of ovary for less than 1 mm, each lobe filiform to narrowly triangular, 2–8 mm long, 0.5–2.5 mm wide at base, margin entire, resinous, midvein occasionally keeled, inside sulcate, green or reddish, glabrous, glandular-resinous; corolla tube ventricose, arcuate, 1.4–2.7 cm long, 2.5–4.0 mm wide at base, broader at the middle and narrowing slightly at the oblique mouth, outside red from a yellowish base, darker at the mouth, glabrous, resinous, inside pink or yellow, glabrous, limb

5-lobed, upper lobes rotund, erect to porrect, ca 2 mm long and wide, glandular, lateral and basal lobes triangular, reflexed, ca 2 mm long and wide, glandular, margins subentire to crenate; stipitate-glandular; stamens 4, adnate to corolla base for less than 1 mm, exserted up to 2 cm, filaments curved, 2.6–4.3 cm long, less than 1 mm wide, reddish, glabrous, anthers rotund to oblong, 1–2 mm long, ca 1 mm wide, coherent in 2 pairs, often separating at anthesis, staminode to 6 mm long; ovary inferior, apex pilose, disc cupulate or annulate, 5-angled, style curved, equaling the length of the stamens and exserted with them, reddish, sparsely pilose, stigma clavate to stomatomorphic or bilobed.

Capsule obovoid to turbinate or globose, 3–7 mm long, 3–6 mm wide, brown to gray, smooth to verrucose, costae 5 or 10, prominent or subalate; seeds narrowly rhombic or fusiform, striated, twisted, less than 1 mm long, brown.

Discussion.—*Gesneria cubensis* varies considerably over its range. The taxa included here have traditionally been distinguished by characters of leaf margin, minor differences in length of corolla tube, exsertion of stamens and style, amount of resin on vegetative and floral parts, stamen connation, etc. These characters are probably dependent on the habitat, exposure to sun and wind, or on the stage of floral development at time of collection. In other sections of *Gesneria,* leaf-margin characters and leaf size and shape have been found extremely variable within one species (e.g., *Gesneria acaulis* and *G. duchartreoides.* All of the specimens included here have a similar corolla color, size, and shape suited for hummingbird pollination. From observations in the greenhouse of other species of *Gesneria,* the variations in lengths of stamens and style and their exsertion have been seen to vary in a single flower during anthesis.

One remarkable variation is the lack of calyx lobes in the taxon separated in the following key. In other characters *G. c.* var. *truncata* clearly shows a close relationship to the typical variety.

6a. *Gesneria cubensis* var. *cubensis*

Gesneria cubensis (Decaisne) Baillon, Hist. Plant. 10:60, 1888.—Morton *in* Leon & Alain, Fl. de Cuba 4:456, 1957.

Pentarhaphia verrucosa Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:107, 1846.—Lindl. & Paxt. *in* Paxton's Fl. Gard. 3:30, pl. 250, 1852–53. [Type-collection: Mt. Liban, Cuba, *J. Linden 1841* (P, holotype; BM, BR, G, K, NY, P, W, isotypes).]

Pentarhaphia cubensis Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:108, 1846; Fl. Serres Jard. Eur., ser. 1, 3: pl. 297, 1847 [cum var. β *coroliae limbo regulari* Lemaire].—Walp., Repert. Bot. Syst. 6:736, 1847.—W. Hook., Bot. Mag. 81: pl. 4829, 1855.

Conradia verrucosa Scheidweiler *in* Otto & Dietrich, Allg. Gartenz. 15:226, 1847 [ex char., excluding locality].

Gesneria verrucosa (Decaisne) O. Kuntze, Rev. Gen. 473, 1891.—Morton *in* Leon & Alain, Fl. de Cuba 4:456, 1957.

Gesneria dolichostyla Urban, Symb. Ant. 7:540, 1913. [Type-collection: Las Cañitas, Dominican Republic, *M. Fuertes 1926* (K, lectotype; A, BM, BP, E, F, G, GH, NY, P, U, W, Z, isolectotypes).]

Gesneria heteroclada Urban, Repert. Spec. Nov. Regni Veg. 18:372, 1922. [Type-collection: Cape Samaná, Dominican Republic, *W. Abbott 1173* (US, lectotype).]

Gesneria domingensis Urban, Repert. Spec. Nov. Regni Veg. 21:223, 1925. [Type-collection: prope Constanza, Dominican Republic, *H. von Türckheim 2023,* not seen, ex char.]

Gesneria scopulorum Urban & Ekman *in* Urban, Ark. Bot. 22A (10):73, 1929. [Type-collection: Morne Saut d'Eau, Haiti, *E. Ekman H5503* (S, holotype, EHH, IJ, S, US, isotypes).]

Gesneria subalata Urban & Ekman *in* Urban, Ark. Bot. 22A (10):74, 1929. [Type-collection: Massif des Matheux, l'Arcahaie, Morne Delpech, Haiti, *E. Ekman H9328* (S, holotype; G, IJ, K, NY, S, isotypes).]

Gesneria mornincola Urban & Ekman *in* Urban, Ark. Bot. 22A (10):75, 1929. [Type-collection: Massif du Nord, Gros-Morne, Morne Chabre, Haiti, *E. Ekman H5003* (S, holotype; EHH, IJ, S, US, isotypes).]

Gesneria calcicola Alain, Mem. New York Bot. Gard. 21 (2): 144, 1971. [Type-collection: Loma del Puerto, Dominican Republic, *Alain Liogier 15537* (NY, holotype; GH, IJ, NY, P, RDJ, US, isotypes).]

Gesneria bonaoana Alain, Phytologia 25:275, 1973. [Type-collection: Loma Peguera, Bonao, Dominican Republic, *Alain Liogier 17372* (NY, holotype; US, isotype).]

Shrubs: stems to 3 m tall.

Leaves often conferted, elliptic to obovate or oblanceolate, 1.1–6.0 cm long, 0.5–2.3 cm wide.

Key to the Varieties of *Gesneria cubensis*

1. Calyx lobes obvious, 2–8 mm long; Cuba, Haiti, and Dominican Republic: Provinces of Azua, Santiago, La Vega, and Samaná ..... 6a. var. ***cubensis***
1. Calyx lobes much reduced, less than 0.5 mm long; Dominican Republic: Province of Barahona ..... 6b. var. ***truncata,*** new rank

Calyx lobes obvious, extending beyond apex of floral tube, 2–8 mm long.

Capsule obovoid to turbinate or globose, costae prominent.

TYPE-COLLECTION.—Pinal de Nimanima, St. Yago de Cuba, *J. Linden 2076* (P, holotype; BM, BR, G, GOET, K, NY (Figure 32), P, TCD, W, isotypes).

DISTRIBUTION AND ECOLOGY.—*Gesneria cubensis* var. *cubensis* is a wide-ranging variety found in eastern Cuba and in Hispaniola growing usually on exposed limestone cliffs or in thickets, from sea level to 1300 m elevation (Figure 33). Flowering specimens have been collected during all months except April and May.

SPECIMENS EXAMINED.—CUBA. PROVINCE OF ORIENTE: Pinal de Nimanima, St. Yago de Cuba, 1843–1844, *J. Linden 2076* ([August 1844] P, holotype of *Pentarhaphia cubensis* Decaisne; BM, BR, G 2 sheets, GOET, K 4 sheets, NY 2 sheets, P 3 sheets, TCD, W); Bayate in decliv. mont. calcar. Picote, 14 March 1918, *E. Ekman 9146* (S); Picote, 14 November 1919, *E. Ekman 10110* (NY, S); Sierra de Nipe, in monte calcareo Picote, 15 July 1916, *E. Ekman 7384* (S 2 sheets); farallones de La Picote, near Palmarito de Cauto, 15 September 1956, *M. Lopez F. 2838* (US 2 sheets); Monte Picote, a foothill at the southern end of Sierra de Nipe, near Palmarito del Cauto, 400 m, 29 January 1956, *C. Morton 9714* (US); Sierra de Nipe in "manacales" ad Río Piloto, ca 350 m, 14 March 1915, *E. Ekman 5022* (S); Florida Blanca, Alto Songo, 450 m, 10 January 1960, *Alain Liogier, J. Acuña & M. Lopez F. 7406* (US); Florida Blanca, 9 February 1957, *M. Lopez F. 2850* (BH, US); mogote peak, W of Santiago, 27 February 1930, *J. Roig 5054* (LS); Loma del Gato and vicinity, Cobre range of Sierra Maestra, 11 July–14 August 1925, *Bro. Edmundo 7* (LS, NY); El Cuero, 400 m, 18, 19 March 1912, *N. Britton & J. Cowell 12771* (NY, US); Guantánamo, Monte Libanon, San Fernandez, ca 700 m, 24 December 1919, *E. Ekman 10270* (S); Mt. Liban, 1843–1844, *J. Linden 1841* ([June 1844] P, holotype of *Pentarhaphia verrucosa* Decaisne; BM 2 sheets, BR, G, K 2 sheets, NY, P 2 sheets, W); Potosi, Mt. Liban, 14 March, La Luisa in Monte Toro, 9 April, and Potosi in Monte Toro, 1 May, 1860–1864, *C. Wright 3076* (GH); Loma del Esparto, Cajobabo, 31 December 1959, *Alain Liogier & M. Lopez F. 7105* (US). LOCALITY UNKNOWN: "Cuba," no date, *R. de la Sagra 816* (P); "Cuba Orientali," 1861, *C. Wright 382* (S); "Cuba," 1860–1864, *C. Wright 3076* (BM, G 2 sheets, K, MO, P, S, W); "Cuba," *C. Wright 3076* ([1856–57] GOET, [1861] GOET, [1865] US, no date NY). HISPANIOLA. HAITI. Département de l'Artibonite: Massif du Nord, Gros-Morne, Morne Chabre, ca 1125 m, 5 October 1925, *E. Ekman H5003* (S, holotype of *Gesneria mornincola* Urban & Ekman; EHH, IJ, S, US, isotypes); Massif des Matheux, l'Arcahaie, Morne Delpech, ca 1200 m, 14 November 1927, *E. Ekman H9328* (S, holotype of *Gesneria subalata* Urban; G, IJ, K, NY, S, isotypes). Département de l'Ouest: Massif des Matheux, Mirebalais, Morne Saut d'Eau, ca 800 m, 6 February 1926, *E. Ekman H5503* (S, holotype of *Gesneria scopulorum* Urban & Ekman; EHH, IJ, S, US, isotypes). DOMINICAN REPUBLIC. Province of Azua: Cordillera Central, San Juan, southern spur of Picacho del Ingenito, ca 1200 m, 8 September 1929, *E. Ekman H13511* (S); Las Cañitas, 1300 m, July 1912, *M. Fuertes 1926* (K, lectotype of *Gesneria dolichostyla* Urban; A, BM, BP, E, F, G 3 sheets, GH, NY, P, U, W, Z); Sierra de Ocoa, San Jose de Ocoa, Bejucal, ca 1000 m, 3 March 1929, *E. Ekman H11755* (K, S). Province of Santiago: Loma del Puerto, on the road to Puerto Plata, 700–800 m, 4 June 1969, *Alain Liogier 15537* (NY, holotype (2 sheets) of *Gesneria calcicola* Alain; RDJ 2 sheets, US, isotypes); Loma del Puerto, 750 m, 27 March 1972, *Alain Liogier 18526* (NY, US). Province of La Vega: Cordillera Central, Loma Chinguela, ca 1300 m, 12 October 1929, *E. Ekman H13738* (S); Loma Peguera, Bonao, 8 August 1970, *Alain Liogier 17372* (NY, holotype of *Gesneria bonaoana* Alain; US, isotype.) Province of Samaná: Los Haitises, near mouth of Barracote river, Samaná Bay, 150 m, 19 March 1969, *Alain Liogier 14494* (NY), *14507* (GH, NY, US); Los Haitises, La Manarlita, 2 July 1930, *E. Ekman H15523* (S); Cape Samaná, Samaná Peninsula, sea level to 100 m, 25 March

FIGURE 32.—Isotype of *Pentarhaphia cubensis* Decaisne and *Gesneria cubensis* (Decaisne) Baillon, *Linden 2076* (NY).

1921, *W. Abbott 1173* (US, lectotype of *Gesneria heteroclada* Urban), *1182* (US); peninsula de Samaná, Cabo Samaná, Playa Madama, 9 May 1930, *E. Ekman H14926* (A, EHH, F, G, GH, K, NY, S, US); peninsula de Samaná, Cabo Samaná, at El Frontón, 18 June 1930, *E. Ekman H15344* (C, S). CULTIVATED: Hort. Soc. Gard. Chiswick, 5 September 1850, *Meisner Herb. sn* (NY); Hort. Van Houtte, no date, no collector (BM).

DISCUSSION.—There are essentially no differences among the many described taxa, included here in *Gesneria cubensis* var. *cubensis* in Cuba and Hispaniola, which can be defended in the light of the range of variability possible among the species. Since other species of *Gesneria* are known across the straits, which separate the islands of the Greater Antilles, the occurrence of *Gesneria cubensis* in both Cuba and Hispaniola cannot be ruled out, particularly since, in Cuba, *G. cubensis* occurs in Oriente Province, the closest of the provinces to Hispaniola, where *G. cubensis* is widespread in scattered populations.

The fruits of this subspecies are distinctive by the large costae, which are most pronounced in the populations from Alto Songo in Cuba and Massif des Matheux in Haiti. The incurved calyx lobes, although variable in width, are sulcate on the inner surface and the midvein becomes prominent or keeled in the capsule.

Openings at the base of the corolla similar to those reported by Alain in *G. calcicola* have also been found in samples labeled *G. bonaoana* and *G. dolichostyla*. Since fenestrate corollas rarely occur in *Gesneria*, these openings may be the result of animal predation on the nectar at the base of the corolla tube, or due to a genetic atavism to polypetaly similar to that seen in artificial hybrids between *Gesneria* species (G–1236, *G. citrina* × *G. pedunculosa*) and in the cultivated polypetalous clone of *Sinningia aggregata*.

The holotype of *G. heteroclada* Urban was probably at Berlin and presumably destroyed. The only known duplicate of *Abbott 1173* in the Department of Botany, Smithsonian Institution, the depository of Abbott's first set of collections, is here selected as lectotype. The divaricate habit of these plants from the Samaná Peninsula of Hispaniola is similar to many collections of *G. cubensis* from Cuba, but appears to be the most divaricate of any population on Hispaniola. The tuberculate or verrucose branches also are more like Cuban populations than others that are closer geographically.

Urban described *Gesneria domingensis* from a specimen that lacked flowers (*von Türckheim 3023*) but was reported to have been collected from the area where *G. cubensis* is known today. No examples of *von Türckheim 3023* have been located, but from the description the species belongs here.

The holotype of *Gesneria dolichostyla* was presumably at Berlin and no longer extant. From the numerous duplicates of *Fuertes 1926*, the

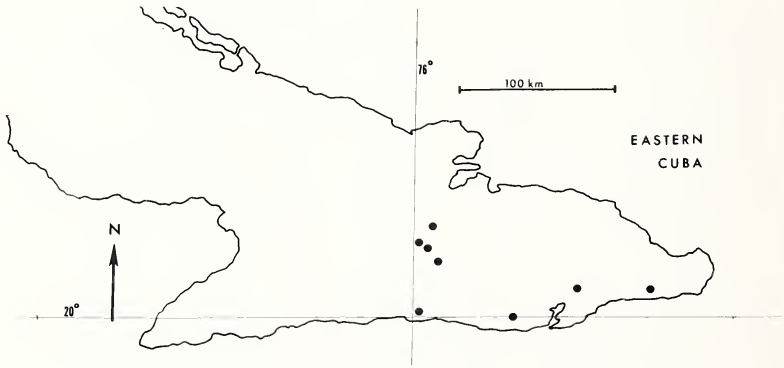

FIGURE 33.—Distribution of *Gesneria cubensis* var. *cubensis* in eastern Cuba.

specimen at Kew, is selected as lectotype for *Gesneria dolichostyla*.

Conradia verrucosa Scheidweiler was described from a cultivated plant grown by de Jonghe, a grower who supplied other species of *Gesneria* (e.g., *G. libanensis*, from seeds collected by Linden in Cuba) to botanical gardens. The locality given by Scheidweiler, "aus dem Orgelgebirge (Brasilien)," is probably in error, since the description fits specimens of *G. cubensis* (*G. verrucosa* Decne.), and no species of *Gesneria* L. are known from Brazil.

Gesneria cubensis persisted in cultivation for many years following the 1840's and was depicted in many horticultural journals. The species is not known to be in cultivation at the present time.

6b. *Gesneria cubensis* var. *truncata* (Alain) L. Skog, new rank

Gesneria truncata Alain, Brittonia 20:155, 1968.

Shrubs: stems to 5 m tall.

Leaves not conferted, usually elliptic, 2.5–7.0 cm long, 0.7–2.7 cm wide.

Calyx lobes much truncated at apex of floral tube, reduced, ca 0.5 mm long.

Capsule subglobose, costae not prominent.

Type-Collection.—La Hotte, between La Cueva and Placer Bonito, Dominican Republic, *R. Howard 12283* (NY, holotype (Figure 31*b*); US, isotype).

Distribution and Ecology.—This variety is known only from the Province of Barahona in Dominican Republic, where it grows on slopes in forests at 900–1500 m elevation (Figure 27). A collection of flowering material was made in August. Fruiting specimens were collected in February.

Specimens Examined.—HISPANIOLA. Dominican Republic. Province of Barahona: La Lanza, between Monteada Nueva and Polo, 900–1000 m, *Alain Liogier 14321* (GH, NY); La Hotte, between La Cueva and Placer Bonito, 5000 ft, 1 August 1950, *R. Howard 12283* (NY, holotype of *Gesneria truncata* Alain); Mt. Laho, trail between La Cueva and Placer Bonito, 4500 ft, 1 August 1950, *R. Howard 12283* (US, isotype).

Discussion.—The sheets of the type collection *Howard 12283*, are labeled as coming from either La Hotte or Mt. Laho. These names are probably variations for the same locality and probably variations of La Jó, a name shown on maps prepared by the Defense Mapping Agency for a hill between La Cueva and Placer Bonito.

7. *Gesneria glandulosa* (Grisebach) Urban

Gesneria glandulosa (Grisebach) Urban, Symb. Ant. 2:373, 1901.—Morton *in* Leon and Alain, Fl. de Cuba 4:463, 1957. *Pentarhaphia glandulosa* Grisebach, Cat. Pl. Cub. 199, 1866.

Shrubs: stems woody, erect, to ca 1 m tall, ca 5 mm in diameter at 10 cm below apex, bark red, densely villous with reddish articulated glandular and eglandular trichomes, resinous above, below gray, glabrescent, and rugose, lenticels obscure; branches few, leaf scars not prominent.

Leaves alternate, scattered toward branch apices: petioles sulcate, 0.6–1.3 cm long, 1–2 mm wide, subcoriaceous, red, densely villous, glandular-resinous; blades elliptic, oblong or oblanceolate, 2.8–7.3 cm long, 1.0–2.9 cm wide, base acute, margin subentire below, serrulate above, apex acute, adaxial surface plane or slightly bullate in older leaves, green, glabrescent with a few scattered trichomes along the impressed midvein, abaxial surface green or reddish-brown, villous with trichomes more dense along the reddish prominent veins, resinous.

Inflorescences in upper axils, 3- to several-flowered, length equaling the subtending leaves: peduncles terete, 1.8–2.9 cm long, ca 1 mm in diameter, red, glandular-villous, resinous; bracts 2, lanceolate, ca 1 cm long, ca 2 mm wide, red, villous; pedicels 0.9–2.4 cm long, ca 1 mm in diameter, red, villous, resinous; floral tube shortly turbinate, 2–3 mm long, 4–5 mm wide at apex, red, glandular-villous, resinous on both sides; corolla tube cylindric, curved, subventricose at middle, 2.0–2.3 cm long, 4 mm wide at base, 5 mm wide at middle, 3 mm wide at throat, outside yellow (fide Wright), pilose and glandular with short unstalked glands, inside yellow, glabrous, limb erect or porrect, 5-lobed, lobes suborbicular, 1–2 mm long, 2–3 mm wide, upper lobes dentate, lateral and basal lobes entire, sparsely glandular; stamens 4, shortly exserted, filaments curved, ca 2 cm long, glabrous, anthers not seen; ovary inferior, apex pilose, disc annular, yellow, style ca 2.2 cm long, reddish, sparsely pilose, stigma curved, clavate.

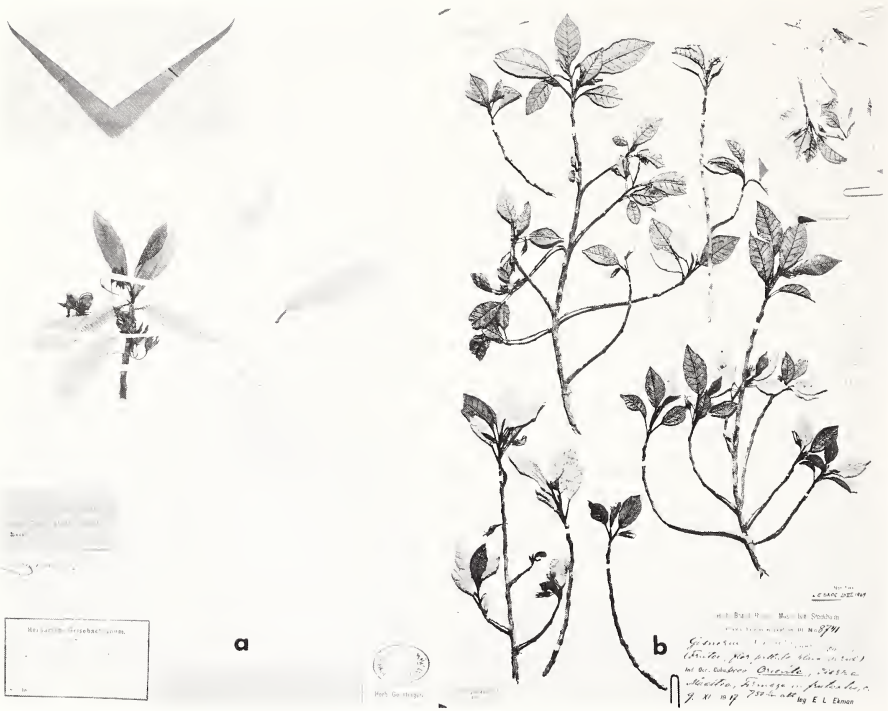

FIGURE 34.—Type specimens: *a*, holotype of *Pentarhaphia glandulosa* Grisebach and *Gesneria glandulosa* (Grisebach) Urban, *Wright 3075* (GOET); *b*, holotype of *G. heterochroa* Urban, *Ekman 8741* (S).

Capsule broadly turbinate, 4–6 mm long, 6–8 mm wide, reddish and pilose to gray and glabrescent with age, persistent calyx lobes patent, costae 5, obscure; seeds rhombic, striate, twisted, ca 1 mm long, 0.5 mm wide, dark red.

TYPE-COLLECTION.—El Yunque de Baracoa, Cuba, *C. Wright 3075* (GOET, holotype (Figure 34*a*); G, GH, K, NY, isotypes).

DISTRIBUTION AND ECOLOGY.—*Gesneria glandulosa* is endemic to El Yunque de Baracoa in Oriente Province of Cuba in rock crevices at ca 500 m elevation (Figure 29). Underwood (1905) reported that Wright, in correspondence to Asa Gray on 3 June 1861, wrote that he would spend a few days on El Yunque. This species was probably collected in flower at that time.

SPECIMENS EXAMINED.—CUBA. PROVINCE OF ORIENTE: El Yunque de Baracoa, *C. Wright 3075* ([1861] GOET, holotype of *Pentarhaphia glandulosa* Grisebach; [1860–1964] G, GH, K, NY, isotypes).

DISCUSSION.—This species, known from a single collection (*Wright 3075*) from El Yunque de Baracoa in eastern Cuba, appears intermediate between *Gesneria salicifolia* and *G. purpurascens*,

both collected from near the type locality of *G. glandulosa*. The erect shrubby habit, subcoriaceous leaves, and elongated sepals are similar to *G. salicifolia*, but the pubescence of the stem, leaves, and inflorescence, fruit shape, and the somewhat bullate condition of the leaves, among other characters, resembles *G. purpurascens*. Abundant fruits appear to be present on the specimens. It is unknown whether the seeds were viable. Hybridization between *Gesneria salicifolia* and *G. purpurascens*, if brought into cultivation, may determine the hybrid nature of *G. glandulosa*.

8. *Gesneria haitiensis* L. Skog

Gesneria haitiensis L. Skog, Baileya 18:114, 1972.

Shrubs: stems woody, erect or contorted at the base to 1.3 m tall, bark brown to gray at maturity, pith reddish; young branchlets divaricate, extending out from the primary branches for 3–9 cm, 1–4 mm in diameter, wider toward the apices, glabrous, resinous, lenticels elongated.

Leaves alternate, crowded at the apices of the branches, resinous: petioles sulcate from a swollen base, 2–6 mm long, ca 1 mm wide, green to brown, glandular and glabrous, except for sparse rows of hairs in the sulcus; blades elliptic to obovate, 2.8–5.2 cm long, 1.5–2.7 cm wide, coriaceous, base cuneate, margin entire, apex rounded to acute, adaxial surface dark green, nitid, glabrous, except for sparse rows of hairs along the immersed midvein, abaxial surface lighter green, glabrous, glandular along the prominent midvein.

Inflorescences from the axils of the crowded leaves, 1-flowered, length equaling the subtending leaves: peduncles very short, bearing 2 lanceolate bracts, 1.5 mm long, reddish-brown, glandular; pedicels terete, 0.8–1.2 cm long, elongating in fruit, ca 1 mm in diameter; floral tube turbinate, 1.5–2 mm long, ca 2 mm wide, reddish-brown, glabrous, glandular-scaly; calyx erect, 5-lobed, the lobes connate for less than 1 mm, aestivation valvate, each lobe sulcate, lanceolate-linear, 5–9 mm long, ca 1 mm broad, apex acuminate, margin entire, exterior surface reddish-brown, glabrous, glandular-scaly, interior surface lighter red, glabrous; corolla tube cylindric, slightly curved from the gibbous base, 0.9–1.2 cm long, 4–6 mm wide at the base, 3–4 mm wide at the middle and 2–3 mm wide at the mouth, outer surface rosy-pink, glabrous, but slightly glandular, interior surface lighter pink, glabrous, limb patent, 1.2–1.8 cm across, 5-lobed, each lobe orbiculate, flat, ca 7 mm long, ca 8 mm broad, rosy-pink, glabrous, margin erose to scalloped, glandular; stamens 4, subexserted, filaments adnate to the base of the corolla for less than 1 mm, linear, curved, ca 9 mm long, ca 1 mm in diameter, white, glabrous except for a group of hairs at the bend 2 mm above the base of the filament, anthers oblong, ca 1 mm long, coherent in 2 pairs, staminode 4 mm long, lacking mature anther; ovary inferior, apex reddish, pubescent disc sinuate-annular, thickened, ca 2 mm across, glabrous, style linear, ca 7 mm long, reddish, pilose, stigma stomatomorphic, and pilose.

Capsule broadly turbinate or ovoid, 4–6 mm long, 6–7 mm in diameter, gray-brown, glabrous, costae 10, prominent; seeds fusiform, twisted, ca 1 mm long, reddish-brown.

Type-Collection.—Between Léon and Fond Cochon, Haiti, *L. Skog, T. Talpey & D. Pfister 1616* (BH, holotype; BM, BR, C, E, F, G, GH, IJ, L, M, MO, NY, P, S, US (Figure 35*a*), W, Z, isotypes).

Distribution and Ecology.—*Gesneria haitiensis* is known only from Département du Sud in western Haiti (Figure 27), where it grows on limestone cliffs overhanging rivers at an elevation of ca 330 m. This species was collected in flower in July. Although in cultivation at Cornell University (G-1366), the plants have not flowered.

Specimens Examined.—HAITI. Département du Sud: along banks of dry Rivière Voldrogue at Bras-Sec [Bois-Sec] between Léon and Fond Cochon, Massif de la Hotte, about 15 miles SE of Jérémie, 1100 ft, 24 July 1970, *L. Skog, T. Talpey & D. Pfister 1616* (BH, holotype: BM, BR, C, E, F, G, GH, IJ, L, M, MO, NY, P, S, US, W, Z, isotypes).

Discussion.—The species in this section, except for *Gesneria aspera* and *G. haitiensis*, are characterized by a bilabiate corolla with an oblique mouth often with stamens and style far exserted, or by a corolla with an arrect limb of lobes less than 2 mm long. *Gesneria aspera* and *G. haitiensis* are similar in having a corolla with a broad patent limb of lobes more than 5 mm long and having included stamens and style. *Gesneria aspera* differs in being pilose on stems, leaves and inflorescences, and having leaves 1.5–2.5 cm long, calyx lobes 2–4 mm long and corolla 1.1–2.2 cm long.

FIGURE 35.—Type specimens: *a*, isotype of *Gesneria haitiensis* L. Skog, *Skog, Talpey & Pfister 1616* (US); *b*, lectotype of *G. harrisii* Urban, *Harris 8670* (F).

9. *Gesneria harrisii* Urban

Gesneria harrisii Urban, Symb. Ant. 5:497, 1908.

Large shrubs or small trees: stems woody, erect, to 3 m tall, 4 cm in diameter at base, bark subrugose brown to gray, glabrous, very resinous, lenticels elongated; branches scattered, terete, ca 4 mm in diameter at 10 cm below apex, green to brown, glabrous, resinous, internodes 0.2–8.7 cm long, leaf scars prominent.

Leaves alternate, well separated or crowded toward branch apices: petioles slender, sulcate, 7–15 mm long, ca 1 mm wide, green to brown, glabrous, glandular-resinous; blades elliptic or oblong, rarely obovate, 3.4–11.0 cm long, 1.3–4.4 cm wide, coriaceous, rigid, base acute, margin entire below, crenate or dentate above, apex acute, adaxial surface plane, green, glabrous, somewhat resinous, veins impressed, abaxial surface lighter green or reddish-brown, glabrous, densely glandular-resinous, veins prominent.

Inflorescences of single flowers, shorter than or equaling the subtending leaves: peduncles (including pedicel) terete, alate toward apex, 2–5 cm long, ca 1 mm in diameter, green to brown, glabrous, resinous; bracts obsolete; floral tube turbinate or obconic, 2–3 mm long, 2–3 mm wide at apex, green to brown, glabrous, resinous, costate; calyx 5-lobed, lobes connate for less than 1 mm, filiform to narrowly lanceolate, erect, becoming incurved in fruit, 9–16 mm long, ca 1 mm wide at base, outside keeled, green, glabrous and

resinous, inside sulcate, green, glabrous, resinous; corolla tube cylindric, wider above middle, 12–17 mm long, ca 4.5 mm wide at throat, outside sulfur yellow, glabrous, resinous, inside yellow-green, glabrous, limb bilabiate, glabrous, resinous, margin subentire to denticulate, stipitate-glandular, upper lobes erect, semiorbiculate, notched, lateral lobes reflexed, rotund, 1.5–2.0 mm long, ca 1.5 mm wide, basal lobe reflexed, triangular, ca 2 mm long and wide, notched; mouth not oblique; stamens 4, staminode 5 mm long, all adnate to base of corolla for less than 1 mm, exserted to length of upper lobes of corolla, filaments curved, 12–17 mm long, ca 0.5 mm wide at base, narrower above, yellow-green, glabrous, anthers oblong, ca 1 mm long, 0.5 mm wide, coherent in 2 pairs or free; ovary inferior, apex pilose, disc short, annular, style curved, 8–16 mm long, yellow-green, darker at base, glabrous, stigma thicker than style, bilobed, papillate.

Capsule turbinate to broadly turbinate, dehiscing from the apex, 4–5 mm long, 5–6 mm wide at apex, gray or brown, glabrous, resinous, costae 5, subalate; seeds fusiform, striate, twisted, ca 1 mm long, ca 0.3 mm wide, reddish or brown.

Type-Collection.—Glasgow, near Troy, Jamaica, *W. Harris 8670* (F, lectotype (Figure 35*b*); BM, UCWI, isolectotypes).

Distribution and Ecology.—*Gesneria harrisii* is endemic to central Jamaica (Figure 36), where it grows on shaded limestone rocks and cliffs from ca 400–850 m elevation. This species appears to be in flower all during the year.

Specimens Examined.—JAMAICA. Parish of Trelawny: near Troy, 1500 ft, 22 November 1905, *W. Harris 9066* (BM, F, NY, UCWI). Parish of Manchester: cliff, Troy to Oxford, Cockpit Country, 13–18 September 1906, *N. Britton 677* (F, NY, US); vicinity of Auchtembeddie, 1750 ft, 1 December 1962, *G. Proctor 22974* (BM, IJ); near Auchtembeddie, ca 1250 ft, 5 November 1964, *G. Proctor 25623* (IJ); near Auchtembeddie, 1250 ft, 15 August 1970, *L. Skog & G. Proctor 1636* (BH, US); N of Mandeville, near Auchtembeddie, 1750 ft, 5 November 1964, *T. Talpey 19* (BH); Glasgow, near Troy, 1400 ft, 20 April 1904, *W. Harris 8670* (F, lectotype of *Gesneria harrisii* Urban; BM, UCWI, isolectotypes); Norway district, 1.5 mi due SW of Craig hill P.O., ca 2300 ft, 30 March 1964, *G. Proctor 24755* (BM, IJ, NY, U); Cockpit Country, ca 2 mi SW of Craig head, ca 2000 ft, 20 June 1959, *G. Webster, J. Ellis & K. Miller 8416* (BM, G, IJ, S). Parish of St. Ann: Douglas Castle district, ca 2300 ft, 28 March 1965, *G. Proctor 26320* (IJ). Parish of Clarendon: Peckham Woods, 2500 ft, 27 September 1912, *W. Harris 11184* (BM, F, NY, US), 27 December 1917, *W. Harris 12782* (F, GH, K, MO, NY, UCWI, US), 7 January 1955, *G. Proctor 9770* (A, IJ, NY); Peckham Woods, north of Frankfield, 2500 ft, 23 December 1955, *W. Stearn 4* (A, BH, BM, K). Locality Unknown: Jamaica, 1844, *W. Purdie sn* (K, NY).

Discussion.—*Gesneria harrisii* resembles *G. cubensis* vegetatively, but differs in corolla color and shape, and in the glabrous style. The flowers are similar in shape to those of *G. jamaicensis*, but are not rose or pink; the longer peduncles and the often obovate leaves of *G. jamaicensis* also separates these two species.

Urban designated two specimens as syntypes, *Harris 8670* and *Harris 9066*. Since the types at Berlin are no longer extant, the specimen of *Harris 8670* at the Field Museum of Natural History, annotated by Urban, is designated here as lectotype.

10. *Gesneria heterochroa* Urban

Gesneria heterochroa Urban, Symb. Ant. 9:270, 1924.—Morton *in* Leon & Alain, Fl. de Cuba 4:456, 1957.

Gesneria clarensis var. *turquinensis* Morton, Brittonia 9:19, 1957.—Morton *in* Leon & Alain, Fl. de Cuba 4:456, 1957. [Type-collection: Pico Turquino, Sierra Maestra, Cuba, *J. Acuña 9712* (SV, holotype; fragment, US).]

Shrubs: stems woody, erect, to 2 m tall, 3–4 mm in diameter at 10 cm below apex, bark verrucose or tuberculate above from erumpent lenticels, dark green to brown, glabrous, sparingly resinous at apex; branches numerous, internodes 4–9 mm long.

Leaves alternate, scattered: petioles sulcate, 4–15 mm long, ca 1 mm wide, dark green or reddish brown, verrucose, glabrous, resinous; blades lanceolate, elliptic, or obovate, 2.0–6.8 cm long, 1.0–3.2 cm wide, subcoriaceous, base acute, margin crenulate or serrulate, revolute, occasionally reddish, apex acute to acuminate, adaxial surface plane, smooth or occasionally rough when dry, green, glabrous, veins impressed, abaxial surface reddish-brown or green, glandular-resinous, veins reddish and prominent.

Inflorescences axillary near branch apices, 1-flowered, about one-half the length of the subtending leaves: peduncles (including pedicel) terete or subalate toward apex, 0.3–1.2 cm long, less than 1 mm in diameter, reddish, resinous; bracts 2, at base of peduncle, each linear, 2–3 mm

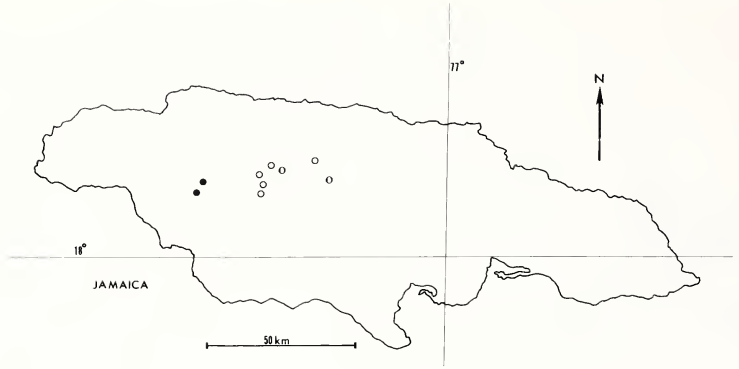

FIGURE 36.—Distribution of *Gesneria* section *Pentarhaphia* in Jamaica. (*G. harrisii* = open circles; *G. jamaicensis* = solid circles.)

long; floral tube narrowly obconic, ca 4 mm long, ca 2 mm wide, reddish-brown, glabrous, resinous, costae 5; calyx lobes 5, erect, connate at base for less than 1 mm, each linear, 5–9 mm long, less than 1 mm wide at base, reddish and resinous both sides, outside with prominent midvein, inside sulcate; corolla tube cylindric, slightly swollen at base then narrower, slightly ampliate below middle, 10–15 mm long, 2–3 mm wide at base, 4–6 mm wide above, outside yellow-green to greenish-white, glabrous, glandular-resinous, inside yellow-green, glabrous, limb slightly bilabiate, 5-lobed, lobes suborbiculate, margins crenate or erose, stipitate-glandular, upper lobes erect, 2–4 mm long, 3–5 mm wide, lateral and basal lobes reflexed, 2–3 mm long and wide; stamens 4, adnate to corolla base for ca 1 mm, exserted ca 5–8 cm beyond corolla, filaments curved 1.6–2.0 cm long, yellow-green, glandular, anthers oblong, 1.0–1.5 mm long, ca 1.0 mm wide, sparsely pilose on back, staminode ca 2.5 mm long; ovary completely inferior, apex pilose, disc annular, yellow, style curved, 1.0–2.5 cm long, pilose, stigma capitate, papillate.

Capsule narrowly turbinate, 5–6 mm long, 2.0–3.5 mm wide at apex, reddish-brown, costae 5; seeds fusiform, striated, twisted, 0.5–1.0 mm long, tawny to dark brown (Figure 19*a*).

TYPE-COLLECTION.—Firmeza, Sierra Maestra, Cuba, *E. Ekman 8741* (S, holotype, Figure 34*b*).

DISTRIBUTION AND ECOLOGY.—*Gesneria heterochroa* is known from Oriente Province of Cuba (Figure 29) at elevations from 750 to 1830 m. Its habitat is among rocks, on cliffs or in thickets in exposed situations. Flowering material has been collected from October to January.

SPECIMENS EXAMINED.—CUBA. PROVINCE OF ORIENTE: top of Pico Turquino, S. Maestra, 1–2 August 1935, *J. Acuña 6787* [ster.] (NY); Pico Turquino, Sierra Maestra, August 1935, *J. Roig & G. Bucher 53* [ster.] (US), *59* [ster.] (US); Pico del Este, Sierra Maestra, 5960 ft, 1–2 August 1935, *J. Acuña 9712* [ster.] (US, holotype fragment of *Gesneria clarensis* var. *turquinensis* Morton); Firmeza, Sierra Maestra, ca 750 m, 9 November 1917, *E. Ekman 8741* (S, holotype of *Gesneria heterochroa* Urban); Gran Peidra, Sierra Maestra, ca 1200 m, *Alain Liogier, J. Acuña & M. Lopez F. 7441* (US); La Gran Piedra, supra Daiquiri, ex colon. "La Florida," ca 850 m, 28–29 June 1914, *E. Ekman 1598* (S); Sierra Maestra, prope Daiquiri, 800–1000 m, 28 October 1916, *E. Ekman 8090* (NY, S).

DISCUSSION.—*Gesneria heterochroa* includes *G. clarensis* var. *turquinensis,* which was described without flowers or fruit. The vegetative characters and the range of this latter population are closer to *G. heterochroa* from Oriente Province than with *G. clarensis* from Las Villas Province of Cuba.

The slender branches bearing well-spaced leaves acute at the apex distinguish the population at Pico Turquino from *G. viridiflora* subsp. *viridiflora* at the same locality, which has stout branches and rotund or emarginate leaves.

11. *Gesneria hypoclada* Urban & Ekman

Gesneria hypoclada Urban & Ekman *in* Urban, Ark. Bot. 20A (5):50, 1926.

Small trees: stems woody, erect, bark verruculose from erumpent lenticels and yellowish when young, becoming rugose to smooth and gray-brown with age, glabrous, apices resinous; branches numerous, terete, slender, ca 2 mm in diameter at 10 cm below apex, internodes 0.1–1.1 cm long, leaf scars prominent.

Leaves alternate, spiral, congested toward the branch apices: petioles sulcate, 3–6 mm long, ca 1 mm wide, verruculose, yellow from resin, glandular; blades elliptic to obovate, 2.1–4.2 cm long, 1.0–1.4 cm wide, subcoriaceous, base narrowly acute, margin subentire below, above crenate or serrate, apex acute, adaxial surface plane, yellow-green from resin, glandular, midvein impressed, abaxial surface yellow-green, glandular, veins darker, prominent.

Inflorescences axillary near branch apices, 1-flowered, equaling the subtending leaves: peduncles curved, terete, 6–8 mm long, less than 1 mm in diameter, yellow, glandular-resinous; bracts 2, caducous, approximate, linear, 1–3 mm long, yellow, glandular-resinous, apex apiculate; pedicels terete or subalate toward apex, 4–9 mm long, less than 1 mm wide, yellow, glandular-resinous; floral tube turbinate, ca 2 mm long, 2–3 mm wide at apex, green to yellow, glandular-resinous, costae 5; calyx 5-lobed, lobes connate at base for less than 1 mm, erect at anthesis becoming sinuate, each narrowly triangular, 4–10 mm long, ca 1 mm wide at base, margin chartaceous, midvein prominent outside, both sides yellow-green, glandular-resinous; corolla tube cylindric, subventricose, 0.8–1.5 cm long, ca 3 mm wide at base, ca 6 mm wide above, green to brown with darker veins, glandular-resinous both sides, limb slightly bilabiate, upper lobes erect, suborbiculate, ca 3 mm long and wide, margin crenate, stipitate-glandular, lateral and basal lobes patent, orbiculate, ca 3 mm long and wide, glandular, entire; stamens 4, adnate to corolla base, exserted only to corolla limb, filaments 1.3–1.5 cm long, yellow-green, glabrous, anthers oblong, ca 1.5 mm long, coherent in 2 pairs at anthesis, staminode 5 mm long; ovary inferior, apex pilose, disc annular, yellow, style 1.7–1.8 cm long, yellow-green, pilose at base, stigma papillate.

Capsule turbinate, ca 4 mm long and wide at apex, brown, glandular-resinous; seeds not seen.

Type-Collection.—Morne Tranchant, Pétionville, Haiti, *E. Ekman H1877* (S, holotype; EHH, IJ, K, NY, S, US Figure 37*a*, isotypes).

Distribution and Ecology.—*Gesneria hypoclada* is known only from the mountains of Département de l'Ouest in southeastern Haiti (Figure 27) at elevations of 1800–1825 m, where it grows on hard limestone. This species has been collected in flower only in September.

Specimens Examined.—HISPANIOLA. Haiti. Département de l'Ouest: Massif de la Selle, Morne Tranchant, Pétionville, 1800–1825 m, 13 September 1924, *E. Ekman H1877* (S, holotype of *Gesneria hypoclada* Urban & Ekman; EHH, IJ, K, NY, S, US 2 sheets, isotypes).

Discussion.—*Gesneria hypoclada* most closely resembles *G. heterochroa* from Cuba in its one-flowered inflorescences with short peduncles bearing greenish flowers. The Cuban species differs in being fruticose rather than arborescent, having capsules 5–6 mm long, and petioles 1.0–1.6 cm long.

This Haitian species from near Pétionville is probably now extinct due to its distribution near the region of dense human population and the incessant search for wood for charcoal by rural people.

12. *Gesneria jamaicensis* N. Britton

Gesneria jamaicensis N. Britton, Bull. Torrey Bot. Club 48: 341, 1922 [1921].—Adams, Fl. Pl. Jamaica 680, 1972.

Small straggling shrubs: stems woody, to 3.3 m tall, 3–4 mm in diameter at 10 cm from apex, bark smooth to rough, green or brown to gray, glabrous, apex verruculose from glandular trichomes, very resinous, lenticels obscure; branches scattered, terete, soon becoming woody, internodes 0.1–14.0 cm long, leaf scars large, prominent.

Leaves alternate, spiral, scattered or congested at branch tips: petioles sulcate, 4–14 mm long, 1–2 mm wide, green, glabrous, glandular and resinous; blades elliptic, oblong or obovate, occasionally falcate, usually broader above the middle, 6.0–15.4 cm long, 1.9–5.7 cm wide, rigid, coriaceous, base acute, margin entire toward the base, serrate or dentate above, apex acute to acuminate, adaxial surface plane, dark green, glabrous, nitid,

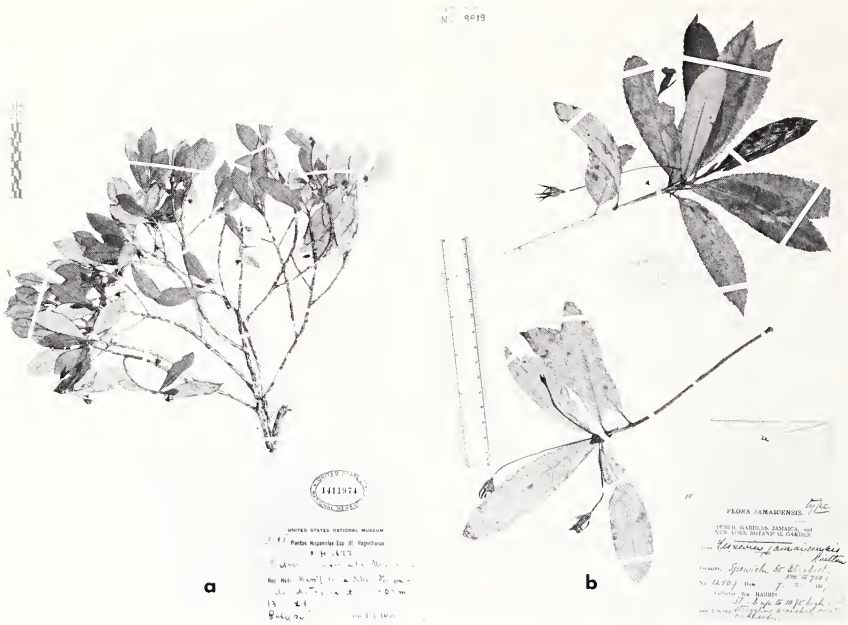

FIGURE 37.—Type specimens: a, isotype of *Gesneria hypoclada* Urban & Ekman, *Ekman H1877* (US); *b*, holotype of *G. jamaicensis* Britton, *Harris 12509* (NY).

glandular-resinous, veins impressed, abaxial surface copper-colored and green at the veins or all green, glabrous, glandular-resinous, veins prominent and darker.

Inflorescences of 1(–2) flowers, length equaling or exceeding the subtending leaves: peduncles (including pedicel) terete or subquadrangular, curved, 4.5–11.8 cm long, 1–2 mm wide at base, slender at middle, broader toward the costate apex, reddish, glabrous, glandular-resinous; bracts obsolete; floral tube obconic or turbinate, 2–8 mm long, 2–4 mm wide, dark red, glabrous, glandular-resinous; calyx lobes 5, erect, incurved, connate for ca 1 mm, each linear to lanceolate, 7–11 mm long, 1–3 mm wide at base, outside keeled, rose, glabrous, glandular-resinous, inside sulcate, green, glabrous, glandular-resinous; corolla tube subcylindric, broadest at base, narrowing to middle, then wider toward mouth, 8–10 mm long, 3 mm wide at base, ca 4 mm wide at mouth, outside deep rose or crimson to rose pink, glabrous and resinous, inside lighter pink, glabrous, limb 5-lobed, glabrous, margin erose or dentate, lobes orbiculate 3–5 mm long, 3–4 mm wide, upper lobes erect to porrect, lateral and basal lobes patent to reflexed, mouth oblique; stamens 4, staminode ca 3 mm long, all adnate to base of corolla tube, not exserted beyond corolla limb, filaments sigmoid-curved, broad at base, filiform above, 8–10 mm long, ca 1 mm wide at base, reddish, glabrous, anthers oblong to rotund, nodding, ca 1 mm long, and wide, coherent in 2 pairs, becoming free; ovary inferior, apex pilose, disc annular, thickened, style curved, 7–8 mm long, ca 1 mm wide, reddish, sparsely pilose at base, glabrous above, stigma bilobed, papillate.

Capsule subglobose to obconic, 4–8 mm long, 4–6 mm wide, reddish-brown to gray, glabrous, resinous, costae 5; seeds fusiform to rhombic, striated, twisted, ca 1 mm long, ca 0.25 mm wide.

TYPE-COLLECTION.—Ipswich, Jamaica, *W. Harris 12509* (NY, holotype, Figure 37*b*; BM, F, GH, K, MO, P, PH, UCWI, US, isotypes).

CHROMOSOME NUMBER.—$n = 14$ (Lee, 1968).

DISTRIBUTION AND ECOLOGY.—*Gesneria jamaicensis* is known only from the parish of St. Elizabeth in western Jamaica (Figure 36), where it grows on shady limestone ledges at 250–400 m elevation. From the wild this species has been collected in flowering condition in March, June, August, and November. A cultivated plant growing in greenhouses at Cornell University (G–879) produced flowers in April.

SPECIMENS EXAMINED.—JAMAICA. PARISH OF ST. ELIZABETH: Ipswich, 7 March 1917, *W. Harris 12509* (NY, holotype of *Gesneria jamaicensis* N. Britton; BM, F, GH, K, MO, P, PH, UCWI, US, isotypes), ca 800 ft, 10 March 1956, *G. Proctor 11732* (GH), *W. Stearn 412* (A, BH, BM 4 sheets, K, S), 4 November 1964, *G. Proctor 25618* (IJ), *T. Talpey 16* (BH), 16 August 1970, *L. Skog & G. Proctor 1640* (BH, US); Mulgrave, 1300 ft, 14 June 1916, *W. Harris 12374* (BM, F, GH, K, NY, UCWI, US).

DISCUSSION.—*Gesneria jamaicensis* has been introduced into cultivation at Cornell University where the T. Talpey introduction of 1964 was grown under the accession numbers G–879 and G–1400.

Among the species that resemble *Gesneria jamaicensis, G. harrisii* can be distinguished by its yellowish corolla and erect fruticose habitat; *G. scabra* var. *sphaerocarpa,* which has been collected near the range of *G. jamaicensis* and has a rosy-pink corolla and a straggling, suffruticose habit, can be separated by the pubescent peduncles, calyces and corollas of the multiflowered inflorescences.

13. *Gesneria lanceolata* Urban & Ekman

Gesneria lanceolata Urban & Ekman *in* Urban, Ark. Bot. 22A (10):72, 1929.

Shrubs: stems woody, erect to ca 2 m tall (fide Ekman); bark smooth, gray-brown, glabrous, resinous toward the apex; branches numerous, terete, internodes to ca 5 cm long, leaf scars prominent on young branches, becoming obscure.

Leaves alternate, scattered at branch apices: petioles sulcate, 8–15 mm long, ca 1 mm wide, glabrous, resinous; blades narrowly elliptic to oblanceolate, 6.7–11.0 cm long 1.5–3.3 cm wide, subcoriaceous, base acute, margin below the middle entire, above denticulate, apex acute to acuminate, adaxial surface plane, smooth, nitid, green, glabrous-glaucescent, midvein impressed, abaxial surface lighter green or light reddish-brown, veins prominent.

Inflorescences in axils of upper leaves, 2- or 3-flowered, ca one-fourth to one-half the length of the subtending leaves: peduncles terete, 3–6 mm long, ca 0.5 mm wide, glabrous; bracts 2, caducous, linear, 2–3 mm long; fruiting pedicels terete, 5–7 mm long, ca 0.3 mm wide. Flowers not seen.

Capsule turbinate, ca 4 mm long, ca 3.5 mm wide toward the apex, gray-brown, glabrous, the persistent calyx lobes linear, ca 1.5 mm long, ca 1 mm wide, fruit apex erumpent, pilose, costae 10; seeds fusiform, ca 0.7 mm long, brown.

TYPE-COLLECTION.—Massif de la Selle, Croix-des-Bouquets, Haiti, *E. Ekman H7861* (S, holotype; IJ, S, isotypes).

DISTRIBUTION AND ECOLOGY.—*Gesneria lanceolata* is endemic to the Massif de la Selle in southern Haiti (Figure 27) at ca 1000 m elevation. The only collection of this species, consisting of fruiting material, was made in March.

SPECIMENS EXAMINED.—HISPANIOLA. HAITI. Département de l'Ouest: Massif de la Selle, Croix-des-Bouquets, Badeau, at Trou-a-l'Eau, ca 1000 m, 15 March 1927, *E. Ekman H7861* (S, holotype of *Gesneria lanceolata* Urban & Ekman (Figure 38*a*); IJ, S, isotypes).

DISCUSSION.—Since *Gesneria lanceolata* was described without flowers, its sectional placement is not definite. On the basis of vegetative characters, *Gesneria lanceolata* is probably closely related to *G. cubensis* but is maintained separately because of the larger leaves and short inflorescences.

14. *Gesneria odontophylla* Urban & Ekman

Gesneria odontophylla Urban & Ekman *in* Urban, Ark. Bot. 24A(4):34, 1931.

Shrubs: stems woody, to 1 m tall, bark smooth, brown, glabrous, resinous, lenticels obscure; branches numerous above, slender, ca 1.5–3.0 mm in diameter at 10 cm below apex, internodes 0.2–12.0 cm long, leaf scars prominent.

FIGURE 38.—Type specimens: *a*, holotype of *Gesneria lanceolata* Urban & Ekman, *Ekman H7861* (S); *b*, holotype of *G. odontophylla* Urban & Ekman, *Ekman H10194* (S).

Leaves alternate, clustered at branch apices: petioles sulcate, 1.1–3.0 cm long, ca 1 mm wide, green to yellow, glandular-resinous; blades broadly elliptic to obovate, 6.1–12.0 cm long, 3.1–7.0 cm wide, membranous, base acute, margin subentire below, serrate above, apex acute to acuminate, adaxial surface plane, smooth, light green, glabrous-resinous at the reddish veins, abaxial surface brownish, glabrous, resinous, veins red, prominent.

Inflorescences in upper leaf axils, 3-flowered: immature peduncles ca 1.5 cm long, ca 1 mm in diameter, resinous; young pedicels ca 2 mm long; flowers not seen.

Capsules turbinate; seeds not seen.

TYPE-COLLECTION.—Fond Cochon, near Bras-Sec, Haiti, *E. Ekman H10194* (S, holotype (Figure 38*b*); EHH, IJ, K, S, US, isotypes).

DISTRIBUTION AND ECOLOGY.—*Gesneria odontophylla* is known only from southwestern Haiti (Figure 27) where it grows on rocky, shady hillsides at ca 300 m elevation. Specimens bearing flowers are not known; the type-collection made in June bears only dry immature inflorescences.

SPECIMENS EXAMINED.—HISPANIOLA. HAITI. Département du Sud: Massif de la Hotte, western group, Les Roseaux, Fond-Cochon, near Bras-Sec, ca 300 m, 28 June 1928, *E. Ekman H10194* (S, holotype of *Gesneria odontophylla* Urban & Ekman; EHH, IJ, K, S, US, isotypes).

DISCUSSION.—*Gesneria odontophylla* was de-

scribed from specimens lacking mature flowers or fruits. The type locality is apparently the same as *G. haitiensis:* Fond-Cochon near Bras-Sec. An attempt was made in 1970 to relocate *G. odontophylla,* but no material was found.

This species is included here based on the habit and vegetative characters. It may be closely related to either *G. clarensis* from Cuba or *G. cubensis* from Cuba and Hispanola. Its large leaves are distinctive, similar to *G. fruticosa,* known also from the type locality of *G. odontophylla,* but the leaves of the latter are more elliptic and glabrous.

15. *Gesneria parvifolia* Alain

Gesneria parvifolia Alain, Mem. New York Bot. Gard. 21:145, 1971.

Shrubs: stems woody, erect, up to 50 cm tall, 5 mm in diameter at 10 cm below apex, bark rough, villous near apex, becoming smooth and glabrescent below, brownish, resinous, lenticels erumpent, dark, becoming striated; branches many, short, slender, internodes up to 5.3 cm long on rapidly growing branches, or ca 1 mm long at branch apices, leaf scars prominent.

Leaves usually conferted at branch apices: petioles subsulcate, 1–3 mm long, ca 1 mm wide, reddish, villous, glandular-resinous; blades elliptic, 1.5–3.3 cm long, 0.7–1.3 cm wide, subcoriaceous, base rounded, margin serrate to dentate, apex acute or rounded, adaxial surface somewhat bullate, green, pilose at the impressed midvein, resinous, nitid, abaxial surface brownish, pilose at the prominent reddish veins, glandular-resinous.

Inflorescences in upper leaf axils of 1–3 flowers, exceeding the subtending leaves: peduncles terete, 6–10 mm long; ca 1 mm in diameter, reddish, pilose; bracts linear 5–7 mm long, ca 1 mm wide, reddish, sparsely pilose, but glandular-resinous; pedicels terete, 1–7 mm long, ca 1 mm in diameter, reddish, pilose; floral tube obconic, 2–3 mm long, 2–3 mm wide at apex, dark, red, pilose; calyx lobes 5, connate for less than 1 mm, erect, each linear to narrowly triangular, 4–7 mm long, 1.0–1.5 mm wide at base, apex acuminate, both sides red and sparsely pilose, resinous, midvein prominent; corolla tube cylindrical, ca 15 mm long, ca 3 mm wide at middle, red, pilose and glandular-resinous, inside red-orange, glabrous, but resinous, limb slightly spreading, lobes 5, rotund, 1–2 mm long, margin entire, glandular; stamens 4, adnate to corolla base for less than 1 mm, filaments linear, yellow or reddish, glabrous, anthers oblong, 1.5 mm long, coherent in 2 pairs, staminode 5 mm long; ovary completely inferior, disc annular, sinuate, 1–2 mm wide, style linear, ca 1.3 cm long, reddish, pilose, stigma capitate.

Mature capsule not seen, immature capsule obovoid, 3 mm long, 3 mm wide, reddish, pilose, costae 5, obscure; seeds not seen.

Type-Collection.—Sierra de Baoruco, Pedernales, Dominican Republic, *Alain Liogier 13864* (NY, holotype (Figure 39*a*); US, isotype).

Distribution and Ecology.—*Gesneria parvifolia* is known only from the mountains of southern Dominican Republic (Figure 27), where it grows on limestone rocks at 800–1100 m elevation. Flowering specimens have been collected in February and July.

Specimens Examined.—HISPANIOLA. Dominican Republic. Province of Pedernales: Cueva de Boucan Calice, Hoyo de Pelempito, 1100 m, 3–8 July 1971, *Alain Liogier 18118* (GH, NY, US); on a knoll between Boucan Calice and Hoyo de Pelempito, Sierra de Baoruco, 800 m, 13 February 1969, *Alain Liogier 13864* (NY, holotype of *Gesneria parvifolia* Alain; US, isotype).

Discussion.—*Gesneria parvifolia* is probably a close relative of *G. aspera,* in which the patent limb of the cylindrical corolla, the single-flowered inflorescences, and the asperate leaves are characteristic.

16. *Gesneria pulverulenta* Alain

Gesneria pulverulenta Alain, Mem. New York Bot. Gard. 21(2):146, 9 June 1971.

Gesneria filisepala Alain, Phytologia 22:173, 2 December 1971. [Type-collection: Hoyo de Pelempito, Dominican Republic, *Alain Liogier 18132* (NY, holotype; GH, US, isotypes).]

Gesneria saxatilis Alain, Phytologia 22:173, 2 December 1971. [Type-collection: Trail between Pedernales and Aceitial, *R. Howard* & *E. Howard 8120* (NY, holotype; BM, GH, P, S, US, isotypes).]

Subshrubs to large shrubs: stems woody, erect, up to 4 m tall, 5 mm in diameter at 5 cm below apex, bark rugose where internodes close, or smooth and striated where internodes well spaced on rapidly elongating branches, reddish-brown or green, glandular-resinous, becoming gray-brown,

FIGURE 39.—Type specimens: *a*, holotype of *Gesneria parvifolia* Alain, *Alain Liogier 13864* (NY); *b*, holotype of *G. pulverulenta* Alain, *Alain Liogier 13871* (NY).

with resin flaking as a yellowish or whitish pulverulence, internodes 0.2–2.3 cm long, leaf scars prominent, pith green or red; branches few or numerous, short, in upper leaf axils, somewhat flattened, lenticels elongated, erumpent, nodes slightly swollen, axillary buds densely or sparsely covered by caducous reddish articulated trichomes, trichomes occasionally adhering to young leaves and inflorescences.

Leaves alternate, when well separated on rapidly growing branches, or approximate and conferted at branch apices; petioles subsulcate, 1–5 mm long, ca 1 mm in diameter, green or reddish, glandular-resinous; blades spathulate, obovate or elliptic, 1.0–3.4 cm long, 1.0–1.7 cm wide, coriaceous, base acute to cuneate, margin entire to coarsely crenate-dentate at the obtuse or subtruncate apex, adaxial surface smooth, nitid, dark green, glabrous but glandular, veins immersed, abaxial surface light green or brownish, glabrous, but glandular, with prominent brown or red veins.

Inflorescences axillary, of 1(–4) flowers, often equaling the subtending leaves: peduncles terete, 1–4 mm long, ca 1 mm in diameter, glandular-resinous; bracts 2, at apex of peduncle, filiform to narrowly lanceolate, 4–9 mm long, ca 1 mm wide, green or reddish, glabrous, glandular-resinous; pedicels terete, 3–9 mm long, ca 1 mm in diameter, green or reddish; floral tube turbinate, 2–5 mm long, 2–3 mm wide, green or reddish, glabrous, nitid, glandular-resinous; calyx erect or slightly spreading, 5-lobed, lobes connate for ca 1 mm,

aestivation valvate, each lobe linear or subulate, sulcate, 7–15 mm long, 1–2 mm wide at base, apex acuminate, both sides green or reddish, glabrous, and nitid, glandular-resinous, with a prominent keel on each lobe base; corolla (Figure 16*j*) tubular, suburceolate, 1.3–1.6 cm long, base narrow ca 3 mm across, 4–5 mm wide below the middle then narrowing to the mouth, ca 3 mm wide; outside red or red-orange, glabrous, nitid, glandular-resinous, inside yellow, glabrous, limb slightly oblique and somewhat spreading, 5-lobed, 3–4 mm wide, lobes semiorbiculate, 1–2 mm long, red, glabrous, margin entire, glandular; stamens 4, adnate to base of corolla for about 1 mm, exserted beyond mouth, at anthesis for up to 3 mm, filaments linear, 1.0–1.3 cm long ca 1 mm in diameter, yellow-green, glabrous, anthers globose, ca 1 mm long, yellow, glabrous, coherent in 2 pairs, pollen grains isopolar, prolate, size small (21.2–23.3 μm long at the polar axis, 11.2 μm wide at the equatorial axis), amb almost circular, tricolpate, colpi ca 21 μm long, ca 1 μm wide, sexine reticulate (Figure 18*c*), heterobrochate, staminode ca 3 mm long; ovary fully inferior, apex pilose, disc sinuate-annular, yellow-green, glabrous, ca 2 mm across, style linear 8–12 mm long, ca 1 mm in diameter, yellow-green or reddish, pilose, stigma capitate, somewhat bilobed, reddish, glandular.

Capsule obovate-turbinate to subglobose, 5–6 mm long, 4–5 mm wide, with 5 prominent costae; seeds fusiform to linear, striate, ca 1 mm long, reddish-brown.

Type-Collection.—Between Boucan Calice and Hoyo de Pelempito, Dominican Republic, *Alain Liogier 13871* (NY, holotype, Figure 39*b*).

Distribution and Ecology.—*Gesneria pulverulenta* is endemic to the Sierra de Baoruco of the Barahona Peninsula of southern Hispaniola (Figure 27), where it has been collected from rocky limestone cliffs and deep gorges in pine woods and thickets at elevations from 800–1300 m. In the wild, plants have been collected in flower from February to August. In the greenhouse, plants bear inflorescences all during the year.

Specimens Examined.—HISPANIOLA. Dominican Republic. Province of Pedernales: trail between Pedernales and Aceitial, 4200 ft, 8–12 August 1946, *R. Howard & E. Howard 8120* (NY, holotype of *Gesneria saxatilis* Alain; BM, GH, P, S, US, isotypes); Aceitillar Cayo, Sierra de Baoruco, 1300 m, 9 February 1969, *Alain Liogier 13672* (GH, NY); Aceitillar, 28 March 1956, *J. Jiménez 3240* (BH, E, RDJ, US); Camote, Aceitillar, 31 March 1961, *E. Marcano 4518* (RDJ, US); Aceitillar, 23 March 1967, *E. Marcano 5261* (BH, NY, RDJ), *T. Talpey 81* (BH); Aceitillar region, 26 February 1971, *Alain Liogier 17913* (NY); between Boucan Calice and Hoyo de Pelempito, E of Aceitillar, Sierra de Baoruco, 800 m, 13 February 1969, *Alain Liogier 13871* (NY, holotype of *Gesneria pulverulenta* Alain); Hoyo de Pelempito, 800 m, 3–8 July 1971, *Alain Liogier 18132* (NY, holotype of *Gesneria filisepala* Alain; GH, US, isotypes). Cultivated: Cornell University, G-1034, 3 November 1970, *L. Skog 1751* (BH).

Discussion.—The synonyms included in this species, *Gesneria filisepala* and *G. saxatilis*, cannot be maintained as separate species. The former was distinguished by the size of the leaves, the filiform calyx lobes, and bracts, as well as the multiflowered inflorescences. *Gesneria pulverulenta* differed from *G. saxatilis* in its pulverulence or resin, which flakes off as a whitish powder from the vegetative parts of the plant. The size difference found in nature on all three taxa are within the limits of variation displayed by representatives in cultivation. The cultivated clone was introduced by T. Talpey in 1967 and subsequently grown in the greenhouses at Cornell University under the accession number G–1034. The variation in bract and calyx lobe shape and size is quite wide. This clone also has an inflorescence of normally a single flower; but examinations of immature flowers show the presence of reduced flower buds in the axils of the linear bracts. These buds may potentially develop to give an inflorescence of 2 or 3 flowers like that found on the holotype specimen of *G. filisepala*. The duplicate specimens of *Alain Liogier 18132*, the type of *G. filisepala*, have single-flowered inflorescences with reduced buds.

Specimens of *Gesneria pulverulenta* have been determined and distributed as *G. mornincola*, a synonym of *Gesneria cubensis*, which differs, among other characters, in having a curved corolla tube from which the stamens and style are exserted more than 1 cm.

17. *Gesneria salicifolia* (Grisebach) Urban

Gesneria salicifolia (Grisebach) Urban, Symb. Ant. 2:373, 1901.

Shrubs or small trees: stems woody, erect, 0.5–2.5 m tall, 3–6 mm in diameter at 10 cm below apex, bark somewhat scabrous, tuberculate or verruculose from erumpent lenticels, reddish

toward apex, brown to gray below, apex resinous; branches sparse or rarely abundant, erect, appearing somewhat swollen below apex, internodes 0.2–2.5 cm long, leaf scars not prominent.

Leaves alternate, at the ends of the branches, but not conferted, soon falling: petioles sulcate, 3.5–12.0 mm long, ca 1 mm wide, green to brown, glandular-resinous, verruculose; blades elongate-elliptic, oblong, oblanceolate, obovate, or spathulate, 2.5–11.2 cm long, 0.7–2.6 cm wide, subcoriaceous, base acute or obtuse, margin entire below, serrulate or denticulate toward apex, recurved, apex acute, acuminate, rounded, or emarginate, adaxial surface plane, smooth or slightly rough when dried, dark green to yellowish, glabrous, nitid, veins impressed, abaxial surface reddish brown, slightly resinous, veins prominent, darker.

Inflorescences numerous, cymose or subcorymbose, in the upper axils, 1– to 4 (–6)-flowered, equaling or exceeding the subtending leaves: peduncles terete or broadened toward apex, curved upward, 4–12 cm long, ca 1 mm in diameter, green or reddish-brown, glabrous, verruculose; bracts 2, caducous, linear, 2–6 mm long, less than 1 mm wide, green or reddish-brown, glabrous; pedicels 0.5–1.5 cm long, ca 1 mm in diameter, green or reddish-brown; floral tube obconic, 2–4 mm long, 2–3 mm in diameter at apex, green or reddish-brown, glandular-resinous; calyx 5-lobed, lobes connate at base for ca 1 mm, each lobe erect or curved, narrowly lanceolate to linear, 0.3–1.5 cm long, 0.7–2.0 mm wide, outside with midvein prominent, inside sulcate, both sides green, yellow or reddish, glandular-resinous; corolla tube cylindric somewhat curved, slightly ventricose at middle, 1.4–2.5 cm long, 3–5 mm wide at base, 4–8 mm wide at middle, 3–6 mm wide at throat, outside pale yellow, pale red, scarlet or yellow-orange, glandular-resinous, inside yellow, glabrous, limb 5-lobed, lobes semiorbiculate, red or yellow, glabrous, margins stipitate-glandular, upper lobes 1–2 mm long, 1.5–2.5 mm wide, erose, lateral lobes 1.0–1.5 mm long, 1–2 mm wide, entire, basal lobe 1–2 mm long ,and wide, entire; stamens 4, shortly adnate to base of corolla tube, included or exserted to mouth of corolla tube, filaments curved, 1.1–1.7 cm long, red or yellow, anthers oblong, 1.0–2.5 mm long, 1.0–1.5 mm wide, sparsely pilose on reverse, staminode ca 2.5 mm long; ovary inferior, apex pilose, disc annular, yellow, style curved, exserted, 2.0–2.6 cm long, green or reddish, pilose, stigma capitate, papillate.

Capsule obconic, turbinate or subglobose, 3–8 mm long, 2.5–5.5 mm wide at apex, brown to gray, smooth, glabrescent, glandular, costae 5 or 10, obscure or prominent; seeds fusiform, striate, twisted, ca 1 mm long, ca 0.25 mm wide, black.

17a. *Gesneria salicifolia* var. *ferruginea* (C. Wright) L. Skog, new rank

Pentarhaphia ferruginea C. Wright *in* Sauvalle, Anales Acad. Ci. Méd. Habana 6:317, 1869.—Sauv., Fl. Cub. 93, 1873.
Gesneria ferruginea (C. Wright) Urban, Symb. Ant. 2:373, 1901.—Morton *in* Leon & Alain, Fl. de Cuba 4:459, 1957.

Shrubs or small trees: stems and branches slightly swollen below apex, sparsely verruculose.

Leaves broadly elliptic or oblong, base obtuse, apex acute.

Flowers yellowish, calyx lobes strongly angled, greenish-yellow, 5–8 mm long, corolla pale yellow.

Capsule narrowly obconic, to 8 mm long, 4–5 mm wide at apex, costae 5, prominent.

TYPE-COLLECTION.—Cuba, *C. Wright 3643* (GH, holotype, (Figure 40*a*); NY, US, isotypes).

Key to the Varieties of *Gesneria salicifolia*

1. Corolla pale yellow, calyx lobes greenish-yellow; leaves broadly elliptic or oblong, bases obtuse; capsules to 8 mm long, obconic, costae prominent; Cuba: Province of Piñar del Río ..... 17a. var. ***ferruginea,*** new rank
1. Corolla pale red, scarlet, or yellow-orange, calyx lobes green or reddish; leaves narrowly elliptic or obovate-spathulate, rarely broadly elliptic, bases acute; capsules obconic to subglobose, 4–6 mm long, costae usually obscure; Cuba: Province of Oriente.
   2. Leaves narrowly elliptic, oblanceolate or oblong, not spathulate, apex acute to acuminate; calyx lobes 7–15 mm long; capsules turbinate or subglobose ..... 17b. var. ***salicifolia***
   2. Leaves obovate to spathulate, apex rounded to emarginate; calyx lobes 3–6 mm long; capsules obconic ..... 17c. var. ***spathulata,*** new variety

Distribution and Ecology.—*Gesneria salicifolia* var. *ferruginea* is known only from the Province of Piñar del Río in western Cuba (Figure 29), where it grows in pine forests on lateritic soil near rivers. Specimens bearing flowers or flower buds were collected in February to April, August, and October.

Specimens Examined.—CUBA. Province of Piñar del Río: Pan de Cajalbana, 1 October 1949, *J. Acuña & Alain Liogier 15687* (SV, US 2 sheets); Loma de la Cajalbana, 1 October 1949, *J. Acuña & Alain Liogier sn* (IJ, US); La Cajalbana, La Palma, 4 February 1956, *J. Acuña, C. Morton & Alain Liogier 20118* (US); La Cajalbana, La Palma, 8 March 1951, *J. Acuña & J. Roig sn* (NY); Las Puercas River, west of Cajalbana Mts., La Palma, 8 February 1952, *Alain Liogier 2360* (US); pinelands, Cajalbana, La Palma, 23 February 1954, *Alain Liogier 3879* (NY, US); pinelands, Cajalbana Mts., La Palma, 1 October 1949, *Alain Liogier & J. Acuña 1134* (GH, US); Loma de Cajalbana in pinetis prope amnem, 10 March 1920, *E. Ekman 10500* (S); Piña de Cajalbana, in savannas at the foot of the mountains, on the edge of a branch of Río Puercos, 28 August 1923, *E. Ekman 17314* (G, NY, S 2 sheets); Pan de Cajalbana, 6 April 1915, *Bro. Leon 4957* (US); on top of Cajalbana, near the waterfall, 6 April 1915, *Bros. Leon & Charles 4957* (NY); Monte La Cajalbana, 4 February 1956, *C. Morton 9825* (US); Cajalbana, 1865, *C. Wright sn* (K); Locality Unknown: Cuba, C. Wright 3643 ([1865] GH, holotype; [no date] NY 2 sheets, US, isotypes); Cuba, *C. Wright sn* (S).

Discussion.—None of the material of the type collection (*C. Wright 3643*) bears any collection data, but since all later collections of this taxon, including *C. Wright sn* (K), have come from La Cajalbana, this is probably the area from which the type was collected.

17b. *Gesneria salicifolia* var. *salicifolia*

Gesneria salicifolia (Grisebach) Urban, Symb. Ant. 2:373, 1901.—Morton *in* Leon & Alain, Fl. de Cuba 4:459, 1957.
Pentarhaphia salicifolia Grisebach, Cat. Pl. Cub. 199, 1866.
Gesneria gibberosa Urban, Repert. Spec. Nov. Regni Veg. 13: 477, 1915.—Urb., Symb. Ant. 9:270, 1924.—Morton *in* Leon & Alain, Fl. de Cuba 4:459, 1957. [Type-collection: Coastal cliffs near Río Yamurí, Cuba, *J. Shafer 7838* (NY, lectotype; US, isolectotype).]

Small trees: stems and branches swollen below apex, verrucose.

Leaves narrowly elliptic, oblong or oblanceolate, apex acute to acuminate.

Flowers reddish, calyx lobes 7–15 mm long.

Capsules turbinate or subglobose, 4–6 mm long.

Type-Collection.—La Catalina, Cuba, *C. Wright 3074* (GOET, holotype (Figure 41*a*); BM, G, GH, K, MO, NY, P, isotypes).

Distribution and Ecology.—*Gesneria salicifolia* var. *salicifolia* grows in the Oriente Province of Cuba on limestone cliffs along rivers and the seacoast at low elevations. Collections of flowering material have been made in July and August and from November to March.

Specimens Examined.—CUBA. Province of Oriente: Farallones, La Catalina, 19 March 1861, *C. Wright 3074* (GOET, holotype; BM, G 2 sheets, GH, K, MO, NY, P, isotypes); vicinity Baracoa, Bahía de Taco, 2 December 1914, *E. Ekman 3697* (G, K, S, US); southern Baracoa region, on the banks of Jauco River, Jauco, 17 July–4 August 1924, *Bro. Leon 11990* (NY 2 sheets, US); Los Alemanes, Río Yumurí, Baracoa, August 1954, *J. Acuña, Pino, Alonso & Venning 19122* (SV, US 2 sheets); paredones, Río Yumurí, Baracoa, 4 February 1952, *J. Acuña & Diaz Barreto 17355* (SV, US 2 sheets); "los Alemanes," Yumurí, Baracoa, 14 January 1956, *Alain Liogier & C. Morton 5082* (GH, IJ); ad flum. "Yumurí," prope Baracoa, 25 November 1914, *E. Ekman 3622* (NY, S); Río Yumurí NW of Cape Maisí, 28 August 1939, *Bro. Leon 17322* (US); cliffs near the mouth of Río Yumurí, east of Baracoa, near sea level, 13 January 1956, *C. Morton & Alain Liogier 9046* (BM, US 2 sheets); Río Yamurí [sic], 6, 12 December 1910, *J. Shafer 7755* (NY, US); coastal cliffs near Río Yamurí [sic], 6, 8 December 1910, *J. A. Shafer 7838* (NY, lectotype of *Gesneria gibberosa* Urban; US, isolectotype); Ovando Mesa, Maisí, January 1940, *Bro. Leon 17579* (GH, US); Mesa de Ovando, Maisí, January 1940, *Prudencio Matos* in *Bro. Leon 17579* (US).

Discussion.—The holotype of *Gesneria gibberosa* was probably at Berlin and is no longer extant. The duplicate at New York Botanical Garden is annotated "Det. Urban," but not in his hand. Neither of the known sheets of *Shafer 7838* has flowers, and Urban described the species without flowers, but later amplified the description after obtaining Ekman collections from the type locality at Río Yumurí.

Gesneria salicifolia was based on collections by Wright from La Catalina, but no further collections are known from the type locality. Material identified as *G. gibberosa* is known from several areas in eastern Oriente Province of Cuba and is here included within the range of *G. salicifolia* (Figure 29).

17c. *Gesneria salicifolia* var. *spathulata* L. Skog, new variety

Frutex. Folia obovata usque ad spathulata, 2.4–5.8 cm longa, ad bases acuta, ad margines infra

FIGURE 40.—Type specimens: *a*, holotype of *Pentarhaphia ferruginea* C. Wright and *Gesneria salicifolia* var. *ferruginea* (C. Wright) L. Skog, new rank, *Wright 3643* (GH); b, holotype of *G. salicifolia* var. *spathulata* L. Skog, new variety, *Acuña 13348* (SV).

medium subintegra, supra medium denticulata, ad apices rotundata vel emarginata. Flores rubelli; calycis lobi 3–6 mm longi. Capsulae obconicae, 3–4 mm longae, ad apices 2.5–3.5 mm latae.

TYPE-COLLECTION.—Paredones del Río Moa, Cuba, *J. Acuña 13348* (SV, holotype, Figure 40*b*; US, isotype).

DISTRIBUTION AND ECOLOGY.—*Gesneria salicifolia* var. *spathulata* is known only from near Río Moa in Oriente Province of Cuba (Figure 29), where it grows at low elevations. Flowering material has been collected only in November.

SPECIMENS EXAMINED.—CUBA. PROVINCE OF ORIENTE: Paredones del Río Moa, Moa, 15 November 1945, *J. Acuña 13348* (SV, holotype; US, isotype).

18. *Gesneria ventricosa* Swartz

Gesneria ventricosa Swartz, Prodr. 89, 1788.

Shrubs or small trees: stems woody to within 30 cm of apex, erect, to 3 m tall or more, up to 2 cm in diameter, bark rugose with long cracks, reddish to gray-grown, glabrous, resinous, lenticels whitish to brown, elongated; branches from the base or in upper axils, slightly flattened, subverrucose, to 1 cm wide at 8 cm below apex, green or red, to brown, glabrous, resinous, internodes about 0.1–3.0 cm long.

Leaves alternate or approximate: petioles sulcate, 0.5–4.5 cm long, 1–5 mm wide, green or reddish-brown, essentially glabrous, resinous;

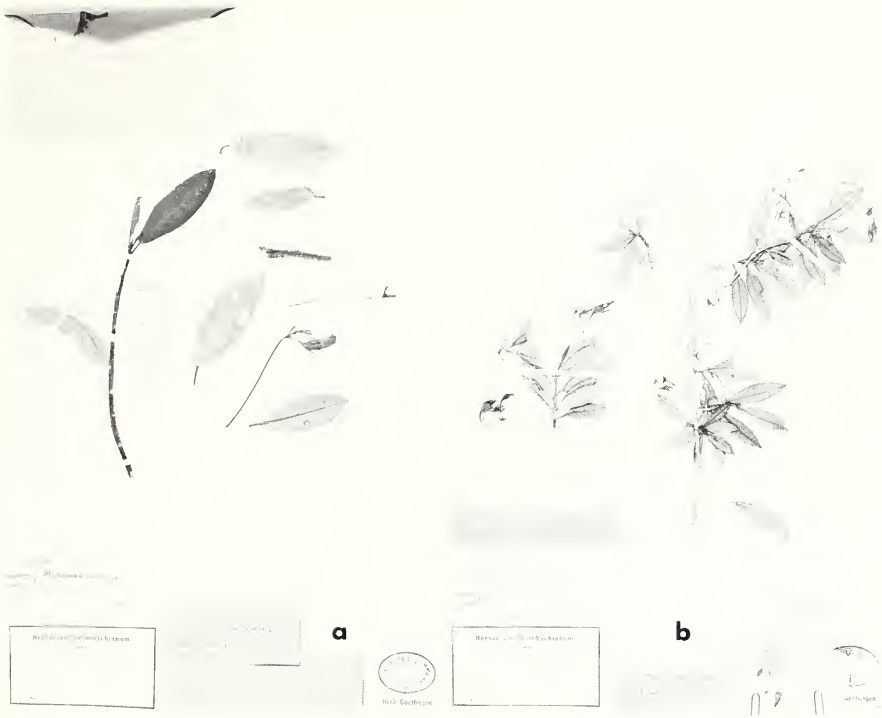

FIGURE 41.—Type specimens: *a*, holotype of *Pentarhaphia salicifolia* Grisebach and *Gesneria salicifolia* (Grisebach) Urban, *Wright 3074* (GOET); *b*, holotype of *Pentarhaphia triflora* Grisebach and *Gesneria wrightii* Urban, *Wright 3072* (GOET).

blades ovate, elliptic to obovate, oblanceolate, occasionally falcate, 4.1–22.7 cm long, 1.8–7.8 cm wide, membranous to subcoriaceous, base acute to truncate or cuneate, margin denticulate to crenate, apex acute to acuminate to rounded, adaxial surface dark green, glabrous or with glandular trichomes, glossy, epidermis sometimes flaky upon drying, abaxial surface lighter green to reddish-brown, glabrous, resinous, veins prominent.

Inflorescences 1- to many-flowered, shorter than or exceeding the subtending leaves: peduncles terete, 2.0–15.9 cm long, 1–4 mm in diameter, green to reddish-brown, glabrous, resinous, with lenticels prominent, elongated, becoming obscure in age; bracts 2, linear-lanceolate, 0.6–1.5 cm long, green to reddish, glabrous, resinous; pedicels terete, jointed or not, curved, 0.5–2.3 cm long, 1–2 mm in diameter, green or reddish-brown; floral tube narrowly turbinate, 2–4 mm long, 3–4 mm wide at the apex, green or reddish, glabrous, resinous; calyx lobes 5, barely connate at base above ovary, each lobe terete and filiform, or narrowly triangular, sulcate, or flattened and keeled, 0.4–2.1 cm long, 0.5–3.0 mm wide at the base, both sides green or reddish and glabrous or glandular; corolla tubular, curved, gibbous above the base, narrowing slightly acropetally, becoming ventricose at or above the middle, 2.1–3.2 cm long,

3 mm wide at the base, 6–10 mm wide at the middle, narrowing to 6 mm wide at the oblique mouth, outside glabrous, resinous, inside yellow at the base, orange toward the middle, becoming red at the mouth, glabrous, limb 5-lobed, each lobe with the margin entire to erose or dentate, stipitate-glandular, upper lobes ovate to semiorbiculate, 2–6 mm long, connate for about 2 mm, erect, lateral lobes 2–5 mm long, erect to reflexed or patent, basal lobe 2–3 mm long, erect to reflexed; stamens 4, adnate for about 1 mm to the base of the corolla tube, exserted to 3 cm beyond corolla mouth, filaments linear, curved, 3.1–5.5 cm long, about 1 mm in diameter, yellow at the base, becoming orange-red toward the apex, glabrous or sparsely pilose, anthers globose or oblong, 1–2 mm long, ca 1 mm wide, red abaxially, glandular, resinous, coherent in two pairs by their apices, staminode to 9 mm long; ovary inferior, apex tomentose with whitish erect trichomes, disc annular, 5-lobed, yellow, puberulent with short glandular trichomes, style linear, curved, to 5.5 cm long, ca 1 mm in diameter, yellow or green at the base, orange or red acropetally, sparsely pilose to glabrescent, stigma stomatomorphic, papillate.

Capsule turbinate to nearly spherical or cyathiform, 0.5–1.0 cm long, 4–6 mm wide, yellowish (from resin) to reddish-brown, glabrous, resinous, dehiscing into two or four valves, costae 5 or 10, prominent or becoming alate; seeds rhombic or fusiform, about 1 mm long, reddish-brown, or dark red, surface cells raised (Figure 19*i*).

Discussion.—*Gesneria ventricosa* is here divided into two subspecies differing in characters of the inflorescences and flowers. The subspecies are geographically distinct: *Gesneria ventricosa* subsp. *cymosa* is known only from the island of St. Vincent in the Lesser Antilles, but the typical subspecies grows on many of the other islands in the Lesser Antilles. Both subspecies may be pollinated by the same species of hummingbird, *Glaucis hirsuta*, found on the same islands.

18a. *Gesneria ventricosa* subsp. *cymosa* (Urban) L. Skog, new rank

Pentarhaphia longiflora sensu Rolfe, Bull. Misc. Inform. 1893 (81):267, 1893 [non Lindley (1827), nec sensu Cook & Collins (1903)].

Gesneria cymosa Urban, Symb. Ant. 2:372, 1901.

Shrubs or trees: branches red, internodes short, 1–3 mm long.

Leaves alternate to approximate: petioles 0.5–1.3 cm long, 1–2 mm in diameter, red; blades elliptic to obovate, base cuneate.

Inflorescences 1- to ∞-flowered, exceeding the subtending leaves: peduncles 7.2–9.8 cm long, 1–2 mm in diameter, red; bracts red; pedicels apparently not jointed, red; floral tube red, calyx lobes sulcate or terete, red; corolla orange-red to scarlet; stamens exserted about 1 cm beyond corolla mouth, filaments sparsely pilose; style green at the base.

Type-Collection.—St. Andrews Mountain, St. Vincent, *H. Eggers 6662* (F, lectotype of *Gesneria cymosa* Urban (Figure 42*a*); A, GOET, M, Z, isolectotypes).

Distribution and Ecology.—*Gesneria ventricosa* subsp. *cymosa* is known only from the island of St. Vincent (Figure 44), growing in moist forest on steep mountainsides or near rivers at 250–600 m elevation. Flowering specimens have been collected from January to May and November to December.

Specimens Examined.—LESSER ANTILLES. St. Vincent: St. Vincent, no date, *A. Anderson sn* (K, 2 sheets); wayside, Mount St. Andrews, 18 November 1945, *P. Beard 1341* (F, GH, MO, NY, S, US); St. Vincent, no date, *G. Caley sn* (G); Charlotte Parish, in forest on steep mountainside up from South Rivers, 1000 ft, 27 January 1962, *G. Cooley 8233* (GH, IJ, USF); St. David Parish, at the foot of the Falls of Balaine, 31 March 1962, *G. Cooley 8573* (GH, IJ, USF); in montibus St. Andrews, 1200 ft, 27 December 1889, *H. Eggers 6662* (F, lectotype of *Gesneria cymosa* Urban; A, GOET 2 sheets, M 2 sheets, Z, isolectotypes); in sylvestris ad Calvary, 1800 ft, 28 December 1889, *H. Eggers 6662* (P, US); St. Vincent, *H. Eggers 6662* (F, L, UCWI); St. Vincent, no date, *Dr. Greville sn* (E-GL); St. Vincent, no date, *Rev. L. Guilding 20* (BM), *sn*

Key to the Subspecies of *Gesneria ventricosa*

1. Inflorescences (1-) many-flowered, peduncles, pedicels, and calyx reddish; pedicels unjointed; filaments sparsely pilose; St. Vincent ..... 18a. subsp. ***cymosa,*** new rank
1. Inflorescences 2- to 4-flowered, peduncles, pedicels, and calyx green; pedicels jointed, filaments glabrous; Lesser Antilles from St. Croix to St. Lucia ..... 18b. subsp. ***ventricosa***

FIGURE 42.—Type specimens: *a*, lectotype of *Gesneria cymosa* Urban and *Gesneria ventricosa* subsp. *cymosa* (Urban) L. Skog, new rank, *Eggers 6662* (F); b, lectotype of *Gesneria ventricosa* Swartz, *Ryan sn* (BM).

(E, K); between Three Rivers and Silver Spoon, 1–7 April 1950, *R. Howard 11140* (BM, GH, IJ, NY); Spring Valley above sawmill, 1500–2000 ft, 3 March 1971; *R. Howard, G. Cooley & R. Weaver, 17871* (A); mountains above Chateaubelair River, 400–750 m, 23 April 1947, *C. Morton 5299* (US); valley of north fork of Cumberland river, 400–600 m, 2–3 May 1947, *C. Morton 5479* (US 2 sheets); Mt. St. Andrew, 500–600 m, 7 May 1947, *C. Morton 5673* (GH, US); Mount Brisbane, 300–750 m, 20–21 May 1947, *C. Morton 6027* (US); upper valley of Richmond valley, 330–540 m, 26–27 May 1947, *C. Morton 6287* (GH, US); St. Vincent, no date, *M. Parker sn* (E-GL); St. Patrick, upper Bellwood Dist., inland from Layou, 800–1500 ft, 24 February 1965, *G. Proctor 25912* (IJ); St. Vincent, March 1890, *H. Smith & G. Smith 55* (BM, GH); forest generally near streams, on second growth on damp hillsides, 500–2000 ft, July, *H. Smith & G. Smith 55* (NY). LOCALITY UNKNOWN: "Martinica," 1848, *Garnier sn* (TCD).

DISCUSSION.—Specimens of *Eggers 6662* are of two, possibly three, collections. The collection cited by Urban from St. Andrews Mountain was probably in the herbarium at Berlin, now destroyed. From the duplicates a lectotype must be chosen. A sheet at the herbarium of the Arnold Arboretum has been annotated as lectotype of *Gesneria cymosa*, but no publication of this lectotypification has been found. Better specimens of the type-collection exist and from these a specimen at the Field Museum of Natural History annotated in Urban's hand as type material is selected here as the lectotype.

The opposite leaf arrangement in *Gesneria ventricosa* subsp. *cymosa*, which Urban used to differentiate the two subspecies (as species), was not apparent from the specimens examined.

Similarities may be seen to *Gesneria onacaensis* Rusby from northern South America, but that species often has areolate leaves and stamens adnate to the corolla for about 2 mm and is considered to belong to the genus *Rhytidophyllum*.

18b. *Gesneria ventricosa* subsp. *ventricosa*

Gesneria ventricosa Swartz, Prodr. 89, 1788.—Sw., Fl. Ind. Occid. 2:1028, 1800.—Lunan, Hort. Jam. 1:322, 1814.—Spreng., Syst. Veg. ed. 16. 2:839, 1825.—Urban, Symb. Ant. 2:371, 1901 [non Hort. Berol. ex Hanstein (1859)].

Pentarhaphia longiflora Lindley, Bot. Reg. 13: sub pl. 1110, 1827 [nom. superfl. ("*Pentaraphia*")].—Griseb., Fl. Brit. W. Ind. 460, 1862.—Hook. f., Bot. Mag. 120: pl. 7339, 1894.—Duss, Ann. Inst. Bot.-Géol. Colon. Marseille 3:430, 1897 [non sensu Cook & Collins (1903)].

Conradia ventricosa (Swartz) Martius ex G. Don, Gen. Syst. 4:650, 1838.—A. P. de Candolle, Prodr. 7:525, 1839.

Conradia ventricosa (Swartz) Martius β *angustior* A. P. de Candolle, Prodr. 7:525, 1839. [Type-collection: Guadeloupe, *G. Perrottet sn* (G-DC, holotype).]

Pentarhaphia lindleyana Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:103, 1846.—Walp., Repert. Bot. Syst. 6:735, 1847.—Hanstein, Linnaea 34:300, 1865. [Type-collection: "In occid.," *de Ponthieu sn* (G, holotype; G, isotype).]

Pentarhaphia swartzii Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:103, 1846 [nom. superfl.].—Walp., Repert. Bot. Syst. 6: 735, 1847.

Pentarhaphia exserta (Swartz) Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:104, 1846 [pro parte, as to Decaisne's description, excluding synonyms of Swartz and Martius].

Pentarhaphia montana Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:105, 1846.—Walp., Repert. Bot. Syst. 6:736, 1847.—Hanstein, Linnaea 34:298, 1865. [Type-collection: Guadeloupe, *F. l'Herminier sn* (P, holotype).]

Pentarhaphia florida Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:106, pl. 7, 1846.—Walp., Repert. Bot. Syst. 6:736, 1847.—Hanstein, Linnaea 34:297, 1865. [Type-collection: Guadeloupe, *Beaupertuis sn* (P, lectotype).]

Pentarhaphia herminieri Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:106, 1846.—Walp., Repert. Bot. Syst. 6:736, 1847.—Hanstein, Linnaea 34:297, 1865. [Type-collection: Guadeloupe, *F. l'Herminier sn* (P, holotype).]

Pentarhaphia ventricosa (Swartz) Hanstein, Linnaea 34:299, 1865.

Gesneria longiflora (Lindley) Baillon, Hist. Plant. 10:59, pl. 94, 95, 1888.

Gesneria angustior (A. P. de Candolle) O. Kuntze, Rev. Gen. 2:473, 1891 ["*Gesnera*"].

Gesneria herminieri (Decaisne) O. Kuntze, Rev. Gen. 2:473, 1891 ["*Gesnera*"].

Gesneria lindleyana (Decaisne) O. Kuntze, Rev. Gen. 2:473, 1891 ["*Gesnera*"].

Gesneria montana (Decaisne) O. Kuntze, Rev. Gen. 2:473. 1891 ["*Gesnera*"].

Pentarhaphia longiflora var. *lindleyana* (Decaisne) Duss, Ann. Inst. Bot.-Géol. Colon. Marseille 3:430, 1897.

Gesneria ventricosa var. β *ovata* Urban, Symb. Ant. 2:373, 1901. [Type-collection: Saba, *W. Suringar sn*, L (Hort. Lugd. Bat. No. 903:310–333), lectotype].

Gesneria ventricosa var. γ *obovata* Urban, Symb. Ant. 2:372, 1901 [nom. superfl.].

Gesneria ventricosa forma *montana* (Decaisne) Stehlé, Bull. Soc. Bot. France 109:31, 1962.

Gesneria ventricosa forma *obovata* (Urban) Stehlé, Bull. Soc. Bot. France 109:31, 1962.

Gesneria ventricosa forma *ovata* (Urban) Stehlé, Bull. Soc. Bot. France 109:31, 1962.

Shrubs or trees: branches green, internodes about 1 cm long.

Leaves alternate: petioles 0.6–2.1 cm long, 3–5 mm wide; blades ovate to obovate, base acute to truncate.

Inflorescences 2- to 4-flowered, shorter than the subtending leaves: peduncles 2.3–15.9 cm long, 2–4 mm in diameter, green; bracts green; pedicels jointed, green; floral tube green; calyx lobes flattened to terete, sometimes keeled, green; corolla yellow-orange to red (Figure 16*d*); stamens exserted to 3 cm beyond corolla mouth, filaments glabrous, pollen grains isopolar, prolate, size small (19.6–21.3 μm long at the polar axis, 11.1 μm wide at the equatorial axis), tricolpate, colpi 15.6–16.9 μm long, mesocolpia overlapping the colpi, apocolpia rounded to truncate, sexine sparsely reticulate, heterobrochate, lumina scattered, less than 0.25 μm across, muri to 1 μm or more wide (Figure 17*g*); style yellow at the base.

Type-Collection.—Paradise Mountain, Montserrat, *J. Ryan sn* (BM, lectotype, Figure 42*b*).

Chromosome Number.—$n = 14$ (Lee, 1966a).

Distribution and Ecology.—*Gesneria ventricosa* subsp. *ventricosa* is known from most of the islands of the Lesser Antilles from St. Croix south to St. Lucia (Figures 43, 44), growing in damp ravines or forest margins at elevations from sea level to 1200 m. Flowering specimens have been collected in all months except March and October. In the greenhouse, the subspecies appears to flower irregularly.

Specimens Examined.—LESSER ANTILLES. St. Croix: below the dam, Caledonia Gut above Ham Bay, 20 January 1961, *R. Howard 15663a* (A); in wet valley, Trasholm, near Annaly, 18 January 1961, *R. Howard 15663b* (A). St. Barthelemy: no date, *Euphrasen sn* (UPS). Saba: Weg i Mountain, 21 August 1947, *Fr. Arnoldo 778* (U); "Rendez-Vous" to road of the Mountain, 600–800 m, 26 December 1965, *Fr. Arnoldo 3260* (U, US); Mountain, 600 m, 14 July 1906, *I. Boldingh 1758B* (NY, U); Mountain, 600 m, 16 July 1906,

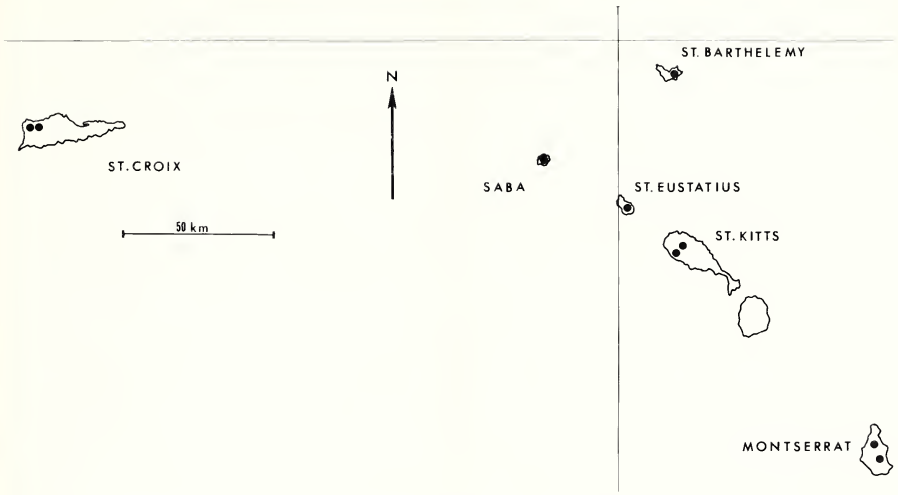

FIGURE 43.—Distribution of *Gesneria* section *Pentarhaphia* in the Lesser Antilles (part). (*G. ventricosa* subsp. *ventricosa* = solid circles.) (Coordinates: 18°N latitude and 63°W longitude.)

I. Boldingh 1783B (U); between Hellsgate and Santa Cruz, 500–600 m, 7 May 1953, *A. Stoffers 3172* (C, U); Mountain, at the "Rendevous side," 600–680 m, 12 May 1953, *A. Stoffers 3248* (IJ, U); Mountains at the "Rendez Vous" side, 550 m, 12 August 1953, *A. Stoffers 4255* (A, U); Mountain, 6–800 m, 23 April 1885, *W. Suringar sn* (L); Crespeen-"Rendez-vous," 23 April 1885, *W. Suringar sn* (L, lectotype of *G. ventricosa* var. β *ovata* Urban). ST. EUSTATIUS: top of the Quill, 400 m, 8 June 1906, *I. Boldingh 471aB* [No. 243] (U, 2 sheets); top of the Quill, 500 m, 8 June 1906, *I. Boldingh 479aB* [No. 251] (U); gap of the Quill, 350–400 m, 13 July 1953, *A. Stoffers 3605* (U); 14 April 1885, *W. Suringar sn* (L); Kant, 18 May 1885, *W. Suringar sn* (L, 3 sheets). ST. CHRISTOPHER (St. Kitts); ex insula St. Christopheri, India occidentalis, no date, *J. Forsstrom sn* (S); 1788, *B. Euphrasen sn* (S); January 1883, *H. Eggers 469b* (M); 1780, *Fr. Masson sn* (BM); forest ravine near Sandy point, 8 September–5 October 1901, *N. Britton & J. Cowell 124* (K, NY, US); interior slopes of the Crater, 2100–2500 ft, 22 February 1959, *G. Proctor 19228* (A, IJ). MONTSERRAT: Centre Hills, 500 m, 6 November 1944, *J. Beard 404* (A, K, NY, U); below actual summit of hill on trail to Chance's pond, 14–18 June 1950, *R. Howard 11912* (A, BM, U, US); area of Lang's Soufrière, Paradise Estate, 5–14 January 1961, *R. Howard & E. Howard 15175* (A, U); summit of English Peak, 5–14 January 1961, *R. Howard & E. S. Howard 15195* (A, U); "b. in Montserrat, Gesneria flexuosa," no date, *J. von Rohr sn* (C, PH); Paradise Mountain, [ca 1780], *J. Ryan sn* (BM, lectotype of *Gesneria ventricosa* Swartz); near Gages Soufrière, 23 January 1907, *J. Shafer 187* (F, NY, US); lower slope of Farrels Mount, 25 July 1937, *F. Squire sn* (A). GUADELOUPE: 1839, *Beaupertuis sn* (P, lectotype of *Pentarhaphia florida* Decaisne); Basseterre, April 1818, *C. Bertero 873* (TO); "Guadeloupe, Balb? 1821," *C. Bertero sn* (G-DC); Pitons des environs des Bâins-Jaunes, 1892 [1893], *Père Duss 2375* (F, GH, MO, NY, PH, US); Lavanea-Mulets, 24 April 1902, *Père Duss 4071* (F, NY, US); 1818, *C. Krauss sn* (G-DC, 3 sheets); "Guadeloupe, no date," *F. l'Herminier sn* (P, 2 sheets, holotypes of *Pentarhaphia herminieri* Decaisne and *P. montana* Decaisne); Montagnes de la Guadeloupe, 18 June 1824, *G. Perrottet 230* (G, P); "Montagnes de la Guadeloupe, 1825," 18 June 1824, *G. Perrottet sn* (G-DC); 21 June 1824, *G. Perrottet sn* (G-DC, holotype of *Conradia ventricosa* β *?angustior* A. P. de Candolle); Antilles, Guadeloupe, 1842, *G. Perrottet sn* (P); Saut du Constantin, 25 April 1941, *A. Questel 5111* (US); Antilles, Guadeloupe, *A. Questel sn* (P); Guadeloupe in vallibus umbrosis praeruptis, 1792, *Herb. M. Richard sn* (P); mornes basaltiques, Houélmont, 450 m, 25 February 1936, *H. Stehlé 568* (US); mornes basaltiques Houélmont an Vieux Fort, 14 September 1938, *H. Stehlé 565* (P). DOMINICA: in silvis et ad vias, July 1881, *H. Eggers 469* (BP, BR, G 3 sheets, GH, GOET, L, M, P, U, W); in silvis et ad vias, July 1881, *H. Eggers 731* (K); Goodwill Valley, 23 February 1880, *H. Eggers sn* (US); Layou River Valley, about ½ mi above the York Valley Estate Bridge, ca 60 m, 12 April 1964, *W. Ernst 1061* (US); road to Brand Bay between Fond Baron Estate and

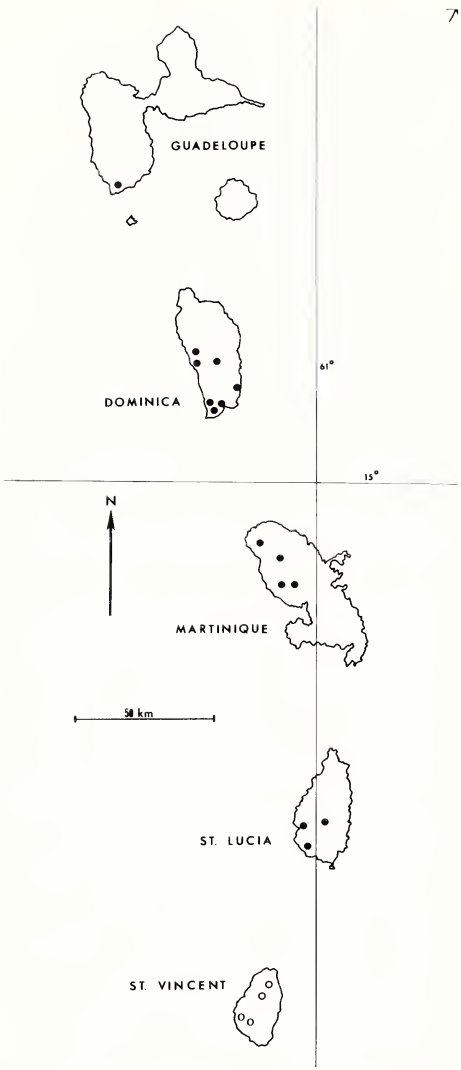

FIGURE 44.—Distribution of *Gesneria* section *Pentarhaphia* in the Lesser Antilles (part). (*G. ventricosa* subsp. *ventricosa* = solid circles; *G. ventricosa* subsp. *cymosa* = open circles.)

Pichelin, ca 160–450 m, 8 July 1964, *W. Ernst 1616* (US); Rivière Douce, 28 February 1880, *H. Eggers sn* (GH); rain forest on the precipitous slopes of Morne Colla Anglais, Sylvania, 610–732 m, 10–23 August 1938, *W. Hodge 835* (BM, GH, NY, US 2 sheets); Sylvania, rain forest on the precipitous slopes of Morne Colla Anglais, 610–732 m, 10 February 1940, *W. Hodge 1185* (GH, US); in woodlands about South Chiltern Estate, 500 m, 27–28 February 1940, *W. Hodge* & *B. Hodge 1551* (GH, NY, US); La Ronde River, 60 m, 24 November 1964, *D. Nicolson 2065* (US); Roseau to Sulfur Springs in Roseau Valley, 27 May–2 June 1950, *R. Howard 11741* (A, U, US); Dominica, no date *J. Imray 40* (K); no date, *J. Imray 87* (GOET); no date, *J. Imray 193* (E, K); Dominica, 1822, *Kohaut sn* [Sieber Flor. Martin. Nro. 394] (BR, GOET, K, L, M, MO, P 2 sheets, W 4 sheets); Dominica, no date, *C. Krauss 399* (E); Soufrière, 1903, *F. Lloyd 468* (NY 2 sheets); waterfall, Roseau valley, 1903, *F. Lloyd 806* (NY); Point Michelle, several hundred feet above the sea, 10 May 1888, *G. Ramage sn* (BM, K); Belfast River Valley, St. Paul, 150 ft, 2 January 1965, *C. Shillingford 191* (MO, UCWI); 2 mi N of Soufrière, ca 75 m, in from the road to Roseau, 30 June 1970, *L. Skog 1583* (BH, US 2 sheets); St. Joseph, banks of Layou River across from Clarke Hall, 5 July 1966, *W. Stern* & *D. Wasshausen 2401* (IJ, US); St. Dominique, in silvis et ad vias, July 1927, *H. von Türckheim 5381* (L); lower slopes of Morne Plat Pays above Bellevue along trail to Grand Bay, 23 July 1964, *R. Wilbur, E. Dunn, H. Hespenheide* & *D. Wiseman 7871* (F, GH, MO, NY, US). MARTINIQUE: Plateau de Larcher (entre le camp-Balata et le Camp-Colson), 1879, 1899, *Père Duss 329, 4543* (NY); pitons du Carbet pitons al marner de l'Alme, 600–900 m, 1882, *Père Duss 330* (NY); Piton du Champ flore, December 1867, *L. Hahn 362* (BM, G 4 sheets, GH, P 3 sheets, U); [Martinique, 1819–1821], *Kohaut sn* [Sieber Flora Mixta No. 407] (E-GL, G, L, LD, NY, P); east slope of L'Ailéron, Mt. Pelee, 950–1100 m, 8 December 1960, *G. Proctor 21750* (A); Pitons du Carbet, 1200 m, 5 September 1937, *H. Stehlé 2261* (US); Piton du Carbet, 1080 m, 5 September 1937, *H. Stehlé 2637* (US); entre Fonds, St. Denis et le Morne-Vert., 650 m, 27 July 1942, *H. Stehlé* & *M. Stehlé 5173* (US); Martinique, 1823, *Wrbna sn* (AWH). ST. LUCIA: Millet, 20 June 1945, *P. Beard 1107* (GH, MO, S, US); Ravine Zenon (Soufrière Valley), 800 ft, 8 November 1938, *H. Box 1921* (BM); 0.5 mi SW of Piton Troumassee, ca 2150 ft, 4 April–12 June 1958, *G. Proctor 17856* (A, BM, IJ, NY, US); Great Piton, 2000 ft or more, 23 September 1888, *G. Ramage sn* (BM, K); rain forest along rocky streambank at foot of Mt. Gimie, ca 1500 ft, 2 August 1959, *G. Webster, J. Ellis* & *K. Miller 9411* (A, IJ, S, U, US); St. Lucia, 3 August 1959, *G. Webster, J. Ellis* & *K. Miller 9455* (A). LOCALITY UNKNOWN: [Lesser Antilles, 1788], *B. Euphrasen sn* (S); 1825, *M. Lambert sn* (G-DC); "In occid.," *de Ponthieu sn* (G, holotype of *Pentarhaphia lindleyana* Decaisne; G, isotype); ex India occidentali, *J. Ryan sn* (C, S); "diffusa vanat floribus rubris et luteis e montis," *J. Ryan sn* (C); *J. Ryan sn* [ex Herb. Schum.] (C 5 sheets); India occid.: Jamaica, *O. Swartz sn* (S 2 sheets); India occidentalis: Jamaica, 1784–1786, *O. Swartz sn* (S); West Indies, 1784–1786, *O. Swartz sn* (S). CULTIVATED: Cornell University, 2 August 1966, *L. Leva 37* (BH); Cornell

University, 12 September 1966, *M. Stone 197* (BH); Cornell University, 6 March 1972, *L. Skog 1817* (BH).

Discussion.—With the concurrence of W. T. Stearn (in litt.), I have selected a collection by J. Ryan as the lectotype for *Gesneria ventricosa*. In his protolog for this species Swartz, in 1788, listed three localities from specimens he studied in the Banksian herbarium in London—now British Museum (Natural History). He later (1800) listed collectors for two of those localities: J. Ryan for Montserrat and de Ponthieu for Dominica. There is no de Ponthieu specimen from Dominica now extant in the Banksian herbarium. Thus, by elimination, *J. Ryan sn* is the lectotype.

The third locality for *Gesneria ventricosa*—Jamaica—mentioned by Swartz was repeated by de Candolle (1839), Grisebach (1862), and Urban (1901), but I believe this extension of the range is erroneous. *Gesneria ventricosa* occurs on the Lesser Antilles from St. Croix south to St. Vincent and has never been accurately recorded from Jamaica. The specimens at Kew labeled *Gesneria ventricosa* from Jamaica are undoubtedly *Gesneria exserta* Swartz. The Swartz specimens at Stockholm are labeled as coming from Jamaica, but the handwriting is not that of Swartz. Possibly the specimens were obtained while Swartz worked with Joseph Banks in London, and they are perhaps duplicates of Ryan, de Ponthieu, and others collected from the Lesser Antilles, especially since no specimens of de Ponthieu are at present in the Banksian Herbarium.

Pentarhaphia florida Decaisne was based on collections by Perrottet and Beaupertuis from Guadeloupe. Leeuwenberg has selected the Beaupertuis specimen at Paris as lectotype for the name. His selection is accepted here; the specimen is annotated in Decaisne's hand as *Pentarhaphia florida*.

The holotype of *Gesneria ventricosa* var. β *ovata* Urban may have been destroyed at Berlin-Dahlem. A duplicate at Leiden of the Suringar specimen, annotated in Urban's hand as belonging to this variety is here selected as the lectotype.

The infraspecific taxa described by Urban and others appear to be ecological variants in leaf size and shape. Growing *Gesneria ventricosa* subsp. *ventricosa* collections from Dominica and St. Kitts in different regimes of light, temperature, and humidity in the greenhouse has resulted in plants similar to those described by Urban (1901), Duss (1897), and Stehlé (1962).

19. *Gesneria wrightii* Urban

Gesneria wrightii Urban, Symb. Ant. 2:373, 1901.—Morton *in* Leon & Alain, Fl. de Cuba 4:459, 1957.

Pentarhaphia triflora Grisebach, Cat. Pl. Cub. 199, 1866 [non *Gesneria triflora* Martens & Galeotti (1842), nec *Gesneria triflora* W. Hooker (1847)].

Small trees: stems woody, erect, to 2.5 m tall, ca 3 mm in diameter at 10 cm below apex, bark verrucose, green to brown above, becoming gray below, glabrous, apex resinous, pulverulent below, lenticels erumpent, elongated; branches occasional, scattered, internodes 0.1–2.7 cm long.

Leaves alternate, usually congested at branch apices: petioles sulcate, 2–4 mm long, ca 1 mm wide, green or reddish, glabrous, verrucose, resinous; blades elliptic or seldom oblanceolate, 2.3–5.3 cm long, 0.7–1.3 cm wide, coriaceous, base and apex narrowly acute, margin sharply serrate, adaxial surface light green, smooth, glabrous, veins obscure, abaxial surface light green to brown, glabrous, resinous, veins prominent.

Inflorescences in axils of upper leaves, slightly longer than the subtending leaves, 2- to 4-flowered, erect: peduncles terete, curved, 1.8–5.2 cm long, ca 1 mm in diameter, red, glabrous, resinous; bracts linear, 2–5 mm long, less than 1 mm wide, resinous; pedicels terete, curved, ca 1.5 cm long, ca 1 mm wide, wider toward apex; floral tube obconic, 2–3 mm long and wide, green or red, glabrous, resinous, pulverulent; calyx 5-lobed, lobes erect or slightly incurved, connate for less than 1 mm at base, linear, 6–9 mm long, ca 1 mm wide at base, red, glabrous, glandular-resinous, outside keeled at base, inside sulcate; corolla tube subventricose from a narrow base, curved, 1.1–1.4 (–2.0, fide Morton) cm long, ca 2.3 mm wide at base, 3–4 mm wide at middle, narrowing slightly at throat, both sides red, glabrous, resinous, limb 5-lobed, lobes broadly rotund, short, ca 1 mm long, ca 2 mm wide, margin entire, mouth slightly oblique; stamens 4, adnate to base of corolla tube for less than 1 mm, slightly exserted beyond corolla tube, filaments curved, ca 1.4 cm long, reddish, glandular, anthers oblong, staminode not seen; ovary inferior, apex pilose, disc annular, style curved ca 1.4 cm long, yellow, sparsely pilose, stigma capitate.

Capsule subglobose, ca 5 mm long and wide, red, glabrous, resinous, costae 5, prominent; seeds not seen.

TYPE-COLLECTION.—San Andre, Cuba, *C. Wright 3072* (GOET, holotype, Figure 41*b*; BM, G, GH, K, MO, NY, P, isotypes).

DISTRIBUTION AND ECOLOGY.—*Gesneria wrightii* has been found only once in Oriente Province of Cuba (Figure 29), growing on limestone cliffs. Collections with flowers were made in October.

SPECIMENS EXAMINED.—CUBA. PROVINCE OF ORIENTE: San Andre, *C. Wright 3072* ([1861] GOET, holotype of *Pentarhaphia triflora* Grisebach [23 October 1860–1864] GH, [1860–1864] BM, G 2 sheets, K, MO, NY, P, isotypes).

DISCUSSION.—The leaves and habit of *Gesneria wrightii* resemble *Gesneria binghamii* Morton, but differ in the smaller size of the leaves (up to 9.9 cm in *G. binghamii*) and corolla (up to 2.6 cm long, fide Morton), and in having inflorescences of 2–4 flowers, rather than single flowers.

Section 2. *Stenochonanthe* L. Skog, new section

Caules erecti vel contorti, usque ad 3 m alti, ad basim vel ex foliorum superiorum axillis ramificantes; folia elliptica, oblanceolata vel obovata, membranacea, planiuscula, nitida; inflorescentiae 3- to ∞-florae, interdum ex gemmis supernumerariis axillaribus ortae, folia subtentes aequantes vel excedentes; flores tubulosi, corollis sensim ex basi orem versus dilatatis, flavis aurantiacis, coccineis, vel roseis, staminibus inclusis; capsulae turbinatae vel fere sphaericae, costis prominentibus vel obscuris.

TYPE-SPECIES.—*Gesneria scabra* Swartz.

DISCUSSION.—Section *Stenochonanthe,* composed of one species including four varieties, is probably related to the other sections containing shrubs or small trees that have flowers with tubular corollas, and it may have evolved from an ancestor of section *Pentarhaphia* in response to a particular pollinator. This section remains distinct, however, due to its narrowly funnelform corolla, occasional multiple axillary buds, and included stamens.

Name derived from the Greek *stenos* (= narrow) + *chone* (= funnel) + *anthe* (= flower).

20. *Gesneria scabra* Swartz

Gesneria scabra Swartz, Prodr. 89, 1788.

Shrubs or trees: stems woody, erect or contorted, 0.5–3.0 m tall, slender, tomentose, becoming glabrescent, resin not abundant at apex; bark reddish-gray, lenticels elongated or not evident, pith green to whitish or pink; branches rarely from supernumerary axillary buds, scattered or clustered near the apices of stems, occasional to numerous, internodes 0.5–8.5 cm long, 2–3 mm in diameter, green, becoming tawny to dark brown or dark red, subverrucose, scabrous-pubescent to strigose or tomentose, trichomes often appressed, nodes slightly swollen.

Leaves alternate, clustered at branch apices: petioles sulcate, 0.4–1.5 cm long, 1.0–2.5 mm wide, green to reddish or brown, scabrous-pubescent or tomentose; blades elliptic-oblong to oblanceolate or obovate, 4.3–17.2 cm long, 2.0–4.5 cm wide, membranous, rigid, plane, base subcuneate, acute or obtuse, margin serrulate-dentate or crenate, ciliate, apex acute to acuminate, adaxial surface dark green, glossy, sparsely pilose to scabrous or strigose, with appressed trichomes more abundant near the midvein, abaxial surface lighter green, sparsely pilose to scabrous or velutinous, veins prominent.

Inflorescences axillary, often more than one at a node, 3- to ∞-flowered, usually only one maturing, or in a compound dichasium and many: peduncles terete, 2.0–10.5 cm long, 1 mm in diameter, pilose; bracts 2, subulate to ovate, minute or 1 mm long, 1.0–2.5 mm wide, green to tawny-reddish or reddish-brown, pilose, caducous; pedicels terete, 0.4–2.0 cm long, 1.0–1.5 mm in diameter, green to reddish-brown, pilose; floral tube turbinate or nearly spherical, 2–4 mm long, 2–4 mm wide, reddish-brown, pilose, calyx lobes 5, connate to 1 mm above ovary apex, suberect to spreading, with valvate or open aestivation, each lobe flat, linear, lanceolate, lingulate, ovate, obovate, or oblong, membranous, 2.5–9.0 mm long, 1–6 mm wide, accrescent, becoming chartaceous in fruit, cuneate or broad at base, pale green to white with prominent veins or reddish-brown, margin entire or serrulate, apex acute or acuminate, dull red or pink, scabrous-pubescent or tomentose; corolla tubular, narrowly funnelform, curved from the slightly gibbous base, tube 1.0–1.7 cm long, 3–5 mm wide at the middle, ca 5 mm wide at the mouth, outside crimson to rosy-pink, or bright yellow to orange-yellow, pilose with

erect, purplish articulate trichomes, inside lighter red to pink or yellow, glabrous, limb 5-lobed, expanded slightly, ca 8 mm wide, each lobe ovate, ca 2 mm long, 2–3 mm wide, pink to red, glabrous, margin erose to entire, occasionally ciliate with glandular trichomes; stamens 4, adnate to the base of the corolla tube for 1 mm, not exserted, filaments linear, 0.8–1.3 cm long, less than 1 mm wide, white or yellowish, glabrous, anthers oblong to sagittate, 1.0–1.5 mm long, 1.0 mm wide, white or yellowish to blackish, coherent in two pairs by their apices until dehiscence, staminode 3–4 mm long, anther lacking or infertile; ovary inferior, covered at the convex apex by dense white articulate trichomes, disc annular, undulating, 1 mm thick, 3 mm in diameter, whitish, glabrous or tomentose, style linear, wider toward apex, ca 1.1 cm long, less than 1 mm in diameter, yellowish or orange-red, glabrous or pubescent, stigma stomatomorphic, ca 2 mm wide.

Capsule turbinate to nearly spherical, 3–7 mm long, 3–7 mm wide, red, pubescent, becoming gray-brown, glabrescent, costae 5, obscure or prominent; seeds rhombic or fusiform, slightly contorted or twisted, 0.5–1.0 mm long, ca 0.7 mm wide, tawny to dark reddish-brown.

Distribution and Ecology.—*Gesneria scabra* occurs in and near the Cockpit Country of western Jamaica (Figure 45). Because of the geographical proximity and the seemingly minor differences in the plants, four taxa are considered here as varieties, differing in corolla color, in size, color, and margin of calyx lobes, and in shape of capsule.

Although the varieties are separated geographically, they may be pollinated by the same species of hummingbirds, *Mellisuga minima* or *Trochilus polytmus*, whose bills are 1.3 cm and 2.0 cm long, respectively.

20a. *Gesneria scabra* var. *fawcettii* (Urban) L. Skog, new rank

Gesneria fawcettii Urban, Symb. Ant. 5:500, 1908.—Adams, Fl. Pl. Jamaica 681, 1972.

Shrubs: stems to 1 m tall.

Leaves 8–13 cm long.

Inflorescences few, 4- to 5-flowered: peduncles 2–6 cm long; calyx lobes lingulate to obovate, 3–6 mm long, reddish-brown, margin serrulate; corolla bright yellow; anthers yellow.

Capsule turbinate, 3–4 mm long, 3–6 mm in diameter.

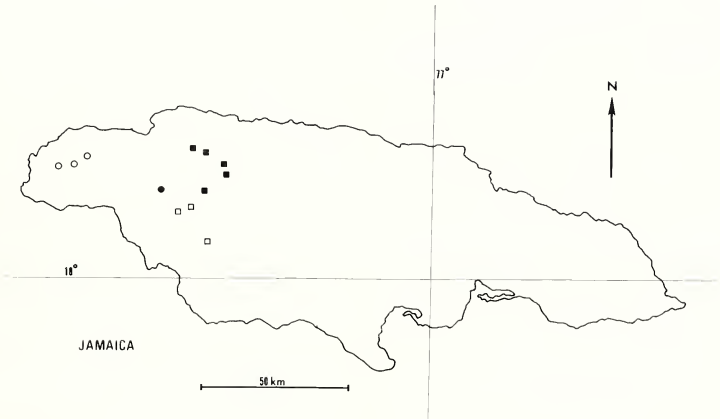

Figure 45.—Distribution of *Gesneria* section *Stenochonanthe* in Jamaica. (*G. scabra* var. *fawcettii* = solid circles; *G. scabra* var. *scabra* = open circles; *G. scabra* var. *sphaerocarpa* = open squares; *G. scabra* var. *viridicalyx* = solid squares.)

Key to the Varieties of *Gesneria scabra*

1. Corolla crimson to rosy-pink; calyx lobes entire, linear to oblong.
   2. Capsule turbinate, broadest at the apex; calyx lobes ovate to oblong, 2.5–7.0 mm long ..... 20b. var. ***scabra***
   2. Capsule nearly spherical, broadest below the apex; calyx lobes linear to lanceolate, 4–9 mm long ..... 20c. var. ***sphaerocarpa,*** new rank
1. Corolla bright yellow to orange-yellow; calyx lobes serrulate, lingulate to obovate.
   3. Calyx lobes reddish-brown, 3–6 mm long; inflorescences few; capsules 3–4 mm long, 3–6 mm in diameter ..... 20a. var. ***fawcettii,*** new rank
   3. Calyx lobes green to white, to 8 mm long; inflorescences many; capsule 3–4 mm long, 5–6 mm in diameter ..... 20d. var. ***viridicalyx,*** new variety

FIGURE 46.—Type specimens: *a*, lectotype of *Gesneria fawcettii* Urban and *Gesneria scabra* var. *fawcettii* (Urban) L. Skog, new rank, *Harris 9883* (UCWI); *b*, holotype of *G. scabra* var. *viridicalyx* L. Skog, new variety, *Proctor 15756* (US).

TYPE-COLLECTION.—Woodstock, Jamaica, *W. Harris 9883* (UCWI, lectotype, Figure 46*a*; BM, F, K, NY, US, isolectotypes).

DISTRIBUTION AND ECOLOGY.—*Gesneria scabra* var. *fawcettii* occurs in Jamaica, parish of Westmoreland (Figure 45), on damp, shady, limestone banks, at 460 m altitude, flowering in September, but probably earlier and later.

SPECIMENS EXAMINED.—JAMAICA. PARISH OF WESTMORELAND: Woodstock, 1400 ft, 21 September 1907, *W. Harris 9883* (UCWI, lectotype of *Gesneria fawcettii* Urban; BM, F, K, NY, US, isolectotypes).

Discussion.—To replace the probably destroyed holotype at Berlin, the isotype specimen at University of West Indies is selected as lectotype.

20b. *Gesneria scabra* var. *scabra*

Gesneria scabra Swartz, Prodr. 89, 1788.—Sw., Fl. Ind. Occid. 2:1020, 1800.—Lunan, Hort. Jam. 1:322, 1814.—Urb., Symb. Ant. 2:381, 1901.—Adams, Fl. Pl. Jamaica 680, 1972.

Conradia scabra (Swartz) Martius, Nov. Gen. & Sp. 3:38, 1829 & 3:196, 1832.—G. Don, Gen. Syst. 4:650, 1838.—DC., Prodr. 7:526, 1839.—Griseb., Fl. Brit. W. Ind. 461, 1862.

Pentarhaphia scabra (Swartz) Hanstein, Linnaea 34:308, 1865.

Shrubs: stems erect, to 2.5 m tall; branches erect, internodes to 2.5 cm long, green to reddish.

Leaves alternate: petioles 2–9 mm long, reddish-brown; blades elliptic, oblong to obovate, 4.3–13.5 cm long, 2.3–4.4 cm wide, base acute to obtuse.

Inflorescences 3- to 8-flowered: bracts minute to 5 mm long, reddish, pilose; floral tube turbinate; calyx lobes ovate to oblong, 2.5–7.0 mm long, 2–4 mm wide, base cuneate, apex acute; corolla tube 0.8–1.6 cm long, crimson to rosy, limb margin erose to denticulate; staminal filaments 0.8–1.3 cm long; style glabrous.

Capsule turbinate, broadest at the apex, 4–7 mm long, 5–7 mm wide, costae usually 5, prominent; seeds rhombic.

Type-Collection.—India occid., Jamaica, *O. Swartz sn* (S, holotype, Figure 47; B, BM, C, G-DC, LD, LINN, M, S, UPS, isotypes).

Distribution and Ecology.—*Gesneria scabra* var. *scabra* grows in western Jamaica (Figure 45) in the parishes of Hanover and St. James, on steep, moist, wooded, rocky limestone hillsides or thickets at elevations from ca 160 m to 550 m. This variety appears to flower during the entire year.

Specimens Examined.—JAMAICA. Parish of Hanover: Retirement, 1.5 miles southeast of Kingsvale, ca 850 ft, 10 October 1950, *G. Proctor 4896* (IJ, US); Retirement Mountain district, 1.25 mi due SE of Kingsvale, 500–800 ft, 13 January 1963, *G. Proctor 23137* (BM, GH, IJ, NY, U, US); Dolphin Head, 1600 ft, 22 May 1906, *W. Harris 9249* (A, BM, F, NY, UCWI, US); summit of the Dolphin Peak, January 1844, *W. Purdie sn* (GH, GOET, K); summit of Dolphin Head, 17 March 1908, *N. Britton & A. Hollick 2214* (F, NY); summit of Dolphin Head, 1789 ft, 29 October 1952, *G. Proctor 7273* (IJ); summit of Dolphin Head, 1750–1786 ft, 11 April 1955, *G. Proctor 10050* (BM, IJ, NY); N. slopes of Bubby Hill, ca 1 mi SW of Hillsbrook, 1000–1400 ft, 29 August 1965, *G. Proctor 26688* (BM). Parish of St. James: between Cambridge and Fern, ca 1000 ft, 4 April 1966, *D. Powell 1669* (IJ); Burke Mountain district, 1 mi NE of Kensington, ca 1600 ft, 15 September 1957, *G. Proctor 16641* (BM, IJ); Pembroke, Flagstaff, Maroon Town, 1500 ft, 11.7. 1967, *H. Osmaston 5004* (UCWI). Locality Unknown: Jamaica, *W. Purdie sn* (K); India occid.; Jamaica, *O. Swartz sn* (holotype, S; isotypes, B, BM, C, G-DC, LD, LINN, M, S, UPS).

Figure 47.—Holotype of *Gesneria scabra* Swartz, *Swartz sn* (S).

20c. *Gesneria scabra* var. *sphaerocarpa* (Urban) L. Skog, new rank

Gesneria sphaerocarpa Urban, Symb. Ant. 5:499, 1908.—Adams, Fl. Pl. Jamaica 680, 1972.

Shrubs or small trees: stems erect or contorted, to 3 m tall; branches often numerous, occasionally from supernumerary buds, weak and drooping or

ascending, internodes 2.0–8.5 cm long, green, becoming tawny to dark brown.

Leaves alternate: petioles 2–9 mm long, green to reddish; blade elliptic to oblanceolate, 2.4–15.8 cm long, 1.0–3.8 cm wide, base subcuneate to acute.

Inflorescences 6- to many-flowered: bracts to 8.0 mm long, 2.5 mm wide, green to tawny-reddish; floral tube nearly spherical; calyx lobes linear to lanceolate, 4–9 mm long, 1–3 mm wide, base not narrowed, apex acuminate; corolla tube 0.8–1.5 cm long, rosy-pink, limb margin entire to erose; staminal filaments 0.8–1.2 cm long, pollen grains isopolar, prolate, size small (18.2–18.8 μm long at the polar axis, 9.8–11.0 μm wide at the equatorial axis), colpi 14.1–15.5 μm long, overlapping to less than 1 μm wide, amb subcircular, apocolpia rounded to truncate, sexine appearing smooth, not reticulate (Figure 17*f*); style puberulent.

Capsule nearly spherical, broadest below the middle, 3–4 mm long, 4–6 mm in diameter, costae obscure to subprominent; seeds fusiform.

Type-Collection.—Bank of Black River, Lacovia, Jamaica, *W. Harris 9956* (BM, lectotype; C, F, K, NY, P, UCWI, US (Figure 48), isolectotypes).

Distribution and Ecology.—*Gesneria scabra* var. *sphaerocarpa* is known from Jamaica, parish of St. Elizabeth (Figure 45), on limestone cliffs, from 250–450 m altitude. This variety, like the typical variety, appears to flower all during the year; in the greenhouse flower buds are present at all times.

Specimens Examined.—JAMAICA. Parish of St. Elizabeth: Gorge of the Jones River, south of Ginger Hill, 800–900 ft, 25 April 1961, *K. Kramer 1750* (U), *G. Proctor 22238* (BM); Ipswich, 900 ft, 13 June 1916, *W. Harris 12361* (BM, F, K, MO, NY, P 2 sheets, S 2 sheets, UCWI, US); Merrywood district, between Ipswich and Mulgrave, 1200 ft, 10 March 1956, *W. Stearn 446* (A, BH, BM); along road between Merrywood and Mulgrave, 1000–1250 ft, 13 May 1960, *G. Proctor 20845* (BM, IJ); between Merrywood and Mulgrave, 1150 ft, 16 August 1970, *L. Skog* & *G. Proctor 1639* (BH); between Merrywood and Mulgrave, 1000 ft, 14 November 1964, *T. Talpey 17* (BH); bank of Black River, Lacovia, 16 September 1907, *W. Harris 9956* (BM, lectotype of *Gesneria sphaerocarpa* Urban; C, F, K, NY, P, UCWI, US, isolectotypes). Cultivated: Cornell University, 16 May 1966, *M. Stone 126* (BH).

Discussion.—The isotype specimen of *Harris 9956* at the British Museum (Natural History) has been chosen as lectotype for this variety. The holotype was probably at Berlin and is no longer extant.

20d. *Gesneria scabra* var. *viridicalyx* L. Skog, new variety

Arbuscula ad 3 m alta. Folia ad 17.2 cm longa. Inflorescentiae flores 6–10, pedunculis 2–6 cm longis: sepala pallide viridia vel etiam albida venis prominentibus, ad 8 mm longa; antherae atratae (fide Proctor). Capsulae turbinatae, ad 3–4 mm longae et 5–6 mm latae.

Type-Collection.—Between Windsor and Tyre, north of Troy, Jamaica, *G. Proctor 15756* (US, holotype, Figure 46*b*; BM, GH, IJ, isotypes).

Distribution and Ecology.—*Gesneria scabra* var. *viridicalyx* is found in Jamaica in the Parishes

Figure 48.—Isolectotype of *Gesneria sphaerocarpa* Urban and *G. scabra* var. *sphaerocarpa* (Urban) L. Skog, new rank, *Harris 9956* (US).

of St. Elizabeth and Trelawny (Figure 45) growing on moist, wooded, rocky limestone hillsides or in sinkholes at elevations from 200–550 m. Flowers are produced in March, May, August, and December.

Specimens Examined.—JAMAICA. Parish of St. Elizabeth: Cooks bottom, east of Elderslie, 1600–1700 ft, 13 May 1960, *G. Proctor 20865* (BM). Parish of Trelawny: Cockpit country, along track between Windsor and Tyre, north of Troy, 700–1700 ft, 28 August 1956, *G. Proctor 15756* (US, holotype of *Gesneria scabra* var. *viridicalyx* L. Skog; BM, GH, IJ, isotypes); Dyers Patent, WNW of Quickstep, 30 December 1949, *R. Bengry sn* (IJ, US); 7 miles NNW of Quickstep, 1500 ft, *J. Poulter et al.* in *Adams 10893* (UCWI); Paynes Patent District, WNW of Quick Step, 2 August 1949, *R. Bengry sn* (IJ, US).

Section 3. *Lachnoblaste* L. Skog, new section

Caules erecti, usque ad 2 m alti, ex foliorum superiorum axillis ramificantes. Folia anguste obtrullata vel oblonga, interdum falcata, membranacea, plana, opaca. Inflorescentiae 1- ad ∞-florae, avam foliis subtentis breviores vel longiores; flores tubulosi ad medium ventricosi rubro-aurantiaci, staminibus exsertis. Capsulae late turbinatae, costis prominentibus.

Type-Species.—*Gesneria decapleura* Urban.

Discussion.—Section *Lachnoblaste,* consisting of a single species from Hispaniola, may have evolved from the stock ancestral to section *Pentarhaphia.* This section, however, differs considerably from the members of *Pentarhaphia* in characters of foliage and fruit. Similarities in habit, leaf shape, indumentum, and fruit are seen in *Gesneria* (*Dittanthera*) *fruticosa* (Linnaeus) O. Kuntze, but corolla shape easily distinguishes that species from *G. decapleura.*

Name derived from the Greek *lachnos* (= shaggy) + *blastos* (= bud).

21. *Gesneria decapleura* Urban

Gesneria decapleura Urban, Symb. Ant. 7:542, 1913.—Urb., Symb. Ant. 8:647, 1921.

Shrubs or trees: stems woody, erect, to 2 m tall, to 1 cm in diameter, bark rugose, white-gray to brown, glabrescent; branches smooth, gray to white or reddish, nodes slightly swollen; buds densely covered with long sordid white articulate trichomes.

Leaves alternate or approximate: petioles flattened to subsulcate, 2–7 mm long, 1–3 mm wide, green to brown, pilose to glabrescent; blades narrowly obtrullate to oblong, occasionally falcate, 5.4–22.2 cm long, 1.3–8.6 cm wide, membranous, plane, base cuneate, margin entire near the base, becoming grossly serrate to lobulate toward the acute or acuminate apex, adaxial surface green, dull, pilose to glabrescent, veins covered with glandular or nonglandular trichomes, abaxial surface lighter green, pilose with articulate trichomes at least on the prominent veins.

Inflorescences from the axils of often reduced leaves, 1- to ∞-flowered: peduncles terete, 2.6–8.0 cm long, 1 mm in diameter, reddish becoming lighter with age, pilose; bracts 2, linear-lanceolate, 3–6 mm long, less than 1 mm wide, pilose, trichomes with reddish to colorless articulations; pedicels terete, 0.8–1.8 cm long, 1 mm in diameter, pilose, trichomes with reddish articulations becoming lighter with age; floral tube broadly turbinate, 2–4 mm long, 3–5 mm wide, densely pilose with reddish, articulate trichomes; calyx lobes 5, spreading, each lobe lanceolate, 5–8 mm long, 2.0–3.5 mm wide at the base, reddish and pilose with appressed trichomes outside and inside, 3- or 5-nerved or nerves obscure; corolla tubular, curved, 1.8–2.5 cm long, 4–6 mm in diameter at the gibbous base, narrowing to 3–5 mm above the base, 0.8–1.1 cm in diameter at the ventricose middle, 0.7–1.0 cm in diameter at the oblique mouth, red to orange, densely pilose outside, inside reddish and glabrescent, limb 5-lobed, each lobe semiorbiculate with margins erose to denticulate and ciliate with glandular trichomes, upper lobes 3–4 mm long, 3–4 mm wide, connate for 1–2 mm, lateral and basal lobes 2.0–3.5 mm long, 3.0–3.5 mm wide; stamens 4, adnate to the base of the corolla tube for 1 mm, exserted to about 5 mm, filaments linear, curved, 2.2–2.6 cm long, about 1 mm in diameter, yellow to red, puberulent with glandular trichomes toward the base, glabrescent above, anthers oblong, 1.0–1.5 mm long, 1 mm wide, coherent in 2 pairs by their apices at anthesis, becoming free, staminode 3 mm long, lacking fertile anther; ovary inferior, apex densely pilose with reddish trichomes, disc annular, yellow with glandular trichomes, style linear, curved, 2.4–3.0 cm long, less than 1 mm in diameter, reddish, puberulent with glandular trichomes

to glabrescent above, stigma capitate, stomatomorphic.

Capsule broadly turbinate, 5–6 mm long, 5–7 mm wide, reddish to gray-brown, apex slightly erumpent, dehiscing into 2–4 valves, densely pilose to glabrescent, costae 10, prominent; seeds fusiform, twisted, ca 0.8 mm long, 0.25 mm wide, reddish-brown.

Type-Collection.—Ad Las Cañitas, Dominican Republic, *M. Fuertes 1860* (A, lectotype, Figure 49).

Distribution and Ecology.—*Gesneria decapleura* is apparently endemic to Hispaniola in the central range of mountains, occurring in the northwest in the Massif du Nord in Haiti and to the southeast in the Cordillera Central in central Dominican Republic (Figure 50), in wet forests on limestone, from 150–1400 m elevation. *Gesneria decapleura* has been collected in flower during April, June, July, and August. Possible hummingbird pollinators for this species might be *Anthracothorax dominicus* and *Chlorostilbon swainsonii*, whose bills are 2.4 cm and 1.9 cm long, respectively.

Specimens Examined.—HAITI. Département du Nord: Massif du Nord, St. Louis du Nord, mountain slope at Rivière Nambiu, ca 150 m, 14 April 1925, *E. Ekman H3809* (A, C, EHH, IJ, K, NY, S, US); Massif du Nord, St. Louis du Nord, top of Morne Chavary, ca 900 m, 25 August 1925, *E. Ekman H4719* (S). DOMINICAN REPUBLIC. Azua Province: Cordillera Central, Loma Nalga de Maco, headwaters of Arroyo del Valle, 1300–1400 m, 10 June 1926, *E. Ekman H6332* (EHH, F, G, GH, IJ, S, US); ad Las Cañitas, 1300 m, July 1912, *M. Fuertes 1860* (A, lectotype of *Gesneria decapleura* Urban); ad Las Cañitas, 1300 m, July 1912, *M. Fuertes 1925* (A, NY, P).

Discussion.—The only known duplicate of *Fuertes 1860,* in the herbarium of the Arnold Arboretum, has been selected as the lectotype, since the holotype at Berlin is presumed destroyed.

Section 4. *Myrmekianthe* L. Skog, new section

Caules erecti, usque ad 2 m alti, ad basim ramificantes. Folia lanceolata, elliptica vel obovata, coriacea, planiuscula, nitida, marginibus recurvatis. Inflorescentiae 1- ad ∞-florae, folia subtentes aequantes vel excedentes; corollae tubulosae fere cylindraceae virides flavae usque rubrae, verrucosae, staminibus non exsertis. Capsulae turbinatae, verruculosae, costis obscuris vel prominentibus.

Type-Species.—*Gesneria duchartreoides* (C. Wright) Urban.

Discussion.—The plants comprising section *Myrmekianthe* were in the past divided into five species. From the examination of many specimens over the whole geographic range of the plants, the taxa appear to be artificial and not based on strongly distinctive morphological characters nor on geographical isolation. Since flowers are seldom present on preserved material (and living plants are not available), attempts were made to distinguish the taxa on the basis of bracts, sepals, capsules, and vegetative organs; none of the characters were dependable either singly or in combination. Variation appears to occur over the entire distributional range; consequently, the taxa are combined here as a single variable species.

Relationships of section *Myrmekianthe* lie,

FIGURE 50.—Distribution of *Gesneria* section *Lachnoblaste* and section *Dittanthera* in Hispaniola. (*G.* (*Lachnoblaste*) *decapleura* = open circles; *G.* (*Dittanthera*) *fruticosa* = solid circles.)

perhaps, with section *Pentarhaphia* on one hand and section *Duchartrea* on the other. The floral characters resemble superficially those found in some members of section *Pentarhaphia,* but stem, foliage, and fruit characters tend toward those that appear in *Gesneria* (*Duchartrea*) *viridiflora* subsp. *viridiflora,* also endemic to Cuba. Plants in section *Myrmekianthe* are probably hummingbird pollinated; *Duchartrea* may have evolved from an ancestor of this section in response to bat pollination.

Name derived from the Greek *myrmekia* (= wart) + *anthe* (= flower).

22. *Gesneria duchartreoides* (C. Wright) Urban

Gesneria duchartreoides (C. Wright) Urban, Symb. Ant. 2:375, 1901.—Morton *in* Leon & Alain, Fl. de Cuba 4:457, 1957.

Pentarhaphia duchartreoides C. Wright *in* Sauvalle, Anales Acad. Ci. Méd. Habana 6:316, 1869.—Sauv., Fl. Cub. 92, 1873 ["duchartraeoides"].

Gesneria nipensis N. Britton & P. Wilson, Mem. Torrey Bot. Club 16:109, 1920.—Morton *in* Leon & Alain, Fl. de Cuba 4:457, 1957. [Type-collection: Sierra Nipe, near Woodfred, Cuba, *J. Shafer 3201* (NY, holotype; F, US, isotypes).]

Gesneria norlindii Urban, Symb. Ant. 9:268, 1924.—Morton *in* Leon & Alain, Fl. de Cuba 4:458, 1957. [Type-collection: Inter Taco et Nibujón, Cuba, *E. Ekman 3730* (S, holotype).]

Gesneria bracteosa Urban, Symb. Ant. 9:269, 1924.—Morton *in* Leon & Alain, Fl. de Cuba 4:458, 1957. [Type-collection: Baracoa, Lomas de Cuaba, Cuba, *E. Ekman 4296* (S, holotype; K, S, isotypes).]

Gesneria pachyclada Urban, Symb. Ant. 9:270, 1924.—Urb., Repert. Spec. Nov. Regni Veg. 21:69, 1925.—Morton *in* Leon & Alain, Fl. de Cuba 4:458, 1957. [Type-collection: Sierra de Cristal, Cuba. *E. Ekman 6822* (S, holotype).]

Shrubs or small trees: stems woody, erect, to 2 m tall, 5–7 mm in diameter immediately below the apex; bark yellow, gray, or reddish-brown, minutely puberulent to glabrous, smooth when young, becoming verrucose with age, lenticels elongated, sometimes erumpent, apex resinous; pith reddish; branches few, from the base, internodes to 2 cm long.

Leaves alternate: petioles sulcate to nearly terete, 0.3–2.5 cm long, 1–3 mm wide, reddish-brown, smooth to verrucose, minutely puberulent to glabrescent, resinous; blades narrowly elliptic to broadly obovate, 3.2–17.7 cm long, 0.8–5.9 cm wide, coriaceous, base cuneate or acute, margin subentire to grossly serrate, apex retuse to acuminate, adaxial surface green, smooth to scabrous, finely puberulent to glabrescent, glossy, abaxial surface green to reddish-brown, glabrous, midvein prominent, verrucose, resinous.

Inflorescences 1- to ∞-flowered: peduncles terete, 2.8–22.1 cm long, 1–5 mm in diameter, green to reddish-brown, puberulent to glabrescent, verrucose; bracts 2 (–3), linear to broadly lanceolate, 0.3–4.2 cm long, 1–8 mm wide, green to reddish-brown, puberulent, apex sometimes caudate, verrucose, resinous; pedicel terete, 0.3–1.2 cm long, elongating in fruit, 1–2 mm in diameter, green to

reddish-brown, puberulent, resinous; floral tube narrowly turbinate, 3–6 mm long, 3–6 mm wide, green to yellow or red, puberulent, verrucose, resinous; calyx lobes erect, 5, each triangular, linear to lanceolate, usually sulcate at the base, narrowing toward the terete apex, 0.3–2.5 cm long, 1–4 mm wide, green to reddish-brown, puberulent to glabrous, verrucose outside, inside glandular-resinous; corolla tube nearly cylindrical, 1.0–1.7 cm long, 3–8 mm wide at the base, slightly contracted, then subventricose above the base, the mouth to 7 mm wide, green to yellow or red, pilose, puberulent to glabrescent, resinous outside, inside verrucose, resinous, limb 5-lobed, each lobe semi-orbiculate, 2–3 mm long, sometimes red-spotted, verrucose, sometimes pilose, margin entire, erose to fimbriate; stamens 4, adnate to the base of the corolla tube, included, filaments linear, reddish, 1.2–1.4 cm long, 1 mm in diameter, pilose to glabrescent near the base, glabrescent toward the apex, anthers oblong, 1–2 mm long, 1.5 mm wide, white, coherent in 2 pairs by their apices; ovary inferior, apex puberulent, disc annular, yellow, pubescent with glandular trichomes, style 1.3–1.6 cm long, reddish pilose to glabrescent, stigma bilobed, 1.5 mm wide.

Capsule turbinate to nearly spherical, dehiscing into 2–4 valves, 0.4–1.1 cm long, 0.4–1.1 cm wide, red or yellow to gray-brown, verrucose, costae obscure or prominent; seeds linear, twisted, ca 1 mm long, 0.25 mm wide, reddish to brown (Figure 19*n*).

Type-Collection.—Cuchillas de Baracoa, Cuba, *C. Wright sn* (GH, holotype; GOET, isotype, Figure 51).

Distribution and Ecology.—*Gesneria duchartreoides* is known only from Oriente Province of Cuba (Figure 52), where it grows on serpentine pine barrens, stream banks, or dry hillsides from 350–1300 m elevation. This species has been collected in every month, but seldom with flowers. Possible hummingbird pollinators might be *Calypte helenae* and *Chlorostilbon ricordii*, whose bills are approximately the same length as the corolla tube.

Specimens Examined.—CUBA. Oriente Province: in "charrascales" ad Río Piloto, 21 July 1914, *E. Ekman 2115* (S); Sierra de Nipe in "charrascales" ad Río Piloto, 20 April 1919, *E. Ekman 9528* (NY, S); Sierra de Nipe (Salto del Sojo), July 1940, *Bro. Leon 17971* (US); Sojo cascade, Sierra de Nipe, Mayarí, July 1940, *Bro. Leon* & *Liogier 17971* (GH); Casimba, Sierra de Nipe, 27 July 1940, *Bro. Leon 19236* (US); La Casimba, Sierra de Nipe, Mayarí, 17 July 1940, *Bro. Leon* & *Alain Liogier 19236* (GH); banks of Río Guayabo, Sierra de Nipe, Mayarí, 29 July 1941, *Bros. Leon* & *Clemente*, & *R. Howard 20408* (GH); banks of Río Guayabo, Sierra de Nipe, 29 July 1941, *Bro. Leon 20408* (US); Sierra de Nipe in cacum. mont. Loma Mensura loc. rup., ca 1000 m, 16 May 1915, *E. Ekman 5738* (G, S); Sierra de Nipe in pinetis ad pedem mont. Loma Mensura, ca 725 m, 18 February 1918, *E. Ekman 9061* (S); Cayo de Monte, S of Loma Mensura, Sierra de Nipe, 7 April 1941, *Bro. Leon 19973* (US); Loma de la Bandera, Sierra de Nipe, March 1944, *Bros. M. Victorin* & *Clemente* in *Leon 22093* (LS); bank of creek near Woodfred village, Sierra de Nipe, June–August 1941, *R. Howard 6123* (BM, GH, NY, P, S, US); road to "Mina Woodfred,"

Figure 51.—Isotype of *Pentarhaphia duchartreoides* C. Wright and *Gesneria duchartreoides* (C. Wright) Urban, *Wright sn* (GOET).

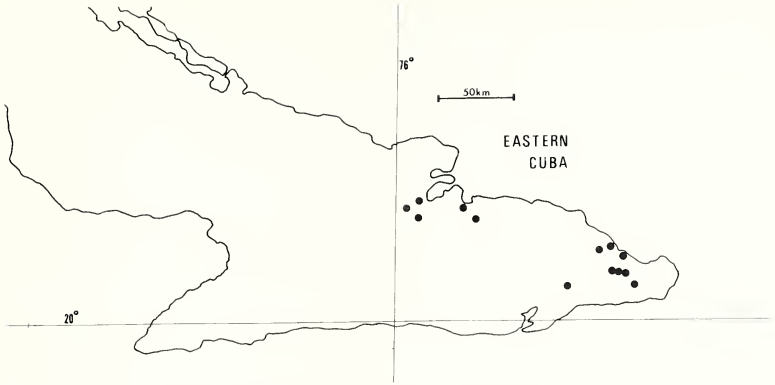

FIGURE 52.—Distribution of *Gesneria* section *Myrmekianthe* in eastern Cuba. (*G. duchartreoides* = solid circles.)

Sierra de Nipe, 26 July 1940, *Bro. Leon 19142* (US); camino de la Mina Woodfred, Sierra de Nipe, 6 April 1941, *Bro. Leon 19830* (US); along Río Medio near Woodfred, Sierra Nipe, 500 m, 18 October 1941, *C. Morton & J. Acuña 3276* (BM, F, G, GH, MO, NY, S, US 2 sheets); Sierra Nipe, near Woodfred, 450–550 m, 17 December 1909, *J. Shafer 3201* (NY, holotype of *Gesneria nipensis* N. Britton & P. Wilson; F, US, isotypes); "charrascales" of Loma del Winch, Sierra de Nipe, 26 February 1956, *M. Lopez F. 2573* (US); El Prado, Nicaro, Mayarí, 26, 27 May 1955, *J. Acuña & F. Zayas 19786* (SV, US 2 sheets); charrascales de los pinares de Micara, 2–7 April 1956. *J. Acuña, Alain Liogier & M. Lopez F. sn* (US 2 sheets); charrascales, Sierra de Micara, "Corea" lumber camp, 27 December 1955, *Alain Liogier & M. Lopez F. 4640* (GH, IJ, US 2 sheets); Sierra de Micara, in pinelands, ca 750 m, 13 December 1922, *E. Ekman 15918* (G, LS, NY 2 sheets, S); Sierra de Micara, in pinelands, 700–850 m, 17 December 1922, *E. Ekman 16020* (S); charrascales de la subida al Sierra Cristal, 2–7 April 1956, *J. Acuña, Alain Liogier & M. Lopez F. sn* (US 2 sheets); Arroyo Cristal, Sierra de Cristal, 29 December 1955, *Alain Liogier & M. Lopez F. 4802* (US); Sierra de Cristal prope cacum. mont. in "charrascales-tibisiales," 1200–1300 m, 8 March 1916, *E. Ekman 6822* (S, holotype of *Gesneria pachyclada* Urban); Pico del Cristal, Sierra del Cristal, 1900–3750 ft, 25 August 1959, *M. Lopez F. 84* (US); entre Las Milis (?) y la Corea, camino de Ulayan abajo a la Sierra del Cristal, 27–28 August 1959, *M. Lopez F. 273* (US); Guantánamo, Monte Libanon, San Fernandez in pinetis, ca 700 m, 24 December 1919, *E. Ekman 10257* (S); Camp La Gloria, south of Sierra Moa, 24–30 December 1910, *J. Shafer 8135* (NY); Camp La Gloria, south of Sierra Moa, 24–30 December 1910, *J. Shafer 8171* (NY); Près l'arroyo Jocotea, sud de Moa, 22 July 1941, *Bros. Leon & Clemente 20153* (LS); Moa, April 1943, *Bro. M. Victorin & Alain Liogier 21440* (LS); minas de Iberia ad Taco Bay, ca 800 m, 7–8 December 1914, *E. Ekman 3813* (S); Camp La Gloria, Monte La Breña, Moa, 5 November 1945, *J. Acuña 13347* (SV, US 3 sheets); Moa, Río Yagrumajes, 14 April 1945, *J. Acuña 12720* (SV, US 2 sheets); banks of Cayoguán River, Moa region, 13–14 July 1949, *Alain Liogier & Bro. Clemente 899* (US); Mina Aromita [?], Cayoguán, Punta Gorda, 24 July 1944, *Bro. Clemente, Alain Liogier & Bro. Chrysogone 4066* (US); valley of Cayoguán river, Moa, 30 March 1942, *Bros. Leon, M. Victorin & Clemente 20931* (US); thickets, El Coco, Moa region, August 1945, *Bros. Leon, Clemente & Alain Liogier 22639* (US); Pinal de Peña Prieta, 22 July 1953, *Alain Liogier 3181* (US); inter Taco et Nibujón in "charrascales-pinales" prope amnem, 4 December 1914, *E. Ekman 3730* (S, holotype of *Gesneria norlindii* Urban); slopes of Sierra Azul, Quibijón, Baracoa, 400 m, *Alain Liogier & M. Lopez F. 7318* (US); pine barrens, N. of El Yunque de Baracoa, 13 January 1960, *Alain Liogier & J. Acuña 7626* (US); Baracoa in pinet. prope El Yunque (ad septentr. versus), 20 December 1914, *E. Ekman 3564* (S); Baracoa, Lomas de Cuaba, edge of manacales, 17 January 1915, *E. Ekman 4296* (S, holotype of *Gesneria bracteosa* Urban; K, S, isotypes); on top of El Yunque de Baracoa, 520 m, 2 January 1960, *Alain Liogier & M. Lopez F. 7179* (US); northern slope of El Yunque de Baracoa, 450 m, 2 January 1960, *Alain Liogier & M. Lopez F. 7179 bis* (US); El Yunque (prope Baracoa) in cacum. montis. solo calcareo., 17–18 December 1914, *E. Ekman 3953* (S, US); south of Monte Cristo, Baracoa, 7 February 1952, *J. Acuña & Diaz Barreto 17384* (SV, US 2 sheets); Baracoa, Lomas de Cuaba in fruticetis, 23 November 1914, *E. Ekman 3611* (S); Cuchillas de Baracoa, 21 June 1860–1864, *C. Wright sn* (GH, holotype of *Pentarhaphia duchartreoides* C. Wright; GOET, isotype); 5 km S of Sabanilla, Vía Azul, 350 m, 17 January 1960, *Alain Liogier & J. Acuña 7707* (US); 5 km S of Sabanilla, Vía Azul, 17 January 1960, 350 m, *Alain Liogier & J. Acuña 7710* (US); on the Vía Azul between

Sabanilla and Cajababo, at 5 km from Sabanilla, ca 500 m, 14 January 1956, *C. Morton & Alain Liogier 9077* (US); banks of a rivulet, pinelands, km 7 S of Sabanilla, Vía Azul, Baracoa, 14 January 1956, *Alain Liogier & C. Morton 5129* (IJ); Pinelands, km 7 south of Sabanilla, Vía Azul, Baracoa, 14 January 1956, *Alain Liogier & C. Morton 5140* (IJ); on the Vía Azul between Sabanilla and Cajababo, at km 7 from Sabanilla, ca 600 m, 14 January 1956, *C. Morton & Alain Liogier 9089* (BM, US); on the Vía Azul between Sabanilla and Cajababo, at km 20 from Sabanilla, ca 800 m, 14 January 1956, *C. Morton & Alain Liogier 9121* (BM, US); on the Vía Azul between Sabanilla and Cajababo, at km 22 from Sabanilla, ca 900 m, 12, 14 January 1956, *C. Morton & Alain Liogier 8992* (US); Sabanilla to Yamurí [sic] Arriba, 30 January–1 February 1911, *J. Shafer 8420* (NY, US).

Discussion.—The holotype of *Gesneria duchartreoides, C. Wright sn,* is deposited in the Gray Herbarium, based on information given by Hitchcock (1934) concerning the location of type specimens of species names published by C. Wright and F. A. Sauvalle. Efforts to obtain information from Cuba concerning Wright collections extant in Cuba have been unsuccessful.

From vegetative material it is very difficult to distinguish this species from *Gesneria viridiflora;* however, characters of the usually filiform calyx lobes and nearly cylindrical, verrucose corolla of *Gesneria duchartreoides* distinguish it from the Cuban material of *Gesneria viridiflora* with its apically thickened calyx lobes and campanulate, nonverrucose corolla.

Section 5. *Gesneria*

Conradia section *Synanthera* G. Don, Gen. Syst. 4:650, 1839. [Lectotype-species: *Conradia humilis* (Linnaeus) Martius ex G. Don.]

Gesneria section *Conradia* (Martius) Fritsch *in* Engler & Prantl, Nat. Pflanzenfam. 4 (3b):184, 1894 [as to description, not as to type].

Plants acaulescent or stem erect, decumbent or pendent, to 0.5 m tall, branching from the base.

Leaves oblanceolate to obovate or ovate, cuneate, membranous, plane, glossy or dull.

Inflorescences exceeding the subtending leaves, either peduncle very long and pedicel very short, or peduncle very short and pedicel long; corollas tubular, red, orange, yellow, green, or white; stamens slightly exserted or included.

Capsule forming a splash cup, costae prominent or obscure.

Type-Species.—*Gesneria humilis* Linnaeus.

Discussion.—Section *Gesneria* contains a seemingly diverse assemblage of plants, but they are combined into a somewhat natural group on the basis of habit, vegetative, inflorescence, and fruit characters. The relationships of this section to others, as well as its origin and position in a phylogenetic sequence in the genus are unclear. Section *Gesneria* resembles section *Physcophyllon* in habit, corolla, and fruit characters and may be closely related, but differs in inflorescence and vegetative traits; however, an origin by reduction from some member or ancestor of section *Pentarhaphia* may be suggested.

23. *Gesneria brachysepala* Urban & Ekman

Gesneria brachysepala Urban & Ekman in Urban, Ark. Bot. 24A (4):34, 1932.

Plants acaulescent or suffruticose: stems woody at the base, to 10 cm tall, 6–9 mm in diameter, bark reddish-brown, villous, lenticels obscure, resin not evident; unbranched, internodes very short, leaf scars prominent.

Leaves alternate: petioles sulcate, 0.5–1.4 cm long, 2–4 mm wide, pilose with reddish or colorless trichomes; blades narrowly obovate, 5.6–13.9 cm long, 2.0–4.4 cm wide, subcoriaceous, base cuneate, margin crenate, subentire toward the base, apex rounded to acute, adaxial surface green, when young covered with broad-based trichomes, at maturity only bases remain to give a scabrous texture, abaxial surface green, with scattered appressed hairs especially along the prominent veins.

Inflorescences 1- to 4 (-many)-flowered: peduncles terete, 9.1–20.4 cm long, 1 mm in diameter, red, glabrescent; bracts 2, linear, about 2 mm long, less than 1 mm wide, red; pedicels terete, 0.9–2.3 cm long, less than 1 mm in diameter, reddish, glabrescent; floral tube turbinate, ca 4 mm long, 3 mm wide, reddish, glabrescent; calyx lobes 5, connate for 1 mm at the base above ovary, erect to patent, with open aestivation, each lobe triangular, 2.0–2.5 mm long, 1.5–2.5 mm wide, reddish, glabrescent on the outside, inside reddish to green, glandular, veins not prominent; corolla tubular, ventricose at the middle, narrowed to both ends, 2.6–3.7 cm long, 6 mm wide at the base and apex,

Key to the Species of Section *Gesneria*

1. Pedicels more than four times as long as the peduncles; corolla orange-yellow to bright yellow, base and lobes of limb sometimes reddish; Puerto Rico ..... 24. ***G. citrina***
1. Pedicels as long as the peduncles or less; corolla yellow-green, orange to red, or white.
   2. Corolla red, more than 2.6 cm long; Haiti ..... 23. ***G. brachysepala***
   2. Corolla orange to yellow-green or white, less than 2.3 cm long.
      3. Corolla tube projected ± horizontally from a nonoblique base, lobes of the limb erect, widest part of the tube at or near the middle; Puerto Rico ..... 26. ***G. pauciflora***
      3. Corolla tube bent downward from an oblique base, widest part of the tube near the mouth, lobes of the limb patent or reflexed; Cuba and Haiti ..... 25. ***G. humilis***

0.9–1.2 cm wide at the middle, outside brilliant red (fide Ekman), glabrous, inside yellow, glabrous, limb very shortly 5-lobed, 5–8 mm wide, each lobe broadly obovate, reflexed, 1–2 mm long, 2–3 mm wide, dark red, margin ciliate; stamens 4, adnate to the base of corolla tube for less than 1 mm, filaments linear, exserted for 2 mm beyond mouth of corolla, curved, ca 3.5 cm long, 1 mm wide, yellow, glabrous, anthers narrowly rectangular, 2–3 mm long, less than 1 mm wide, yellow, glandular, coherent in 2 pairs by their apices, staminode ca 6 mm long; ovary inferior, disc annular, puberulent with glandular trichomes, 2 mm long and 2 mm wide, reddish, style curved, 3.0–3.5 cm long, yellow, glandular, stigma clavate, papillate.

Capsule broadly turbinate, becoming a splash cup, ca 4 mm long, 5 mm wide, gray at maturity, costae 5–10, obscure; seeds fusiform, less than 1 mm long, black.

Type-Collection.—Les Roseaux at Débarcadère-Plingué, Haiti, *E. Ekman H10776* (S, holotype, Figure 53*a*; A, EHH, F, G, GH, IJ, K, NY, S, US, isotypes).

Distribution and Ecology.—*Gesneria brachysepala* is endemic to the southern peninsula of Haiti, Département du Sud (Figure 54) on steep shaded cliffs overhanging the sea, down to sea level. *Gesneria brachysepala* has only been collected in October. This species would seem to be adapted for pollination by a hummingbird, but no known hummingbird species in Hispaniola has a bill long enough to reach the base of the corolla tube. Perhaps the nectar collects at the base of the ventricose middle and is thus accessible to shorter-billed birds.

Specimens Examined.—HAITI. Département du Sud: Massif de la Hotte, western group, Les Roseaux at Débarcadère-Plingué [Pliqué], steep shaded cliffs, down to sea level, 4 October 1928, *E. Ekman H10776* (S, holotype of *Gesneria brachysepala* Urban & Ekman; A, EHH, F, G, GH, IJ, K, NY, S, US, isotypes).

Discussion.—*Gesneria brachysepala* has been collected only once. T. Talpey and I sought this rare species at the type locality in July 1970 but failed to find it. Residents in the area reported that the cliff face, where presumably *Gesneria brachysepala* grew, was destroyed by the effects of a hurricane a number of years ago. Plants were not located on nearby cliffs.

Gesneria brachysepala resembles other members of this section in its habit, inflorescence structure, and splash-cup fruit. The species may be distinguished from others, however, in its red tubular corolla up to 3.7 cm long.

24. *Gesneria citrina* Urban

Gesneria citrina Urban, Symb. Ant. 1:477, 1900.—Britt. & Wils., Sci. Surv. P.R. & V.I. 6:205, 1925.

Subshrubs: stems woody at the base, pendent or decumbent, to 1 m long, 2–5 mm thick, bark of young stems reddish to brown, becoming brown to gray, glabrescent, apex slightly resinous, lenticels sometimes erumpent, elongated, white to brown; pith reddish; branches from the stem base, rarely in upper leaf axils, internodes 0.1–1.0 cm long, leaf scars swollen.

Leaves alternate, petiolate or sessile, persistent: petioles terete to subsulcate, 0–1.0 cm long, 1–2 mm in diameter, red to gray-brown, sparsely pubescent with glandular or eglandular trichomes or glabrous; blades obovate or spathulate, 1.2–5.9 cm long, 0.5–2.9 cm wide, coriaceous, plane, base cuneate, margin ciliate to glabrescent, serrate to dentate toward apex, apex acute to obtuse, adaxial surface dark green, glabrous, glossy, abaxial sur-

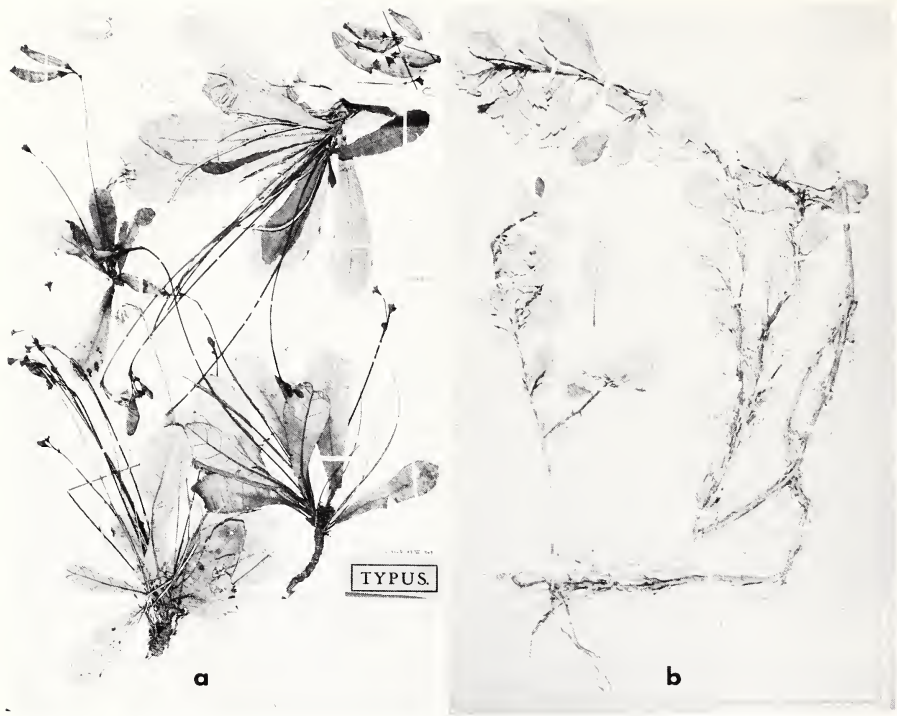

FIGURE 53.—Type specimens: *a*, holotype of *Gesneria brachysepala* Urban & Ekman, *Ekman H10776* (S); *b*, lectotype of *G. citrina* Urban, *Sintensis 6590* (S).

face lighter green, becoming white when dry, glabrous, occasionally with a few appressed trichomes along the midvein, glossy, veins sometimes reddish-brown, prominent, dried leaves with exfoliating epidermis.

Inflorescences 1- to 4 (-∞)-flowered: peduncles very short, 1–2 mm long, flattened to terete, about 1 mm wide, red, glandular-pubescent, occasionally resinous; bracts 2–4, linear, 1–3 mm long, less than 1 mm wide, red, resinous; pedicels terete, arcuate, 2.8–6.3 cm long, about 1 mm in diameter, red, sparsely pilose; floral tube shortly turbinate, 2 mm long, 2–3 mm in diameter at anthesis, green to red, sparsely pilose to glabrous, resinous; calyx lobes 5, connate for 1–2 mm at base, each narrowly triangular, 2–3 mm long, 1.0–1.5 mm wide at the base, apex acute to acuminate, reddish or green, sparsely pilose, veins 3, prominent, inner surface with short glandular trichomes; corolla tube, curved, nearly cylindrical, 1.6–2.1 cm long, 3 mm wide at the sometimes reddish base, widening to 7 mm at the slightly (Figure 16*i*) ventricose middle, then narrower toward the oblique mouth where 5 mm wide, outside orange-yellow to bright yellow, densely puberulent, inside lighter yellow, glabrous, limb 5-lobed, erect, each lobe semiorbiculate, glabrous, yellow or sometimes reddish, margin subentire, often ciliate, upper lobes 1 mm long, 2 mm

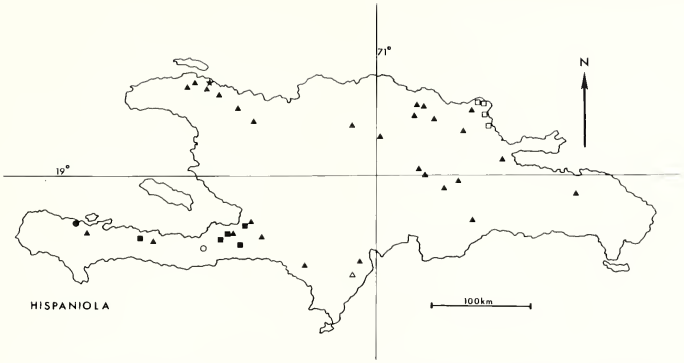

FIGURE 54.—Distribution of *Gesneria* section *Gesneria* and Section *Physcophyllon* in Hispaniola. (*G.* (*Physcophyllon*) *barahonensis* = open triangles; *G.* (*Gesneria*) *brachysepala* = solid circles; *G.* (*Physcophyllon*) *christii* = solid squares; *G.* (*Gesneria*) *humilis* = open circles; *G.* (*Physcophyllon*) *hybocarpa* = stars; *G.* (*Physcophyllon*) *pedicellaris* = open squares; *G.* (*Physcophyllon*) *reticulata* = solid triangles.)

wide, lateral lobes 3 mm long, 2.5 mm wide, basal lobe 2.5 mm long, 2.5 mm wide; stamens 4, adnate to the base of the corolla tube for less than 1 mm, not exserted, filaments linear, straight, 1.6–1.9 cm long, less than 1 mm in diameter, yellow or white, glabrous, anthers rectangular, 1.5 mm long, 1 mm wide, yellow to red on back, coherent in two pairs by their apices, pollen grains isopolar, with size small to medium (18.8–25.6 μm long at the polar axis, 12.3–16.0 μm wide at the equatorial axis), with a nearly circular amb, tricolpate, colpi 20 μm long, less than 1 μm wide, apocolpia rounded to acute, prolate, sexine reticulate, heterobrochate, lumina 0.1–1.0 μm across, larger near the equatorial axis, muri about 0.5 μm across; ovary inferior, disc annular, 1.5 mm long, green, puberulent with glandular trichomes, style straight except curved at apex, to 2.3 cm long, white, glabrous, stigma clavate, papillate.

Capsule broadly turbinate, becoming a splash cup, 3–5 mm long, ca 6 mm in diameter, gray-brown, glabrescent, glossy, costae 5–10, prominent; seeds narrowly fusiform, less than 1 mm long, tawny.

TYPE-COLLECTION.—Prope Utuado, Puerto Rico, *P. Sintenis 6590* (S, lectotype, Figure 53*b*; BM, BP, BR, C, E, F, G, GH, GOET, K, L, LD, M, MO, NY, P, UCWI, US, W, Z, isolectotypes).

CHROMOSOME NUMBER.—$n = 14$ (Lee, 1966).

DISTRIBUTION AND ECOLOGY.—Known from limestone cliffs in the hills of north-central Puerto Rico (Figure 55) at about 200–325 m elevation, *Gesneria citrina* has been collected in flower during the months of February, March, May, August to November in the field. In the greenhouse it flowers in May and October. The corolla tube appears to be adapted for pollination by hummingbirds (*Chlorostilbon maugaeus* or *Orthorhynchus cristatus*).

SPECIMENS EXAMINED.—PUERTO RICO: Quebradillas, 22 November 1913, *F. Stevens* & *W. Hess 5163* (NY); Lares, 325 m, 24 October 1943, *F. Sargent 3235* (US); near the Arecibo Ionospheric Observatory on P. R. Hwy 625 about 15 km S of Arecibo, 27 August 1970, *L. Skog* & *J. Skog 1716* (BH, E, K, US); Esperanza, ⅜ mi along path toward the left just before the entrance to Cornell Radar in Esperanza south of Arecibo, ca 800 ft, 12 February 1965, *T. Talpey 28* (BH, US); Arecibo radar station, 27 February 1965, *T. Talpey 41* (BH, US); cliffs, Arecibo, 31 May 1935, *F. Sargent 703* (US); base of cliff between Arecibo and Utuado, 8 February 1924, *N. Britton* & *E. Britton 7976* (GH, NY, PH, US); prope Utuado in sylva primaeva montis Cerro Hueco ad Cayuco, 25 March 1887, *P. Sintenis 6590* (S, lectotype of *Gesneria citrina* Urban; BM, BP, BR, C, E, F 2 sheets, G 5 sheets, GH GOET, K, L, LD, M, MO, NY, P, UCWI, US, W, Z, isolectotypes); Barceloneta, S of Florida, 250 m, 23 August 1963, *H. McKee 10616* (K, P, US); near Florida on route 140, 27 September 1967, *R. Wagner 1233* (A); Río Piedras, Ciales, 17 August

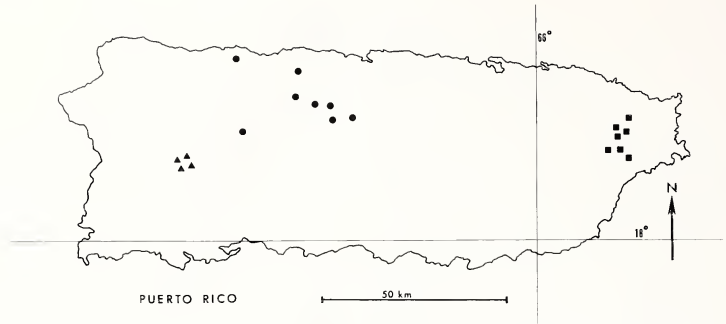

FIGURE 55.—Distribution of *Gesneria* section *Gesneria* and section *Duchartrea* in Puerto Rico. (*G.* (*Gesneria*) *citrina* = solid circles; *G.* (*Gesneria*) *pauciflora* = solid triangles; *G.* (*Duchartrea*) *viridiflora* subsp. *sintenisii* = solid squares.)

1903, *J. Johnston 974* (NY, US). LOCALITY UNKNOWN: Río Arriba, Forest Reserve, *I. Velez 1606* (NY). CULTIVATED: Cornell University, G–888, 5 October 1969, *L. Skog 1408* (BH), 23 May 1966, *M. Stone 130* (BH).

DISCUSSION.—*Gesneria citrina* is distinct from all other species in this section in its short peduncles, 1–2 mm long; peduncles of the remainder of the species are more than 2 cm long. Its subshrubby habit with long pendent or decumbent branches in combination with yellow tubular corollas make *Gesneria citrina* distinguishable from all other known species of *Gesneria*.

From the many duplicates of the presumed destroyed holotype, *Sintenis 6590* at Berlin, a sheet at Stockholm has been chosen as lectotype. None of the isotypes found in many herbaria display flowers or is annotated in Urban's hand, but the specimen at Stockholm is typical of those examined.

25. *Gesneria humilis* Linnaeus

Gesneria humilis Linnaeus, Sp. Pl. ed. 1, 612, 1753.—Plum., Pl. Am. 125, pl. 133: fig. 2, 1757.—Lam., Encyl. Méth. Bot. 2:702, 1788 [as to the type, excluding synonyms of Sloane and Ray].—Lunan, Hort. Jam. 1:322, 1814.—Poir. *in* Lam., Illustr. 3: pl. 536: fig. 2, 1819.—Spreng., Syst. Veg. ed. 16. 2:839, 1825.—Urb., Symb. Ant. 2:377, 1901.

Conradia humilis (Linnaeus) Martius ex G Don, Gen. Syst. 4:650, 1838.—DC., Prodr. 7:526, 1839.—Rich. *in* Sag., Hist. Fís., Pol. Nat. Cuba 11:71, 1850.—Hanst., Linnaea 26: pl. 1: fig. 34, 1854.—Griseb., Mem. Amer. Acad. Arts, n.s. 8:526, 1862; Fl. Brit. W. Ind. 461, 1862; Cat. Pl. Cub. 200, 1866.

Pentarhaphia humilis (Linnaeus) Hanstein, Linnaea 34:294, 1865.

Conradia celsioides Grisebach, Cat. Pl. Cub. 200, 1866. [Type-collection: Viñales, Cuba, *C. Wright 3077* (GOET, holotype; BM, G, GH, K, MO, P, S, W, isotypes).]

Pentarhaphia celsioides (Grisebach) Gomez de la Maza, Anales Soc. Esp. Hist. Nat. 23:279, 1894.

Gesneria acuminata Urban, Symb. Ant. 1:479, January 1900.—Morton *in* Leon & Alain, Fl. de Cuba 4:463, 1957. [Type-collection: Arroyo de Pedro, Cuba, *H. Eggers 4892* (GOET, lectotype; C, P, Z, isolectotypes).]

Gesneria incisa Urban, Symb. Ant. 1:479, January 1900. [Type-collection: In rupibus fluminum Cubae, *E. Poeppig sn* (W, lectotype; BP, BR, MO, isolectotypes).]

Conradia pumila sensu Millspaugh, Publ. Field Columbian Mus. Bot. Ser. 1:434, August 1900 [non *Conradia pumila* (Swartz) Martius (1829 et 1832).]

Gesneria celsioides (Grisebach) Urban, Symb. Ant. 2:377, 1901.—Morton *in* Leon & Alain, Fl. de Cuba 4:463, fig. 201, 1957.

Subshrubs: stems woody, erect or occasionally pendent or decumbent, to 0.5 m tall, bark greenish-gray, smooth, rarely resinous, lenticels obscure; branching at the base or rarely above, new growth green, pilose to glabrous, internodes 0.1–2.0 cm long, leaf scars prominent.

Leaves alternate and spiraled, petiolate or sessile: petioles flattened to sulcate, 0–1.3 cm long, 1–3 mm wide, light or dark green or reddish-brown, sparsely glabrous to pubescent-glandular;

blades narrowly oblanceolate to narrowly obovate or ovate, 1.3–18.0 cm long, 0.6–4.3 cm wide, membranous, plane, base cuneate, margin serrate to crenate or lobulate, subentire toward base, sparsely ciliate to glabrous, apex acute to acuminate, adaxial surface dark green, sparsely pilose near the base, trichomes appressed, sometimes with broad bases, glossy to dull, abaxial surface lighter green, sparsely pilose to glabrescent on the prominent veins.

Inflorescences 1- to 3 (-∞)-flowered: peduncles terete, 0.4–17.8 cm long, elongating in fruit, 1.5–2.0 mm in diameter, green to reddish, usually glabrous; bracts 2, linear to lanceolate, 0.1–1.0 cm long, 1–3 mm wide, green, glabrous, base cuneate, apex acute; pedicels terete, 2.2 cm long, less than 1 mm in diameter, green to reddish, glabrous; floral tube turbinate to nearly spherical, 1–3 mm long, 2–3 mm in diameter, dark green or reddish, glabrous; calyx lobes 5 (–7), erect, connate for 1–2 mm above ovary, with open aestivation, each lobe lanceolate or triangular, 1.0–4.5 cm long, 1–3 mm wide at the base, apex acute to acuminate, both sides green or reddish and glabrous, veins 3, not prominent, but converging at apex; corolla tube narrowly campanulate, 0.6–2.0 cm long, base oblique, 2–4 mm wide, gradually (Figure 16*l*) widening to ventricose on the lower side, slightly constricted at the mouth, 3–8 mm wide, greenish-white to yellow, glabrous outside and inside; limb 5- or rarely 6-lobed, 4–8 mm wide, each lobe patent to reflexed, semiorbiculate, green to white, rarely pinkish, 1–5 mm long, 3–6 mm wide, upper lobes subentire to erose, glandular, lateral lobes erose to subentire, basal lobe subentire; stamens (3–)4 (–5), adnate to the base of corolla tube for less than 1 mm, not exserted, filaments linear, geniculate, 0.4–1.3 mm long, green to yellow, glabrous, anthers triangular to globose or oblong, ca 1 mm long, 0.5–1.0 mm wide, green, seldom coherent, pollen grains often distorted, isopolar, size small (15.1 μm long at the polar axis, 8.5 μm wide at the equatorial axis), tricolpate, colpi 11.5 μm long, less than 1 μm wide, apocolpia acute, prolate, sexine reticulate, nearly homobrochate, lumina 0.25–0.5 μm across, muri ca 0.5 μm wide (Figure 17*h*), staminode 1 or rarely 2, ca 2 mm long, lacking fertile anther; ovary inferior, disc an undulating collar, 1 mm tall, white, pubescent, style linear, curved, 0.5–1.4 cm long, about 0.5 mm in diameter, green, glabrous, stigma slightly enlarged, stomatomorphic, 1–3 mm across, occasionally adherent to the anthers.

Capsule turbinate to nearly spherical, forming a splash cup with the calyx lobes, 3–7 mm long, 4–8 mm in diameter, gray-brown, glabrous, costae 10, usually prominent; seeds rhombic to broadly fusiform, slightly twisted, ca 0.5 mm long, 0.2 mm wide, brownish (Figures 19*j*, 20*b*).

Type.—Plumier, Nov. Pl. Am. Gen. 27, fig. 9, 1703. The type figure was only part of the original drawing made by Plumier shown in Figure 57.

Distribution and Ecology.—*Gesneria humilis* is known in Cuba (Figure 56) from the Provinces of Piñar del Río, La Habana (including the Isle of Pines), Las Villas, and Oriente; and in Haiti (Figure 54) from the Département de l'Ouest. Plants grow in dense, damp limestone woods near streams or on rocks in streams. *Gesneria humilis* has been collected in the wild with flowers and fruits in all months of the year, but with fewer collections in late spring; greenhouse plants flower with the same regularity. The pollinators of this species have not been determined, but the plants may be visited by hummingbirds.

Local Name.—"Clavellina" fide *Luna 217* (NY).

Specimens Examined.—CUBA. Province of Piñar del Río: Jovero, Guanes, 19 January 1948, *J. Acuña 14940* (SV, US); San Julián, in pineland savannas at the headwaters of Río Verde, 6 June 1920, *E. Ekman 11134* (S); Sierra de Cobra, on Guane Road, 9, 11 September 1910, *N. Britton, E. Britton & C. Gager 7216* (NY), *7220* (NY, US); Surgidero, Río San Vincente, Viñales, August, 1954, *J. Acuña & Maza 19352* (SV, US); San Vicente, Viñales, 2 February 1951, *J. Acuña & J. Roig sn* (US); vicinity of San Vicente, near Viñales, near sea level, 5 February 1956, *C. Morton 9927* (US); base of Sierra del Ruiseñor, Viñales, 21–22 May 1955, *Alain Liogier 4322* (GH, NY); Viñales, Río Pan de Azúcar, 9 October 1955, *Alain Liogier 4434* (US); Pan de Azúcar, 20–100 m, 5 February 1956, *C. Morton 9918* (US); Baños San Vicente, 12–16 September 1910, *N. Britton, E. Britton & C. Gager 7358* (NY), *7359* (NY); Viñales, Sierra de la Guasaca, 10 March 1924, *E. Ekman 18683* (S); Viñales, 11 December 1930, *E. Killip 13579* (US); San Vicente, April 1937, *Bro. Leon 16808* (US); Cueva de San Vicente, San Vicente, Viñales, 2–3 September 1937, *Bro. Leon 16960* (GH, US); El Guao, Viñales, July 1939, *Bro. Leon 19045* (US); El Valle de Ancón, near San Vicente, 4 February 1956, *C. Morton 9773* (US); base of Sierra del Ruiseñor, Finca El Ancón, near Viñales, ca 150 ft, 17 March 1957, *G. Proctor 16357* (IJ); on cliff, Viñales, 1860–1864, *C. Wright 3077* (GOET, holotype of *Conradia celsioides* Grisebach; BM, G 2 sheets, GH, K, MO, P, S, W, isotypes); Arroyo del Sumidero, 7, 9 August 1912, *J. Shafer &*

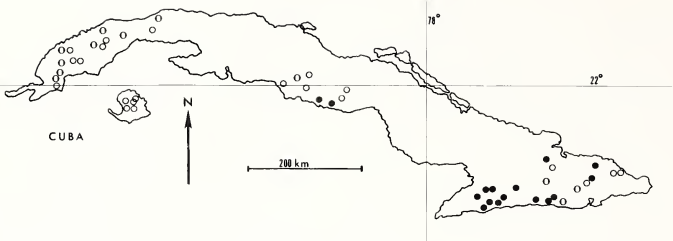

FIGURE 56.—Distribution of *Gesneria* section *Gesneria* and section *Duchartrea* in Cuba. (*G.* (*Gesneria*) *humilis* = open circles; *G.* (*Duchartrea*) *viridiflora* subsp. *viridiflora* = solid circles.)

Bro. Leon 13601 (F, NY, PH, US); in mountains near El Guama, 6 March 1900, *W. Palmer* & *J. Riley 153* (US); vicinity of Piñar del Río Arroyo, 3 March 1911, *N. Britton, E. Britton* & *J. Cowell 9723* (NY); La Cajálbana, 1 October 1949, *J. Acuña* & *Alain Liogier 15686* (SV, US); Loma de la Cajálbana, 1 October 1949, *J. Acuña* & *Alain Liogier sn* (IJ 2 sheets, US); in water of a waterfall, Cajálbana Mt., La Palma, 10 October 1949, *Alain Liogier 1185* (GH, US); in a stream, Cajálbana pinelands, La Palma, 7 December 1955, *Alain Liogier 4491* (US); Pinar del Cajálbana, in savannas at the foot of mountains, on the edge of a branch of Río Puercos, 28 August 1923, *E. Ekman 17311* (S); banks of the river, San Diego de los Baños, 19 August 1914, *Bro. Leon 4410* (NY, US 2 sheets); in mountains north of San Diego de los Baños, 11 April 1900, *W. Palmer* & *J. Riley 520* (NY, US); rocky stream bed, San Diego de Los Baños, 31 August–3 September 1910, *N. Britton, F. Earle* & *C. Gager 6740* (NY 2 sheets); rocky stream bed, San Diego de Los Baños, 31 August–3 September 1910, *N. Britton, F. Earle* & *C. Gager 6889* (NY, US); Bahia Honda, 31 March 1946, *J. Roig, J. Acuña* & *Naranjo sn* (US); Río Taco-Taco, Rangel, August 1927, *J. Acuña sn* (US); mountains above Taco-Taco, *C. Baker 3832* (NY); source of Río Taco-Taco, Sierra de Los Organos, 400–500 m, 18 November 1941, *C. Morton 4283* (BM, F, G, GH, MO, NY, S, U, US); Rangel, Arroyo de la Plata, 23, 24 December 1951, *Alain Liogier* & *E. Killip 2010* (US); vicinity of Guane, falls, Río Portales, 3 March 1911, *N. Britton, E. Britton* & *J. Cowell 9765* (NY); Río Portales, 26 December 1911, *J. Shafer 11171* (F, GH, MO, NY, U, US); Bahia Honda to El Rosario, crossing of San Miguel, 29 January 1912, *J. Shafer 12000* (K, NY 2 sheets, U, US); Bahia Honda to El Rosario, 29 January 1912, *J. Shafer 12002* (MO, NY 2 sheets); Cascada de Saroa, Candelaria, 5 March 1951, *J. Acuña sn* (NY); Río Manantеales north of Candelaria, 10 February 1916, *N. Britton, P. Wilson* & *Bro. Leon 14127* (NY); San Pedro del Caimito to San José de Sagua, 27 January 1912, *J. Shafer 11956* (MO, NY, US). PROVINCE OF LA HABANA, ISLE OF PINES: vicinity of Los Indios, 13 February 1916, *N. Britton, E. Britton* & *P. Wilson 14241* (GH, MO, NY, S); rocky ford south of Santa Bárbara, 11 March 1953, *E. Killip 43088* (F, NY, US); between San Francisco de las Piedras and Cerro La Cañada, 27 January 1955, *E. Killip 44616* (US); dense woods along river, Razlag property along Río Mal Pais, 25 December 1955, *E. Killip 45270* (US); in savannas at Loma Daquilla, 3 December 1920, *E. Ekman 12496* (S); Santa Fe, cerca del Río Vellegas, 15 March 1923, *M. Calvino* & *E. Manueli 7988* (SV, US); Santa Fe, 15 March 1953, *M. Calvino* in *Leon 22385* (US); bank of stream, Santa Fé, 8 March 1953, *E. Killip 43050* (US); dense woods along stream, Mrs. Jones' Jungle, 7 March 1957, *E. Killip 45830* (US); "Isla De Piños," June, *J. Blain 50* (F). PROVINCE OF LA HABANA: asphalt mines, Santiago de las Vegas, 18 September 1904, *H. van Hermann 42* (BM, F, NY); on rocks in rapids of stream, Bajucál, 5 December 1904, *H. van Hermann 332* (F, NY); near asphalt mines above Bajucál, 18 September 1904, *H. van Hermann 1848* (NY); Loma Coca near Campo Florida, at Rio Quezada, 21 September 1921, *E. Ekman 13226* (S); banks of the river near Cumbre Hermosa, 3 January 1912, *P. Wilson* & *Bro. Leon 2847* (NY); on rocks in stream, Cumbre Hermosa, 3 January 1912, *P. Wilson* & *Bro. Leon 11617* (NY); "Havanna," *G. Don sn* (GOET); "Havana," 1833, *R. de la Sagra 647* (G-DC). PROVINCE OF LAS VILLAS (formerly Santa Clara): San Blas, 17 March 1929, *L. Bailey 12433* (BH); above San Blas (La Sierra), 7 April 1928, *J. Jack 5951* (A, LS); Loma Ventana, San Blas, La Sierra, 1400 ft, 22 July 1930, *J. Jack 8035* (S, US): Loma Ventana, San Blas-Las Vegas, La Sierra, 1400 ft, 24 July 1930, *J. Jack 8067* (A, S, US); San Blas, 300–600 m, 9–10 November 1941, *C. Morton 4110* (BM, US); Mina Carlota, SE of Cumanayagua, Sierra de San Juan, 300–400 m, August 1940, *R. Howard 4480* (A); Arroyo Navarro, Mina Carlota, southeast of Cumanayagua, Sierra de San Juan, 300–400 m, 7 July 1941, *R. Howard 5716* [Pl. ex. Grayanae 1182] (BH, BM, BR, C, COL, CU, E, G, GH, IJ, K, L, LD, MO, NA, NY, NYS, PH, S, U, US, USF); Arroyo Navarro, Mina Carlota, in Sierra de San Juan southeast of Cumanayagua, ca 1000 ft, 22 March 1957, *G. Proctor 16403* (IJ); Mina Carlota, southeast of Cumanayagua, Sierra de San Juan, 300–400 m, 21–23 March 1938, *H. Senn 331* (GH, US); Hanabanilla Falls, 1–20 July 1950, *R. Howard, W. Briggs, P. Kamb, I. Lane* & *R. Ritland 148* (A);

Hanabanilla Falls, Trinidad Mountains, 23 February 1956, *C. Morton 10446* (US); Hoyo de Manicaragua, 26–28 February 1910, *N. Britton, E. Britton* & *P. Wilson 4695* (F, NY 2 sheets); El Porvenir, Trinidad Mountains, 650–750 m, 9 March 1910, *N. Britton* & *P. Wilson 5274* (NY); western slopes of Mt. Naranjal above San Blas, Trinidad Mountains, 28 July 1936, *L. Smith, A. Hodgdon* & *F. Gonzales 3248* (F, GH, MO, NY, S, US); Buenos Aires, Trinidad Mountains, 21 February 1956, *C. Morton 10309* (US); Lomas de Banao, February 1920, *A. Luna 217* (NY); Madrigal near Sancti Spiritus, 27 August 1909, *Bro. Leon 948* (NY); vicinity of Sancti Spiritus, 15–24 February 1912, *J. Shafer 12165* (F, MO, NY, US); Pitajones to Ciegas de Ponciano, 29 February 1912, *J. Shafer 12254* (NY, U, US). Province of Oriente: Bayate, at margin Arroyos Vivano, 18 July 1914, *E. Ekman 1993* (K, S); Bayate in saxis in Art. Bibano, 5 May 1919, *E. Ekman 9615* (S); Puerto Boniato, Santiago de Cuba, August 1949, *Bro. Clemente 6998* (GH, US); Sierra de Nipe, El Taller in saxis in flumine Río Piloto, 3 November 1914, *E. Ekman 3324* (G, K, S); Manantial, Sta. Fe, N. de Guantánamo, 7 December 1917, *Bros. Hioram* & *Btiste 1380* (NY, US); Guantánamo, Monte Libanon, San Fernandez ad amnem in "manacales," ca 700 m, 24 December 1919, *E. Ekman 10243* (S); Arroyo Henequen, foot of El Yunque, 1 December 1910, *J. Shafer 7695* (NY); Veriles, sur de Monte Cristo, 7 February 1952, *J. Acuña* & *Diaz 17453* (US); Arroyo de Pedro, 500 m, March 1889, *H. Eggers 4892* (GOET, lectotype of *Gesneria acuminata* Urban; C, P, Z, isolectotypes); "in Cuba Orientali," 1856–1857, *C. Wright 355* (BR, G, GH, GOET, K, MO, NY, PH); prope villam Monte Verde dictam, January–July 1859, *C. Wright 355* (GH, GOET, K); "in Cuba Orientali," 1860, *C. Wright 355* (K, W); in Río Santa Cruz and others, 12 October 1860–1864, *C. Wright 355* (BM); "in Cuba Orientali," 1860–1864, *C. Wright 355* (BM, BR, G, GOET, P). Locality Unknown: window ravine, 2 March 1920, *J. Bijhouwer 428* (WAG); Santa Catalina, Sierras of Western Cuba, January–February 1907, *H. Caldwell* & *C. Baker 7029* (F); "In rupibus fluminum Cubae," *E. Poeppig sn* (W, lectotype of *Gesneria incisa* Urban; BP, BR, MO, isolectotypes); "Flos. Cubens.—ad torrentio.," July [18]23, *E. Poeppig sn* (P, S); "Cuba," 1822, *E. Poeppig sn* (K); "Cuba," *R. de la Sagra sn* (W); "Obre 833, Legit R. de la Sagra," [*J. M.*] *Valenzuela sn* (P); "Cuba occ.," 1863, *C. Wright 647* (S). HAITI. Département de l'Ouest: plants collected from the base of a volcanic rock cliff at Fond de Baudin along Rivière Torcau [R. Gauche?] about 2.5 mi NE of Trouin, 18°23′ N lat. 72°38′ W long., 1100 ft, 22 July 1970, *L. Skog, T. Talpey* & *D. Pfister 1610* (topotype: BH, MO, US).

Discussion.—*Gesneria humilis* was first discovered in Haiti by Plumier who described the species as *Gesnera humilis, flore flavescente* in 1703. No collections from Haiti, however, were known until its rediscovery in 1970 (Skog and Talpey, 1971). This species has been widely collected in Cuba, where it is the most common species of *Gesneria*, according to Morton (1957b).

Specimens from both islands are very similar except in pollen. Pollen from plants collected in Haiti appears distorted and collapsed under scanning electron microscopy (Figure 18*f*); samples from Cuban collections appear to be normal (Figure 17*h*). The Haitian plants, however, produce viable seed.

One population at Viñales, Cuba, has been separated as a distinct species, *Gesneria celsioides* (Grisebach) Urban. The characters, however, that distinguish this species may be the result of

Figure 57.—Original manuscript drawing by Plumier of *Gesnera humilis, flore flavescente* from the Bibliothèque Centrale of the Muséum National d'Histoire Naturelle at Paris. (See Figure 58 for representative specimen of *Gesneria humilis* from Haiti.)

FIGURE 58.—Representative specimen of *Gesneria humilis* Linnaeus from Haiti, *Skog, Talpey & Pfister 1610* (BH).

ecological conditions. Other populations dwelling in or near streams appear distinctive in being much reduced, perhaps because they are often inundated. Neither of these populations is here considered as a taxon separate from the typical *Gesneria humilis*.

Both *Gesneria acuminata* and *G. incisa* were based by Urban on more than one collection. It is presumed that the original syntypes were at Berlin and destroyed, thus, it is necessary to select lectotypes of these species.

Urban based *Gesneria acuminata* on *Wright 355, Valenzuela 10, Eggers 4892* and *4892b*. The Valenzuela specimen has not been located in any herbarium, nor has the second Eggers number been found. Wright specimens bearing the same number were not necessarily collected at the same time nor at the same site; some specimens with the number *Wright 355* bear the date 1856–1857 and others the date 1860–1864. Often two specimens with different dates but the same number are mounted on the same sheet. It is impossible to determine which specimen corresponds to the appropriate date. Those dated 1856–1857 give as locality only "Cuba orientali." The others are located as "prope villam Monte Verde dictam, Cuba orientali." In still other herbaria, collection dates are either July 7, 1859, Jan–Jul 1859 or Oct 12, or labeled as coming from "in Río Santa Cruz and others." It would be difficult to select one of the Wright specimens to be the lectotype due to the disparate dates and localities. Only a few are labeled in Urban's handwriting. I suspect, however, that the *Wright 355* Urban listed as a syntype was a 1856–1857 collection, for if the specimen had been collected in 1860–1864 it would have also been labeled with a definite locality. Thus by elimination I have selected *Eggers 4892* (GOET) as the lectotype for *Gesneria acuminata*. It is labeled in Urban's handwriting and has a definite collection locality and date. The specimen has both flowers and fruiting material present.

Gesneria incisa was based on specimens collected in Cuba by E. Poeppig and R. de la Sagra. If Urban had specimens from these collections at Berlin, they are now not extant. Other specimens of these collectors can be found in many herbaria, but none has been found to have any annotation by Urban. I have selected a Poeppig specimen in the herbarium at Vienna to be the lectotype for *Gesneria incisa*. It is a representative specimen with both flowers and fruits.

Many authors, including de Candolle and Urban, have cited Martius as the author who made the combination *Conradia humilis*, since it was listed in 1829 as one of the species of *Gesneria* Linnaeus that Martius proposed to include in his new genus. The combinations of the *Gesneria* species in *Conradia* were made in the index in 1832, except for *Gesneria humilis* Linnaeus and *G. ventricosa* Swartz. Apparently through an oversight these species were not included in Martius' index. G. Don finally made the transfers in 1838.

26. *Gesneria pauciflora* Urban

Gesneria pauciflora Urban, Symb. Ant. 1:478, 1900.—Urb. Symb. Ant. 2:381, 1901; 4:571, 1911.—N. Britt. & P. Wils., Sci. Surv. P. R. & V. I. 6:205, 1925.

Plants acaulescent or suffruticose: stems woody at the base, erect or decumbent, to 3 dm tall, to 8 mm thick, bark smooth, gray-brown, glabrescent, lenticels obscure; branches few from the base of the stem, deep red, pilose with appressed hairs, internodes 1 cm long or more, leaf scars slightly enlarged.

Leaves alternate: petioles terete or flattened, 2–7 mm long, 1–2 mm wide, green, pilose; blade narrowly obtrullate, 2.8–9.2 cm long, 0.9–2.3 cm wide, membranous, plane, base cuneate, margin subentire toward the base, serrate to sublobate above, ciliate when young, becoming glabrescent, apex acuminate, adaxial surface dark green, glabrescent, glossy, abaxial surface lighter green, pilose along the prominent veins.

Inflorescences 1- to few-flowered: peduncles terete, 6.1–15.3 cm long, 1–2 mm in diameter, slightly curved, reddish-brown, pilose; bracts 2, linear, ca 1 cm long, 0.5 mm wide, green, pilose; pedicels terete, 1–2 cm long, 1 mm in diameter, reddish-brown, pilose to glabrescent; floral tube shortly turbinate, ca 2 mm long, 3 mm wide at anthesis, green, pilose; calyx lobes 5, connate for about 1 mm at base, erect, with valvate or open aestivation, each lobe narrowly triangular, 3–4 mm long, 1–2 mm wide at the base, green, reddish toward the acuminate apex, margin entire, outside pilose to glabrescent, inside glabrous, veins 3, not prominent; corolla (Figure 16*k*) tubular, curved, 2.0–2.3 cm long, 4 mm wide at the base, narrowing to 3 mm wide, then widening at the ventricose middle to 5 mm and narrowing at the mouth to 4 mm, outside yellow-orange, densely pilose with appressed hairs, inside glabrous, limb 5-lobed, 6 mm wide, each lobe erect, broadly elliptic, yellow with an entire, ciliate margin, upper lobes 1 mm long, 3 mm wide, lateral lobes 2.5 mm long, 2 mm wide, basal lobe 4 mm long, 3 mm wide, mouth lined with glandular trichomes; stamens 4, adnate to the base of the corolla tube for 1.5 mm, not exserted, but extending to within 2–4 mm of the mouth, filaments linear from a broad base, 1.5–1.8 cm long, 1 mm wide at the base, yellow, pilose only near the base, glabrous above, anthers broadly ovate, less than 1 mm long, yellow, coherent in 2 pairs by their apices, becoming free, pollen grains isopolar, size small (19.0 μm long at the polar axis, 11.0–11.5 μm wide at the equatorial axis), amb nearly circular, tricolpate, colpi 17.0 μm long, apocolpia truncate, sexine reticulate, homobrochate, lumina 0.5 μm wide, muri 0.25 μm across, (Figure 18*e*), staminode 7 mm long, adnate to corolla for 4 mm; ovary inferior, disc a 5-angled thick ring, yellow-green, pilose, style linear, slightly curved, 1.4–1.9 cm long, yellow, glabrous, becoming puberulous near the apex, stigma stomatomorphic, papillate.

FIGURE 59.—Lectotype of *Gesneria pauciflora* Urban, *Sintenis 327* (GOET).

Capsule becoming a splash cup, ca 4 mm long, 4 mm wide, gray-brown, glabrescent, costae 5–10, not prominent; seeds broadly fusiform, twisted, less than 1 mm long, ca 0.5 mm wide, dark reddish-brown.

TYPE-COLLECTION.—Maricao, Puerto Rico, *P. Sintenis 327* (GOET, lectotype, Figure 59; BM, BP, G, GH, K, LD, M, P, S, US, isolectotypes).

CHROMOSOME NUMBER.—$n = 14$ (Lee, 1966).

DISTRIBUTION AND ECOLOGY.—*Gesneria pauciflora* is endemic to the mountains of western Puerto Rico (Figure 55) in wet forests at stream sides at elevations from 500–720 m. *Gesneria pauciflora* has been collected in flower in all months except March, July, and September; in the greenhouse flowers may appear every month. Hummingbird pollination is suspected in this species. *Sericotes holosericeus* with a bill averaging 21 mm long may be adapted to feed from *Gesneria pauciflora*.

SPECIMENS EXAMINED.—PUERTO RICO: River valley, Río de Maricao, 600–720 m, 14 February 1915, *N. Britton & J. Cowell 4192* (NY); Indiera Fria, near Maricao, rocky arroyo, 500 m, 19–22 February 1915, *N. Britton, J. Cowell & S. Brown 4546* (F, MO, NY, US); on rocks in wooded valley, Río de Maricao, 500–600 m, 2 April 1913, *N. Britton, F. Stevens & W. Hess 2442* (F 2 sheets, GH, MO, NY 2 sheets, US 2 sheets); Maricao in rupibus ad rivulum in "Indiera-Fria," 3 December 1884, *P. Sintenis 327* (GOET, lectotype; BM, BP, G 2 sheets, GH, K, LD, M, P, S, US, isolectotypes); along trail near Río Maricao about 1 km S of the fish hatchery at Maricao, 550 m, 13 June 1970, *L. Skog 1539* (BH), 16 June 1970, *L. Skog 1542, 1544* (BH), 26 August 1970, *L. Skog & J. Skog 1704* (BH, E, NY, S); Río Maricao above Maricao, 20 October 1913, *F. Stevens & W. Hess 3716* (NY); Maricao, 18 November 1913, *F. Stevens & W. Hess 4872* (NY); one-third of way down path from El Monte de Estado to fish hatchery at Maricao, 2000 ft, February 1965, *T. Talpey 30* (BH, US). LOCALITY UNKNOWN: matted in mountain brook, forest, 19 May 1935, *F. Sargent 613* (US). CULTIVATED: Cornell University, 15 January 1964, *R. Clark sn* (BH).

DISCUSSION.—*Gesneria pauciflora* resembles *Gesneria humilis* from Haiti and Cuba in its vegetative and fruit characters, and habitat. *Gesneria humilis* differs in having a yellow-green to white corolla, about 1.2 cm long, a patent or reflexed limb, and greenish stems and peduncles. *Gesneria citrina*, a closely related species in Puerto Rico, differs in having its peduncles much shorter than pedicels, leaves obovate or spathulate with rounded apices, in its decumbent habit and drier habitat.

From among the many duplicate specimens of the holotype (*Sintenis 327*), which was at Berlin and probably destroyed, a specimen at Göttingen has been selected as a lectotype. This specimen bears flowers and fruits, and the sheet was annotated by Urban as *Gesneria pauciflora*.

Section 6. *Physcophyllon* L. Skog, new section

Plantae erectae vel decumbentes acaulescentes, caulibus raro usque ad 0.5 m altis, ex basi vel ex foliorum superiorum axillis ramificantes. Folia cuneata, lanceolata vel oblanceolata, membranacea, bullata, scabrosa vel pilosa, marginibus interdum crispis vel lobulatis. Inflorescentiae 1- ∞-florae, quam foliis subtentibus breviores; flores tubulosi, fere cylindracei, curvati vel subventricosi, aurantiaci vel rubri, staminibus inclusis. Capsulae turbinatae vel fere sphaericae, interdum calycibus praeditae scyphulas formantes, in *Marchantiae* (bryophytorum) memoriam revocantes, costis prominentibus vel obscuris.

TYPE-SPECIES.—*Gesneria cuneifolia* (A. P. de Candolle) Fritsch.

DISCUSSION.—Section *Physcophyllon* comprises a complex of species, occurring on the islands of the Greater Antilles, which share similar characters and resemble each other to such a degree that they are distinguished with difficulty. This section resembles sections *Gesneria* and *Chorisanthera* in habit, foliage and fruit characters, and may be closely related to them. Because of the presence of the red tubular corolla in all of the species, the pollinator of each of the species is probably a hummingbird.

Name derived from the Greek *physke* (= blister) + *phyllon* (= leaf).

27. *Gesneria acaulis* Linnaeus

Gesneria acaulis Linneaus, Syst. Nat. ed. 10, 2:1110, 1759.

Subshrubs: stems woody, erect, pendent or decumbent, short, usually about 20 cm, rarely to 60 cm tall, 3–5 mm in diameter at 5 cm below apex, bark smooth and gray-brown to glabrescent and greenish toward the resinous apex, lenticels obscure or erumpent longitudinally; rarely branched or branching from the base, internodes 0.1–2.0 cm long, leaf scars prominent.

Leaves alternate, spiraled, clustered at the apex of stem: petioles sulcate, 0.1–1.9 cm long, 0.1–0.3 cm wide, green or appearing reddish from reddish multicellular trichomes, villous and somewhat resinous from short glandular trichomes; blades oblanceolate to obovate or often falcate, (2.5–)3.6–23.4 (–25.0) cm long, 1.0–8.1 cm wide, membranous, base subcuneate to subcordate, usually oblique, margin crenate, dentate, serrate, double-serrate or irregularly lobulate, apex acuminate, acute or obtuse, adaxial surface bullate to

Key to the Species of Section *Physcophyllon*

1. Petioles, floral tubes, and capsules verrucose; calyx lobes connate for ca 3 mm; Haiti ..... 31. ***G. hybocarpa***
1. Petioles, floral tubes, and capsules smooth or pubescent, not verrucose; calyx lobes connate for 2 mm or less.
   2. Leaves narrowly oblanceolate, margins regularly undulate-lobulate; calyx lobes narrow, 1–2 mm wide at base, apex recurved; inflorescences usually of one flower; peduncles 2 mm long or less; Haiti ..... 29. ***G. christii***
   2. Leaves oblanceolate or obovate, margins irregularly serrate or crenate; calyx lobes usually broad, if narrow then apex not recurved; inflorescences of one to many flowers; peduncles usually longer than 2 mm.
      3. Corolla tube straight, or only slightly curved at apex, cylindric, limb patent, lobes nearly equal; Cuba, Hispaniola, and Puerto Rico ..... 35. ***G. reticulata***
      3. Corolla tube curved at or near the middle, usually ventricose, if not ventricose then leaves glabrous above, limb spreading or lobes erect or reflexed and usually unequal.
         4. Subtending leaves ca 5 times as long as the inflorescences, leaves spathulate or narrowly obovate, margin crenate; Cuba ..... 34. ***G. purpurascens***
         4. Subtending leaves either less than 4 times as long as the inflorescences, usually much less, or leaves irregularly serrate.
            5. Corolla 1.5–1.8 cm long; peduncles glabrescent; flowers many; southern Dominican Republic ..... 28. ***G. barahonensis***
            5. Corolla 1.8 cm or more long, if less than peduncles pubescent to villous; flowers one to many.
               6. Leaves scabrous; persistant calyx lobes on capsule reflexed, peduncles 0.8–10.2 cm long; northern Dominican Republic ..... 33. ***G. pedicellaris***
               6. Leaves bullate or smooth, if scabrous then persistant calyx lobes erect or spreading, peduncles 0.1–3.1 cm long.
                  7. Capsules obconic or narrowly turbinate; leaves bullate or smooth, not scabrous; peduncles 0.1–0.5 cm long, rarely to 2.6 cm; bracts 0.3–1.0 cm long; inflorescences of 1–3 flowers; Puerto Rico ..... 30. ***G. cuneifolia***
                  7. Capsules broadly turbinate or globose; leaves scabrous or not; peduncles 0.2–3.1 cm long; bracts to 3.4 cm long, usually more than 1 cm long; inflorescences of 1–5 or many flowers.
                     8. Calyx lobes erect, 1.5–7.0 mm long; inflorescences occasionally as long as the subtending leaves; corolla scarlet or dark red, base attenuate and ventricose above; leaves scabrous; Cuba ..... 32. ***G. libanensis***
                     8. Calyx lobes spreading, 7.0–20.0 mm long; inflorescences shorter than the subtending leaves; corolla red, dull rose or orange, base ampliate and not ventricose above, or narrow at base and ventricose above; leaves seldom scabrous, but glabrous in var. *glabrata;* Jamaica ..... 27. ***G. acaulis***

flat, light to dark green, villous or trichomes stiff and appressed, trichomes occasionally suffused with calcium carbonate and whitish, or glabrous, veins immersed, abaxial surface lighter green with prominent dark green or reddish veins, villous or trichomes appressed usually more dense at the veins, resinous from glandular trichomes.

Inflorescences 1–3 (-many) in pedunculate cymes about one-quarter of the length of the subtending leaves: peduncles terete, 0.1–3.1 cm long, 1–2 mm in diameter, green or red, puberulous to villous, occasionally resinous; bracts leaflike, linear, lanceolate, or elliptic, to 3.4 cm long, to 0.8 cm wide, green or red, villous to glabrescent; pedicels terete, 0.4–2.9 cm long, elongating in fruit, 1–2 mm in diameter, green or red, glabrous or puberulous to villous; floral tube obconic or turbinate, 2–4 mm long, 1.2–3.0 mm wide, green or red, villous to glabrescent, resinous, costae 5 or 10, usually prominent; calyx lobes 5, spreading, connate at base for 0.5–2.0 mm, each linear or lanceolate, 0.7–2.0 cm long, 1–4 mm wide at the base, narrowing gradually to apex, margin entire, outer surface green or red, glabrous to villous, occasionally villous only near the margin, trichomes many-celled, or appressed, stiff and white, glandular-

resinous, veins 3–5, nearly parallel, inside green or red, glabrous or sparingly pubescent, glandular-resinous, glands becoming more dense toward the base; corolla tube cylindric or subventricose, bent at or above the middle, little or much expanded above floral tube, 1.8–3.6 cm long, 2–4 mm in diameter, middle 4–7 mm in diameter, narrowing somewhat at the throat, 3–6 mm in diameter, outside red, dull rose, or orange, occasionally yellow at the veins, puberulous to villous, trichomes occasionally of 2 lengths, inside yellow or light red, glabrescent or glabrous, limb 5-lobed, nearly erect, darker red-orange, upper lobes exceeding lower lobe, upper lobes broadly ovate, 1.0–2.5 mm long, 2.0–3.0 mm wide, margins suberose, stipitate-glandular, lateral lobes and basal lobe broad, rounded, seldom more than 1 mm long and 2 mm wide; stamens 4, adnate for about 1 mm to base of corolla tube, exserted only to length of upper corolla lobes, filaments linear, curved, 1.8–3.5 cm long at anthesis, less than 1 mm in diameter, reddish, yellow, or white and nearly transparent, sparingly pubescent with a few scattered trichomes near the middle, anthers oblong, 1–2 mm long, 1 mm wide, pinkish, yellow, or white, glabrous, adherent in 2 pairs, staminode up to 5 mm long with undeveloped anther; ovary completely inferior, apex villous, disc 5-angled, unlobed, glabrous, style linear, curved, slightly exceeding the stamens at maturity, red, yellow, or white, sparsely pubescent, stigma clavate, recurved, yellow or white, papillate.

Capsule broadly turbinate to globose, 2–4 mm long, 4–6 mm wide, grayish brown or gray, villous or glabrescent, dehiscing from the apex, costae 5–10 and usually prominent; seeds numerous, fusiform, twisted ca 0.5 mm long, ca 0.25 mm wide, reddish-brown to black, nitid (Figures 19*b*, *e*).

27a. *Gesneria acaulis* Linnaeus var. *acaulis*

Gesneria acaulis Linnaeus, Syst. Nat. ed. 10. 2:1110, 1759.—Linn., *in* Elmg., Pl. Jam. Pug. 15, 1759.—Linn., Amoen. Acad. 5:400, 1760; Sp. Pl. ed. 2. 2:850, 1763; Syst. Nat. ed. 12. 2:409, 1767.—Murr., Syst. Veg. ed. 13, 554, 1784—Sw., Obs. Bot. 227, 1791.—Poir. *in* Lam., Illustr. 3:88, 1823 [as to description, not as to illustrated plant].—Urb., Symb. Ant. 2:379, 1901.—Adams, Fl. Pl. Jamaica 680, 1972.

Conradia sloanei A. P. de Candolle, Prodr. 7:526, 1839.—Griseb., Fl. Brit. W. Ind. 462, 1862 [nom. illeg.]. [Type-collection: Jamaica, *O. Swartz, sn* (G-DC, holotype; B, C, LD, M, S, UPS, isotypes).]

Conradia hispida Bentham, Pl. Hartw. 264, 1846.—Walp., Repert. Bot. Syst. 6:395, 1847. [Type-collection: Between Kingston and Spanish Town, Jamaica, *C. Hartweg 1551* (K, holotype; BM, K, LD, isotypes).]

Chorisanthera hispida (Bentham) Ørsted, Cent. Gesn. 68, 1858.

Conradia libanensis sensu Grisebach, Fl. Brit. W. Ind. 462, 1862 [excl. syn.].

Pentarhaphia hispida (Bentham) Hanstein, Linnaea 34:293, 1865.

Pentarhaphia sloanei (A. P. de Candolle) Hanstein, Linnaea 34:295, 1865.—Hitchcock, Rep. Missouri Bot. Gard. 4:114, 1893 ("*Pentaraphia*").

Gesneria hispida (Bentham) O. Kuntze, Rev. Gen. 2:473, 1891.

Pentarhaphia acaulis (Linnaeus) Bentham & Hooker f. ex Fawcett, Prov. List, Jam. 28, 1893.—Druce, Rep. Bot. Exch. Cl. Brit. Isles 3:422, 1913 ["1914"]. ["*Pentarraphia*"].

Pentarhaphia libanensis (Grisebach) Bentham & Hooker f. ex Fawcett, Prov. List, Jam. 28, 1893 [nom. illeg., non Hanstein (1865)].

Gesneria acaulis Linnaeus var. *grandifolia* Urban, Symb. Ant. 2:380, 1901. [Type-collection: Jamaica, *C. Bertero 2183* (TO, lectotype).]

Leaves pubescent above, margin lobate, often double-serrate, apex acute to obtuse, stomata scattered, seldom in groups.

Calyx lobes bearing many-celled or appressed trichomes on the exterior at least at the margin, inside glandular; corolla tube cylindric, inflated at base, ventricose at middle, narrowed and bent slightly down above middle, slightly flared at apex; pollen grains isopolar, prolate, size small (18.5–22.5 μm long at the polar axis, 10.2–12.5 μm wide at the equatorial axis), amb nearly circular, tricolpate, apocolpia truncate or slightly rounded, sexine heterobrochate, lumina 0.4–1.5 μm across (Figure 17*d*).

Type.—H. Sloane, Voy. Jam. Hist. 159, pl. 102: fig. 1, 1725 (Figure 60).

Chromosome Number.—$n = 14$ (Lee, 1966), and fide *Davidse & Conroy 3270* (MO).

Distribution and Ecology.—*Gesneria acaulis* var. *acaulis* is endemic to Jamaica (Figure 61), where it can be found in all parishes except Manchester. Its habitat is damp rocky soil or banks from ca 25–700 m elevation. This variety flowers throughout the year.

Specimens Examined.—JAMAICA. Parish of Hanover: 5 mi W of Lucea, near sea level, 28 February 1968, *G. Proctor 28559* (F, IJ, MO). Parish of Westmoreland: One-day Cave,

Key to the Varieties of *Gesneria acaulis*

1. Leaves often double-serrate, pubescent above; calyx lobes bearing many-celled or appressed trichomes at least at the margin dorsally; corolla bent above the ventricose middle ..... 27a. var. ***acaulis***
1. Leaves never double-serrate, but crenulate to dentate or single serrate, glabrous above; exterior of calyx lobes glabrous; corolla bent at middle, scarcely wider than the base at any point ..... 27b. var. ***glabrata,*** new variety

ca 1 mi W of Rat Trap, 1000–1100 ft, 9 April 1961, *G. Proctor 22160* (BM). Parish of St. Elizabeth: Cook's Bottom, N of Ipswich, 400–450 m, 31 March 1920, *W. Maxon & E. Killip 1460* (A, F, GH, NY, US). Parish of Trelawny: 1 mi SW of Bunkers Hill, ca 400 ft, 12 January 1964, *G. Proctor 24493* (BM, IJ); Windsor House estate, 400 ft, 11 March 1956, *W. Stearn 469* (A, BM); path to Windsor Cave, 450 ft, 23 August 1955, *D. Powell 140* (IJ); SW of Windsor caves, ca 500–750 ft, 13 August 1963, *M. Crosby & W. Anderson 1171* (F, MO, NY, US, USF); Burnt Hill, 500 m, 29 April 1952, *F. Barkley 22J236* (IJ, US); 0.5 mi N of Spring Garden, ca 1700 ft, 4 November 1968, *G. Proctor 29329* (IJ); Barbecue Bottom, 6 mi N of Albert Town, Cockpit Country, 29 July 1962, *F. Fosberg 42920* (NY, US). Parish of Clarendon: Peckham Woods, 2000–2250 ft, 10 July 1960, *C. Adams 7545* (UCWI). Parish of St. Ann: near Brown's Town, 18 January 1938, *F. Hunnewell 15356* (GH); Liberty Hill, 27–30 March 1908, *N. Britton 2500* (NY); 2.2 mi W by road of Albion, 2300–2400 ft, 9 August 1965, *H. Hespenheide 923* (GH, MO, NY, US, Z); Dry Harbour Mountains, 2 mi W of Albion, 18 January 1956, *W. Stearn 155* (BM, 2 sheets); Roaring River Falls, 7 March 1936, *F. Hunnewell & L. Griscom 14386* (IJ); near Lydford PO, 1500 ft, 20–31 December 1953, *R. Howard & G. Proctor 13444* (A, IJ); Union Hill, near Moneague, 13 July 1950, *R. Howard 12017* (A, US); Union Hill and vicinity, northern slopes of Mount Diablo, 400–750 m, 24 July 1926, *W. Maxon 10424* (GH, US); Moneague, 27 February 1927, *E. Wall sn* (S); Moneague, December 1849, *R. Alexander sn* (GOET); Union Hill, near Moneague, 650 m, 6–7 April 1908, *N. Britton & A. Hollick 2804* (NY); Roaring River Falls, 27–30 March 1908, *N. Britton 2487* (NY); Dunn River Falls, 11 March 1936, *F. Hunnewell & L. Griscom sn* (GH); Hollymount Road, 2300 ft, 27 August 1963, *C. Adams 12644* (BM, UCWI); Mt. Diablo, 2 April 1903, *W. Harris 8485* (UCWI); Mt. Diablo, 8 March 1936, *F. Hunnewell & L. Griscom 14385* (GH); eastern slopes of Mt. Diablo, 7 March 1916, *E. Killip 448* (BM, MO); Mt. Diablo, January 1850, *R. Prior 560* (K); Mt. Diablo, 1800 ft, 20 March 1970, *M. du Quesnay 257* (UCWI); Mt. Diablo, 2000–3000 ft, March 1952, *R. Robbins 1513* (UCWI); along road to Hollymount above Mount Diablo Afforestation area, 13 August 1970, *L. Skog 1634* (BH, US); Mt. Diablo, road to Hollymount, ca 1.7 mi SW of Schwallenburgh, 11 July 1954, *G. Webster & K. Wilson 5017* (A); on way to Hollymount, 2000–2500 ft, 18 February 1958, *T. Yuncker 18215* (BM, F, S); Schwallenburgh, Mt. Diablo, ca 2000 ft, 30 November 1964, *D. Powell 1642* (IJ); between Mount Rosser and Schwallenburgh, on east side of Mount Diablo, 1700 ft, 12

Figure 60.—Type of *Gesneria acaulis* Linnaeus: Sloane, *Voy. Jam. Hist.*, pl. 102: fig. 1, 1725.

April 1956, *W. Stearn 712* (BM); Moneague to Mount Diablo, 5 April 1908, *N. Britton 2720* (F, NY); cliffs in Fern Gully, 19 March 1897, *J. Churchill sn* (GH); Fern Gully, February 1916, *H. Ridley sn* (K); Fern Gully, 500–1000 ft, July 1951, *R. Robbins 1517* (UCWI); along Hwy A3 in Fern Gully about 3 mi from Ocho Rios, 13 August 1970, *L. Skog 1633* (BH, US); near Fern Gully, above Ocho Rios, 500–1000 ft, 23 December 1957, *T. Yuncker 17781* (BM, F, S, UCWI); nr. Burts Run, 1800 ft, 13 November 1965, *C. Adams 12745* (UCWI); Somerton district, ca 1700 ft, 28 March 1956, *G. Proctor & W. Stearn 11923* (IJ), near Mosely Hall Cave, 1 mi W of Blackstonedge PO, ca 2000 ft, 15 July 1952, *G. Proctor 6926* (IJ, NY). Parish of St. Catherine: Forest Reserve area east of Crofts Mountain, 1650–1850 ft, 6 September 1962, *G. Proctor 22762* (BM, IJ); Holly Mt., 2 August 1931, *L. Bailey 705* (BH); Hollymount, 19, 20 September 1906, *N. Britton 733* (NY); Hollymount near Ewarton, 2500 ft, 10 August 1896, *W. Harris 6453* (BM, C, UCWI), 14 February 1905, *W. Harris 8886* (BM, F, K, NY, UCWI), 31 August 1905, *W. Harris 9003* (BM, F 2 sheets, K, NY, UCWI); Hollymount and vicinity, 750–850 m, 24 July 1926, *W. Maxon 10449* (S, US); Holly Mount, 2600 ft, February 1916, *J. Perkins 487a* (G); 1 mi due W of Riverhead, ca 1500 ft, 16 October 1960, *G. Proctor 21443* (BM, IJ, US); Linstead, 400 ft, 1 November 1953, *G. Proctor 8148* (IJ, USF); Linstead, December 1959, *L. Wynter 5669* (UCWI); Bog Walk, 4–5 May 1910, *J. Crawford 832* (NY, PH); 2.1 mi SE of Bog Walk along main hwy to Spanish Town, 80 m, 26 November 1971, *G. Davidse & E. Conroy 3270* (MO); Bog Walk, 2 February 1901, *W. Fawcett 8127* (BM, NY); Bog Walk, 17 December 1890, *A. Hitchcock sn* (F, MO); Bog Walk and vicinity, 27 July 1926, *W. Maxon 10485* (S, US); Bog Walk, 10 March 1885, *N. Kidder sn* (GH, 2 sheets); Bog Walk, February 1916, *H. Ridley sn* (K); Bog Walk, 17 December 1890, *J. Rothrock 87* (F); Flat Bridge to Bog Walk, 200 ft, 13 March 1960, *C. Adams 6476* (MO, UCWI); Rio Cobre, river bank south of Kent Village, ca 250 ft, 30 June 1963, *M. Crosby, H. Hespenheide & W. Anderson 410* (F, NY, USF); cliffs near Rabys Corner, ca 2 mi SE of Bog Walk, ca 500 ft, 10 June 1959, *G. Webster, J. Ellis & K. Miller 8087* (BM, G, S); Natural Bridge, Riversdale, 400–500 ft, 3 April 1961, *G. Proctor 22145* (BM, IJ); between Kingston and Spanish Town, *C. Hartweg 1551* (K, holotype of *Conradia hispida* Bentham; BM, K, LD, isotypes); St. Thomas in the Vale, June 1843, *W. Purdie sn* (K); on the road to Sixteen-Mile-Walk, *H. Sloane sn* [Horti Sicci 3:27] (BM). Parish of St. Mary: Dressikie, 600–700 ft, 3 November 1968, *G. Proctor 29306* (IJ); 1 mi S of Boscobel PO, 300 ft, 2 May 1952, *G. Proctor 6614* (IJ, US). Parish of St. Andrew: Iron Face, Chester Vale, 3000 ft, 2 December 1907, *W. Harris 10026* (A, BM, C, F, K, NY, P, UCWI, US, Z); vicinity of Cinchona, Old England, 2–10 September 1906, *D. Marble 242* (NY); Port Royal Mountains, November 1845, *G. MacNab sn* (P), no date, *W. Lane 443* (K); in montibus (copia pluviale minore) prope Kingston, 1897, *C. Hanson sn* (C, L). Parish of Portland: near Chester Vale, 9 December 1891, *W. Fawcett sn* (UCWI); Haycock Hill, 18 March 1962, *A. Shelding* in *C. Adams 10857* (UCWI); along road between Section and Silver Hill Gap, ca 3500 ft, 3 December 1963, *G. Proctor 24271* (BM, IJ); John Crow Peak, no date, *J. Hart 1219* (UCWI); vicinity of Thomson's Gap, ca 1000 m, 5–6 March 1920, *W. Maxon & E. Killip 785* (US); Blue Mts. between Vinegar Hill and Thomson's Gap, 30 March 1916, *J. Perkins 1025* (GH); New Eden, January 1847, *J. Wolle sn* (USF); Swift River Gorge at Eden, ½ mi E of Paradise, 100 ft, 19 March 1956, *W. Stearn 552* (BM); Swift River Bridge near Paradise, ca 80 ft, 25 November 1959, *C. Adams 5570* (UCWI); St. Margaret's Bay, November 1900, *C. Millspaugh 1927* (F); near mouth of Rio Grande, ca 25 ft, 19 March 1956, *G. Proctor & W. Stearn 11859* (IJ); mouth of the Rio Grande, 20–30 ft, 18 March 1956, *W. Stearn 546* (BM, 2 sheets); St. Margaret's Bay, 5 mi W of Port Antonio, mouth of the Rio Grande, 18 February 1906, *A. Wight 130* (F, NY); coast road near Port Antonio, 9 May 1904, *W. Maxon 2105* (NY, US); near Moorestown, 25 September 1906, *D. Marble 856* (NY); Ginger House to Comfort Castle, 400 ft, 10 August 1962, *C. Adams 11471* (UCWI); Corn Puss Gap ca 2000–3000 ft, 14 August 1954, *K. Wilson & W. Murray 594* (A, IJ); N of Ecclesdown, 1500–2000 ft, 3 November 1964, *T. Talpey 15* (BH); 1.5–2.5 mi SW of Ecclesdown, 1500–2500 ft, 24 January 1956, *R. Howard, G. Proctor & W. Stearn 14797* (A, BM, IJ); Cuna-Cuna Pass, 24 July 1897, *A. Fredholm 3172* (NY); Cuna-Cuna Pass, 15 September 1908, *W. Harris & N. Britton 10559* (F, K, NY, UCWI); John Crow Mt., March 1951, *R. Robbins 1516* (UCWI); NW slope of Joe Hill, 1600 ft, 13 February 1956, *W. Stearn 246* (A, BH, BM, K). Parish of St. Thomas: Rowlandsfield district, SE slope of John Crow Mts., 18 March 1952, *G. Proctor 6428* (IJ, US); above Rowlandsfield, 1500 ft, 16 March 1956, *W. Stearn 510* (BH, BM). Locality Unknown: 1850, *R. Alexander sn* (K); June 1821, *C. Bertero 2183* (TO, lectotype of *Gesneria acaulis* var. *grandifolia* Urban); no date, *P. Browne sn* (UPS); no date, *H. Distin sn* (K); no date, *Gower collection sn* (E); borealis in montibus humidus copia pluvialis, 1897, *C. Hanson sn* (C); Dollwood, October 1893, *W. Harris sn* (BM, UCWI); no date, *J. Hart sn* (US); no date, *W. Lane 84* (K), March 1939, *J. Roig 14224* (SV); no date, *J. MacFadyen sn* (K); 1858, *W. March 1197* (K); no date; *O. Swartz sn* (G-DC, lectotype of *Conradia sloanei* A. P. de Candolle: B, C, LD 2 sheets, M, S 2 sheets, UPS, isotypes); no date, *J. Wiles sn* (G). Cultivated: Cornell University, G–877, 2 August 1966, *L. Leva 39* (BH), 5 October 1969, *L. Skog 1410* (BH), 3 November 1970, *L. Skog 1732* (BH), 27 January 1967, *M. Stone 216* (BH); Cornell University, G–1003, 18 October 1966, *M. Stone 234* (BH).

Discussion.—In the protolog for *Gesneria acaulis*, Linnaeus cited Sloane's plate of *Rapunculo affinis anomala vasculifera*, . . . ("Sloan, jam. t. 102, f. 1"). This must be considered the type for the name. A specimen in the Sloane herbarium (Horti Sicci 3:27) at the British Museum (Natural History) is a match for the drawing and may be considered the typotype in the sense of Dandy (Stearn, 1957).

Apparent natural bigeneric hybrids between *Gesneria acaulis* and *Rhytidophyllum tomentosum*

(Linnaeus) Martius have been collected in the parishes of St. Ann and Manchester. Specimens of *C. Adams 12643* and *G. Proctor 29384* were the basis for the separation of *Gesneria* sp. "A" by Adams (1972). Characters appear intermediate between the two species, but no viable seed has been found. Hybrid plants may be expected wherever the species are found growing in the same locality. Plants of an apparent hybrid between *Gesneria acaulis* var. *glabrata* and *Rhytidophyllum tomentosum* were introduced into cultivation in 1970 and grown at Cornell University under the accession number G–1371 (Figure 1*j*).

The arrangement of the stomata of the abaxial leaf epidermis was discussed and illustrated by Wiehler (1970). He pointed out that the two clones of *Gesneria acaulis* in cultivation at Cornell University differed markedly in stomatal arrangement. The epidermis of a typical specimen of the variety described here as var. *acaulis* (from the Parish of Portland and grown under the accession number G–877) had stomata scattered more or less generally over the abaxial surface. A typical specimen of var. *glabrata* (G–876, from the Parish of Manchester), described below as new, has stomata in apparent clusters (termed "islands" by Wiehler). These clusters appear to correspond to the summits of the stomatal domes. It seems likely that if the epidermis did not have the domes, the stomata would not appear to be clustered. Weihler probably examined only the two specimens in cultivation. My examination of the two cultivated clones found the cells arranged as he described; however, there appears to be considerable variation in samples collected from the area between the typical forms, particularly in samples from the Cockpit Country of Jamaica. Some examples bear one to few stomata in an apparent cluster perhaps at the apex of a stomatal dome.

27b. *Gesneria acaulis* var. *glabrata* L. Skog, new variety

Folia supra glabra vel prope basim raro sparsim pubescentia, ad margines crenulata vel dentata vel singulatim serrata, non lobata, ad apices acuta vel acuminata, cellulis epidermalibus plerumque discretis. Calycis lobi utroque dense glandulosi, venis 3 prominentibus; corollarum tubi cylindracei, non ventricosi, ad medium deorsum flexi (Figure 16g).

Type-Collection.—Marshall's Pen, Jamaica, *L. Skog 1642* (US, holotype, Figure 62a; BH, isotype).

Chromosome Number.—$n = 14$ (fide *Skog 1731*).

Distribution and Ecology.—*Gesneria acaulis* var. *glabrata* is known only from the parish of Manchester in Jamaica (Figure 61) where it grows on shaded limestone banks at 650–800 m elevation. This variety flowers throughout the year.

Specimens Examined.—JAMAICA. Parish of Manchester: Bellefield to Banana Ground, 2450 ft, 11 December 1960, *C. Adams 8451* (UCWI); Mandeville and vicinity, 29 August

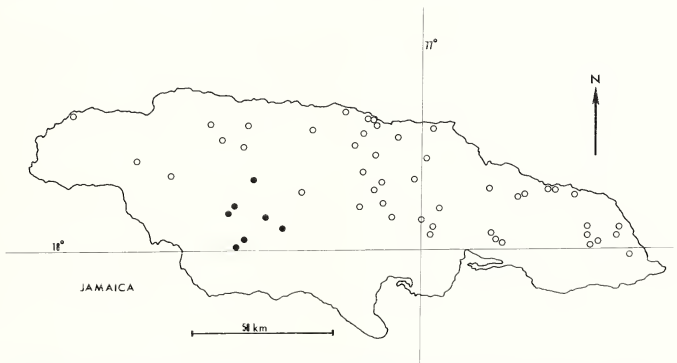

Figure 61.—Distribution of *Gesneria* section *Physcophyllon* in Jamaica. *(G. acaulis* var. *acaulis* = open circles; *G. acaulis* var. *glabrata* = solid circles.)

1907, *N. Britton 1000* (NY); cliffs, Somerset, 21–23 September 1908, *N. Britton 3732* (NY); Mandeville and vicinity, 15–26 February 1910, *S. Brown 68* (NY, PH), *239* (NY, PH, US); Marshall's Pen, Mandeville, 2200 ft, 29 April 1896, *W. Harris 6322* (BM, UCWI, US); Walderston, 2200 ft, 14 October 1901, *W. Harris 8415* (BM, UCWI); Marshall's Pen, no date, *A. Katzenberger* & *R. Katzenberger 113* (RDJ); vicinity of Marshall's Pen Estate, near Mandeville, 2300 ft, 24 April 1961, *K. Kramer 1691* (U, WAG 2 sheets); Cockpit Country, bank near Derry, 13–18 September 1906, *D. Marble 709* (F, NY, US); Marshall's Pen, 2.25 mi due NW of Mandeville, 2100–2300 ft, 16 August 1965, *G. Proctor 26617* (IJ); Marshall's Pen, 6 January 1959, *E. Robertson 5374* (K, UCWI); Marshall's Pen, 2.25 mi NW of Mandeville, 2100–2300 ft, 15 August 1970, *L. Skog 1642* (US, holotype of *Gesneria acaulis* var. *glabrata* L. Skog; BH, isotype); Somerset, 2300 ft, 25 February 1956, *W. Stearn 350* (BH, BM, K); S of Green Hill, 5 November 1964, *T. Talpey 18* (BH); halfway between Coleyville and Molton, 2000–2250 ft, 20 June 1959, *G. Webster, J. Ellis* & *K. Miller 8421* (BM, G, S); Bethany, 1849, *H. Wullschlägel 957* (M). Locality Unknown: 1875, *T. Hogg sn* (NY); no date, *J. MacFadyen sn* (K); no date, *W. Wright sn* (BM); no date, *H. Wullschlägel sn* (GOET, W). Cultivated: Cornell University, G–876, 5 October 1969, *L. Skog 1425* (BH), 3 November 1970, *L. Skog 1731* (BH).

Discussion.—This variety was brought into cultivation by T. Talpey in 1964 and was grown at Cornell University as G–876.

28. *Gesneria barahonensis* Urban

Gesneria barahonensis Urban, Symb. Ant. 7:379, 1912.

Subshrubs: stems unbranched, woody, to 15 cm tall, glabrescent below, villous and resinous toward apex, internodes short, to 5 mm long.

Leaves alternate, clustered near stem apex: petioles sulcate, 3–6 mm long, 1–2 mm wide, green or reddish, sparsely pilose and glandular; blades oblanceolate to obovate, 5.6–15.4 cm long, 2.4–5.1 cm wide, membranous, base acute or rounded, margin serrate to crenate, apex acute, adaxial surface slightly rough, green, pilose with appressed white trichomes, abaxial surface lighter green, villous and glandular along the prominent veins.

Inflorescences condensed cymes, nearly umbellate, flowers many, the whole about one-half the length of the subtending leaf: peduncles terete, 0.7–2.3 cm long, ca 1 mm in diameter, glabrescent; bracts 2, linear, 5–7 mm long, ca 1 mm wide, reddish, pilose; pedicels terete, to 1.8 cm long, ca 1 mm in diameter, reddish; floral tube obconic or turbinate, ca 2 mm long and wide, reddish to green, glandular and pilose, trichomes more dense just above junction with pedicel, veins not prominent; calyx lobes 5, erect, connate 1–2 mm at base, narrowly triangular, 5–9 mm long, 1–2 mm wide at base, both sides green or somewhat reddish, glandular-glabrescent at the base externally, margin ciliate, 3-veined; corolla tube cylindric, but slightly broader below the middle, then narrowed toward throat, with limb slightly flaring, tube 1.5–1.8 cm long, ca 2 mm broad at base, 4–6 mm wide at broadest point, ca 2.5 mm wide at throat, dark red outside, pilose, trichomes more dense at mouth, inside lighter red, glabrous, mouth slightly oblique, lobes crescent-shaped about 1 mm long, margin entire to erose, glandular-ciliate; stamens 4, with a reduced staminode, adnate to base of corolla tube, exserted only to corolla limb, filaments slightly curved, glabrous, reddish, anthers oblong, ca 1 mm long, ca 0.5 mm wide, slightly coherent; ovary inferior, disc annular, lobed, style curved, equaling the stamens in length, red, stigma clavate.

Capsule obovoid, 4–6 mm long, 3–4 mm in diameter, gray-brown, glabrescent, costae 10; seeds fusiform, twisted, ca 0.5 mm long, dark brown or black.

Type-Collection.—"An Felsen der Tha'ler von Pae-Mingo nach Bahoruco," Dominican Republic, *M. Fuertes 1049* (A, lectotype, Figure 62*b*).

Distribution and Ecology.—*Gesneria barahonensis* is apparently endemic to the Barahona Peninsula of Hispaniola (Figure 54), where it grows on rocky cliffs from 100–1200 m elevation. This species was collected in flower in September.

Specimens Examined.—HISPANIOLA. Dominican Republic: Barahona Province: an Felsen der Tha'ler von Pae Mingo nach Bahoruco, 100–1200 m, June–September 1911, *M. Fuertes 1049* (A, lectotype of *Gesneria barahonensis* Urban); in saxosis convallium inter Pae-Mingo et Bahoruco, 100–1200 m, 17 September 1912, *M. Fuertes 1399b* (A, E, NY, P).

Discussion.—This species is known only from two collections, both made by Fuertes in probably the same locality. The type, *Fuertes 1049,* consists of a single sheet annotated by Urban in the Arnold Arboretum, which is designated the lectotype until an authentic holotype is found. This sheet, unfortunately, is a mixed collection: two specimens are truly *Gesneria barahonensis,* the third is a specimen of *G. reticulata* (Grisebach) Urban

FIGURE 62.—Type specimens: *a*, holotype of *Gesneria acaulis* var. *glabrata* L. Skog, new variety, *Skog 1642* (US); *b*, lectotype of *Gesneria barahonensis* Urban, *Fuertes 1049* (A). (Lectotype includes specimen on right and lower plant.)

lacking flowers and superficially resembling *G. barahonensis*.

Gesneria barahonensis is a rare species closely related to other members of this section and most similar to *G. acaulis* Linnaeus of Jamaica and *G. christii* Urban of Haiti. This species differs from both in having a much shorter corolla tube, narrower sepals than *G. acaulis* and many more flowers per inflorescence than *G. christii*.

29. *Gesneria christii* Urban

Gesneria christii Urban, Symb. Ant. 6:42, 1909.
Gesneria acaulis sensu Poiret, *in* Lam., Illustr. 3:88, pl. 536: fig. 1, 1823, non Linnaeus (1759).

Subshrubs: stems slow-growing, woody, erect or pendent, up to 12 cm tall, thick, to 8 mm in diameter at 5 cm below apex, bark smooth or rugose, brown and glabrescent below, above green, sparsely pilose, apex resinous; branching from base and above, internodes short, usually less than 6 mm long, leaf scars obvious.

Leaves alternate, spiral, closely spaced: petioles sulcate, 5–9 mm long, 1–2 mm wide, green or reddish, pilose or villous; blades narrowly obovate or narrowly oblanceolate, occasionally falcate, 6.3–26.9 cm long, 0.7–4.9 cm wide, membranous, base narrowly cuneate or acute, margin regularly undulate-lobulate, lobules serrate or dentate, apex acute, adaxial surface bullate to flat, light to dark green, with sparse appressed whitish trichomes from enlarged bases, lateral veins diverging at an

angle usually less than 45° from the midvein, abaxial surface much lighter green with prominent reddish veins, trichomes very sparse, appressed, veins pilose with numerous short glands among the eglandular appressed trichomes.

Inflorescences of usually one maturing flower, rarely 2 or 3 in cymes, much shorter than the subtending leaves: peduncles very short, at most 2 mm long, ca 1 mm in diameter, green or red, glandular-resinous; bracts 2, linear, ca 1 cm long, green, sparsely pilose; pedicels terete, 1.0–4.2 cm long, elongating in fruit, ca 1 mm in diameter, green or red, pilose and glandular; floral tube ovoid, 2–3 mm long, 2–3 mm in diameter, green or red, villous; calyx lobes 5, erect, connate at base for 1–2 mm, linear or lanceolate, 0.6–1.6 cm long, 1–2 mm wide above base, narrowing rapidly to middle, then gradually to apex, apex recurved, curling on drying, 3-nerved, margin entire, outer surface green with reddish veins, pilose, glandular, inside green, glabrous or very sparsely pilose, but glandular; corolla tube ventricose or inflated at the middle, narrowed at both ends, bent upward above the base, and slightly downward (Figure 16*e*) above the middle, 2.8–3.7 cm long, 2–3 mm in diameter at base, 5–9 mm wide at middle, 3–5 mm in diameter at throat, outside yellow-orange to red, darker at the veins, sparsely pilose, glandular, inside yellow or reddish, glabrous, mouth oblique, limb 5-lobed, lobes erect to porrect, orbiculate, ca 3 mm long, 4 mm wide, darker red than tube, lighter spots at the notches, margins stipitate glandular, upper lobes erose, others subentire; stamens 4, with a reduced staminode, filaments adnate to base of corolla for only 0.5 mm, linear, slightly curved, as long as corolla tube and not exserted, white, glabrous, anthers oblong, ca 2 mm long, ca 1.5 mm wide, yellow, coherent in pairs or free, pollen grains isopolar, prolate, size small (22.5–24.5 μm long at the polar axis, 11.0–14.0 μm wide at the equatorial axis), tricolpate, colpi 19.4 μm long, apocolpia blunt, sexine finely reticulate, lumina ca 0.5 μm wide; ovary inferior, apex green, pilose, disc thin, 5-lobed and angled, yellowish, style linear curved, as long as the corolla tube, white, stigma bilobed, recurved.

FIGURE 63.—Lectotype of *Gesneria christii* Urban. *Christ 1888* (IJ).

Capsule ovoid or globose, 4–7 mm long, 5–7 mm wide, gray to brown, glabrescent, dehiscing from the apex, costae 10, prominent or obscure; seeds fusiform, twisted, 0.5–1 mm long, blackish (Figures 19*c*, 20*a*).

TYPE-COLLECTION.—Furcy, Haiti, *E. Christ 1888* (IJ, lectotype, Figure 63).

CHROMOSOME NUMBER.—$n = 14$ (Lee, 1966a).

DISTRIBUTION AND ECOLOGY.—*Gesneria christii* is known only from southern Haiti, where it grows on shaded limestone cliffs on river banks at ca 60–1500 m elevation (Figure 54).

This species has been collected in the wild with flowers during January, February, July, and August. Under greenhouse conditions it flowers most of the year.

SPECIMENS EXAMINED.—HISPANIOLA. HAITI: Département du Sud: Massif de la Hotte, group Morne Rochelois, Miragoane, at Lebrun, ca 500 m, 25 July 1926, *E. Ekman H6517* (C, EHH, IJ, S, US). Département de l'Ouest: Massif de la Selle, Crête-à-Piquants, Port-au-Prince, secc. Laval, ca 600 m, 28 January 1926, *E. Ekman H5475* (EHH, S, US); Massif de la Selle, Port-au-Prince, Rivière Froide, ca 150 m, 29 Janu-

ary 1926, *E. Ekman H5480* (A, F, IJ, S), 2 August 1926, *E. Ekman H6629* (EHH, G, GH, IJ, K, NY, S, US), 21 July 1970, *L. Skog, T. Talpey & D. Pfister 1608* (BH, US), 19 February 1966, *T. Talpey 43* (BH); Furcy, 1500 m, January 1899, *E. Christ 1888* (IJ, lectotype of *Gesneria christii* Urban); Massif de la Selle, Port-au-Prince, Morne de l'Hôpital, 400 m, 20 May 1927, *E. Ekman H8192* (S). Locality Unknown: no date, *Lamarck Herb. No. 198* (P-LA). Cultivated: Cornell University, G-1008, 4 November 1966, *M. Stone 235* (BH).

Discussion.—The holotype specimen of *Christ 1888* was probably at Berlin and destroyed. The only known extant sample of the type is a leaf fragment now deposited in the Institute of Jamaica, but originally part of the Buch herbarium in Haiti. Until other examples are found, this fragment must be the lectotype.

A specimen in the Lamarck herbarium (no. 198) in Paris, possibly collected by J. Martin, who was a gardener at the botanical garden in Port-au-Prince, is presumably the basis for *Gesneria acaulis* sensu Poiret.

Gesneria christii Urban is apparently most closely related to *G. acaulis* Linnaeus of Jamaica. The specimens of *G. acaulis* from the eastern end of Jamaica bear a striking resemblance to *G. christii* in the lobulate leaves, but the leaves of *G. acaulis* are not regularly undulate-lobulate and are usually much wider toward the leaf apex, the peduncles are much longer, and are equal to or longer than the pedicels, and the base of the corolla tube is expanded above the apex of the floral tube. The peduncles of *G. christii* are very short and may not be apparent in a cursory examination. The abbreviated peduncle may be the reason Urban described this species as one-flowered. On specimens which have one-flowered inflorescences, the secondary flowers may be reduced to lateral bulges on the peduncle.

30. *Gesneria cuneifolia* (A. P. de Candolle) Fritsch

Gesneria cuneifolia (A. P. de Candolle) Fritsch *in* Engler & Prantl, Nat. Pflanzenfam. 4 (3b):184, 7 August 1894.
Conradia cuneifolia A. P. de Candolle, Prodr. 7:526, 1839.
Pentarhaphia cuneifolia (A. P. de Candolle) Hanstein, Linnaea 34:294, 1865.
Gesneria portoricensis A. P. de Candolle ex Bello, Anales Soc. Esp. Hist. Nat. 10:288, 1881, nom. nud.
Conradia reticulata sensu Stahl, Estudios Fl. Puerto Rico, ed. 1, 6:259, 1888; ed. 2, 3:327, 1937 [1936], non Grisebach (1866).
Gesneria cuneifolia Sessé & Mocino, Fl. Mex. ed. 2, 144, 1894, nom. illeg.—Urb., Symb. Ant. 4:571, 1911; 8:647, 1921 [pro parte].—N. Britt. & P. Wils., Sci. Surv. P. R. & V. I. 6:205, 1925.

Subshrubs: stems herbaceous or occasionally woody, erect or decumbent, short, seldom to 15 cm tall, 3–4 mm in diameter at 5 cm below apex, apex green or red, pilose and somewhat resinous, soon becoming glabrescent; branches from the base, internodes usually very short, but up to 1 cm long in rapidly elongating individuals, leaf scars prominent on mature stems.

Leaves alternate, spiraled, usually clustered at apex of stem or branch: petioles sulcate, 0.3–1.2 cm long, ca 2 mm thick, green or reddish, pilose to glabrescent; blades oblanceolate or obovate, 2.1–14.1 cm long, 1.3–4.2 cm wide, membranous, base acute, cuneate or subcordate, margin shallowly or grossly crenate or dentate, often ciliate, apex acute to obtuse, adaxial surface somewhat bullate, light or dark green, glabrous or rarely sparingly pilose at base or on midrib toward the base, veins lighter green, abaxial surface light green, glabrous or pilose along veins toward the base, veins prominent, epidermis with stomata grouped into clusters of 2 to 4.

Inflorescences cymose, pendent, 1- to 3-flowered, usually shorter, but occasionally as long as the subtending leaves: peduncles short, 0.1–0.5 cm, rarely to 2.6 cm long, pubescent; bracts linear or lanceolate, green 0.3–1.0 cm long, 1–2 mm wide, pubescent; pedicels 1.4–6.5 cm long, green or reddish, pilose; floral tube obconic, longer than broad at anthesis, 2–4 mm long, 2–3 mm in diameter, green to dark red, costate, pilose; calyx lobes erect, narrowly triangular, connate 1–2 mm at base, 2–6 mm long, 1.0–2.5 mm wide at base, outside green to dark red, glabrous or rarely sparsely pubescent, glandular, margin entire, ciliate, 3–5 nerved, inside glabrous, but glandular; corolla tubular (Figure 16*h*), obviously ventricose at middle, base gibbous on upper side, 1.6–2.6 cm long, 2–3 mm wide at base, expanding to 4–6 mm wide at middle, decreasing to 2–3 mm wide at throat before expanding at limb, outside light to dark red, with darker veins or yellowish on lower side, puberulent, inside yellow or light red, glabrous, limb of 5 lobes erect to porrect, 6–9 mm wide, red to yellow, sparsely glandular, upper lobes broadly orbiculate, 1.5–2.0 mm long, ca 3 mm

wide, serrate, lateral and basal lobes broadly ovate, ca 2 mm long, ca 3.5 mm wide, entire to suberose; stamens 4, not exserted beyond corolla throat, basally adnate to corolla for less than 1 mm, filaments linear, curved, ca 1.5–2.0 cm long, less than 1 mm in diameter, yellow to pink, glabrous, anthers oblong, ca 2 mm long, ca 1.5 mm wide, yellow-white, connate in 2 pairs, staminode ca 7 mm long; ovary completely inferior, sparsely pilose at apex, disc 5-angled, ca 1.5 mm wide, style curved, 1.6–1.9 cm long, white, glabrous, stigma clavate, papillate.

Capsule upright, obconic or narrowly turbinate, persistent calyx lobes spreading, 4–7 mm long, 3–5 mm wide, gray, glabrous, only apex dehiscing, costae 10, prominent; seeds elliptic, striated, ca 0.75 mm long, ca 0.25 mm wide, tawny (Figures 19*k*, 20*d*).

FIGURE 64.—Type of *Gesneria cuneifolia* (A. P. de Candolle) Fritsch, A. de Candolle, *Calq. des Dess. Fl. Mex.*, plate 723, 1874.

TYPE.—A. de Candolle, Calq. des Dess. Fl. Mex. pl. 723, 1874 (Figure 64).

CHROMOSOME NUMBER.—$n = 28$ (Lee, 1964; Talpey, 1966).

LOCAL NAMES.—"Yerba parrera" (fide Bello), "Flor de cueva" (fide Sintenis ex Urban).

DISTRIBUTION AND ECOLOGY.—*Gesneria cuneifolia* grows in the central and western part of Puerto Rico (Figure 65) on shaded, damp limestone banks and cliffs at elevations of ca 250–400 m. Plants have been collected in flower during every month of the year, both from the wild and in cultivation.

SPECIMENS EXAMINED.—PUERTO RICO: vicinity of Mayaguez, 4–10 March 1906, *E. Britton & D. Marble 662* (NY); Finca Alvarez, Quebradillas, January 1913, *Bro. Hioram sn* (NY); Quebradillas, 22 November 1913, *F. Stevens & W. Hess 5154* (NY); Collazo River, 19 February 1926, *N. Britton 8583* (NY, S, US); prope Pepino ad Encas, 10 January 1887, *P. Sintenis 5827* (F), *5829* (BM, BR, E, G 4 sheets, K, L, LD, MO, NY 2 sheets, PH, P 2 sheets, UCWI, US 2 sheets, W, Z); ad Encas, 10 October 1887, *P. Sintenis sn* (GH); Lake Guajataca, 25 August 1963, *Alain Liogier 10187* (IJ, NY, US); Sierra de Lares in rupibus calcar. ad "Guajataca," 3 February 1887, *P. Sintenis 6096* (C, UCWI, US); Lares, 400–500 m, 6 April 1913, *N. Britton, E. Britton & W. Hess 2735* (F, NY, US); Lares, 400 m, 31 October 1943, *F. Sargent 3248* (US); Lares, 30 June 1914, *J. Stevenson & J. Johnston 2060* (US); Lares in praeruptis ad cavernam Pajita, 13 January 1887, *P. Sintenis 5845* (BM, C, F, G 5 sheets, GH, GOET, K, L, LD, M, MO, NY 2 sheets, P 2 sheets, S, U, UCWI 3 sheets, US 2 sheets, W, Z); Lares in rupibus ad ostium cavernam "Partita," January 1887, *P. Sintenis sn* (GH); cliffs along P.R. Hwy 129 about 8 km E of Lares, 27 August 1970, *L. Skog & J. Skog 1707* (BH, US); Esperanza, Dominguito road, October 1911, *H. Cowles 223* (US); Hato Arriba near Arecibo, 3 March 1914, *N. Britton & J. Cowell 2012* (NY); Hato Arriba, near Arecibo, 1 March 1915, *E. Britton 5102* (NY, US); Arecibo, 5 October 1963, *T. Talpey 11a* (US 2 sheets); near the Arecibo Ionospheric Observatory on P.R. Hwy 625 about 15 km S of Arecibo, 27 August 1970, *L. Skog & J. Skog 1715* (BH, US); near radar site, Esperanza, S of Arecibo, February 1965, *T. Talpey 27* (BH); Esperanza, 10 October 1963, *T. Talpey 11b* (US 2 sheets); between Arecibo and Utuado, 4 March 1914, *N. Britton & J. Cowell 2042* (NY); Arecibo to Utuado, 14 March 1906, *N. Britton & J. Cowell 1458* (NY); between Utuado and Arecibo, 13 March 1906, *J. Cowell 802* (F, NY, US); Utuado to Arecibo, 14 June–22 July 1901, *L. Underwood & R. Griggs 803* (NY 2 sheets, US 2 sheets); Adjuntas, February 1886, *P. Sintenis sn* (GH); P.R. Rte 10 north of Utuado, 17 March 1970, *M. Meagher 189* (USF); below Utuado, 20 February 1923, *N. Britton & E. Britton 7525* (G, GH, NY, US); prope Utuado in sylva

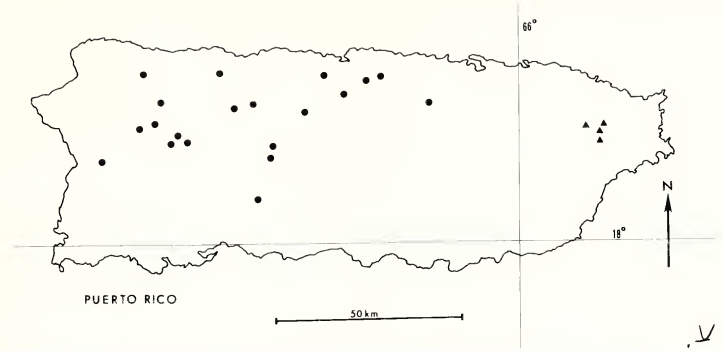

FIGURE 65.—Distribution of *Gesneria* section *Physcophyllon* in Puerto Rico. (*G. cuneifolia* = solid circles; *G. reticulata* = solid triangles.)

primaeva montis Hueco ad Cayuco in praeruptis calc., 25 March 1887, *P. Sintenis 6568* (GH, K); Utuado, in praeruptis ad los Angeles, 17 January 1887, *P. Sintenis 5935* (K, LD, UCWI); Utuado, 8 November 1913, *F. Stevens* & *W. Hess 4694* (NY); near Florida, 31 January 1925, *N. Britton, E. Britton* & *K. Boynton 8184* (NY); S of Florida, 250 m, 23 August 1963, *H. McKee 10617* (P); Manati, 7 November 1913, *W. Hess 4137* (NY); Ciales, 21 July 1962, *Alain Liogier 9581* (IJ, NY); Ciales, 24 February 1926, *N. Britton 8594* (NY); Ciales, 17 August 1913, *J. Johnston 957* (NY); District Bayamon, Ciales, Bo. Cordillera, 12 December 1937, *J. Otero 356* (MO); prope Vega-baya, October 1886, *A. Stahl 605b* (L); Km 28, San Juan–Arecibo road, 13 January 1935, *F. Sargent 131* (US); Toa Alta, 8 February 1927, *N. Britton* & *E. Britton 8791* (NY, S); above Toa Alta, 300 ft, 26 November 1966, *T. Talpey 64* (BH); near Toa Alta, toward Esperanza, 26 November 1966, *T. Talpey 63* (BH). LOCALITY UNKNOWN: "Mexique," no date, *M. Pavon sn* [Sessé & Mociño] (G); "Guadeloupe," 1846, *M. Garnier sn* (P); "Peru," 1827, *M. Pavon sn* (P); in rupibus calcareis, August 1827, *H. Wydler 453* (G 2 sheets). CULTIVATED: Brooklyn Botanic Garden, 1 May 1923, *M. B. sn* (BH); Cornell University, April 1960, *H. Moore sn* (BH), G-285, 18 December 1962, *R. Clark sn* (BH), November 1956, *H. Moore 7172* (BH, US), G-763, 8 October 1964, *R. Clark sn* (BH), 2 August 1966, *L. Leva 38* (BH), G-857, 3 October 1969, *L. Skog 1411* (BH), 1 December 1965, *M. Stone 123* (BH), G-869, 18 March 1969, *J. Ambrose 121* (BH), 14 September 1966, *M. Stone 215* (BH, NA); Longwood Gardens, Acc. 5565, 7 December 1960, *J. Peele 408* (BH), 31 August 1961, *J. Peele 635* (BH).

DISCUSSION.—*Conradia cuneifolia* was described by A. P. de Candolle from the original Sessé and Mociño drawings, which are now missing. Until these are found, the tracings published by A. de Candolle in 1874 are considered as the types for his new species names. There is a specimen from the Moricand herbarium (now at Geneva) that closely matches the tracing of *Gesneria cuneifolia*. Although the collector on the sheet is given as Pavon, the specimen was probably collected by Sessé and Mociño in Puerto Rico and later became part of the Pavon herbarium.

The authority for the combination *Gesneria cuneifolia* was determined only after examining all of the available evidence concerning conflicting dates of publication. The combination was published twice in 1894 and both names could probably be traced back to the original drawings and collections made by Sessé and Mociño in Puerto Rico during their expedition to Nueva España (1787–1804). Stafleu (1967) gives the exact date for the publication of the part of *Die natürlichen Pflanzenfamilien* containing the new combination *Gesneria cuneifolia* (A. P. de Candolle) Fritsch as 7 August 1894. The second edition of *Flora Mexicana* by Sessé and Mociño was published in Mexico also sometime in 1894, but no information has been found to establish the exact month and date of publication, which might prove to be earlier. Until evidence is found that *Gesneria cuneifolia* of Sessé & Mociño has priority, the combination made by Fritsch is accepted as the earliest.

Gesneria cuneifolia has been introduced into cultivation and is widely grown in botanic gardens and as house plants. One collection of seed made

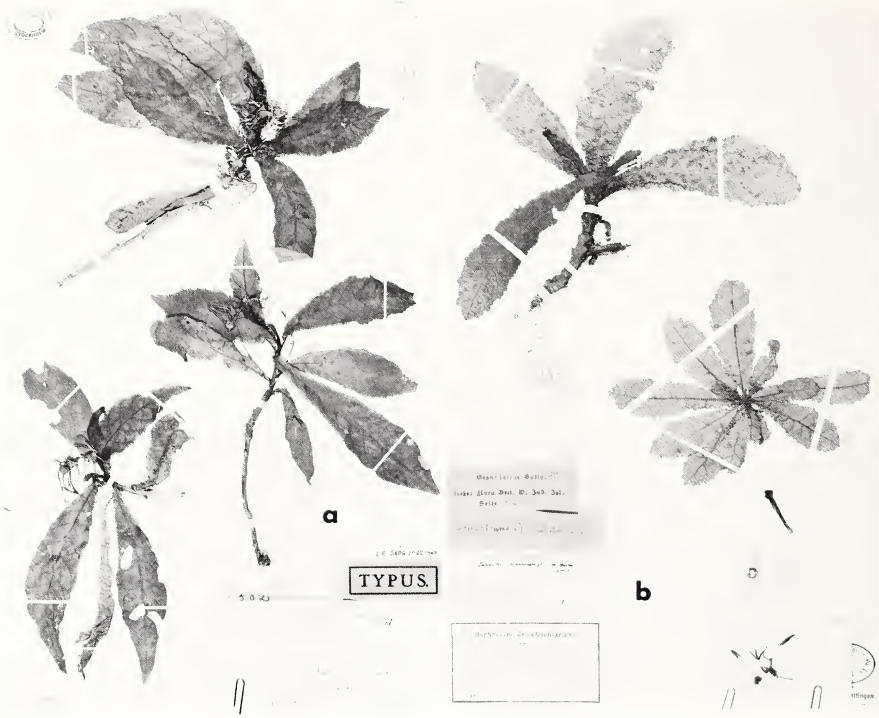

FIGURE 66.—Type specimens: *a*, holotype of *Gesneria hybocarpa* Urban & Ekman, *Ekman H4382* (S); *b*, lectotype of *Gesneria purpurascens* Urban, *Wright sn* (GOET). (Lectotype is upper plant.)

by T. Talpey in 1963 from Quebradillas gorge in Puerto Rico is available under the cultivar name 'Quebradillas.' Other color variants of *Gesneria cuneifolia* are grown but have not been given cultivar names. The chromosomes of two cultivated clones at Cornell University have been counted and found to be $n = 28$, the highest haploid number known in *Gesneria*.

31. *Gesneria hybocarpa* Urban & Ekman

Gesneria hybocarpa Urban & Ekman *in* Urban, Ark. Bot. 22A (10):76, 1929.

Subshrubs: stems woody, decumbent or suberect, up to 20 cm tall or rarely more, bark green, verruculose, and pilose when young, becoming gray, smooth and glabrescent with age; branches from the base, slender, 3–4 mm in diameter at 10 cm below the resinous apex, internodes up to 2 cm long.

Leaves alternate, not clustered: petioles sulcate or flattened, 1–6 mm long, ca 1 mm in diameter, green, verrucose and pilose-glandular; blades rhombic to oblanceolate, often falcate, 5.1–14.9 cm long, 1.9–4.2 cm wide, membranous, base cuneate or acute, margin serrulate to strongly serrate, occasionally shallowly undulate, apex acute or acuminate, adaxial surface green, subscabrous from remnants of scattered appressed white trichomes, abaxial surface lighter green,

pilose with sparse appressed white trichomes and scattered glands, veins prominent, verruculose.

Inflorescences numerous, each of 1–3 flowers: peduncles terete, up to 3.9 cm long, ca 1 mm in diameter, green, very sparsely pilose; bracts 2, linear-lanceolate, ca 1.5 cm long, ca 1 mm wide, green and pilose; pedicels terete, up to 3.2 cm long, ca 1 mm in diameter, green and pilose; floral tube obconic, 2–3 mm long, ca 2 mm in diameter, pilose and verrucose; calyx spreading, connate for ca 3 mm above apex of ovary, 5-lobed, each lobe narrowly triangular, 1.2–2.1 cm long, ca 2.5 mm wide at base, outside green, pilose with trichomes at margins appressed, veins 3, prominent, inside green and glabrous; corolla tube curved, up to 3 cm long, ca 2.5 mm wide at base, ca 8 mm broad below the middle and narrowing to ca 4.5 mm at the throat, dark red, essentially glabrous with a few trichomes near the limb, limb 5-lobed, each lobe semiorbicular, ca 0.5 mm long, margin erose, mouth oblique; stamens 4, adnate to base of corolla tube and reaching the mouth of the corolla. Stigma exerted 4 mm beyond corolla (vide Urban).

Capsule globose, 3–5 mm long, 4–6 mm in diameter, brownish, glabrescent, and verrucose, costae 10; seeds fusiform, twisted, ca 1 mm long, dark brown.

Type-Collection.—Anse-à-Foleur, Haiti, *E. Ekman H4382* (S, holotype, Figure 66*a*; EHH, IJ, K, NY, S, US, isotypes).

Distribution and Ecology.—*Gesneria hybocarpa* is known only from northern Haiti (Figure 54), where it grows on limestone cliffs. The type-collection with flowers was made in June.

Specimens Examined.—HISPANIOLA. Haiti. Département du Nord: Massif du Nord, Anse-à-Foleur, at Rivière St. Anne, 21 June 1925, *E. Ekman H4382* (S, holotype of *Gesneria hybocarpa* Urban & Ekman; EHH, IJ, K, NY, S, US 2 sheets, isotypes).

Discussion.—*Gesneria hybocarpa* is a poorly known species based on a single collection by Ekman (*H4382*). Only one mature flower was present on the material available, that on the holotype at Stockholm. The apparent sigmoid curve of the red corolla is similar in shape to the corollas of *G. acaulis* and *G. christii*. *Gesneria hybocarpa* differs from both in the prolonged connation of the calyx lobes above the attachment of the corolla to the floral tube, and in the verrucose petioles and floral tube.

32. *Gesneria libanensis* Linden ex Morren

Gesneria libanensis Linden ex Morren, Ann. Soc. Roy. Agric. Gand 2:361, pl. 84, October 1846.—Walp., Repert. Bot. Syst. 6:737, 1847.—W. Hook., Bot. Mag. 74: pl. 4380, 1848.—Fritsch, *in* Engl. & Prantl, Nat. Pflanzenfam. 4(3b):184, fig. 81D, 1894.—Urb., Symb. Ant. 2:381, 1901.—Morton *in* Leon & Alain, Fl. de Cuba 4:462, 1957.

Rhytidophyllum floribundum Lemaire, Fl. Serres Jard. Eur. 2: pl. 178, December 1846 [superfluous name].

Conradia floribunda Paxton, Paxton's Mag. Bot. 15:99, 1848. [Type: plate and description.]

Herincquia floribunda (Lemaire) Decaisne ex Herincq, Rev. Hort. ser. 3, 2:323, 1848.—Jacques & Herincq, Man. Gén. Pl. 2:562, 1850.—Lavallée, Horticulteur Franç. 1864:177, pl. 11, 1864.

Ophianthe libanensis (Linden ex Morren) Hanstein, Linnaea 26:205, pl. 1: fig. 33, 1854.

Conradia corrugata Grisebach, Mem. Amer. Acad. Arts, n.s. 8:526, 1862. [Type-collection: Monte Verde, Cuba, *C. Wright 1335* (GOET, holotype; BR, G, GH, K, MO, NY, P, PH, W, isotypes).]

Conradia libanensis (Linden ex Morren) Grisebach, Fl. Brit. W. Ind. 462, 1862 [pro parte as to Cuban material].—Griseb., Cat. Pl. Cub. 201. 1866 [pro parte].

Pentarhaphia libanensis (Linden ex Morren) Hanstein, Linnaea 34:292, 1865.

Pentarhaphia floribunda (Lemaire) Bentham & Hooker f. ex Carrière, Rev. Hort. 1878:30 and plate, 1878.—Anon., Gard. Chron. 1878 (2):593, 1878.

Gesneria hondensis Morren ex Jackson, Index Kewensis 1: 1024, 1893 [sphalm., non Humboldt, Bonpland & Kunth (1817–1818)].

Pentarhaphia corrugata (Grisebach) Gomez de la Maza, Anales Soc. Esp. Hist. Nat. 23:280, 1894.

Gesneria libanensis var. *corrugata* (Grisebach) Urban, Symb. Ant. 2:381, 1901.

Gesneria lopezii Morton, Brittonia 9:19, 1957.—Morton *in* Leon & Alain, Fl. de Cuba 4:462, 1957. [Type-collection: Oriente, Cuba, *C. Morton, M. Lopez F. & Alain Liogier 8759* (US, holotype; BM, isotype).]

Slow-growing subshrubs: stems woody, erect or pendent, to 60 cm tall, ca 3 mm in diameter at 10 cm below apex, bark rugose, or smooth, brown to gray, apex pilose, resinous; branches occasional, internodes 0.7 to 2.0 cm long.

Leaves alternate in a rosette, deciduous or persistent: petioles sulcate, 0.7–2.0 cm long, 1–2 mm wide, green, villous, blades oblanceolate, 1.9–16.0 cm long, 0.6–4.0 cm wide, membranous, base acute, margin crenate to serrate, occasionally irregularly undulate-lobulate, adaxial surface occasionally bullate, or smooth, dark green, glabrous or with appressed pubescence when young, becoming glabrescent and trichomes white with broad bases,

veins sunken, abaxial surface lighter green, trichomes occasionally reddish, appressed between veins, or glabrous, some veins prominent, pilose, diverging at an angle of ca 45°.

Inflorescences of 1–5 protandrous flowers, occasionally as long as the leaves: peduncles short, 0.2–2 cm long, sparsely pilose; bracts 2, linear, up to 2 cm long, ca 1 mm wide, green, pilose; pedicels 1.5–2.5 cm long, red or green, pilose; floral tube obconic or turbinate, ca 2 mm long, 2.0–3.5 cm wide, green, pilose to villous with reddish or colorless trichomes, costae 10; calyx 5-lobed, lobes connate ca 1–2 mm, erect, broadly triangular, 1.5–7.0 mm long, ca 1.0–2.5 mm wide at base of free part, margin entire, apex acute, outside green, sparsely pilose, glandular, reddish or colorless trichomes, becoming white, veins prominent, inside green, glabrous; corolla tube ventricose at the middle from a long attenuate base, 1.9–3.6 cm long, ca 2.5 mm at base, ca 8 mm wide above middle, 3–4 mm wide at throat, outside yellow at base, scarlet above, pilosity more dense toward limb, inside red or yellow, glabrous, mouth oblique, limb somewhat expanded, upper lobes exceeding lower lobes, suborbiculate, ca 2–3 mm long, 2–3 mm wide, sparsely pilose, margin dentate, lateral and basal lobes ca 1–2 mm long and wide, margin subentire, sparsely glandular; stamens 4, adnate for less than 1 mm to base of corolla tube, exserted about 2 mm beyond corolla mouth, filaments up to 3.0 cm long, yellow or red, glabrous, anthers oblong, ca 1 mm long, ca 0.5 mm wide, coherent in 2 pairs, staminode ca 3 mm long; inferior ovary pilose at apex with colorless or white trichomes, disc annular, 5-angled, style exserted beyond upper corolla lobes, to 4.0 cm long, yellow or red, glabrous, stigma clavate, recurved, papillate.

Capsule ovoid to globose, 3–5 mm long, 3–5 mm wide, green to brown or gray, pilose, dehiscing apically, costae 5 or 10; seeds fusiform, twisted, striated, less than 1 mm long, ca 0.25 mm wide, reddish-brown.

Type-Collection.—Mt. Liban, Oriente, Cuba, *J. Linden 1833* (GENT, lectotype, Figure 67; BM, BR, G, K, NY, P, W, isolectotypes).

Distribution and Ecology.—*Gesneria libanensis* grows in the Province of Oriente in Cuba (Figure 68) on damp limestone rocks and cliffs at 100–700 m elevation. Flowering collections have been made during every month of the year.

Specimens Examined.—CUBA. Province of Oriente: Sierra de Nipe, farallones de Cayo del Rey, 16 April 1940, *J. Carabia 3527* (NY, US); Cayo Rey, July 1943, *Bro. Clemente 2956* (US); Cayo del Rey, southwestern base of the Sierra de Nipe, ca 100 m, 7 January 1956, *C. Morton, Alain Liogier & M. Lopez F. 8759* (US, holotype of *Gesneria lopezii* Morton; BM, isotype); Sierra de Nipe, desfiladero del Río Bío, 16 September 1922, *E. Ekman 15113* (F, G, K, NY, S, US); Maceo, Cayo Rey, 30 January 1955, *M. Lopez F. 1787* (NY); Miranda, Sierra de Nipe, November 1940, *Bro. Leon 19510* (US 2 sheets); Bayate, Picote (in Sierra de Nipe), ca 550 m, 16 July 1916, *E. Ekman 7405* (G, K, NY, S); Bayate in decliv. mont. calcar. Picote, 14 March 1918, *E. Ekman 9148* (S); Picote in declivibus arduis, 14 November 1919, *E. Ekman 10112* (S); Monte Picote, near Palmito del Cauto, 400 m, 29 January 1956, *C. Morton 9669* (US 2, sheets); Florida Blanca, Alto Songo, 450 m, 19 January 1960, *Alain Liogier, J. Acuña & M. Lopez F. 7402* (US), 5 February 1954, *M. Lopez F. 1111* (LS), 9 February 1957, *M. Lopez F. 2854* (BH, US), 1 May 1957, *M. Lopez F. 2873* (US); Represa del Guaso,

Figure 67.—Lectotype specimen of *Gesneria libanensis* Linden ex Morren, *Linden 1833* (GENT).

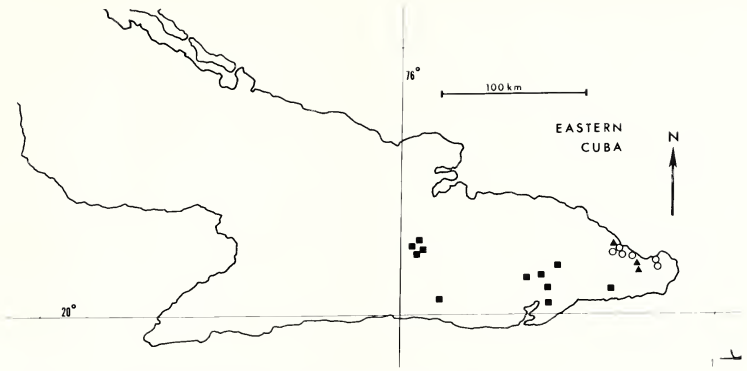

FIGURE 68.—Distribution of *Gesneria* section *Physcophyllon* in Cuba. (*G. libanensis* = solid squares; *G. purpurascens* = open circles; *G. reticulata* = solid triangles.)

28 December 1917, *Bros. Hioram & Angel 1510* (LS, NY); Guantánamo, Monte Libanon, San Fernandez, ca 700 m, 24 December 1919, *E. Ekman 10282* (G, K, NY, S); on cliffs, Monte Libano, 5 March [1861], *C. Wright 3080* (GH); Monte Liban, 1843–1844, *J. Linden 1833* (GENT, lectotype of *Gesneria libanensis* Linden ex Morren; BM 3 sheets, BR, G, K 2 sheets, NY, P 2 sheets, W 2 sheets, isolectotypes); Monte Verde, January–July 1859, *C. Wright 1335* (GOET, holotype of *Conradia corrugata* Grisebach; GH, isotype), 1859 or 1860, *C. Wright 1335* (BR, G 3 sheets, K, NY, P, PH, W); La Perla, 600–650 m, 6–18 February 1911, *J. Shafer 8547* (NY); La Alcachofa, Guantánamo, December 1934, *Bro. Hioram 8* (LS, NY); Yateras, January 1933, *Bro. Hioram 14076* (GH); banks of Río de Peña, Toa, near Dos Pasos, 400 m, December 1953, *Alain Liogier 3647* (GH, NY). LOCALITY UNKNOWN: Bayate de Monte-Rus, 24–25 February 1955, *M. Lopez F. 1979* (NY, US); 1861, *C. Wright 377* (=*3080*) (S).

DISCUSSION.—*Gesneria libanensis* Linden ex Morren was probably brought into cultivation by Linden, who collected plants from Cuba in 1844 and may have sent living plants or seeds to de Jonghe or Van Houtte (Lavallée, 1864). Within a few years the plant became well known in horticulture and was distributed under many different names. No material attributable to *Gesneria libanensis* is now known to be in cultivation.

Morren (1846) studied both cultivated material and the original collection by Linden, but unfortunately did not select a holotype. Many duplicates of *Linden 1833* exist. The specimens may not have been collected at the same time, because on the sheet at Vienna is written "1844 fl. en juin . . .," while on other sheets flowering is reported as occurring in May. The adequate sheet of *Linden 1833* at GENT has been chosen as lectotype. According to de Candolle (1880) the Linden collection is at the University of Ghent, but whether this is the main Linden herbarium is doubtful (Van Veken, in litt.).

For the application of the name *Conradia libanensis* sensu Grisebach, see the discussion under *Gesneria purpurascens* Urban.

The type of *Conradia corrugata* Grisebach, *C. Wright 1335,* was collected at Monte Verde, a coffee plantation north of Guantanamo. Wright spent many weeks at various times from 1857 through 1861 collecting in the area of Monte Verde (Underwood, 1905), thus, specimens numbered 1335 were probably collected at different times. Only those dated January–July 1859 can be considered part of the type-collection.

33. *Gesneria pedicellaris* Alain

Gesneria pedicellaris Alain, Mem. New York Bot. Gard. 21 (2):146, 1971.

Subshrubs: stems woody, erect or pendent, to 0.75 m long, ca 5 mm in diameter at 10 cm below apex, apex resinous, red or green, becoming brown, bark pilose to densely villous with red articulated

many-celled trichomes, appearing brown in dried specimens, glabrescent below, lenticels obscure; branches usually from the base, internodes usually very short, seldom to 2 cm long.

Leaves alternate, usually congested at apex of stem: petioles sulcate, 0.3–1.6 cm long, 1–2 mm wide, usually red, villous with numerous short glands; blades oblanceolate or obovate, falcate, 3.7–16.4 cm long, 1.0–4.2 cm wide, membranous, base cordate, obtuse or cuneate, margin crenate to grossly serrate, apex acute, adaxial surface light or dark green, nitid, scabrous with appressed broad-based white trichomes, veins impressed, abaxial surface lighter green, villous along the red or yellow-green prominent veins, stomata sometimes in groups.

Inflorescences axillary, shorter than, equal to, or longer than the subtending leaves, 1- to 4-flowered, erect: peduncles terete, 0.8–10.2 cm long, 1–2 mm in diameter, green or reddish, villous; bracts linear, 1.2–3.0 cm long, ca 1 mm wide, green, pilose, primary pedicels 1.5–2.5 cm long, secondary pedicels 2.5–5.6 cm long, ca 1 mm in diameter, green or red, villous; floral tube obconic, ca 2 mm long, 2.0–3.5 mm wide, yellow, green, or red, villous, 10-ribbed; calyx 5-lobed, lobes connate for ca 1–2 mm, erect, linear to lanceolate, 0.4–1.4 cm long, 2–3 mm wide at base, outside green, sparsely velutinous, 3-nerved, inside green, glabrous; corolla tube curved slightly above the base and curved (Figure 16*f*) slightly downward above the inflated middle, sparsely velutinous, 1.9–3.5 cm long, base ca 4 mm in diameter, yellow, middle 5–9 mm in diameter, red-orange, narrowing to 3.5–5.0 mm in diameter at the red throat, becoming dark red on the limb, inside yellow-orange, glandular-pubescent, limb 5-lobed, oblique, lobes erect, orbiculate, erose to serrate, upper lobes ca 2 mm long, 3 mm wide, lateral lobes ca 1 mm long, ca 2 mm wide, basal lobe ca 1.5 mm long, ca 2 mm wide; stamens 4, not exserted at anthesis, filaments linear, curved, slightly shorter than corolla tube, adnate at the base for ca 1 mm, yellow to white, glabrous, except pubescent near middle, anthers oblong, ca 1.5 mm long, ca 1 mm wide, coherent in 2 pairs, pollen yellow, grains isopolar, prolate, size small (22.2 μm long at the polar axis, 10.6 μm wide at the equatorial axis), tricolpate, colpi 20.6 μm long, apocolpia rounded (Figure 17*b*), sexine heterobrochate, reticulate, lumina ca 0.3 μm across, muri to 0.5 μm wide; staminode ca 5 mm long; ovary completely inferior, white villous at apex, disc 5-angled, 2 mm wide, white to reddish, glandular, style exserted longer than corolla tube, curved, up to 3.5 cm long, white, pubescent near base, stigma clavate, papillate.

Capsule globose, persistent calyx lobes reflexed, 3–4 mm long, 4–5 mm wide, brown, pilose to glabrescent, costae 10, dehiscent at the apex; seeds striated, ca 0.5 mm long, 0.2 mm wide, tawny, nitid.

TYPE-COLLECTION.—Near Abreu, Dominican Republic, *Alain Liogier 16150* (NY, holotype, Figure 69; F, GH, IJ, P, US, isotypes).

DISTRIBUTION AND ECOLOGY.—*Gesneria pedicellaris* is known only from the north coast of Dominican Republic (Figure 54), where it grows on shaded steep limestone cliffs at elevations from near sea level to ca 50 m. Flowering collections have been made of this species in the wild during January to March, July, and September. In the greenhouse plants bear flowers throughout the year.

SPECIMENS EXAMINED.—HISPANIOLA. DOMINICAN REPUBLIC. Province of Maria Trinidad Sánchez: ca 2 km W of Abreu, ca 50 m, 8 July 1970, *L. Skog 1589* (BH, US 2 sheets); near Abreu, about sea level, 28 September 1969, *Alain Liogier 16150* (NY, holotype of *Gesneria pedicellaris* Alain, consisting of two sheets; F 2 sheets, US, isotypes); near Cabrera, ca 100 m, 28 September 1969, *Alain Liogier 16154* (NY, US); El Diamante, Cabrera, about sea level, 21–23 January 1972, *Alain Liogier 18467* (NY); near la playa del Diamante, between Julia Molina and Cabrera, 1 March 1953, *J. Jiménez 2563* (BH, E, RDJ, US); between La Entrada and Abreu, 19 February 1965, *T. Talpey 33* (BH, E, US); El Diamante, north from Nagua, 19 February 1965, *T. Talpey & J. Jiménez 5120* (BH, RDJ, US), *T. Talpey 5120* (NY). CULTIVATED: Cornell University, G-898, 5 October 1969, *L. Skog 1415* (BH), 23 June 1966, *M. Stone 132* (BH); G-1226, 5 October 1969, *L. Skog 1409* (BH), 3 November 1970, *L. Skog 1749* (BH); G-1395, 14 March 1972, *L. Skog 1819* (BH).

DISCUSSION.—*Gesneria pedicellaris* (introduced by T. Talpey in 1965) was available in the horticultural trade long before it was described as a new species. The plants, however, were distributed as either *G. christii* Urban, native to southern Haiti, or *G. barahonensis* Urban, from southern Dominican Republic, both of which *G. pedicellaris* resembles. *Gesneria pedicellaris* can be distinguished from both by the scabrous leaves and the bracts more than 1.2 cm long, from *G. barahonensis* by the corolla tube more than 1.9

FIGURE 69.—Holotype specimens of *Gesneria pedicellaris* Alain, *Alain Liogier 16150* (NY).

cm long, and from *G. christii* by the erect orientation of the flowers in living material and by the leaf margin, which is crenate or serrate, not lobulate.

A few hybrids have been produced with species not closely related to *Gesneria pedicellaris* (see Table 7). Backcrosses to the parents have not been successful (Table 8). The hybrid plants (G-1231, G-1239, G-1245, G-1420) appear intermediate in most morphological characters, but due to their large size, none of the hybrids are likely to have horticultural potential.

34. *Gesneria purpurascens* Urban

Gesneria purpurascens Urban, Symb. Ant. 2:380, 1901.—Morton *in* Leon and Alain, Fl. de Cuba 4:461, 1957.

Gesneria yumuriensis N. Britton & P. Wilson, Mem. Torrey Bot. Club 16:109, 1920 ["yamuriensis"].—Morton *in* Leon and Alain, Fl. de Cuba 4:462, 1957. [Type-collection: Near Río Yamurí, Cuba, *J. Shafer 7786* (NY, holotype; US, isotype).]

Slow-growing subshrubs: stems woody, erect or pendent to ca 20 cm tall, 1 cm in diameter at 10 cm below apex, bark smooth and villous to rugose and glabrescent, green or reddish above, becoming brown to gray, apex slightly resinous; branches few, internodes to 0.9 cm long.

Leaves alternate, usually closely spaced in a rosette: petioles subsulcate, 0.3–2.0 cm long, 1–2 mm wide, green or reddish, villous with reddish or tawny trichomes; blades spathulate or narrowly obovate, broadest beyond the middle, seldom falcate, 3.9–21.9 cm long, 1.8–5.0 cm wide, mem-

branous, base cuneate to cordate, margin crenate, apex acute or obtuse, adaxial surface strongly bullate, dark green, glandular pubescent when young, glabrescent with age, trichome bases enlarged and white, lateral veins diverging from the midvein at an angle usually greater than 45°, abaxial surface lighter green, with appressed white hairs between veins, veins prominent, trichomes on veins red or green.

Inflorescences of several flowers, about one-fifth the length of the subtending leaves: peduncles very short, ca 5 mm long, bracts linear, ca 1.5 cm long, ca 1 mm wide, reddish, pilose, pedicels 0.8–2.5 cm long, reddish, pilose to villous; floral tube obconic or turbinate ca 2 mm long, 2–3 mm wide, reddish, villous, costae obscure; calyx lobes 5, erect, connate 1–2 mm at base, each narrowly triangular, 0.4–1 cm long, ca 2 mm wide at base of free part, margin entire, apex acute, curved, outside red, sparsely pilose, 3-nerved, inside red, glabrous, but glandular; corolla tube ventricose at middle from a narrow base, 2.8–3.3 (–4.0) cm long, 2–3 mm in diameter at base, broadening to ca 9 mm above middle, then narrowing to 2.5–4.0 mm at throat, outside yellow at base with red lines, scarlet above, more densely pilose toward apex, inside yellow or with red lines, glabrous, mouth oblique, limb slightly expanded, lobes orbiculate, usually suberose to erose, rarely subentire, upper lobes ca 2–4 mm long, ca 3 mm wide, lateral lobes ca 1.5 mm long, ca 2 mm wide, basal lobe ca 1 mm long, ca 2 mm wide, dark red, glandular, becoming stipitate-glandular at the margin; stamens 4, shortly adnate to base of corolla tube, barely exserted beyond mouth to ca 2 mm, filaments ca 3 cm long, yellow, glabrous, anthers oblong, 1.0–1.5 mm long, 0.5–1.0 mm wide, yellow, coherent in pairs, staminode ca 6 mm long; ovary inferior, apex pilose, disc annular, 5-angled, style exserted, ca 3.2 cm long, curved at apex, yellow or reddish, sparsely pubescent at base, stigma clavate, papillate.

Capsule broadly turbinate, ca 3–4 mm long, ca 6 mm wide, gray-brown, pilose or glabrescent, dehiscing at the apex, costae 5 or 10; seeds fusiform, striate, ca 1 mm long, ca 0.5 mm wide.

Type-Collection.—Oriente, Cuba [1860–1864], *C. Wright 3080* (BM, G, K, MO, P); Baracoa, Oriente, Cuba [1861], *C. Wright, sn* (GOET, lectotype; Figure 66*b*).

Distribution and Ecology.—*Gesneria purpurascens* is known from near the northern coast of the Province of Oriente in Cuba (Figure 68), where it grows in moist places on limestone cliffs from near sea level to 400 m elevation. Flowering specimens have been collected in November through April and August.

Specimens Examined.—CUBA. Province of Oriente: northern slope of El Yunque de Baracoa, 300 m, 2 January 1960, *Alain Liogier & M. Lopez F. 7178* (US), 14 January 1960, *Alain Liogier & J. Acuña 7533* (US); near the base of El Yunque de Baracoa, toward the east, ca 300 m, 14 January 1960, *Alain Liogier & J. Acuña 7541* (US), *7546* (US); El Yunque de Baracoa, 300 m, 14 January 1960, *Alain Liogier & J. Acuña 7696* (US); side and top of El Yunque, 20 December 1910, *J. Shafer 7894* (NY); on rocks by Río Macaguanigua, 20 March 1931, *L. Bailey 15153* (BH); Baracoa ad Río Macaguanigua, 19 January 1915, *E. Ekman 4328* (G, K, NY, S); Baracoa, March 1903, *L. Underwood & F. Earle 235* (NY); vicinity of Baracoa, 18 February, 11 March 1910, *J. Shafer 3916* (F, NY 2 sheets, US); Santiago, vicinity of Baracoa, 24–29 January 1902, *C. Pollard, E. Palmer & W. Palmer 42* (CU, F, GH, MO, NY, PH, US); Mata, Baracoa, 14 January 1956, *Alain Liogier & C. Morton 5101* (GH); Bahia de Mata, Baracoa, 1 February 1952, *J. Acuña & Diaz Barretó 17379* (SV, US); ad Mata Bay, 26 November 1914, *E. Ekman 3653* (NY, S); Abra del Yumurí, Baracoa, *Alain Liogier & C. Morton 5092* ([13 April 1956] GH, [13 January 1956] IJ); Río Yumurí, entre Baracoa y Maisi, 26 August 1939, *Bro. Leon 17249* (US 2 sheets); cliffs near the mouth of the Río Yumurí, east of Baracoa, near sea level, 13 January 1956, *C. Morton & Alain Liogier 9023* (BM, US 2 sheets), *9038* (BM, US); Yumurí prope Baracoa, 25 November 1914, *E. Ekman 3636* (F, G, K, S, US); near Rio Yamurí (sic), 6, 8 December 1910, *J. Shafer 7786* (NY, holotype of *Gesneria yumuriensis* N. Britton & P. Wilson; US, isotype); Baracoa, 1861, *C. Wright sn* (GOET, lectotype of *Gesneria purpurascens* Urban); [locality unknown] 1860–1864, *C. Wright 3080* (BM, G 3 sheets, GH, K, MO, P, isolectotypes).

Discussion.—The typification of *Gesneria purpurascens* Urban is complex and probably involves four taxa. In 1846, Morren described *Gesneria libanensis,* ostensibly from cultivated material, but cited *Linden 1833* from Monte Liban, Cuba, as the type. Grisebach, in 1862, made a new combination, *Conradia libanensis,* based on Morren's description, but misapplied the name to Jamaican and Haitian plants citing collections by MacFadyen and Lane (now at Kew) from Jamaica. In 1866, Grisebach applied the name *Conradia libanensis* to *Linden 1833* and *Wright 3080.* Although, *C. Wright 3080,* found in many herbaria, is usually a mixed collection, one

part is truly *Gesneria libanensis* Linden ex Morren. In 1901, Urban realized the disparity between the Wright collection and the species described as *Gesneria libanensis*. Urban's solution follows: (1) the misapplied 1862 name for the Jamaican plants he placed under a new variety of *Gesneria acaulis* Linnaeus; (2) he cited Grisebach's 1866 use of *Conradia libanensis* under *Gesneria libanensis* Linden ex Morren, excluding the 1862 interpretation; and (3) he described a new species, *Gesneria purpurascens*, based on that part of *Wright 3080* collected in 1861 at Baracoa. Later Urban (1912), in an observation under *Gesneria barahonensis* Urban, cited *Conradia libanensis* sensu Grisebach as to the Haitian plants mentioned by Grisebach in 1862, but wrote that he had not seen the Grisebach material. Subsequent search for material from Hispaniola annotated by Grisebach as *Conradia libanensis* has not been successful.

The specimen Urban designated as the type was probably at Berlin and is no longer extant. No other material of *Wright 3080* from Baracoa, dated 1861, has been found. Wright apparently numbered his specimens by taxon rather than by collection, and he rarely supplied collection data on the sheets. Only one Wright collection of *Gesneria purpurascens*, from Baracoa, 1861, has been found annotated by Urban, but unfortunately it bears no collection number. In view of Wright's haphazard numbering system, this specimen (at Göttingen) was very likely part of the type gathering and is here selected as lectotype to stabilize the nomenclature.

The type of *Gesneria yumuriensis* N. Britton & P. Wilson, *J. Shafer 7786*, differs from typical specimens of *Gesneria purpurascens* only in being more glabrescent and resinous. In all other characters the species are identical. Specimens of both species have been collected from the type-locality of *Gesneria yumuriensis* and show a range in pilosity.

35. *Gesneria reticulata* (Grisebach) Urban

Gesneria reticulata (Grisebach) Urban, Symb. Ant. 1:478, 1900 & 2:378, 1901 [pro parte, as to basionym].
Conradia reticulata Grisebach, Cat. Pl. Cub. 201, 1866.
Conradia reticulata β *obovata* Grisebach, Cat. Pl. Cub. 201, 1866. [Type-collection: Yunque de Baracoa, *C. Wright sn* (GOET, holotype).]
Pentarhaphia reticulata (Grisebach) Gómez de la Maza, Anales Soc. Esp. Hist. Nat. 23:280, 1894.
Pentarhaphia reticulata β *obovata* (Grisebach) Gómez de la Maza, Anales Soc. Esp. Hist. Nat. 23:280, 1894.
Gesneria cuneifolia var. *obovata* (Grisebach) Morton, Brittonia 9:19, 1957.
Gesneria cuneifolia var. *disjuncta* Morton, Brittonia 9:19, 1957. [Type-collection: Río San Juan, Dominican Republic, *G. Miller 1244* (US, holotype).]

Subshrubs: stems herbaceous or seldom woody, erect, to 20 cm tall, 2–4 mm in diameter at 5 cm below apex, green or reddish, glandular-resinous at apex, becoming brown to gray below; branches from near the base, internodes to 1.6 cm long, leaf scars prominent above.

Leaves alternate, rosulate or clustered at apex or spread along rapidly growing stems: petioles sulcate, broad, 1–3 mm long, ca 2 mm wide, green or reddish, glandular-pubescent or glabrous; blades oblanceolate, ovate, obovate or spathulate, 1.8–11.4 cm long, 0.7–5.2 cm wide, membranous, smooth or bullate and wrinkled especially at the midvein, base cordate to cuneate, margin entire to serrulate to grossly dentate, often ciliate, apex acute, rounded or rarely emarginate, adaxial surface light to dark green, glabrous or with sparse appressed trichomes, rarely pilose toward the base, abaxial surface lighter green or reddish, glabrous or with sparse appressed pubescence, veins prominent and strongly arching, stomata scattered.

Inflorescences cymose, of 1–3 flowers, usually ca two-thirds the length of the subtending leaves: peduncles terete, 1–7 mm long, usually short, ca 1 mm in diameter, green or red, glandular; bracts linear or oblanceolate, 3–7 mm long, ca 1–2 mm wide, green or red, glabrous; margin entire or serrate, pedicels terete, 1.5–5.4 cm long, ca 1 mm in diameter, green or red, glabrous; floral tube broadly obconic, 2–3 mm long, 4–7 mm wide, green or red, glabrous, alate; calyx 5-lobed, porrect to patent, lobes connate ca 1.5 mm at the base, ovate, 4–7 mm long, ca 2 mm wide at base, 2–4 mm wide at middle, apex acute, margin entire, occasionally ciliate; outside green or reddish, glabrous or sparsely pilose, with 3 prominent veins, inside green or reddish, glabrous; corolla tube cylindric, with a slight bend at throat, tube 1.1–2.7 cm long, 2.5–3.2 mm wide at base, not gibbous, 2.5–3.5 mm at middle, not ventricose, 3.5–4.5 mm in diameter at throat, outside red, orange-red, or

pallid yellow, pilose, inside yellow to orange, glabrous, limb flaring to patent, 1.0–2.1 cm wide, sparsely pubescent, lobes 5, serrate or notched, upper lobes obovate, 5–6 mm long, 6–7 mm wide, lateral lobes 5–6 mm long, 4–6 mm wide, basal lobe 4–6 mm long, 5–8 mm wide; stamens 4, adnate for less than 1 mm to base of corolla tube, not exserted, filaments slightly curved, 0.9–2.4 cm long, reddish, yellow, or white, glabrous, anthers oblong, ca 1.5 mm long, 1 mm wide, coherent in two pairs; ovary completely inferior, apex pilose, disc 5-angled, unlobed, yellow, glabrous, style curved, 1.0–1.8 cm long, reddish, yellow to white, glabrous, stigma clavate.

FIGURE 70.—Type specimens: *a*, isotype of *Conradia reticulata* Grisebach and *Gesneria reticulata* (Grisebach) Urban, *Wright 3081*, including label bearing number 3081 (GH); *b*, isotype of *Conradia reticulata* β *obovata* Grisebach (= *Gesneria reticulata*), *Wright sn* (GH).

Capsule erect, broad to globose, ca 3–5 mm long, 4–8 mm wide, brown to gray, glabrous, dehiscing at the apex, costae prominent, persistent sepals patent; seeds broadly fusiform, twisted, ca 0.5 mm long, 0.25 mm wide, reddish-brown to black, nitid.

TYPE-COLLECTION.—Yunque de Baracoa, Cuba, *C. Wright 3081* (GOET, holotype; BM, G, GH (Figure 70*a*), K, isotypes).

DISTRIBUTION AND ECOLOGY.—Of all known species of *Gesneria*, *G. reticulata* is the most widespread with a center of distribution in the mountains of Hispaniola and outliers in the Oriente Province of Cuba and in the Luquillo Mountains of eastern Puerto Rico (Figures 54, 65, and 68). Its habitat is usually wet woods, near or at the edge of streams and waterfalls on igneous or limestone rocks from 80 to 1200 meters elevation. This species has been collected with flowers in all months except September. In cultivation, plants may flower continuously.

SPECIMENS EXAMINED.—CUBA. PROVINCE OF ORIENTE: Taco Bay, 5 December 1914, *E. Ekman 3753* (S); on the road to Quibiján, Baracoa, 80 m, 1 January 1960, *Alain Liogier* & *M. Lopez F. 7151* (US); N of El Yunque, Baracoa, 150 m, 13 January 1960, *Alain Liogier* & *J. Acuña 7609* (US); inner valley of El Yunque, Baracoa, ca 500 m, 14 January 1960, *Alain Liogier* & *J. Acuña 7543* (US); at the base of El Yunque de Baracoa, 200 m, 2 January 1960, *Alain Liogier* & *M. Lopez F. 7247* (US); El Yunque in rupibus calcareis, 17–18 December 1914, *E. Ekman 3912* (S); slopes and summit of El Yunque, near Baracoa, 1000–2000 ft, 30–31 January 1902, *C. Pollard* & *W. Palmer 137* (CU, F, GH, MO, NY, PH, US); El Yunque Mt., Baracoa, March 1903, *L. Underwood* & *F. Earle 622* (NY), *690* (NY), *1062* (NY); Yunque de Baracoa, June [1861], *C. Wright sn* (GOET, holotype of *Conradia reticulata* β *obovata* Grisebach; GH, isotype); Arroyo Frio, Sra. de Imías, So. Baracoa, 950 m, 17 July–4 August 1924, *Bro. Leon 12180* (GH, NY, US). LOCALITY UNKNOWN: "Cuba," 1860–1864, *C. Wright 3081* (GOET, holotype of *Conradia reticulata* Grisebach; BM, G, GH, K, isotypes). HISPANIOLA. HAITI. Département du Sud: Morne de la Hotte, ca 800 m, 10 June 1917, *E. Ekman H132* (C, S); Riviére Glace, 750 m, 6 August 1945, *L. Holdridge 2184* (US); Massif de la Hotte, group Morne Rochelois, Miragoane, on the path Lebrun to Quatre-Chemins, ca 700 m, 30 March 1927, *E. Ekman H7923* (S); Département du Nord: Massif du Nord, Port-de-Paix, top of Haut Piton, 1100–1205 m, 6 April 1925, *E. Ekman H3711* (EHH, S, US); vicinity of St. Louis du Nord, 30 March–7 April 1929, *E. Leonard* & *G. Leonard 14245* (GH, K, MO, NY, US), 2 April 1929, *E. Leonard* & *G. Leonard 14248* (US), 6 April 1929, *E. Leonard* & *G. Leonard 14472* (US); Massif du Nord, Bayeux, top of Morne Brigand, 900–1150 m, 20–21 December 1924, *E. Ekman*

H2972 (S); Port Margot to Correil, 1200–1500 ft, 7 August 1903, G. *Nash 196* (NY); ravine NW of Marmelade, 2230 ft, 3 August 1905, G. *Nash* & *N. Taylor 1353* (NY). Département de l'Ouest: Morne Fourmi, 900 m, June 1905, *W. Buch 765* (IJ); Massif de la Selle, Croix-des-Bouquets, Badcau, ca 1200 m, 14 March 1927, *E. Ekman H7851* (A, S); Massif de la Selle, Port-au-Prince, Morne Malanga, ca 1200 m, 27 January 1926, *E. Ekman H5457* (EHH, F, G, GH, IJ, NY, S, US). DOMINICAN REPUBLIC. Province of Pedernales: Agua Negra, Sierra de Bahoruco, 23 March 1967, *E. Marcano 5274* (NY, RDJ); Agua Negra, 750 m, 22 March 1967, *T. Talpey 77* (BH); Agua Negra, Sierra del Baoruco, 800 m, 17 February 1969, *Alain Liogier 13949* (NY). Province of Barahona: Cañada Maluca, above Barahona, 27 July 1952, *R. Howard 12192* (A, US); 1912, *M. Fuertes 1411b* (K). Province of Monte Cristi: Distr. of Sabaneta, bank of Río Cidra, 5–600 m, 30 November 1930, *E. Valeur 569* (US). Province of Santiago: overlooking Río Antonzape Malo, Mata Grande, San José de las Matas, 1000 m, 1–7 October 1968, *Alain Liogier 12965* (NY); Arroyo del Toro, Tamboril, 20 February 1965, *E. Marcano* & *J. Jiménez 5121* (E, NY, RDJ, US); Arroyo del Toro, February 1965, *T. Talpey 35* (BH). Province of La Vega: Casabito, 6 April 1968, *E. Marcano* & *T. Talpey 5394* (NY, RDJ); Casabito, 10 April 1968, *E. Marcano* & *T. Talpey 5428* (NY, US 2 sheets); 22 km E of El Río along road toward the Santiago–Sto. Domingo Hwy, 900 m, 12 August 1970, G. *Davidse 2660* (BH, MO); road from Bonao to Constanza, 1000 ft, 29 May 1970, *M. Meagher 295* (USF); ca 20 km from El Río near road from Bonao to El Río, 16 July 1970, *L. Skog 1606* (BH, US 2 sheets); Piedra Blanca, 10 December 1947, *H. Allard 17795* (US); 19 January 1948, *H. Allard 18902* (BH, US); near Piedra Blanca, at km 73 of the Carretera Duarte, ca 200 m, 12 February 1929, *E. Ekman H11544* (K, S, US); banks of Maimon river, 13 April 1954, *J. Jiménez 2607* (E, US); near Río Maimon, along the road from Piedra Blanca to Maimon, ca 500 m, 6 July 1970, *L. Skog 1586* (BH, US). Province of Puerto Plata: Gurabito de Yaroa, coffee plantations and woods, Yaroa valley, 350–500 m, 1 May 1968, *Alain Liogier 11028* (NY); Cordillera de Yaroa, limestone ridge facing Yaroa valley, 800–850 m, 11 May 1968, *Alain Liogier 11234* (F, NY, USF). Province of Duarte: Quita Espuela, vicinity of San Francisco de Macorís, 400–1000 m, 5–17 April 1922, *W. Abbott 2087* (IJ, NY, US). Provinces of Espaillat or Maria Trinidad Sánchez: Río San Juan, 22 March 1928, G. *Miller 1244* (US, holotype of *Gesneria cuneifolia* var. *disjuncta* Morton). Province of San Cristóbal: Cabirma de la Loma, 600 m, 28 November 1970, *Alain Liogier 17752* (NY); Cabirma de la Loma, 19 March 1967, *E. Marcano 5207* (BH, NY, RDJ); Cabirma de la Loma, NW of San Cristóbal, 2000 ft, 9 April 1968, *T. Talpey 92* (BH); Los Guineos, San Cristóbal, 24 March 1958, *E. Marcano* & *J. Jiménez 3656* (RDJ, US). Province of Samaná: Yuna river, 28 February 1963, *Bro. Basilio Augusto 736* (NY). Province of El Seibo: Liali, banks of Rio Lajiagua, 100–500 m, 8–20 February 1923, *W. Abbott 2623* (NY, US). LOCALITY UNKNOWN: "St. Domingo," 1857, *R. Schomburgh sn* (K). PUERTO RICO: Sierra de Luquillo, in monte Jiménes, 17 July 1885, *P. Sintenis 1343* (BM, G 3 sheets, GH, GOET, K, L, LD, M, P, S, UCWI, US); El Yunque, 6 October 1963, *T. Talpey 12* (US); El Yunque forest, km 10 on Route 191, 12 February 1965, *T. Talpey 25* (BH, US); at km 10 on Palmer to Florida road through Luquillo Mts., 15 August 1963, *R. Wagner 353* (A); on the sides of the waterfall at marker 10.2 km on P.R. Hwy 191, in the Caribbean National Forest (Luquillo Experimental Forest), 500 m, 5 June 1970, *L. Skog 1517* (BH), 20 August 1970, *L. Skog* & *J. Skog 1644* (BH); km 14 of Route 191 through Luquillo Mts., 3 April 1965, *R. Howard* & *L. Nevling 15775* (A, US). CULTIVATED: Cornell University, G-784, 7 October 1964, *R. Clark sn* (BH), 3 October 1969, *L. Skog 1412* (BH), 16 February 1966, *M. Stone 117* (BH, NA); Cornell University, G-897, 5 October 1969, *L. Skog 1413* (BH), 22 December 1967, *M. Stone 350* (BH).

DISCUSSION.—Plants of *Gesneria reticulata* have been brought from Puerto Rico and the Dominican Republic and grown at Cornell University under the accession numbers G-784 and G-897, respectively. The plants from Puerto Rico available in the horticultural trade under the name *Gesneria cuneifolia* 'El Yunque' were first collected at El Yunque peak in the Luquillo Mountains by Talpey in 1963 (Talpey, 1966). As a cultivar 'El Yunque' was first validly published in 1966 by Katzenberger (as *Gesneria cunefolia* var. 'el Yunque' [sic]). 'El Yunque' has been erroneously misapplied (Elbert, 1973) to plants in cultivation but probably originally collected by McKee from near Florida in central Puerto Rico. The latter plants are part of *Gesneria cuneifolia,* while cv. El Yunque correctly refers to cultivated material of *Gesneria reticulata.*

Section 7. *Dittanthera* (G. Don) L. Skog, new transfer

Conradia section *Dittanthera* G. Don, Gen. Syst. 4:650, 1838.
Pentarhaphia section *Codonoraphia* (Ørsted) Bentham *in* Bentham & Hooker, Gen. Pl. 2:1005, 1876.
Pentarhaphia section *Vaupellia* (Grisebach) Bentham *in* Bentham & Hooker, Gen. Pl. 2:1005, 1876.
Gesneria section *Codonoraphia* (Ørsted) Fritsch *in* Engler & Prantl, Nat. Pflanzenfam. 4 (3b):184, 1894.

Shrubs or trees: stems erect, to 8 m tall; branches from the base and from the upper leaf axils.

Leaves lanceolate, elliptic to obovate, occasionally falcate or oblanceolate, membranous to subcoriaceous, plane to subbullate, glossy.

Inflorescences 1- to 4-flowered, exceeding the subtending leaves; corollas infundibuliform-campanulate, green, yellow, reddish-brown, or rose;

stamens long-exserted, or extending only to the corolla mouth.

Capsule turbinate or elongate, costae prominent.

LECTOTYPE-SPECIES.—*Gesneria exserta* Swartz.

DISCUSSION.—The ancestral stock of section *Dittanthera* probably included plants similar to those now found in section *Pentarhaphia*. From this ancestral source of fruticose, hummingbird-pollinated plants, *Dittanthera* may have evolved as a response to bat-pollination mechanisms. In habit and vegetative characters, this section resembles sections *Pentarhaphia, Lachnoblaste*, and *Myrmekianthe*.

The species in section *Dittanthera* appear to be distinct from each other by combinations of characters and are separated geographically. Any one of the characters may be found in more than one of the species, but not always in the same combinations. The large number of taxa in this section have probably evolved due to the high concentration of possible pollinators in the small land area in Jamaica and the other islands.

To stabilize the concept of section *Dittanthera, Gesneria exserta*, one of the species included in Don's circumscription, is here selected as lectotype species.

36. *Gesneria alpina* (Urban) Urban

Gesneria alpina (Urban) Urban, Symb. Ant. 5:498, 1908.—Adams, Fl. Pl. Jamaica 681, 1972.

Gesneria calycosa var. *alpina* Urban, Symb. Ant. 2:376, 1901.

Shrubs: stems woody, spreading, bark rugose, gray-brown, to 6 m tall, verrucose, lenticels elongated; branches 5 mm in diameter at 30 cm from the apex, lower branches to 6.1 m long (fide Stearn), nodes enlarged, leaf scars prominent.

Leaves alternate or approximate: petioles sulcate, 0.7–1.5 cm long, 1–2 mm wide, green to brown, glabrous, verrucose to smooth; blades ovate to obovate, occasionally falcate, 6.0–11.4 cm long, 3.5–4.7 cm wide, membranous, base acute or rounded, margin serrate to dentate, apex acuminate, adaxial surface dark green, glabrous, abaxial surface lighter green, glabrous, veins prominent, verrucose.

Inflorescence 1-flowered, in leaf axils near branch apices: peduncles terete, 1.0–1.6 cm long, 1–2 mm in diameter, glabrous, resinous; bracts 2, linear, 4 mm long, less than 1 mm wide, brownish, resinous; pedicels 3.1–3.9 cm long, 1–2 mm in diameter, wider toward the apex, green, glabrous; floral tube turbinate, ca 4 mm long, 7 mm in diameter, glabrous, resinous; calyx lobes 5, connate for less than 1 mm at base, each lobe sulcate at base, 1.5–1.9 cm long, 2–3 mm wide at the base, outside dark green, glabrous, resinous, inside pilose, resinous; corolla campanulate, tube 1.5–2.5 cm long, 6 mm wide at the base, expanding to ca 2 cm wide at mouth, both sides yellow, glabrous, resinous, limb 5-lobed, each lobe glandular, upper lobes ca 8 mm long, 6 mm wide, margin dentate, lateral and basal lobes ca 8 mm long, 9 mm wide, margin subentire; stamens 4, shortly adnate to corolla base, not exserted, filaments linear, ca 16 mm long, pale yellow, glabrous, glandular, anthers oblong, 2 mm long, 1 mm wide, red or brown on back, glandular; ovary inferior, disc annular, 4 mm long, yellow, puberulent with glandular trichomes, style ca 2.3 cm long, exserted, green, puberulous, glandular, stigma stomatomorphic.

Capsule turbinate, dehiscing into four valves, ca 1.0 cm long, 8 mm wide, green to gray, glabrous, costae 5; seeds fusiform, twisted, ca 1 mm long, red to brown (Figure 19*m*).

TYPE-COLLECTION.—Near Blue Mountain Peak, Jamaica, *W. Harris 7547* (BM, lectotype, Figure 71*a*; GH, K, NY, UCWI, isolectotypes).

DISTRIBUTION AND ECOLOGY.—*Gesneria alpina* is known only from the parishes of St. Andrew and St. Thomas in eastern Jamaica (Figure 72) at high elevations of 1100–2200 m. Its habitat is usually limestone soil in deeply shaded, wet, mountain forests. *Gesneria alpina* appears to flower only during the winter months, November to March. The corolla could accommodate the heads of the larger flower-feeding bats in Jamaica, *Brachyphylla pumila* and *Phyllonycteris aphylla*, and probably the heads of smaller bats as well, all of which may be pollinators.

SPECIMENS EXAMINED.—JAMAICA. PARISH OF ST. ANDREW: summit cone of John Crow Peak, Blue Mountains, 5500–5700 ft, 24 November 1954, *G. Proctor 9526* (IJ); Vicinity of Cinchona, New Haven Gap, 2–10 September 1906, *N. Britton 150* (NY); Cinchona, Blue Mountains, leeward slopes, 9 February 1915, *J. Harris & J. Lawrence C15129* (US); Cinchona, Blue Mountains, windward slopes, 2 March 1915, *J. Harris & J. Lawrence C15324* (NY); Cinchona, Blue Mountains, leeward slopes, 9 March, 1915, *J. Harris & J. Lawrence C15394* (US) Cinchona, Blue Mountains, windward slopes, 13 March 1915, *J. Harris & J. Lawrence C15470* (F); Blue Mts., near Abbey Green, 3500 ft, *A. Rehder sn* (A). PARISH OF ST. THOMAS: above Portland Gap, 5800 ft, 18

Key to the Species of Section *Dittanthera*

1. Calyx lobes connate in a cup for over half their length above the ovary; floral tube and capsule linear, elongate, and slender; Jamaica ... 37. ***G. calycina***
1. Calyx lobes connate for less than one-tenth of their length above the ovary; floral tube and capsule narrowly turbinate to nearly spherical.
   2. Stamens and style long exserted, twice as long as the corolla tube or more.
      3. Calyx lobes surpassing corolla, sulcate at base; inflorescences 1-flowered; capsules 1.5 cm long or more; Jamaica ... 38. ***G. calycosa***
      3. Calyx lobes not exceeding corolla, nor sulcate; inflorescences of (1–) 2 or more flowers; capsule less than 1 cm long.
         4. Leaf bases acute; calyx lobes more than 6 mm long; Puerto Rico ... 43. ***G. pedunculosa***
         4. Leaf bases truncate to cordate; calyx lobes 5 mm long or less; Jamaica ... 40. ***G. exserta***
   2. Stamens and style less exserted, or included, one and one-half times as long as the corolla tube or less.
      5. Inflorescences of two or more flowers; corolla green with purple maculae; margin of corolla limb fimbriate; Hispaniola ... 41. ***G. fruticosa***
      5. Inflorescences of a single flower: corolla dull rose, green to yellow with no maculae; margin of corolla limb dentate to subentire; Jamaica.
         6. Calyx lobes flat at base; apex of stem, petioles and inflorescences pilose, rarely resinous ... 39. ***G. clandestina***
         6. Calyx lobes sulcate at base; apex of stem, etc., glabrous, resinous.
            7. Calyx lobes surpassing corolla, spurred on inner surface above sulcus, apex awned, corolla green, reddish-brown or dull rose, tube 1.1–1.3 cm long ... 42. ***G. onychocalyx,*** new species
            7. Calyx lobes shorter than or seldom equaling corolla, not spurred above sulcus, apex not obviously awned; corolla yellow, tube 1.5–2.5 cm long ... 36. ***G. alpina***

February 1962, *C. Adams 10700* (UCWI); Portland Gap, ca 5250 ft, 13 December 1954, *G. Proctor 9616* (IJ, NY, US); Portland Gap, ca 5250 ft, 8 January 1956, *G. Proctor* & *W. Stearn 11451* (IJ); near Blue Mountain Peak, 6500 ft, 30 November 1898, *W. Harris 7547* (BM, lectotype of *Gesneria calycosa* var. *alpina* Urban; GH, K, NY, UCWI, isolectotypes); near Blue Mt. Peak, 31 January 1893, *W. Harris sn* (BM, UCWI); Blue Mt. Peak, 13 December 1890, *A. Hitchcock sn* (F, MO); west slope of Blue Mt. Peak, 6000–7000 ft, 8 November 1954, *G. Proctor 9445* (A, IJ, NY); by side of trail, west spur of Blue Mt. Peak, 6000–6500 ft, 8 January 1956, *W. Stearn 100* (A, BH, BM, K, P, S, UCWI). Locality Unknown: "America Meridionalis," no date, *Shakespear sn* (BM).

Discussion.—Since no authentic holotype specimen has been discovered, the specimen of *Harris 7547* at British Museum (Natural History) has been selected as lectotype.

37. *Gesneria calycina* Swartz

Gesneria calycina Swartz, Prodr. 90, 1788.—Sw., Fl. Ind. Occid. 2:1026, 1800 (*"Gesnera"*).—Lunan, Hort. Jam. 1:322, 1814.—Spreng. Syst. Veg. ed. 16, 2:839, 1825; Fritsch *in* Engler & Prantl, Nat. Pflanzenfam. 4 (3b):184, 1894.—Urb., Symb. Ant. 2:376, 1901.—Adams, Fl. Pl. Jamaica 680, 1972.

Conradia calycina (Swartz) Martius, Nov. Gen. & Sp. 3:38, 1829 & 3:191, 1832.—G. Don, Gen. Syst. 4:651, 1838.—DC., Prodr. 7:525, 1839.

Sinningia calycina (Swartz) Hort. ex Don *in* Loudon, Hort. Brit. 241, 1830.

Gloxinia calycina (Swartz) Hort. ex Steudel, Nom. Bot. ed. 2, 1:690, 1840 ("calicyna").

Gloxinia lindleyi Steudel, Nom. Bot. ed. 2, 1:690, 1840 [pro parte, as to Swartz synonym].

Vaupellia calycina (Swartz) Grisebach, Fl. Brit. W. Ind. 460, 1862.

Pentarhaphia calycina (Swartz) Hanstein, Linnaea 34:307, 1865.

Shrubs or trees: stems woody, erect, bark exfoliating, gray-brown, lenticels numerous, erumpent, subverrucose, resin abundant apically and covering younger leaves; branches from enlarged nodes, green-brown, glabrous, internode length less than 1.5 cm.

Leaves alternate to approximate, crowded at branch apices: petioles sulcate, 1.0–3.0 cm long, 1–2 mm wide, green, glabrous, verrucose; blades

FIGURE 71.—Type specimens: *a*, lectotype of *Gesneria calycosa* var. *alpina* Urban and *Gesneria alpina* (Urban) Urban, *Harris 7547* (BM); *b*, holotype of *Conradia clandestina* Grisebach and *Gesneria clandestina* (Grisebach) Urban, *Wilson sn* (K).

elliptic to oblanceolate or obovate, 12.0–21.6 cm long, 2.8–5.5 cm wide, membranous to subcoriaceous, base acute to cuneate, margin slightly crenate to dentate, apex acute to caudate, both sides green, glabrous, abaxial veins prominent, resinous occasionally.

Inflorescences axillary, 2- to 4-flowered: peduncles terete, 5.8–11.5 cm long, 1–2 mm in diameter, green to brown, verrucose; bracts 2, linear to lanceolate, 0.8–2.0 cm long, 1–4 mm wide, caducous, glabrous, apex acute; pedicels terete, 1–4 cm long, 1 mm in diameter; floral tube linear, 5–8 mm long, elongating in fruit, 1–2 mm wide, green, glabrous, verrucose, resinous; calyx lobes 5, connate at the base for over half their length into a cup, each free portion flat, membranous, ovate, 0.6–1.6 cm long, 4–8 mm wide, apex acute to rounded, margin entire, green and glabrous both sides, veins prominent; corolla obliquely subcampanulate, tube 0.8–1.2 cm long, ca 1.6 cm wide at mouth, inside and outside green, glabrous, limb 5-lobed, each lobe erect, green, rounded at apex, margin subentire; stamens 4, adnate to the base of the corolla tube, exceeding the corolla tube by 6 mm, filaments linear, 2.0–2.5 cm long, greenish, glabrous, anthers oblong, ca 2 mm long, 1 mm wide, not coherent; ovary inferior, disc annular, entire, style linear, broader toward apex, ca 2 cm long, greenish, glabrous, stigma stomatomorphic.

Capsule elongate, splitting into 2 valves from the apex, 1.2–2.0 cm long, 4–5 mm wide, gray-brown, glabrous, verrucose, costae 10, prominent; seeds

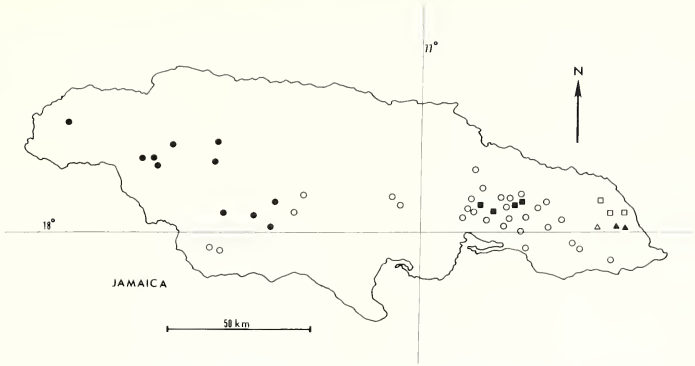

FIGURE 72.—Distribution of *Gesneria* section *Dittanthera* in Jamaica. (*G. alpina* = solid squares; *G. calycina* = open squares; *G. calycosa* = solid circles; *G. clandestina* = open triangles; *G. exserta* = open circles; *G. onychocalyx* = solid triangles.)

linear, twisted, 1 mm long or slightly longer, less than 0.25 mm wide, reddish-brown (Figure 19*f*).

TYPE-COLLECTION.—"India occid: Jamaica," *O. Swartz sn* (S, holotype, Figure 73*a*; BM, LINN, M, UPS, isotypes).

DISTRIBUTION AND ECOLOGY.—*Gesneria calycina* is found in the John Crow Mountains of eastern Jamaica (Figure 72), on moist shaded limestone slopes at 400–700 m altitude. *Gesneria calycina* has been collected with flowers from November to April. This species may be pollinated by any of the flower-feeding bats in Jamaica (Table 6).

SPECIMENS EXAMINED.—JAMAICA. Parish of Portland: 5 mi SW of Priestman's River, ca 1500 ft, 6 February 1953, *G. Proctor 7635* (IJ); Ecclesdown, 1200 ft, 1 March 1961, *C. Adams 9096* (UCWI 2 sheets), 29 March 1961, *C. Adams 9343* (BM, UCWI); John Crow Mts. above Ecclesdown, 1350 ft, 8 April 1967, *A. Katzenberger* & *R. Katzenberger 108* (RDJ); east slope of John Crow Mts., 1.5 mi SW of Ecclesdown, 1500 ft, 3 April 1951, *G. Proctor 5682* (IJ, US); east slope of the John Crow Mts., 1.5–2 mi SW of Ecclesdown, 1500–2000 ft, 14 January 1955, *G. Proctor 9800* (IJ); east slope of the John Crow Mts., 1–1.5 mi SW of Ecclesdown, 1 March 1961, *G. Proctor 22125* (BM, GH, IJ, US); SW of Ecclesdown, 1600 ft, 3 November 1964, *T. Talpey 13* (BH); 1–2 mi SW of Ecclesdown, John Crow Mts. foothills, 1500–2500 ft, 30 March 1958, *T. Yuncker 18541* (BM, F, G, IJ, S); Betty's Hope, near Manchioneal, 3000 ft, 20 March 1858, *N. Wilson 463* (GOET, K). LOCALITY UNKNOWN: "Jamaica," no date, *W. Macfadyen sn* (K); "India occid: Jamaica," no date *O. Swartz sn* (S, holotype of *Gesneria calycina* Swartz; BM, LINN, M, UPS, istoypes).

DISCUSSION.—*Gesneria calycina* is unusual in the genus in having the calyx lobes connate for over half their length into a cup above the apex of the ovary. The distinctiveness of the very striking calyx was realized by Grisebach (1859–1864) when he erected a new genus, *Vaupellia*, for the species. The connation in *Gesneria calycina* is an elaboration of the usual condition in the genus, calyx lobes connate for 1–2 mm at the base. In other characters this species resembles others in section *Dittanthera*.

38. *Gesneria calycosa* (W. Hooker) O. Kuntze

Gesneria calycosa (W. Hooker) O. Kuntze, Rev. Gen. 473, 1891 ("*Gesnera*").—Fritsch *in* Engl. & Prantl, Nat. Pflanzenfam. 4 (3b):184, fig. 81A, 1894.—Urb., Symb. Ant. 2:376, 1901.—Adams, Fl. Pl. Jamaica 681, 1972.

Conradia calycosa W. Hooker, Icon. Pl. 7: sub pl. 689–690, 1844.—Walp., Repert. Bot. Syst. 6:395, 1847.

Pentarhaphia calycosa (W. Hooker) Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:99, 1846.—Walp., Repert. Bot. Syst. 6:735, 1847.—Hanst., Linnaea 26:214, fig. 32A, 1854.—Griseb., Fl. Brit. W. Ind. 460, 1862.—Hanst., Linnaea 34:304, 1865.

Codonoraphia calycosa (W. Hooker) Ørsted, Cent. Gesn. 68, 1858.

Shrubs or trees: stems woody, erect, to 5 m tall, becoming whitish to gray-brown, lenticels ca 2 mm long, white, apex resinous, pith reddish; branches many, internodes 0.5–2.0 cm long, nodes swollen.

Leaves alternate: petioles sulcate, 1.5–2.4 cm long, 1–2 mm wide, green, glabrous, resinous when young; blades elliptic to oblong, 9.0–17.5 cm

FIGURE 73.—Type specimens: *a*, holotype of *Gesneria calycina* Swartz, *Swartz sn* (S); *b*, holotype of *Conradia calycosa* Hooker and *Gesneria calycosa* (Hooker) O. Kuntze, *Purdie 635* (K).

long, 3.8–6.2 cm wide, membranous, base acute, margin subentire to serrate-crenate, apex acuminate, adaxial surface green, glabrous, abaxial side lighter green, glabrous, with a rusty appearance from flaking resin, veins prominent.

Inflorescences from axils of young leaves, 1-flowered: peduncles slightly flattened, 1.0–2.8 cm long, ca 2.5 mm in diameter, glandular, verrucose; bracts 2, linear, 0.5–2.0 mm long, less than 1 mm wide; pedicels slightly flattened, 2.8–4.7 cm long, ca 2 mm in diameter, green, glandular; floral tube turbinate, 6–8 mm long, 0.6–1.1 mm wide at apex, glabrous, resinous; calyx lobes 5, connate at the base for 1.5 mm above ovary apex, each lobe erect, lanceolate, sulcate at base, 2.6–4.4 cm long, 3–5 mm wide at base, both sides green, glabrous, resinous, midvein prominent; corolla obliquely subcampanulate, tube 1.6–2.0 cm long, 1.4–1.5 cm wide at the mouth, outside yellow-green to cream, glabrous, resinous, inside greenish-white, glabrous, limb 5-lobed, patent to suberect, ca 2.5 cm broad, each lobe semiorbiculate, ca 8 mm long, 8 mm wide, margin erose, glandular; stamens 4, adnate to base of corolla tube for about 1.5 mm, exserted about 2 cm beyond corolla mouth, filaments linear, narrowing to apex, curved, to 4 cm long, 1.5 mm wide, green, glabrous, anthers rectangular, 3–7 mm long, 2–3 mm wide, green to pale brown, coherent in 2 pairs by their apices, pollen grains isopolar (Figure 18*j*), with a nearly circular amb, tricolpate, prolate, size medium (25.5 μm long at the polar axis, 11.0–14.0 μm wide at the equatorial

axis), sexine reticulate, heterobrochate with larger lumina near the equator, 0.5–1.0 μm wide, at the poles less than 0.25 μm wide, colpi long and narrow, staminode 6 mm long, bearing rudimentary anther; ovary inferior, green, glabrous at apex, disc 5-lobed, green, resinous, style linear, becoming wider near apex, to 4.5 cm long, 1 mm in diameter, green, glabrous, stigma stomatomorphic.

Capsule turbinate, elongate to clavate, splitting from the apex almost to the base into 2 or 4 valves, smooth to verrucose, gray-brown, costae 10, prominent; seeds linear, twisted, 1–2 mm long, 0.25 mm wide, tawny to brown (Figure 19*g*).

Type-Collection.—Sedburgh, Jamaica, *W. Purdie 635* (K, holotype, Figure 73*b*; GOET, isotype).

Distribution and Ecology.—*Gesneria calycosa* grows in the Cockpit country of central to western Jamaica (Figure 72), in damp forests among limestone hills. *Gesneria calycosa* appears to flower during every month of the year; in the greenhouse this species has flowered continually for two years. The pollinator is probably the flower-feeding bat, *Phyllonycteris aphylla*.

Specimens Examined.—JAMAICA. Parish of Hanover: interior summit slopes of Dolphin Head, 1500–1700 ft, 11 April 1955, *G. Proctor 10024* (IJ, NY); interior summit slopes of Dolphin Head, 1500–1700 ft, 7 March 1960, *G. Proctor 20688* (IJ). Parish of Westmoreland: 1 mi WNW of Hopewell, 1750 ft, 21 November 1955, *G. Proctor 11228* (IJ); vicinity of Woodstock, 24 October 1960, *G. Proctor 21517* (BM, GH, IJ); 0.5 mi SW of Darliston, 1300–1500 ft, 24 February 1970, *G. Proctor 31232* (IJ); Clarks Wood district, SE of Woodstock, 1300 ft, 24 April 1961, *K. Kramer 1718* (U, WAG); Clarks Wood district, SE of Woodstock, 1200–1400 ft, 6 February 1961, *G. Proctor & W. Mullings 22001* (BM 2 sheets, GH, IJ) Clarks Woods, N of Exeter, 1300 ft, 11 April 1967, *A. Katzenberger & R. Katzenberger 112* (RDJ). Parish of St. James: Mocho Road, Catadupa, 1900 ft, 14 February 1906, *W. Harris 9178* (F, NY 2 sheets, UCWI, US). Parish of St. Elizabeth: Near Maggotty, 950 ft, 28 December 1961, *C. Adams 10197* (BM, MO, UCWI). Parish of Trelawny: Windsor estate, ca 400 ft, 23 August 1956, *G. Proctor 15684* (BM, F, GH, IJ); Windsor Cave, 5/6/1966, *I. Cornman sn* (UCWI); Windsor, 100–150 m, 1 April 1931, *G. Miller 1479* (US); ca 3.5 mi WNW of Quick Step near Paynes Patent, 9 March 1949, *C. Lewis sn* (IJ, US). Parish of Manchester: Inglewood to Endeavour near Mile Gully, 1750 ft, 23 December 1968, *C. Adams 13097* (UCWI); vicinity of Mandeville, 15–26 February 1910, *S. Brown 205* (NY, PH, US); vicinity of Mandeville, 26–30 April 1910, *J. Crawford 662* (PH, US), *668* (NY); Sedburgh, December 1843, *W. Purdie 635* (K, holotype of *Conradia calycosa* W. Hooker; GOET, isotype). Parish of St. Ann: Albion Pen, 2000 ft, 12/5/1915, *W. Harris 12004* (BM, F, K, MO, NY, UCWI, US); 1.2 mi E of Albion, ca 1500 ft, 4 July 1965, *G. Webster 13627* (US). Locality Unknown: Port Royal Mountains, June 1843, *W. Purdie sn* (K); "Jamaica," 1844, *W. Purdie sn* (K); "Jamaica," no date, *W. Purdie sn* (K, TCD); Jamaica, no date, *W. Wright sn* (BM).

Discussion.—*Gesneria calycosa* differs from all other known species of *Gesneria* in having inflorescences of one flower with stamens more than twice as long as the campanulate, green corolla.

39. *Gesneria clandestina* (Grisebach) Urban

Gesneria clandestina (Grisebach) Urban, Symb. Ant. 2:377, 1901.—Adams, Fl. Pl. Jamaica 681, 1972.
Conradia clandestina Grisebach, Fl. Brit. W. Ind. 461, 1862.
Pentarhaphia clandestina (Grisebach) Fawcett, Prov. List, Jam. 28, 1893.

Shrubs: stems woody to within 30 cm of the apex, to 5 m tall, bark rugose, gray-brown, glabrescent, lenticels elongated, white, erumpent, becoming verrucose with age; branches from base and upper leaf axils, to 1.0 cm in diameter, green to red, pilose with reddish-articulate hairs, primary internodes to 12 cm long, others much shorter, 0.2–1.0 cm long.

Leaves alternate: petioles sulcate, 0.8–2.7 cm long, 2–4 mm wide, reddish, pilose with reddish-articulate trichomes; blade elliptic to oblong or oblanceolate, often falcate, 6.9–14.7 cm long, 3.1–6.1 cm wide, membranous, base rounded to cuneate, margin serrate or dentate, ciliate, apex acuminate to caudate, adaxial surface dark green, sparsely pilose, glossy, pubescent, abaxial surface lighter green, pilose along the prominent veins.

Inflorescences of one flower: peduncles terete, 4–5 mm long, 1–2 mm in diameter, red, pilose; bracts 2, lanceolate, about 2 mm long, less than 1 mm wide, red, pilose; pedicels terete, 0.9–1.8 cm long, elongating in fruit, 1–2 mm in diameter; floral tube turbinate, ca 6 mm long, 7 mm wide at apex, red, densely pilose; calyx lobes 5, connate for less than 1 mm at the base, each lobe erect, narrowly ovate, 2.2–2.7 cm long, 5 mm wide above the base, margin entire, ciliate, apex narrowly acuminate or caudate, outer surface reddish, densely appressed-pilose, midvein prominent, inner surface reddish-green, sparsely pilose; corolla broadly campanulate, tube 1.7–2.5 cm long, 6–8 mm wide at the base, gradually wider to the

mouth, 1.5–2.5 cm wide, outside greenish-yellow, densely puberulent, inside green, glabrous, limb 5-lobed, each lobe subpatent, broadly ovate, glandular, margin entire, upper lobes ca 8 mm long, 9 mm wide, lateral lobes ca 8 mm long, 7–11 mm wide, basal lobes 6–8 mm long, 8 mm wide; stamens 4, adnate to the base of the corolla tube, exserted for about 4 mm beyond the corolla mouth, filaments linear, ca 2.9 cm long, red, sparsely pilose, anthers oblong, 4 mm long, 2 mm wide, coherent in 2 pairs by their apices, pollen grains (Figure 18*a*) isopolar, with a nearly circular amb, size small (18.7–19.2 μm long at the polar axis, 11.6–13.7 μm wide at the equatorial axis), tricolpate, colpi 16 μm long, 1 μm wide, apocolpia nearly truncate, prolate, sexine appearing homobrochate, lumina 0.25 μm across, muri about 0.5 μm across, verrucose, warts 1.25 μm across, scattered at random, about 1 μm apart; ovary inferior, disc annular, style about 3.5 cm long, reddish pilose, stigma stomatomorphic.

Capsule turbinate, 1.0–1.3 cm long, 0.9–1.1 cm wide, red, glabrescent, costae of 5 prominent wings; seeds narrowly fusiform to linear, less than 1 mm long, red to brown.

Type-Collection.—"Jamaica," *N. Wilson sn* (K, holotype, Figure 71*b*; GOET, K, isotypes).

Distribution and Ecology.—*Gesneria clandestina* grows in shaded wet mountain forests in eastern Jamaica (Figure 72) at elevations of 350–725 m. This species has been collected in flower in January, March, and June, with fruits collected about two months later; plants have not yet flowered in cultivation. As with *Gesneria alpina*, this species may be visited and pollinated by *Brachyphylla pumila* and *Phyllonycteris aphylla* among the flower-feeding bats.

Specimens Examined.—JAMAICA. Parish of St. Thomas: Cuna Cuna Gap and vicinity, 600–725 m, 13–19 June 1926, *W. Maxon 9153* (NY, US); south slopes of Corn Puss Gap, 1600–2000 ft, 1 January 1967, *G. Proctor 27755* (IJ); vicinity of Corn Puss Gap, ca 1800 ft, 1 January 1967, *G. Gastony 113* (GH): south slopes of Corn Puss Gap, ca 2000 ft, 29 January 1967, *G. Proctor 27785* (GH, IJ, U, US); south slope of Corn Puss Gap, 1 March 1969, *G. Proctor 29991* (IJ); on the trail to Corn Puss Gap, about 500 ft. from the gap, and 6 miles from Bath, 11 August 1970, *L. Skog 1623* (BH, UCWI); John Crow Mountains, valley, SE foothills, 350 m, 2–4 March 1909, *N. Britton 3941* (NY); south eastern foothills of John Crow Mts., 2 March 1909, *W. Harris* & *N. Britton 10679* (F, NY, UCWI). Locality Unknown: "Jamaica," no date, *N. Wilson sn* (K, holotype of *Conradia clandestina* Grisebach; GOET, K, isotypes).

Discussion.—*Gesneria clandestina* is probably most closely related to *G. alpina* and *G. onychocalyx;* however, both differ from this species in being glabrous and in other characters. *Gesneria alpina* has a yellow corolla and is more spreading in its growth habit. *Gesneria onychocalyx* can be distinguished by its longer flower stalks, which are up to 4 cm long, and by its spurred calyx lobes.

40. *Gesneria exserta* Swartz

Gesneria exserta Swartz, Prodr. 90, 1788.—Sw., Fl. Ind. Occid. 2:1024, 1800 ("*Gesnera*").—Lunan, Hort. Jam. 1:322, 1814.—Spreng., Syst. Veg. ed. 16, 2:839, 1825.—Urb., Symb. Ant. 2:369, 1901.—Adams, Fl. Pl. Jamaica 681, 1972.

Conradia exserta (Swartz) Martius, Nov. Gen. & Sp. 3:38, 1829 & 3:191, 1832.—G. Don, Gen. Syst. 4:650, 1838.—A. P. de Candolle, Prodr. 7:525, 1839.

Gesneria corymbosa Herbarium Balbis & Bertero ex A. P. de Candolle, Prodr. 7:525, 1839 [non Swartz (1788), nom. nud. pro syn.].

Pentarhaphia catalpiflora Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:100, 1846 ("catalpaeflora").—Walp., Repert. Bot. Syst. 6:735, 1847.—Griseb., Fl. Brit. W. Ind. 460, 1862.—Hanst., Linnaea 34:303, 1865. [Type-collection: "Jamaica," *J. Wiles sn* (*G*, holotype).]

Pentarhaphia lessertiana Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:101, 1846.—Walp., Repert. Bot. Syst. 6:735, 1847.—Hanst., Linnaea 34:302, 1865. [Type-collection: "Jamaica, high mountains," *J. Wiles sn* (*G*, holotype).]

Pentarhaphia parviflora Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:102, 1846.—Walp., Repert. Bot. Syst. 6:735, 1847.—Hanst., Linnaea 34:302, 1865. [Type-collection: "*Hb. Delessert,*" (collector unknown), (*G*, holotype).]

Gesneria quadriflora Herbarium Lambert ex Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:102, 1846 [nom. nud. pro syn.].

Pentarhaphia exserta (Swartz) Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:104, 1846 [pro parte, as to the synonyms of Martius and Swartz and the description by Swartz].

Codonoraphia catalpiflora (Decaisne) Ørsted, Cent. Gesn. 68, 1858 ("catalpaeflora").

Codonoraphia lessertiana (Decaisne) Ørsted, Cent. Gesn. 68, 1858.

Codonoraphia parviflora (Decaisne) Ørsted, Cent. Gesn. 68, 1858.

Gesneria catalpiflora (Decaisne) O. Kuntze, Rev. Gen. 2:473, 1891 ("*Gesnera*").

Gesneria lessertiana (Decaisne) O. Kuntze, Rev. Gen. 2:473, 1891 ("*Gesnera*").

Gesneria parviflora (Decaisne) O. Kuntze, Rev. Gen. 2:473, 1891 ("*Gesnera*").

Shrubs or trees: stems woody, erect, to 5 m tall, to 2 cm in diameter, bark reddish-brown, resinous

near apex; branches many, 5 mm in diameter, reddish-brown, glabrous and resinous, lenticels elongated, erumpent, internodes 0.3–3.5 cm long, shorter toward the apices, nodes slightly swollen.

Leaves alternate: petioles sulcate, 1.5–3.5 cm long, 2–3 mm wide, green to brown, glabrous, resinous, not verrucose; blades ovate, elliptic to obovate, 6.3–13.5 cm long, 2.0–5.3 cm wide, subcoriaceous, plane, base subcordate to truncate, oblique, margin crenate, apex acute to acuminate, adaxial surface dark green, glabrous, glossy, veins immersed, abaxial surface lighter green, glabrous with prominent veins.

Inflorescences 1- to 4-flowered: peduncles terete, 4.1–6.0 cm long, 1–2 mm in diameter, reddish-brown, glabrous, glandular-resinous; bracts 2, lanceolate, 1–2 mm long, less than 1 mm wide, very resinous; pedicels terete, 1.3–2.8 cm long, 2 mm in diameter, green, glabrous, resinous, with elongated lenticels; floral tube ca 5 mm long, 7 mm wide, green, glandular-resinous; calyx lobes 5, each linear-lanceolate to triangular, 4–5 mm long, 3 mm wide at the base, apex acute, withering at anthesis, green and very resinous, with one prominent vein; corolla narrowly campanulate, tube ca 1.5 cm long, gibbous at the base, then contracted to 7 mm in diameter, then becoming wider at the mouth, ca 12 mm broad vertically, 7 mm wide horizontally, both inner and outer surfaces of the tube greenish white, glandular, margin suberose and ciliate, upper lobes semiorbiculate, ca 6 mm long, 7 mm wide, erect to patent, lateral lobes ca 9 mm long,

FIGURE 74.—Type specimens: *a*, holotype of *Gesneria exserta* Swartz, *Swartz sn* (S); *b*, holotype of *Gesneria onychocalyx* L. Skog, new species, *Proctor 9799* (BM).

10 mm wide, reflexed, lower lobe ca 6 mm long, 6 mm wide, reflexed; stamens 4, adnate to the base of the corolla, exserted at anthesis ca 2 cm beyond the mouth of the corolla tube, filaments linear, straight, ca 3.5 cm long, 1 mm in diameter, green, glabrous, anthers rotund, 1 mm long, 1 mm wide, green, glabrous, coherent in two pairs by their apices, staminode 5 mm long, lacking fertile anther; ovary inferior, apex glabrous, disc 5-angled, ca 5 mm long, 3 mm wide, yellow-green, style linear, to 4 cm long, 1 mm in diameter, green, glabrous but for a few appressed trichomes at the base, stigma stomatomorphic, papillate, nectar abundant, clear and viscid.

Capsule nearly spherical, dehiscing from the apex into 2–4 valves, 5–6 mm long, 6 mm in diameter, brownish, glabrous, resinous, costae 10, not prominent; seeds linear, twisted, about 1 mm long, less than 0.5 mm wide, reddish-brown.

Type-Collection.—"India occidentalis: Jamaica," *O. Swartz sn* (S, holotype, Figure 74*a*; G-DC, LINN, M, UPS, isotypes).

Chromosome Number.—$n = 14$ (Lee, 1966a).

Distribution and Ecology.—*Gesneria exserta* is endemic to Jamaica (Figure 72) growing in thickets on steep, rocky, shaley slopes or on wooded limestone hillsides at altitudes from 75 to 1200 m. There are collection records for this species from every month except May. Flowering specimens could not be found in Jamaica in early August despite observation in many localities. In the greenhouse, *G. exserta* has produced flowers in December, January, and April. Bat pollination seems likely for *G. exserta,* possibly by *Glossophaga soricina antillarum.*

Specimens Examined.—JAMAICA. Parish of St. Elizabeth: Malvern to Mountainside, 1600 ft, 27 March 1962, *C. Adams 10919* (MO, UCWI); Santa Cruz Mountains, Bideford district, southwest of Malvern, 1000–2000 ft, 12 August 1954, *G. Webster* & *G. Proctor 5317* (A, BM 2 sheets, US); Bideford district, 1.5 mi due S of Malvern, 2000 ft, 25 January 1964, *G. Proctor 24513* (BM, MO). Parish of Clarendon: Brown's Gate to Thomson Town, Mocho Mountains, 2000 ft, 26 June 1960, *C. Adams 7283* (MO, UCWI); 2 miles southeast of Crooked River PO, 700 ft, 11 April 1953, *G. Proctor 7870* (IJ, NY). Parish of St. Catherine: Bog Walk, 250 ft, 6 December 1953, *G. Proctor 8287* (IJ, US, USF); between Flat Bridge and Kensington along Cobre River, 6 November 1964, *T. Talpey 22* (BH). Parish of St. Mary: Castleton Road, 600 ft, 27 February 1896, *E. Campbell 6246* (UCWI). Parish of St. Andrew: Swain Spring near Coopers Hill, 1900 ft, 29 August 1965, *B. Morley 83* (UCWI); Coopers Hill, Red Hills, 21 March 1954, *G. Proctor 8496* (IJ, NY); Red Hills, on way to Coopers Hill, on rocky slope ¾ mi ESE of summit, 2000 ft, 1 January 1956, *W. Stearn 62* (A, BH, BM 2 sheets); Golden Spring, 267 m, 14 August 1900, *W. Fawcett 7986* (F, NY); Golden Spring, 800 ft, 14 August 1900, *W. Thompson 7986* (UCWI); Hermitage Dam, ca 1750 ft, 8 January 1944, *A. Barry sn* (IJ); Moresham River, west side, ¼ mi above Hermitage Dam, 7 March 1956, *W. Stearn 411* (A, BH, BM 2 sheets); along road between Mt. James and Mt. Airy, ca 1500 ft, 31 January 1970, *G. Proctor 31212* (IJ); Road to Gordon Town, February 1885, *J. Hart 1136* (UCWI); Bellevue, 4500 ft, 27 January 1888, *H. Eggers 3764* (B, L, US); Flamstead, January 1927, *I. Maxwell sn* (BM); along trail between Galloway Gap and Flamstead, Port Royal Mountains, ca 3000 ft, 13 December 1947, *A. van der Porten sn* (IJ); Bellevue, near Flamstead, April 1952, *R. Robbins 1514* (UCWI); near Bellevue, 3000–4000 ft, 17 November 1957, *T. Yuncker 17404* (BM, F); Guava Ridge, ca 3000 ft, 26 January 1955, *G. Proctor 9841* (A, IJ, NY, US); Mt. Rosanna, 3800–4000 ft, 23 October 1964, *A. Skelding sn* (UCWI); ca 1 mi N of Woodford on path to Hardwar Gap, 2500 ft, 14 February 1957, *E. Robertson 3220* (UCWI 2 sheets); Irish Town, 2450 ft, 20 December 1959, *C. Adams 5821* (BM, UCWI); vicinity of Newcastle, Irish Town, 11 September 1908, *N. Britton 3452* (NY); along road to Newcastle about 2 mi above Irish Town, 12 August 1970, *L. Skog 1630* (BH); road to Content, 2500 ft, 20 December 1905, *W. Harris 9124* (BM 2 sheets, F 2 sheets, K, NY, UCWI, US); Charlottenburg, 7 March 1960, *A. Skelding 6705* (UCWI); "Big Rock," below Cinchona, 11 March 1920, *W. Maxon* & *E. Killip 976* (A, F, GH, NY, US); near Green River, on trail from Cinchona to Whitfield Hall, 22 March 1920, *W. Maxon* & *E. Killip 1351* (A, BM, F, HG, NY, US); Blue Mountains, banks of Green River, 2500 ft, 13 February 1903, *A. Rehder sn* (A 2 sheets, NY); Clydesdale, 3500 ft, 7 November 1948, *R. Bengry sn* (IJ, US); Norbrook, 600 ft, 27 December 1895, *E. Campbell 6136* (NY, UCWI, US); Norbrook, 600 ft, 27 December 1895, *W. Harris 6136* (F); Halberstadt, Port Royal Mountains, 2500 ft, 1924, *C. Norman 188* (BM); Halls Delight, 500 m, 15 January 1895, *W. Harris 5547* (BM, F, NY, UCWI, US); bei Kingston in d. anderen Bergen, December 1881, *F. Lehmann 982* (BM); Sky Ridge above Penfield, 2000 ft, 18 January 1959, *A. Skelding 5450* (K). Parish of Portland: near Cedar Valley, ca 1900 ft, 25 November 1962, *G. Proctor 22965* (BM, GH, IJ); Hardwar Gap, Silver Hill Gap, 26 February 1941, *W. Burrowes 13047* (UCWI); John Crow Peak, *J. Hart 1219* (UCWI). Parish of St. Thomas: Sheldon district, below Penlyne Castle, 2000–2750 ft, 27 December 1955, *G. Proctor 11424* (BM, IJ); Arntully, 2900 ft, 3 February 1963, *C. Adams 12212* (UCWI); Arntully, ca 3000 ft, 9 March 1963, *G. Proctor 23313* (BM); Newfield district, along upper course of the Morgans River, 2000–2500 ft, 7 January 1964, *G. Proctor 24129* (IJ); gorge of Plantain Garden River, NNW of Whitehall, 1000 ft, 15 March 1956, *W. Stearn 491* (A, BH, BM); gorge of the Plantain Garden River, NNW of Whitehall, ca 1000 ft, 15 March 1956, *G. Proctor 11781* (IJ); along trail between Whitehall and Big Hill, 1000–3000 ft, 12 February 1953, *G. Proctor*

7684 (IJ, NY); along east arm of the Morant River between dam and marble quarry, 500–700 ft, 3 February 1966, *G. Proctor 26844* (BM, IJ, U); Blue Mountains, December 1951, *R. Robbins 1515* (UCWI); Blue Mountains, 1897, *C. Hanson sn* (C); coffee vegetation of Blue Mt., 28 March 1850, *R. Alexander 559* (K). Locality Unknown: "Jamaica," no date, *Dr. Armstrong sn* (E-GL); "Jamaica," 1850, *R. Alexander sn* (NY); "Jamaica," 1821, *Bertero sn* (TO); "Jamaica," 1822, *M. Balbis sn* [collected by Bertero] (G-DC); "Jamaica Wald," no date, *Goods sn* (W); "Gesneria 4-flores," no date, *Hb. Delessert* [collector unknown] (G, holotype of *Pentarhaphia parviflora* Decaisne); Cascade River, 23 June 1926, *D. Johnson sn* (F); Cascade River, 13 July 1926, *D. Johnson sn* (F); "Jamaica," no date, *J. Macfadyen sn* (K 2 sheets); "Jamaica," no date, *G. McNab sn* (E); "Jamaica," no date, *W. March 1516* (GOET); "Jamaica," no date, *F. Masson sn* (BM); Liguana Mts., 20 February 1850, *R. Alexander 558* (K); "Jamaica," 1844, *W. Purdie sn* (K, 2 sheets); "America Meridionalis," no date, *R. Shakespear sn* (BM); "India occidentalis: Jamaica," no date, *O. Swartz sn* (S, holotype of *Gesneria exserta* Swartz; G-DC, LINN, M, UPS, isotypes); "Jamaique," 1802, *F. de Tussac sn* (G-DC); "Jamaica, high mountains, small tree," no date, *J. Wiles sn* (G, holotype of *Pentarhaphia lessertiana* Decaisne); "Jamaica," no date, *J. Wiles sn* (G, holotype of *Pentarhaphia catalpiflora* Decaisne); *"Jamaica,"* no date, *N. Wilson sn* (K 2 sheets). Cultivated: Cornell University, G-901, 15 April 1966, *M. Stone 134* (BH).

Discussion.—*Gesneria exserta* appears to be most closely related to *G. pedunculosa* of Puerto Rico and is contrasted with that species.

41. *Gesneria fruticosa* (Linnaeus) O. Kuntze

Gesneria fruticosa (Linnaeus) O. Kuntze, Rev. Gen. 2:473, 1891.—Urb., Symb. Ant. 2:374, 1901; 8:646, 1921.

Craniolaria fruticosa Linnaeus, Sp. Pl. ed. 1, 2:618, 1753.—Plum., Pl. Am. 128, pl. 133: fig. 2, 1757.

Martynia fruticosa (Linnaeus) Gloxin, Obs. Bot. 15, 1785.

Gesneria fimbriata Lamarck, Encyl. Meth. Bot. 2:703, April 1788 [nom. superfl.].

Gesneria craniolaria Swartz, Prodr. 89, July 1788.—Sw., Fl. Ind. Occid. 2:1015, 1800 (*"Gesnera"*).—Spreng., Syst. Veg. ed. 16, 2:839, 1825 [nom. superfl.].

Conradia craniolaria (Swartz) Martius, Nov. Gen. & Sp. 3:38, 1829 & 3:191, 1832.—G. Don, Gen. Syst. 4:650, 1838.—A. P. de Candolle, Prodr. 7:525, 1839.

Pentarhaphia craniolaria (Swartz) Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:99, 1846.—Walp., Repert. Bot. Syst. 6:735, 1847.—Griseb., Fl. Brit. W. Ind. 460, 1862.—Hanst., Linnaea 34:303, 1865.

Codonoraphia craniolaria (Swartz) Ørsted, Cent. Gesn. 68, 1858.

Shrubs: stems woody to within 7 cm of the apex, to 2 m tall, erect, 2.5 cm in diameter near the base; bark reddish-brown or gray, rugose, pilose with colorless articulate trichomes to glabrescent; branches ca 5 mm in diameter, green, pilose, internodes 5 mm long, leaf scars enlarged.

Leaves alternate, or rarely opposite and decussate: petioles subsulcate or flattened, 2–6 mm long, 3–4 mm wide, green, pilose with red or colorless articulate hairs to glabrescent; blades elliptic to narrowly obtrullate, lobulate above, resembling leaves of *Quercus*, 11.6—22.5 cm long, 3.1–7.5 cm wide, membranous to subcoriaceous, base cuneate to acute, margin dentate to serrate, apex acute to acuminate, adaxial surface dark green, sparsely pilose to glabrescent, abaxial surface lighter green, pilose to glabrescent on the prominent veins.

Inflorescences 1-flowered, from the axils of usually reduced leaves: peduncles terete, 6.5–21.5 cm long, 1–2 mm in diameter, green or reddish, villous; bracts usually four, linear, 0.5–1.5 cm long, 1–2 mm wide, green, pilose; pedicels terete, 2–5 cm long, 2 mm in diameter, green or reddish; floral tube turbinate, 5–7 mm long, 5–7 mm in diameter at apex, green to red, pilose, strongly ribbed; calyx lobes 5, erect, connate for about 1 mm at the base, each lobe lanceolate, 1.1–2.5 cm long, to 6 mm wide at the base, apex acute to acuminate, outside surface green to red, pilose with erect hairs, shorter toward the entire margin, inside surface green to red, puberulent to pilose with appressed glandular and nonglandular hairs, veins not prominent; corolla broadly campanulate, tube 1.3–2.4 cm long, 6–9 mm wide at the base, broadening to 1.8 cm wide at the mouth, outside pilose, inside lighter green with purple maculae which are more dense toward the mouth, limb 5-lobed, margins fimbriate, fimbria to 7 mm long, ciliate with glandular trichomes, each lobe erect, broadly ovate, upper lobes ca 7 mm long, 1.1 mm wide, connate for 5 mm, lateral and basal lobes 5–6 mm long, 4–5 mm wide; stamens 4, adnate for only 1 mm at the base of the corolla tube, not exserted beyond corolla mouth, filaments linear from a broad base, slightly geniculate, 1.5–3.0 cm long, 1–2 mm in diameter, green, densely pilose at base, glabrescent toward the apex, anthers ovate, 3–4 mm long, 2–3 mm wide, reddish abaxially, glabrous, coherent in two pairs at their apices, pollen grains isopolar, with a nearly circular amb, tricolpate, colpi 14 μm long, 0.5 μm wide, apocolpia rounded to truncate, prolate, size small (17 μm

FIGURE 75.—*a*, Representative specimen of *Gesneria fruticosa* (Linnaeus) O. Kuntze, *Swartz sn* (S); *b*, original manuscript drawing by Plumier of *Gesnera arborescens, amplo flore fimbriato, et maculoso* (from the Bibliothèque Centrale of the Muséum National d'Histoire Naturelle at Paris).

long at the polar axis, 9 μm wide at the equatorial axis), sexine with lumina heterobrochate, 0.1 μm across, muri 3 μm across, verrucose, warts about 1 μm across and 1 μm apart; ovary inferior, disc a 5-lobed ring, ca 7 mm long, 6 mm wide, 2 mm thick, yellow, puberulent, style linear, curved, to 3.3 cm long, 1–2 mm in diameter, green to white, reddish toward the apex, pubescent, stigma stomatomorphic, 2–4 mm wide, papillate.

Capsule turbinate, 8–11 mm long, 8–9 mm wide, reddish to gray-brown, pilose to glabrescent, costae 10, prominent; seeds fusiform, about 1.5 mm long, tawny to red.

TYPE.—Description of *Craniolaria fruticosa* Linnaeus based on Plumier description (Nov. Pl. Am. Gen. 27, 1703) and an unpublished Aubriet copy of Plumier drawing (Figure 75*b*).

DISTRIBUTION AND ECOLOGY.—*Gesneria fruticosa* grows in mesic limestone forests in south-central Dominican Republic and on the southern peninsula of Haiti at elevations from 500–1500 m (Figure 50). This species has been collected in flower in nearly every month. In the greenhouse a single inflorescence continued to produce flowers for nearly a year. Pollination may be facilitated by visits of the largest flower-feeding bat on Hispaniola, *Brachyphylla pumila*.

SPECIMENS EXAMINED.—HAITI. DÉPARTEMENT DU SUD:

Massif de la Hotte, eastern group, Morne Rouge, at Chapelle Mont Carmel, ca 600 m, 8 November 1924, *E. Ekman H2429* (EHH, IJ, S 2 sheets, US); along trail down to Bras-Sec [Bois-Sec] and along banks of dry river between Leon and Fond Conchon about 15 miles SE of Jérémie, 1100 ft, 24 July 1970, *L. Skog, T. Talpey & D. Pfister 1615* (BH, E, F, NY, S, U, US); Morne de la Hotte in decliv. sept.-orient in mont. sylvatic., ca 800 m, 11 June 1917, *E. Ekman H198* (C, K, S). Département de l'Ouest: Massif de la Selle, Etang du Jonc, in steep limestone rocks at Rivière Froide, ca 700 m, 19 September 1924, *E. Ekman H1973* (S). DOMINICAN REPUBLIC. Province of La Vega: Sierra de Ocoa, San José de Ocoa, Bejucal, slope of Loma de los Palos Mojados, ca 1500 m, 8 March 1929, *E. Ekman H11827* (S); Cordillera Central, Slope of Loma La Campana, ca 800 m, 11 February 1929, *E. Ekman H11526* (S). Province of San Cristóbal: Cordillera Central, San Cristóbal, near Cambita, in Cuchilla de los Mameyes, ca 500 m, 27 January 1929, *E. Ekman H11334* (S); La Cabirma, San Cristóbal, 10 April 1968, *E. Marcano & T. Talpey 5435* (NY, RDJ, US); La Cabirma de la Loma, north of San Cristóbal about 25 km, 550 m, 19 March 1967, *T. Talpey 71* (BH); La Cabirma de la Loma, 2000 ft, 9 April 1968, *T. Talpey 94* (BH); Cabirma de la Loma, 750 m, 25 March 1972, *Alain Liogier 18513* (NY, US). Locality Unknown: India occid.: Hispaniola, no date, *O. Swartz sn* (BM, G-DC, LD, M, S Figure 75*a*, UPS). Cultivated: Cornell University, G-1035, 3 November 1970, *L. Skog 1737* (BH), 11 May 1972, *L. Skog 1829* (BH).

Discussion.—In characters of leaf size and shape, habit, habitat, range, and calyx shape, *Gesneria fruticosa* resembles most closely *G.* (*Lachnoblaste*) *decapleura;* the latter species differs, however, in having a red tubular corolla, 2.0–2.5 cm long, and peduncles up to 7 cm long.

From other species in this section, *G. fruticosa* can be distinguished by its fimbriate corolla limb, many-flowered inflorescences, and lobulate leaves.

Plants with opposite and decussate leaves are known from a single locality in the Dominican Republic and were brought into cultivation at Cornell University (G-1035). A discussion of this aberrant form is found in the discussion of leaf morphology.

Two collections from eastern Cuba, *Alain & Lopez 7130* and *Shafer 8012,* are probably referable to *G. fruticosa* based on habit, vegetative and fruit characters. Lack of flowers makes the determination of these two specimens not definite.

In lieu of a specimen collected by Plumier, his drawing may serve as representative of the species. A Swartz collection, possibly a topotype, displays many of the characters Plumier illustrated (Figure 75*a*).

42. *Gesneria onychocalyx* L. Skog, new species

Gesneria sp. B., Adams, Fl. Pl. Jamaica 681, 1972.

Plantae fruticosae, caule lignoso erecto usque ad 3 m alto, cortice ferrugineo verruculoso, ramulis alternis 4 mm in diametris viridi-brunneis glabris resinosis, internodiis 0.5–1.0 cm longis, nodis tumidis, gemmis resinosis. Folia alterna, petiolus sulcatus 0.8–2.2 cm longus 1–2 mm in diametro viridi-brunneus glaber, lamina elliptica vel oblanceolata, interdum falcata 8.4–15.5 cm longa 2.8–5.6 cm lata ad basim anguste acuta, secus margines dentata, ad apicem acuminata vel cuspidata, pagina adaxiali atrovirenti praeter glandulas secus costam glabra, pagina abaxiali pallide viridi glabra, costa prominenti et verrucosa. Inflorescentiae uniflorae, pedunculis teretiusculis 1.3–3.6 cm longis 1.0–1.5 mm in diametris ferrugineis glabris resinosis, bracteis 1–2 reductis, pedicellis teretibus, 1.1–1.3 cm longis 1 mm in diametris, ferrugineis glabris resinosis; tubus floralis turbinatus, ca 5 mm longus 5 mm ad apicem latus ferrugineus glaber resinosus, calycis lobis 5 erectis, ad basim 1 mm connatis, ad basim sulcatis, ad sulci apicem calcar usque ad 4 mm longo instructis, superne aristis ad apicem introrsum curvis armatis unguem avis similibus 2.0–3.5 cm longis ad basim 5–7 mm latis ferrugineis extus glabris et resinosis intus glandulosis, costis carinatis; corolla campanulata, tubus 1.1–1.3 cm longus, ad basim 5 mm latus, ad orem 1.5 cm latus, extus viridis ferrugineus vel obscure roseus (fide Proctor) glaber glanduloso-resinosus intus viridis glaber glanduloso-resinosus; limbus leviter expansus, 5-lobatus, glandulosus, lobis superioribus suborbicularibus, ca 7 mm longis 8 mm latis ad margines dentatis, lobis lateralibus obtusis ca 7 mm longis 1.0 cm latis ad margines integris, lobo basali rotundo ca 6 mm longo 6 mm lato ad margines integro; stamina 4, ad corollae orem extensa, filamentis linearibus ca 2.3 cm longis rubris glabris resinosis, antheris oblongis 2–3 mm longis 2 mm latis rubris binatim conniventibus; ovarium inferum, apice pubescenti, disco annulari, stylo stamina aequanti rubro glabro, stigmate stomatiformi 2–3 mm lato. Capsula turbinata, ca 1 cm longa 8 mm lata viridis vel cinerascenti-brunnea glabra, costis 5 alatis; semina fusiformia torta 1 mm longa 0.25 mm lata ferruginea, apicibus elongatis.

TYPE-COLLECTION.—East slope of the John Crow Mts., Jamaica, *G. Proctor 9799* (BM, holotype, Figure 74*b*; GH, isotype).

DISTRIBUTION AND ECOLOGY.—Apparently endemic to eastern Jamaica (Figure 72) on the east slope of the John Crow Mountains in the parish of Portland, *Gesneria onychocalyx* is found on moist limestone slopes in thickets.

Gesneria onychocalyx has only been collected in flower in January. Flower-feeding bats, *Brachyphylla pumila* and *Phyllonycteris aphylla*, may effect pollination in this species.

SPECIMENS EXAMINED.—JAMAICA. PARISH OF PORTLAND: John Crow Mts., 1.5–2.5 mi SW of Ecclesdown, 1500–2500 ft, 24 January 1956, *R. Howard, G. Proctor & W. Stearn 14780* (A, BM): east slope of the John Crow Mts., 1.5–2.0 mi SW of Ecclesdown, 1500–2000 ft, 14 January 1955, *G. Proctor 9799* (BM, holotype of *Gesneria onychocalyx* L. Skog; GH, isotype); John Crow Mountains, ca 1.3 mi SW of Ecclesdown, 1500–2000 ft, 24 August 1954, *G. Webster 5570* (A, BM).

DISCUSSION.—*Gesneria onychocalyx* differs from all known species of *Gesneria* in possessing sepals with spurs on the inner surface.

43. *Gesneria pedunculosa* (A. P. de Candolle) Fritsch

Gesneria pedunculosa (A. P. de Candolle) Fritsch *in* Engler & Prantl, Nat. Pflanzenfam. 4 (3b):184, 1894.—Little, Woodbury & Wadsworth, Trees of P. R. & V. I. 2:908, 1974.

Conradia pedunculosa A. P. de Candolle, Prodr. 7:525, 1839.—A. de Candolle, Calq. des Dess. Fl. Mex., pl. 717, 1874.—Stahl, Estudios Fl. Puerto Rico, ed. 1, 6:258, 1888; ed. 2, 3:327, 1937.

Gesneria exogonia Sessé & Mociño ex A. P. de Candolle, Prodr. 7:525, 1839 [nom. nud. pro syn.].

Pentarhaphia albiflora Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:101, 1846.—Walp., Repert. Bot. Syst. 6:735, 1847.—Hanst., Linnaea 34:302, 1865.—Cook & Collins, Contr. U. S. Natl. Herb. 8:215, pl. 51, 1903.—N. Britt. & P. Wils., Sci. Surv. P. R. & V. I. 6:206, 1925.—N Britt., Addisonia 13:63, pl. 448, 1928. [Type-collection: Antilles, Puerto Rico, *A. Plée 866* (P, lectotype; P, isolectotype).]

Pentarhaphia pedunculosa (A. P. de Candolle) Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:108, 1846.—Hanst., Linnaea 34:295, 1865.

Codonoraphia albiflora (Decaisne) Ørsted, Cent. Gesn. 68, 1858.

Conradia pedunculosa var. α *pallida* Bello y Espinosa, Anales Soc. Esp. Hist. Nat. 10:288, 1881 [ex char.].

Conradia pedunculosa var. β *lutea* Bello y Espinosa, Anales Soc. Esp. Hist. Nat. 10:288, 1881 [ex char.].

Tupa acuminata sensu Stahl, Estudios Fl. Puerto Rico. 6:29, 1888 [non A. P. de Candolle (1839)].

Gesneria albiflora (Decaisne) O. Kuntze, Rev. Gen. 2:473, 1891 ("*Gesnera*").—Urb., Symb. Ant. 2:370, 1901; 4:570, 1911.

Gesneria exogonia Sessé & Mociño, Fl. Mex. ed. 2, 143, 1894. [Type-collection: "Mexique," *M. Pavon herbarium* [*Sessé & Mociño*] *sn* (G, holotype).]

Gesneria sp. Sessé & Mociño, Fl. Mex. ed. 2, 143, 1894 [ex char.].

Gesneria biflora Sęssé & Mociño, Fl. Mex. ed. 2, 144, 1894. [Type-collection: "Mexique," *M. Pavon herbarium* [*Sessé & Mociño*] *sn* (G, holotype).]

Pentarhaphia longiflora sensu Cook & Collins, Contr. U. S. Natl. Herb. 8:215, 1903 [non Lindley (1827), nec sensu Rolfe (1893)].

Shrubs or trees: stems woody, erect, 0.5–5.0 m tall, to 2 cm in diameter, bark white, gray to brown, exfoliating, very resinous near apex, pith white; branches many, 3–6 mm in diameter, green to brown, glabrous, resinous, somewhat verrucose, lenticels raised, elongated, internodes very short at the apices of slowly growing branches, to 5 cm long on young actively growing branches, nodes slightly swollen.

Leaves alternate, crowded at the branch apices: petioles sulcate, 1.0–1.5 cm long, 2 mm wide, green to brown, glabrous, verrucose, resinous; blades elliptic to obovate, 4.6–11.0 cm long, 1.7–4.8 cm wide, subcoriaceous, plane, base acute, margin subentire to dentate, apex acute, adaxial surface dark green, glabrous, glossy, abaxial surface lighter green to brownish, glabrous with prominent veins.

Inflorescences 2- to 4-flowered: peduncles terete, 8.3–16.5 cm long, about 1 mm in diameter, green, glabrous, glandular-resinous; bracts not evident; pedicels terete, 2–4 cm long, 1 mm in diameter, green, glabrous; flowers protandrous; floral tube obconic, ca 6 mm long, 6 mm wide, light green, glabrous, glandular-resinous; calyx lobes (4–)5, connate for less than 1 mm at the base, aestivation valvate, each lobe erect, elliptic to narrowly ovate, (6–)7–10 mm long, ca 4 mm wide at the base, apex narrowly acute, margin entire, outside green, glandular-resinous, midvein prominent, inside lighter green, glabrous, not resinous; corolla campanulate, tube gibbous at the base, then constricted, finally ampliate toward the mouth, oblique, tube 1.1–1.9 cm long, 1.0 cm wide at the mouth, outside yellow-green to pinkish-white, glandular-resinous, inside yellow-green, glabrous, limb 5-lobed, ca 2 cm wide, each lobe reflexed,

upper lobes semiorbiculate, ca 7 mm wide, lateral lobes ovate, ca 8 mm wide, basal lobe rotund, ca 8 mm wide, lateral and basal lobes with occasional red to purple lines on the midvein and purple maculae near the margin at the junction of the lobes, margins undulating and sometimes ciliate; stamens 4, adnate to the base of the corolla tube for less than 1 mm, exserted at anthesis about 2.3 cm beyond the mouth of the corolla tube, filaments linear, 3.2–3.9 cm long, 1 mm wide, green, sparsely pilose near the base, glabrous above, anthers oblong, 3 mm long, 2 mm wide, coherent in two pairs by their apices, or 1 or 2 free, pollen grains isopolar, with a nearly circular amb, tricolpate, colpi 22 μm long, 1 μm wide, prolate, size medium (26.5 μm long at the polar axis, 13.5 μm wide at the equatorial axis), sexine reticulate, heterobrochate, with larger lumina near the equator 1–1.5 μm wide, at the polar axis 0.25 μm wide, muri about 1 μm wide, staminode 9 mm long; ovary inferior, apex tomentose, accrescent, disc undulate, ca 5 mm long, 3 mm wide, green, style linear, wider toward apex, at first bent upward, later erect and equaling the stamens, ca 3.2 cm long, green or rubrescent near apex, glabrous, stigma stomatomorphic, 2.5 mm wide, papillate.

Capsule obconic, dehiscent from the apex into 4 valves, 6–9 mm long, 5–7 mm wide, brown to gray, glabrous, resinous, costae 10, prominent; seeds elongate, twisted, ca 1 mm long, less than 0.5 mm wide, reddish-brown.

Type-Collection.—"Mexique," *M. Pavon Herbarium* [*Sessé & Mociño*] *sn* (G, holotype, Figure 76).

Chromosome Number.—$n = 14$ (Lee, 1964).

Local Names.—"Spanish Tea" (Cook & Collins, 1903), "Arbol de navidad," (Little et al., 1974).

Distribution and Ecology.—Endemic to Puerto Rico (Figure 77) on dry exposed limestone hills at altitudes from 50 to 900 m, *Gesneria pedunculosa* has been collected in flower during every month of the year except July. From personal observations in Puerto Rico in 1970, no plants were in flower anywhere during the early summer, but by the end of August this species appeared to be the most common flowering plant in certain areas. In the greenhouse, this flowering schedule is similar. The effective pollinator of this species may be any of the flower-feeding bats in Puerto Rico: *Brachyphylla cavernarum, Erophylla bombifrons bombifrons,* or *Monophyllus redmani portoricensis.*

Specimens Examined.—PUERTO RICO: Prope Aguadilla in sylvis montibus ad Victoria, 27 December 1886, *P. Sintenis 5782* (S); near Mayaguez, 100 ft, 9 February 1900, *A. Heller 4559* (A, CU, E, F, G, GH, L, MO, NY, P, PH, US); prope Mayaguez in Monte Mesa, 24 October 1884, *P. Sintenis 44* (BM, F, G 3 sheets, GH, K, L, LD 2 sheets, M, MO, NY, P, S, UCWI, US, W, Z); vicinity of Mayaguez, Quebrada de Limones, 4–10 March 1906, *E. Britton & D. Marble 666* (F, NY, US); Limon road, toward Maricao, km 18.4, 9 November 1954, *B. Schubert & H. Winters 312* (GH, US); Maricao State Forest, 600–800 m, 31 December 1961, *Alain Liogier 9069* (IJ, NY); Maricao to Monte Alegrillo, 650–750 m, 3 April 1913, *N. Britton, F. Stevens & W. Hess 2561* (F, NY, US); Maricao National Forest, 26 November–4 December 1963, *J. Duke 7045* (US); Maricao Federal Forest, Hwy 120, km 4.7 (from Sabana Grande), February 1967, *L. Spetzman & J. Diaz Colon 23* (NA); Maricao forest, 28 September

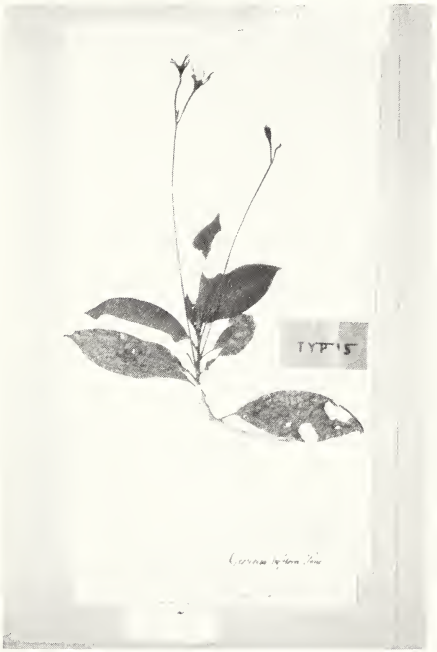

Figure 76.—Holotype of *Conradia pedunculosa* A. P. de Candolle and *Gesneria pedunculosa* (A. P. de Candolle) Fritsch, *Pavon Herb.* [*Sessé & Mociño*] *sn* (G).

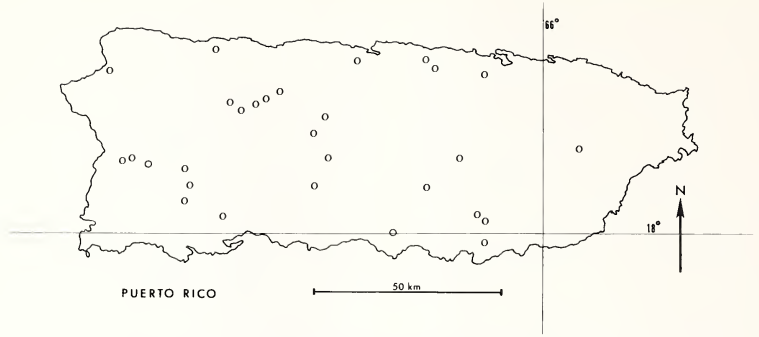

FIGURE 77.—Distribution of *Gesneria* section *Dittanthera* in Puerto Rico. (*G. pedunculosa* = open circles.)

1968, *R. Wagner 1664* (A, IJ, MO); along trail near Río Maricao about 1 km S of the fish hatchery at Maricao, 550 m, 26 August 1970, *L. Skog & J. Skog 1705* (BH); along PR Hwy 120 at marker 16.5 km on Las Tetas de Cerro Gordo in the Forest Reserve at Maricao, 800 m, 26 August 1970, *L. Skog & J. Skog 1688* (BH, MO, US); Indiera Fria, Maricao, 8 October 1913, *W. Hess 3431* (NY); km 8 between Sangre [Sabana?] Grande and Maricao, 22–30 January 1963, *R. Howard & L. Nevling 15372* (A, U); Sabana Grande, 29 May 1935, *F. Sargent 710* (US); near Sabana Grande, on road to Maricao, km 4.4, 14 November 1954, *B. Schubert, H. Winters & I. Vélez 329* (GH, US); Quebradillas, 3 February 1926, *H. Gleason & O. Cook G-41* (NY); prope Pepino in detioribus umbrosis ad Encas, 10 January 1887, *P. Sintenis 5832* (BM, G, GH, K, L, US, W); Yauco, 1880, *A. Garber 59* (GH, K, NA, NY 2 sheets, PH); Yauco, 3 October 1913, *F. Stevens & W. Hess 3257* (NY); Lares, 400–500 m, 6 April 1913, *N. Britton, E. Britton & W. Hess 2715* (NY, US); along PR Hwy 129 about 8 km E of Lares, 27 August 1970, *L. Skog & J. Skog 1706* (BH, US); barrio Hoyo Nial, Lares–Camuy road, January 1950, *I. Vélez 3673* (US); along path toward the left just before entrance to Cornell Radar in Esperanza south of Arecibo, ca 1000 ft, 14 February 1965, *T. Talpey 26* (BH, US); Arecibo to Utuado, 15–20 March 1906, *N. Britton & J. Cowell 403* (F, NY, US); Utuado, 1864, *R. de Grosourdy Cat. no. 13* (P); prope Utuado in scopulosis ad los Angeles, 17 January 1887, *P. Sintenis 5910* (BM, GH, K); 2 mi W, Utuado, 1500 ft, 29 March 1972, *E. Little & R. Woodbury 26170* (US); Monta-Llano, 17 November 1899, *G. Goll 459* (NY, US); Barceloneta, S of Florida, 250 m, 23 August 1963, *H. McKee 10619* (P, US); along route 140 near Florida, 27 September 1967, *R. Wagner 1234* (A); Toro Negro area, 25 August 1965, *R. Wagner 640* (BM, U); prope Manati in fruticetis ad Coto, 27 April 1887, *P. Sintenis 6755* (G, L, US, W); Manati, 13 June 1914, *J. Stevenson 547* (US); vicinity of Coamo Springs, 7 February 1922, *N. Britton, E. Britton & M. Brown 5915* (F, G, NY, US); Coamo Springs and vicinity, 17–22 March 1913, *E. Britton & D. Marble 2254* (NY, US); prope Coamo ad rivulum Moreno, 18 December 1885, *P. Sintenis 3153* (M, MO, NY); Higuillar, S. of Dorado, 8 February 1964, *Alain Liogier 10685* (F, IJ, NY, US); near Toa Alta, north of road toward Esperanza, km 23.7 of Route 2, November 1966, *T. Talpey 62* (BH); prope Aybonito in convalli ferminis Guava, 2 December 1885, *P. Sintenis 2950* (BM, F, G 3 sheets, GH, K, L, LD, M, MO, NY, P, US, W); Río Piedras, Comerío, 10 August 1913, *J. Johnston 922* (NY); District Bayamon, Cayey, Bo. Maton, 5 January 1938, *J. Otero 422* (A, MO, US); inter Cayey et Cidra ad flumen "Plata," 16 October 1885, *P. Sintenis 2311* (C); prope Cayey ad Campito, 30 September 1885, *P. Sintenis 2314* (BP, P, Z); Bayamon, 11 November 1899, *G. Goll 225* (US); Bayamon, November 1887, *A. Stahl 675* (L, S); mountain between Cuayama and Cayey, 700–900 m, 15 March 1922, *N. Britton, E. Britton & M. Brown 6534* (NY); mountain road near Cayey, 7 October 1963, *R. Wagner 412* (A, BM, U); bank above Caguas, 15 February 1928, *N. Britton & E. Britton 9003* (NY), *9093* (GH). LOCALITY UNKNOWN: Hill west of Mayaurou [?], 1 February 1924, *N. Britton & E. Britton 7938* (NY); "Mexique," no date, *M. Pavon herbarium* [Sessé & Mociño] *sn* (G, holotype of *Conradia pedunculosa* A. P. de Candolle, *Gesneria exogonia* Sessé & Mociño, and *Gesneria biflora* Sessé & Mociño); "Porto Rico, Antilles," 1846, *A. Plée 409* (P 2 sheets, TCD); "Antilles, Puerto Rico," no date, *A. Plée 866* (P, lectotype of *Pentarhaphia albiflora* Decaisne; isolectotype, P); "Porto Rico," no date, *A. Riedle sn* (P); "Porto Rico," no date, *A. Stahl sn* (GOET). CULTIVATED: Cornell University, G-767, 6 January 1964, *R. Clark sn* (BH), 5 October 1969, *L. Skog 1406* (BH), 10 June 1968, *M. Stone 412* (BH); Hort. Kew, October 1883, *A. Garber 59* (K); Hort. Kew, 6 December 1883, *A. Garber 59* (K).

DISCUSSION.—*Gesneria pedunculosa* is most similar to and probably most closely related to *G. exserta* Swartz from Jamaica. It differs from the

latter species in having the leaves acute at the base rather than truncate, the sepals elliptic to narrowly ovate and 0.6–1.0 cm long as opposed to sepals linear-lanceolate to triangular and about 5 mm long, and in having purple lines and maculae on the corolla.

Plants included in this species were known for many years under the epithet "albiflora" of Decaisne based on a Plée collection from Puerto Rico. The type of *Conradia pedunculosa* A. P. de Candolle was believed to have been collected in Mexico by Sessé and Mociño. Plants of this species have not since been known from Mexico, but are known from Puerto Rico where Sessé and Mociño also collected. One of the taxonomic synonyms included here, *Gesneria* sp. described in Sessé and Mociño's *Flora Mexicana* (1894), has as its locality, Toa Alta, a region in Puerto Rico where *Gesneria pedunculosa* grows today. This locality was also given for *G. cuneifolia* considered by Fritsch (1894) and others to come from Mexico, but now known from Puerto Rico. Denham (1968) considered the evidence for uniting *G. albiflora* and *G. pedunculosa* and concluded that they are synonymous; I agree with his conclusions. The specimen in the Moricand herbarium (now at the Conservatoire et Jardin botaniques, Genève, Switzerland), which de Candolle used as the holotype for *Conradia pedunculosa,* agrees with other material from Puerto Rico. De Candolle also used plate 717 of the copies of the original Sessé and Mociño drawings as a basis for his name. Denham stated that this plate must serve as the lectotype for the name; however, this is unnecessary since the specimen fitting the description and annotated by de Candolle can serve as the holotype.

Specimens of *Gesneria pedunculosa* in many herbaria have been misidentified as *Pentarhaphia longiflora* Lindley (= *Gesneria ventricosa* Swartz), probably because of a misidentification by Urban of a specimen collected by Sintenis in 1884 and subsequently widely distributed. Without flowers, the morphological characters may remind one of *Gesneria ventricosa* in a cursory examination. The error persisted in herbaria and was put into print by Cook and Collins (1903). The specimen from the Cook and Collins expedition to Puerto Rico labeled *"Pentarhaphia longiflora" (Goll 459,* US) is truly *Gesneria pedunculosa.*

Section 8. *Duchartrea* (Decaisne) Fritsch

Gesneria section *Duchartrea* (Decaisne) Fritsch *in* Engler & Prantl, Nat. Pflanzenfam. 4(3b):184, 1894.

Pentarhaphia section *Duchartrea* (Decaisne) Bentham *in* Bentham & Hooker, Gen. Pl. 2:1005, 1876.

Plants erect, stems to 5 m tall, branching from the base.

Leaves elliptic to obovate, membranous to coriaceous, plane, glossy.

Inflorescences 1- to ∞-flowered, exceeding the subtending leaves at anthesis: corollas infundibuliform-campanulate, green, brown, red to purple; stamens included, green or yellow.

Capsules turbinate, verrucose; costae obscure.

Type-Species.—*Gesneria viridiflora* (Decaisne) O. Kuntze.

Discussion.—Plants of section *Duchartrea* are difficult to distinguish morphologically on the basis of reliable and consistent characters when dried as herbarium specimens. Living plants in the greenhouse offer only a few clues to the biology of the plants in the field. Characters that may be important in the biology of the plant in its environment in the wild, such as colors, textures, or odors which may serve as attractants to pollinators, are seldom available on preserved material. From examination of herbarium material, supplemented by observations in the field and greenhouse, the four taxa in *Duchartrea* are here distinguished as subspecies of a single variable species. The subspecies are each found in one of four widely separated regions: eastern Cuba, southwestern Haiti, north-central Dominican Republic, and northeastern Puerto Rico, a distribution similar to *Gesneria reticulata* (Grisebach) Urban. Due to the geographic isolation of the taxa, the pollinators are likely to be different; however, the pollinators are probably closely related to each other (*i.e.,* species of the same genus) or are similar in characters important for pollination (*i.e.,* size and shape of rostra of bats, etc.), so that the plants have apparently evolved similar organs for reproduction or attraction. It is probable that if a plant from one subspecies were transplanted to the locality of another subspecies, cross-pollination and interbreeding may occur. Crosses in the greenhouse have not been achieved because *Gesneria viridiflora* subsp. *sintenisii* has never produced open flowers.

Habitats differ somewhat among the subspecies. *Gesneria viridiflora* subsp. *sintenisii* is found in wet depressions usually on lateritic soil; *G. viridiflora* subsp. *quisqueyana* and subsp. *acrochordonanthe* are probably found on drier limestone exposures, but subsp. *acrochordonanthe* is found also on laterite, and the typical subspecies is located in both wet and dry habitats. *Gesneria viridiflora* subsp. *sintenisii* when grown in dry conditions in the greenhouse produces abundant resin, seemingly as a response to the drier environment and similar to the resinous condition of other subspecies. In humid conditions the same subspecies produced flexible membranous leaves different from the rigid coriaceous leaves of *Gesneria viridiflora* subspecies *quisqueyana* in the same greenhouse environment.

The pollen characteristics among the subspecies investigated are similar (Figures 17*a*, 18*b*).

Morton (1957) divided *Gesneria viridiflora* into three varieties on the basis of leaf characters; however, his varietal distinctions are not maintained here because of observations made in the field and in the greenhouse on *Gesneria viridiflora* subsp. *sintenisii* and subsp. *quisqueyana*. Populations of a species can display wide variation in leaf characters, probably due to response to ecological pressures during ontogeny. The development of leaves in this group is unusual: the midvein develops first and projects beyond the stem apex like a finger, and a group of developing leaves appears clawlike. Much later the lateral laminar meristem becomes active. Any injury to the latent lateral meristem by drying, or response to sun or shade, appears to affect the ultimate leaf shape. Living plants of *Gesneria viridiflora* subsp. *viridiflora* should be tested to determine if the same responses are possible, for they would determine the validity of infraspecific taxa based on vegetative characters.

As a group, the plants in this section are probably descended from plants similar to those found in section *Myrmekianthe,* but they are presumed to have responded to the development of bat pollination.

Corolla and vegetative characters of this section resemble those found in a few species of *Rhytidophyllum,* which may suggest either parallel or convergent evolution in response to pollination mechanisms, or an exchange of genes in the distant past. However, the similar species of *Rhytidophyllum—R. grande* (Swartz) Martius from Jamaica and another from southwestern Hispaniola—occur at the present time far removed from most of the subspecies of section *Duchartrea.*

44. *Gesneria viridiflora* (Decaisne) O. Kuntze

Gesneria viridiflora (Decaisne) O. Kuntze, Rev. Gen. 2:473, 1891.

Shrubs: stems woody, erect, to 6 m tall, bark rugose to smooth, gray to yellow or reddish, verrucose, glabrous, striated, apex resinous, lenticels elongated, erumpent; branches few, from the base, green to brown.

Leaves alternate: petioles sulcate to terete, 0.7–2.8 cm long, 1–4 mm in diameter, green to red or brown, glabrous, verrucose, resinous; blades narrowly elliptic to obovate, 5.1–18.4 cm long, 1.9–7.5 cm wide, coriaceous, base narrowed to cuneate, acute or cordate, sometimes oblique, margin entire to serrate, apex retuse or obtuse to acute, adaxial surface green, glabrous, glossy, midvein sometimes bearing glandular trichomes, abaxial surface green or copper-colored, glabrous, midvein prominent, reddish or green, verrucose, lenticels sometimes elongated.

Inflorescences of one to many flowers, usually exceeding the subtending leaves: peduncles terete, 3.4–18.5 (–25) cm long, 2–4 mm in diameter, becoming wider toward the apex, reddish-brown, verrucose, glabrous, resinous; bracts 2–4, linear to ovate, 0.6–1.2 cm long, 3 mm wide, red, resinous; pedicels terete, 0.5–1.4 (–7.0) cm long, 1–3 mm in diameter, red to brown, glabrous; floral tube narrowly to broadly turbinate, 4–7 mm long, 3–5 mm wide, green to reddish-brown, glabrous, sometimes verrucose; calyx lobes (4–) 5, erect to spreading, connate for 1 mm at their bases, each narrowly ovate to sulcate, sometimes keeled, thickened apically or rounded, 0.5–1.1 cm long, 1–3 mm wide at the base, both sides green to red, glabrous, sometimes resinous, inside sometimes puberulent, veins not prominent; corolla campanulate, tube ca 1.2 cm long, oblique at the base, 3–7 mm wide, narrowed to 3–4 mm at the middle, then expanding to 1.0–1.2 cm wide at the oblique mouth, outer surface yellow-green to red or purple to pallid brown, puberulent with glandular hairs to glabrous, res-

inous, glossy, inner surface pilose to glabrous, green, usually with reddish veins, limb 5-lobed, upper lobes semiorbiculate, 3–5 mm long, 0.6–1.3 mm wide, lateral lobes rounded, 4–5 mm long, 0.6–1.1 cm wide, basal lobe rounded, 4–5 mm long, 8 mm wide, margins entire to dentate or fimbriate; stamens 4 (–5), adnate to base of the corolla tube for about 1 mm, included, filaments linear, curved or geniculate, 0.9–1.6 cm long, 1 mm wide, green to red, pilose to glabrous, anthers oblong to ovate, 2–3 mm long, 1.5–2 mm wide, coherent in two pairs by their apices; ovary inferior, apex pilose, disc annular, 5-angled, style 1.3–1.6 cm long, 1–2 mm in diameter, green to yellow at the base, reddish toward the apex, puberulent, stigma stomatomorphic, papillate.

Capsule turbinate to nearly spherical, 0.5–1.2 cm long, 4–8 mm wide, reddish-brown, verrucose, resinous, costae 5–15, not prominent; seeds linear to fusiform, twisted, 0.5–1.0 mm long, 0.25 mm wide, reddish-brown.

44a. *Gesneria viridiflora* subsp. *acrochordonanthe* L. Skog, new subspecies

Plantae fruticosae, caule lignoso, cortice ferrugineo glabro verrucoso ad apicem resinoso. Folia alterna; petiolus sulcatus, 0.9–1.8 cm longus, 1–3 mm in diametro, rubellus, verrucosus; lamina elliptica vel obovata, 6.8–11.9 cm longa, 2.1–4.8 cm lata, coriacea, ad basim acuta, ad margines serrulata vel serrate, apice rotundo vel acuto, pagina adaxiali viridi glabra praeter venam mediam puberulenti, pagina abaxiali ferruginea glabra vena media prominente resinosa. Inflorescentiae 1- ad ∞-florae, pedunculis teretibus 9.7–16.2 cm longis 2–3 mm in diametris verruculosis, bracteis ellipticis ca 3 mm longis verrucosis, pedicellis teretibus 0.6–1.5 cm longis 2 mm in diametris; tubus floralis turbinatus, ca 5 mm longus, 4 mm in diametro, ferrugineus, verrucosus, resinosus; calycis lobi 5, late lineares, 5–6 mm longi, 2 mm lati, extus et intus ferruginei, resinosi, apice quam basi aliquantulum crassiore; corolla campanulate, tubo (in corollis immaturis visis) 6 mm longo viridulo maculas rubras ferenti verrucoso resinoso, limbo 5-lobato, lobis superioribus 4 mm longis, 5 mm latis ad margines fimbriatis trichomata glandulosa gerentibus, lobis lateralibus 3 mm longis 5 mm latis ad margines integris, lobo basali 4 mm longo 6 mm lato ad margines integro, staminibus 4, filamentis ad corollae basim 1 mm adnatis curvatis, antheris binatim conniventibus, ovario inferiore apice puberulente disco annulari. Capsula turbinata 0.6–1.0 cm longa 6–8 mm lata grosse verrucosa costis obscuris, seminibus elongatis fusiformibus, 1 mm longis minus quam 0.25 mm latis ferrugineis apicibus elongatis.

Type-Collection.—St. Louis du Sud, Bonnet-Carré, Haiti, *E. Ekman H9236* (S, holotype; EHH, K, US Figure 78*a*, isotypes).

Distribution and Ecology.—This subspecies is known from southwestern Haiti in the Massif de la Hotte, in forests on limestone and lateritic soil at altitudes from 1000–1200 m. *Gesneria viridiflora* subsp. *acrochordonanthe* has been collected in flower only in November. The plants are probably bat-pollinated and may be visited by any of the flower-feeding bats found on Hispaniola (Figure 79).

Key to the Subspecies of *Gesneria viridiflora*

1. Capsule grossly verrucose; upper corolla lobes fimbriate; calyx lobes thickened apically, or if rounded to acute, then corolla verrucose; leaves coriaceous.
   2. Corolla verrucose; calyx lobes rounded to acute; southwestern Haiti ..... 44a. subsp. ***acrochordonanthe,*** new subspecies
   2. Corolla smooth; calyx lobes thickened apically; Cuba ..... 44d. subsp. ***viridiflora***
1. Capsule smooth to finely verrucose; upper corolla lobes entire to denticulate; calyx lobes rounded to acuminate; corolla not verrucose; leaves coriaceous or membranous, at least when young.
   3. Leaves membranous when young, becoming subcoriaceous, abaxial surface green; upper corolla lobes entire; minor leaf veins obscure; Puerto Rico ..... 44c. subsp. ***sintenisii,*** new rank
   3. Leaves coriaceous even when young, abaxial surface copper-colored; upper corolla lobes denticulate; minor leaf veins obvious; Dominican Republic ..... 44b. subsp. ***quisqueyana,*** new rank

FIGURE 78.—Type specimens: *a*, isotype of *Gesneria viridiflora* subsp. *acrochordonanthe* L. Skog, new subspecies, *Ekman H9236* (US); *b*, holotype of *G. quisqueyana* Alain and *G. viridiflora* subsp. *quisqueyana* (Alain) L. Skog, new rank, *Alain Liogier 15386* (NY).

SPECIMENS EXAMINED.—HAITI. DÉPARTEMENT DU SUD: Massif de la Hotte, western group, Torbeck, Formon, 1000 m, 4 January 1927, *E. Ekman H7572* (EHH, G, IJ, NY, S, US); Massif de la Hotte, central group, St. Louis de Sud, Bonnet-Carré, ca 1200 m, 2 November 1927, *E. Ekman H9236* (S, holotype of *Gesneria viridiflora* subsp. *acrochordonanthe* L. Skog; EHH, K, US, isotypes).

DISCUSSION.—The material included in this subspecies was considered by Urban to belong to *Gesneria sintenisii;* however, the distinctive fimbriate and verrucose corolla separates these plants from the Puerto Rican material.

44b. *Gesneria viridiflora* subsp. *quisqueyana* (Alain) L. Skog, new rank

Gesneria quisqueyana Alain, Mem. New York Bot. Gard. 21 (2):147, 1971.

Gesneria sylvicola Alain, Phytologia 25:276, 1973. [Type-collection: La Descubierta, Dominican Republic, *Alain Liogier 18024* (NY, holotype; US, isotype).]

Plants to 6 m tall.

Leaves alternate: petioles sulcate, 0.7–2.0 cm long, green to brown; blades elliptic to narrowly obovate, 6.3–18.4 cm long, 2.1–4.6 cm wide, cori-

FIGURE 79.—Distribution of *Gesneria* section *Duchartrea* in Hispaniola. (*G. viridiflora* subsp. *acrochordonanthe* = solid squares; *G. viridiflora* subsp. *quisqueyana* = solid circles.)

aceous even when young, base narrowed to acute, apex retuse to acute, abaxial surface copper-colored or reddish-brown.

Inflorescences 1- to many-flowered: peduncles 9.3–18.5 (–25) cm long, 3–4 mm wide at the base, up to 1.0 mm wide at the apex, brown, glabrous, resinous; bracts 3, linear-lanceolate to ovate, 0.3–1.2 cm long, apex rounded, green to brown; pedicels to 1.0 cm long; floral tube ca 4 mm long, 3–4 mm in diameter, green to brown; calyx lobes 5, narrowly ovate, sulcate, 0.8–1.1 cm long, 2–3 mm wide at the base, apex rounded, outside green to red, inside reddish, sometimes puberulent; corolla (Figure 16*m*) ca 1.0 cm wide at the mouth, inside usually with reddish veins and maculae, or all green, pilose with glandular hairs, limb sparsely glandular, upper lobes ca 4 mm long, to 6 mm wide, margin denticulate, lateral and basal lobes 5 mm long, to 8 mm wide, margin entire; staminal filaments slightly geniculate, 1.6 cm long, green to yellow, pilose at the base, glabrescent toward the apex, anthers broadly ovate, 2 mm long, 1.5 mm wide, glandular, staminode ca 8 mm long; disc 5-angled, ca 5 mm long, 3 mm wide, green, puberulent, style ca 1.6 cm long, sparsely puberulent, stigma stomatomorphic.

Capsule turbinate to nearly spherical, 0.8–1.2 cm long, 8 mm wide, finely verrucose, costae obscure.

TYPE-COLLECTION.—La Cumbre, Jamao, Dominican Republic, *Alain Liogier 15386* (NY, holotype, Figure 78*b*; GH, NY, isotypes).

DISTRIBUTION AND ECOLOGY.—Apparently endemic to the mountains of northern central Hispaniola (Figure 79), growing on limestone cliffs, 700–900 m elevation, *Gesneria viridiflora* subsp. *quisqueyana* has been collected in flower in February, May, June, and August. In the greenhouse, this species flowers from late January to late summer. This subspecies may be pollinated by the bats, *Erophylla bombifrons santacristobalensis* or *Monophyllus cubanus ferreus*.

SPECIES EXAMINED.—HISPANIOLA. DOMINICAN REPUBLIC: Province of Puerto Plata: Cordillera Septentrional, Loma del Puerto, 700–800 m, 4 June 1969, *Alain Liogier 15543* (NY, US). Province of Santiago: Cordillera de Yaroa, limestone ridge, 850 m, 11 May 1968, *Alain Liogier 11204* (NY, US); Cordillera de Yaroa, near the trail to Arroyo del Toro, 800–850 m, 28–29 June 1968, *Alain Liogier 11866* (NY, US); Arroyo del Toro, Puerto Plata, 3 August 1958, *J. Jiménez 3728* (RDJ, US); Arroyo del Toro, Tamboril, 800 m, 20 February 1965, *E. Marcano & J. Jiménez 5131* (BH, E, GH, NY 2 sheets, RDJ 2 sheets, US); north of El Toro mountain on limestone rocks above village of Arroyo del Toro, 20 February 1965, *T. Talpey 34* (BH, US). Province of La Vega: La Descubierta, Constanza, 1300 m, 1–2 May 1971, *Alain Liogier 18024* (NY, holotype of *Gesneria sylvicola* Alain; US, isotype); Cuatro Alas, NW of La Culata, 1500–1600 m, *Alain Liogier 13078* (NY, US); Loma de la Sal, Jarabacoa, 17–18 June 1968, *Alain Liogier 11710* (NY, US). Province of Espaillat: in wood on limestone crest, La Cumbre, Jamao, Moca, 700–800 m, 27 May 1969, *Alain Liogier 15386* (NY, holotype of *Gesneria quisqueyana* Alain; GH, NY 2 sheets, isotypes); Cordillera Septentrional, Moca, Colonia de Jamao, ca 900 m, 21 May 1929, *E. Ekman H12577* (S); near the top of a limestone cliff in moist forest, Cordillera Septentrional,

between villages of San Victor and Jamao, near Moca-Sabaneta de Yásica road about 15 km N of Moca, 12 July 1970, *L. Skog 1593* (BH, US 2 sheets). Province of Samaná: vicinity of Laguna, Samaná Peninsula, on the Pilón de Azúcar; 100–500 m, 18 December 1920, *W. Abbott 294* (US), 26 December 1920, *W. Abbott 457* (US). Province of El Siebo: south shore of Samaná Bay, Boca del Infierno, 3 March 1928, *G. Miller sn* (US); Boca del Infierno, Bahía de San Lorenzo, Bahía de Samaná, 14 August 1960, *J. Jiménez 4209* (US).

Discussion.—Specimens lacking adequate flowering or fruiting material for identification, which probably belong in this subspecies, are from Haiti (*Ekman H5728* [S]) and the Dominican Republic in the provinces of San Rafeal or Independencia (*Alain Liogier, J. Jiménez & E. Marcano 14635* [NY, US]; *Alain Liogier 12584* [NY, US]; *E. Marcano, J. Jiménez & Alain Liogier 5619* [NY]), Samaná (*E. Marcano & J. Jiménez 5088b* [RDJ]). and El Siebo (*E. Marcano 5036* [RDJ]; *E. Marcano & J. Jiménez 5051* [NY, RDJ]).

Two sheets of the type-collection at the New York Botanical Garden have been designated as sheets one and two of the holotype. If a single sheet must be chosen as the holotype specimen in accordance with the Code, the specimen labeled "Sheet 1" would be the better specimen.

-Alain Liogier (1971a) distinguished this taxon from others now included in this section by characters of leaf shape, calyx pubescence, and inflorescence length, all of which may be quite variable.

44c. *Gesneria viridiflora* subsp. *sintenisii* (Urban) L. Skog, new rank

Gesneria sintenisii Urban, Symb. Ant. 2:375, 1901.—Urb., Symb. Ant. 4:571, 1911.

Duchartrea sintenisii (Urban) N. Britton *in* N. Britton & P. Wilson, Sci. Surv. P. R. & V. I. 6:206, 1925.

Plants to 5 m tall: stems with nodes slightly swollen.

Leaves alternate: petioles slightly sulcate, 1.0–1.6 cm long, green; blades elliptic to obovate, 8.0–18.2 cm long, 4.5–7.5 cm wide, membranous when young, becoming subcoriaceous with age, base cordate to acute, oblique, apex retuse, obtuse or mucronate, abaxial surface light green.

Inflorescences 1- to many-flowered: peduncles 8.6–16.8 cm long, 2–3 mm in diameter, red, verrucose, glabrous; bracts 2–4, linear ca 6 mm long, reddish-brown; pedicels 5–14 mm long; floral tube ca 5 mm long, 4 mm wide, reddish-brown; calyx lobes narrowly ovate, ca 7 mm long, 1–2 mm wide at the base, apex rounded; corolla ca 1.2 cm wide at the mouth, upper lobes ca 3 mm long, 7 mm wide, lateral lobes ca 4 mm long, 6 mm wide, basal lobe ca 4 mm long, 8 mm wide, margins entire, not ciliate or glandular; staminal filaments ca 1.6 cm long, green to yellow, puberulent at the base with glandular trichomes, glabrescent toward the apex, anthers oblong, 2–3 mm long, 2 mm wide, glabrous, pollen grains isopolar, prolate, size small (20 μm long at the polar axis, 14.0–16.5 μm wide at the equatorial axis), amb almost circular (Figure 17*a*), tricolpate, colpi 18 μm long, about 1 μm wide, sexine rugose, reticulate, heterobrochate, lumina 0.4 μm across, muri 0.5–1.0 μm wide; disc annular, 5 mm long, 6 mm wide, puberulent with glandular trichomes.

Capsule turbinate, 5–8 mm long, 4–6 mm wide at the apex, finely verrucose, costae obscure.

Type-Collection.—Sierra de Naguabo, Puerto Rico, *P. Sintenis 5332* (M, lectotype, Figure 80a; BM, F, G, GH, K, L, MO, NY, P, S, UCWI, US, W, Z, isolectotypes).

Chromosome Number.—$n = 7$ (Nevling, 1969).

Distribution and Ecology.—This subspecies is endemic to eastern Puerto Rico (Figure 55) in the Sierra de Luquillo, in mountain rain forest and wet ravines at 465–1065 m elevation. *Gesneria viridiflora* subsp. *sintenisii* has been collected with flowers in the field during the months of January, February, April, May, July, October, and December. In the greenhouse flower buds have been produced in December and January, but have never opened. This subspecies may be visited and pollinated by any of the flower-feeding bats in Puerto Rico.

Specimens Examined.—PUERTO RICO. Catalina–Yunque Trail, Luquillo Mountains, 850 m, 23–26 February 1923, *N. Britton & E. Bruner 7601* (NY); Luquillo Mountains, El Yunque, 900–1065 m, 26–27 July 1962, *Alain Liogier 9593* (IJ); near summit of El Yunque, Sierra Luquillo, 1000 m, 7 August 1963, *Alain Liogier 10071* (IJ, NY, US); Luquillo mountains, 950 m, 8 August 1963, *Alain Liogier 10086* (NY); near summit of Mt. El Yunque, 19 February 1925, *K. Boynton 8221* (NY); trail to Pinnacle, El Yunque, 18 January 1941, *J. Otero 771* (A, MO); El Yunque, 3000 ft, 31 December 1937, *F. Sargent B131* (US); Sierra de Luquillo in cacumine montis "Yunque," 13 July 1885, *P. Sintenis 1484* (C); along upper Baño de Oro, Luquillo Mts., 23 December 1939, *L. Holdridge 85* (NY); La Mina, El Yunque, 7 April 1939,

FIGURE 80.—Type specimens: *a*, lectotype of *Gesneria sintenisii* Urban and *G. viridiflora* subsp. *sintenisii* (Urban) L. Skog, new rank, *Sintenis 5332* (M); *b*, holotype of *Duchartrea viridiflora* Decaisne and *Gesneria viridiflora* (Decaisne) O. Kuntze, *Linden 1702* (P).

J. Otero 618 (F, NY); lower trail, Mt. Britton, Luquillo Insular Forest, 22 November 1954, *B. Schubert & H. Winters 401* (GH, US); lower trail, Mt. Britton, Luquillo Insular Forest, 22 November 1954, *B. Schubert & H. Winters 406* (GH, US); along trail to summit of Mt. Britton, 2400 ft, 21 August 1970, *L. Skog & J. Skog 1687a* (BH, E); along trail to Mt. Britton, El Yunque, 2800 ft, February 1965, *T. Talpey 23* (BH, US); near the entrance to the Mt. Britton Trail from Road 930, El Yunque Forest, ca 2500 ft, 3 January 1972, *J. Vivaldi 72–8* (BH); Mt. Britton, Luquillo Mts., 30 January 1964, *R. Wagner 464* (BM, IJ, S, U); on trail to El Toro, 700 m, 5 June 1970, *L. Skog 1516* (BH); Sierra de Naguabo, Rio Icaco and adjacent hills, 465–720 m, 30 July–5 August 1914, *J. Shafer 3527* (F, NY, US); lee side of East Peak, Luquillo Mts., 6 February 1969, *R. Howard 17252* (A); Sierra de Naguabo, Barrio de Maizales, ravine, 600 m, 8 March 1914, *N. Britton & J. Cowell 2209* (NY, US); Sierra de Naguabo in sylva prim. montis los Rabanos, 5 November 1886, *P. Sintenis 5332* (M, lectotype of *Gesneria sintenisii* Urban; BM, F, G 5 sheets, GH, K, L, MO, NY, P 2 sheets, S, UCWI, US, W, Z, isolectotypes); Sierra de Naguabo in sylva primaeva montis Piedra pelada, 27 October 1886, *P. Sintenis 5335* (C, E, GOET, P).

DISCUSSION.—Flowering specimens of the syntypes are rare, although Urban described the flowers in some detail, suggesting that the specimens at Berlin had flowers. From among the many duplicates of the syntypes, I have selected *Sintenis 5332* at Munich to be the lectotype. This specimen has fragments of a flower and is labeled in Urban's hand.

The chromosome count of $n = 7$ is the lowest reported in the Gesnerieae and may be a base number.

44d. *Gesneria viridiflora* subsp. *viridiflora*

Gesneria viridiflora (Decaisne) O. Kuntze, Rev. Gen. 2:473, 1891 ("*Gesnera*").—Fritsch *in* Engl. & Prantl. Nat. Pflanzenfam. 4 (3b):184, fig. 81C, 1894.—Urb., Symb. Ant. 2:375, 1901.—Morton *in* Leon & Alain, Fl. de Cuba 4:457, 1957.

Duchartrea viridiflora Decaisne, Ann. Sci. Nat. Bot. ser. 3, 6:109, pl. 8, 1846.—Walp., Repert. Bot. Syst. 6:737, 1847.—Hanst., Linnaea 26:205, pl. 1: fig. 31, 1854.—Griseb., Cat. Pl. Cub. 199, 1866.—Sauv., Anales Acad. Ci. Méd. Habana 6:316, 1869.

Pentarhaphia viridiflora (Decaisne) Hanstein, Linnaea 34: 306, 1865.—Gómez de la Maza, Anales Soc. Esp. Hist. Nat. 23:279, 1894 ("viridifolia").

Gesneria viridiflora (Decaisne) O. Kuntze var. *acutifolia* Morton, Brittonia 9:21, 1957.—Morton *in* Leon & Alain, Fl. de Cuba 4:457, 1957. [Type-collection: Nimanima, Cuba, *C. Wright 354* (GH, holotype).]

Gesneria viridiflora (Decaisne) O. Kuntze var. *colorata* Morton, Brittonia 9:21, 1957.—Morton *in* Leon & Alain, Fl. de Cuba 4:457, 1957. [Type-collection: Naranjo, Buenos Aires, Trinidad Hills, Cuba, *J. Jack 8111* (US, holotype; NY, isotype).]

Gesneria viridiflora (Decaisne) O. Kuntze var. *obovata* Morton, Brittonia 9:21, 1957.—Morton *in* Leon & Alain, Fl. de Cuba 4:457, 1957. [Type-collection: Cañizo, S. of Loma del Gato, Cuba, *Bro. Leon 9821* (US, holotype).]

Plants to 4 m tall.

Leaves alternate: petioles sulcate to terete, 2.1–2.8 cm long, 2–3 mm in diameter, red to brown; blades narrowly elliptic to obovate, 5.1–14.6 cm long, 1.9–3.6 cm wide, coriaceous, base narrowed to cuneate, margin serrulate to serrate, apex retuse or obtuse, abaxial surface copper-colored.

Inflorescences 1- to many-flowered: peduncles 3.4–14.4 cm long, 2–4 mm in diameter, reddish-brown, glabrous, resinous; bracts 2–4, ovate, ca 6 mm long, 3 mm wide, red, resinous; pedicels ca 7 mm long; floral tube ca 7 mm long, 5 mm wide, reddish-brown; calyx lobes 5, sulcate, 0.5–1.0 cm long, 2 mm wide at the base, both sides reddish, glabrous, verrucose, apex thickened; corolla ca 1.0 cm wide at the mouth, outer surface puberulent with glandular hairs, not verrucose, resinous, inner surface glabrous, limb glandular, upper lobes ca 5 mm long, 1.3 mm wide, lateral lobes ca 5 mm long, 1.1 cm wide, margin fimbriate; staminal filaments 0.9–1.2 cm long, red, glabrous, anthers oblong, 2 mm long, 2 mm wide, pollen grains isopolar, prolate, size small (12.8–14.8 μm long at the polar axis, 8.4–10.4 μm wide at the equatorial axis), tricolpate, colpi 11.2–12.8 μm long, 0.8 μm wide, apocolpia rounded, sexine heterobrochate, reticulate, lumina about 0.4 μm across, muri to 0.5 μm wide (Figure 18*b*); style ca 1.3 cm long, yellow at the base, reddish acropetally, puberulent.

Capsule turbinate to nearly spherical, ca 1.2 cm long, 7 mm wide, grossly verrucose, resinous, costae 5–15, not prominent.

TYPE-COLLECTION.—St. Yago de Cuba, Sierra Maestra, Cuba, *J. Linden 1702* (P, holotype, Figure 80*b*; BM, G, K, P, W, isotypes).

DISTRIBUTION AND ECOLOGY.—*Gesneria viridiflora* subsp. *viridiflora* grows in the mountains of central and eastern Cuba (Figure 56), in the provinces of Las Villas and Oriente in wet forests or in and near streams. This species has been collected in every month except February, although open flowers are rarely seen or collected. The pollinators might be the bats *Brachyphylla nana* or *Phyllonycteris poeyi*, whose heads could fit into the campanulate corollas.

SPECIMENS EXAMINED.—CUBA. PROVINCE OF LAS VILLAS (formerly Santa Clara): roadside on the way to La Chispa, Tope de Collantes, Trinidad Mts., 800 m, 1 April 1959, *Alain Liogier 6651* (US); Trinidad Mts., Arroyo Cimarron, ravine, 470 m, 5 March 1910, *N. Britton* & *E. Britton 5087* (NY); Trinidad Mts., ravine, El Porvenir, 650–750 m, 9 March 1910, *N. Britton* & *P. Wilson 5270* (NY); mountains of Trinidad, slopes of Pico Potrerillo, 700–900 m, 12 June 1922, *E. Ekman 13984* (S); Trinidad, mountains of the Liguanéa–Trinidad group, slopes of Pico Potrerillo, ca 700–800 m, 30 March 1924, *E. Ekman 18933* (S); mountains of the Liguanéa–Trinidad group, in forests between Playetas (on Río Hanabanilla) and Mameyar, 700–800 m, 15 February 1924, *E. Ekman 18521* (S); Buenos Aires, Trinidad Mts., June–August 1941, *R. Howard 5209* (GH, NY); Buenos Aires, Trinidad Mountains, 21 February 1956, *C. Morton 10308* (US), *10310* (US); on limestone cliff at Gavilan, Trinidad Mts., San Blas-Buenos Aires, June–August 1941, *R. Howard 6464* (GH); Naranjo, Buenos Aires, Trinidad Hills, 2500–3500 ft, 24 July 1930, *J. Jack 8111* (US, holotype of *Gesneria viridiflora* var. *colorata* Morton; NY, isotype). PROVINCE OF ORIENTE: alrededores del Pico Turquino, Sierra Maestra, July 1936, *J. Acuña* & *Darlington sn* (IJ, US 2 sheets); top of Turquino, S. Maestra, 1–2 August 1935, *J. Acuña 6768* (NY); near Cueva del Cura, Loma Cardero, Pico Turquino, 12–14 October 1924, *G. Hucter 38* (NY); in Sierra Maestra inter Río Yara et Río Palma Mocha, 1100 m, 17 July 1922, *E. Ekman 14382* (S); Sierra Maestra, Arr. Jiménez (trib. of Río Plata), 600–900 m, 9 August 1922, *E. Ekman 14811* (S); northern slopes of main ridge above Río Yao, Sierra Maestra, 300–1000 m, 27–28 October 1941, *C. Morton* & *J. Acuña 3627* (BM, GH, NY, US); Sierra Maestra in jugo mont. inter Loma Joaquín et R. de Palma Mocha, ca 1350 m, 8 April 1915, *E. Ekman 5331* (S); Sierra Maestra, La Bayamesa, in jug. mont. inter Río Óro et Río Yao, 1100–1400 m, 3 May 1916, *E. Ekman 7080* (S); along Río Peladero,

below Aserradera San Antonio de los Cumbres, crest of Sierra Maestra, ca 1300 m, 23 January 1956, *C. Morton 9477* (BM, US); Sierra Maestra int. Sevilla et Baire in "Fongales," ca 1000 m, 14 January 1920, *E. Ekman 10342* (S); Nimanima, in Cuba orientali, *C. Wright 354* (GH, holotype of *Gesneria viridiflora* var. *acutifolia* Morton); Hongolosongo, Loma del Gato, Sierra Maestra, 25 September 1935, *J. Acuña sn* (IJ); Loma del Gato, September 1935, *J. Acuña sn* (US); Cañizo, seashore, S of Loma del Gato, July 1921, *Bro. Leon 9821* (US, holotype of *Gesneria viridiflora* var. *obovata* Morton); Loma del Gato, no date, *Bro. Leon 22389* (US); Loma del Gato, Cobre Range of Sierra Maestra, 800–1000 m, 11 July–14 August 1921, *Bros. Leon, Clemente,* & *Roca 9821* (NY); St. Yago de Cuba, Sierra Maestra, 3000–4000 ft, 1843–1844, *J. Linden 1702* (P, holotype of *Duchartrea viridiflora* Decaisne; BM 2 sheets, G, K 2 sheets, P 2 sheets, W, isotypes); "La Florida" prope Daiquiri, ca 750 m, 28–29 June 1914, *E. Ekman 1538* (NY, S); Sierra Maestra sup. Daiquiri prope amnem, ca 700 m, 28 October 1916, *E. Ekman 8055* (S); La Florida, 23 January 1919, *Bro. Hioram 2310* (NY); Cordillera de la Gran Piedra, near Santiago de Cuba, 900 m, 22 April 1956, *M. Lopez F. 2690* (US 2 sheets); Gran Piedra Range, Sierra Maestra, 1 July 1956, *M. Lopez F. 2760* (US 2 sheets); Firmeza to Gran Piedra, 4–5 March 1911, *J. Shafer 8949* (GH, NY 2 sheets, US); Sierra Maestra, Firmeza, 750 m, 9 November 1917, *E. Ekman 8745* (S); Alcarraza Arribe, Sierra Maestra, 18 July 1946, *Bro. Clemente 5089* (US); Sierra de Nipe ad margin. flumin. Piloto, 4 November 1914, *E. Ekman 3350* (G, K, S); Monte Verde, on the edge of cliff, 28 December (January–July 1859), *C. Wright 354* (GOET, K); Paredones del Río Moa, Moa, 15 November 1945, *J. Acuña 13346* (SV, US 3 sheets); El Sonador rivulet, near Piedra La Vela, Sierra de Moa, 800 m, 24 July 1953, *Alain Liogier 3223* (US); El Sonador rivulet, near Piedra La Vela, Sierra de Moa, ca 800 m, *Alain Liogier 3230* (US). Locality Unknown: in Cuba Orientali, 1859, 1860, *C. Wright 354* (["Jan. 8"] MO, S, W); in Cuba Orientali, 1860, *C. Wright 354* (G, MO, P); along rivulets, 1860–1864, *C. Wright 354* (BM); in Cuba Orientali, 1856–1857, *C. Wright 354* (BR, G, K, MO, NY, PH, S).

Discussion.—This subspecies may be distinguished from *Gesneria* (*Myrmekianthe*) *duchartreoides* by its campanulate corolla and apically thickened calyx lobes.

Section 9. *Chorisantherа* (G. Don) L. Skog, new transfer

Conradia section *Chorisantherа* G. Don, Gen. Syst. 4:651, 1838.

Plants acaulescent, or stems erect or decumbent to pendent, up to 1 m long, branches arising from the base or from the upper leaf axils.

Leaves oblanceolate to obovate, cuneate, membranous to coriaceous, plane to bullate, occasionally resinous.

Inflorescences of 1–4 flowers, shorter than the subtending leaves: peduncles often curved or pendent; corollas infundibuliform to narrowly campanulate, red, rose, yellow, green to white; stamens slightly exserted, filaments usually reddish at the base, anthers arranged side by side, or coherent in 2 pairs by their apices.

Capsules nearly spherical to turbinate, costae prominent or obscure.

Type-Species.—*Gesneria pumila* Swartz.

Discussion.—Section *Chorisantherа* is probably derived from the ancestral stock from which section *Physcophyllon* evolved. At the present time, these

Key to the Species of Section *Chorisantherа*

1. Leaf margins ciliate with erect, gland-tipped trichomes, blades densely pilose, membranous, trichomes not having broad bases; anthers arranged side by side and free; calyx lobes usually over 1.2 cm long; stems and petioles not verrucose; western Cuba ..... 45. ***G. gloxinioides***
1. Leaf margins glabrous, or, if ciliate, with few appressed or spreading gland-tipped trichomes, the trichomes occasionally with broad bases, blades glabrous, glabrescent to sparsely pilose, membranous to coriaceous; anthers arranged side by side and free or coherent, or coherent apically; calyx lobes usually less than 1.0 cm long; stems and petioles often verrucose.
   2. Capsule widest at the apex, turbinate, with the apex uppermost and probably forming a splash cup; corolla tube occasionally red, dark red, or yellow with red veins, or all yellow; leaves pilose, glabrous or glabrescent, bullate, abaxial surface usually reddish-brown; eastern Cuba ..... 47. ***G. shaferi***
   2. Capsule narrowed at the apex, nearly spherical to obovoid, often with the apex downward, not forming a splash cup, corolla tube and lobes rarely dark red, or with obvious red veins; leaves sparsely pilose to glabrous, subbullate, or plane, abaxial surface usually green; Jamaica ..... 46. ***G. pumila***

two sections differ mainly in the form of the corolla and a complex of other characters.

The name *Chorisanthera* as used by Don refers to the free or loosely coherent anthers in the flowers of some subspecies of *Gesneria pumila* and *G. gloxinioides*. The anthers in these plants are arranged side by side and not coherent at the apices as in other *Gesneria* species.

45. *Gesneria gloxinioides* (Grisebach) Urban

Gesneria gloxinioides (Grisebach) Urban, Symb. Ant. 2:377, 1901.—Morton *in* Leon & Alain, Fl. de Cuba 4:460, 1957.
Conradia gloxinioides Grisebach, Cat. Pl. Cub. 200, 1866.
Pentarhaphia gloxinioides (Grisebach) Gómez de la Maza, Anales Soc. Esp. Hist. Nat. 23:279, 1894.

Shrubs: stems woody, erect, to 1 m tall (fide Morton), 6 mm in diameter at 3 cm from the apex, lenticels hidden, only slightly resinous at apex, pith reddish; branches few, not verrucose, internodes very short, gray-brown when dried, covered with glandular and eglandular articulate, pallid tomentum, nodes slightly swollen.

Leaves alternate, crowded at branch apices: petioles swollen at base, slightly sulcate, 0.8–1.0 cm long, 1 mm wide, green, pilose with glandular and eglandular trichomes; blades obovate, 8.5–15.0 cm long, 3.5–5.8 cm wide, membranous, base oblique, cuneate to acute, margin crenate, ciliate with numerous erect glandular trichomes, apex acute, adaxial surface dark green, densely pilose with glandular and eglandular trichomes, abaxial surface lighter green, densely pilose with glandular and eglandular trichomes, the pilosity becoming more dense at the prominent veins.

Inflorescences in the axils of young leaves, 2- to 4-flowered: peduncles terete, 1.0–1.2 cm long, 1.5 mm in diameter, densely pilose; bracts 2–4, linear to lanceolate, 0.7–1.3 cm long, 0.5–3.0 mm wide, base cuneate, margin entire to slightly crenate, ciliate-glandular, apex acute, pilose with glandular and eglandular trichomes; pedicels terete, 1.2–1.9 cm long, 1 mm in diameter; floral tube obovoid-turbinate, 2–3 mm long, ca 3 mm wide at apex, green, densely pilose with mostly glandular trichomes; calyx lobes 5, lanceolate, flat, membranous, connate at the base for about 1 mm, 1.0–1.5 cm long, 1–3 mm wide at base, apex acuminate, both sides green, pilose with glandular and eglandular trichomes, veins 3, prominent; corolla obliquely subcampanulate, tube 1.2–1.5 cm long, to 8 mm wide at mouth, outside green to cream, pilose, inside lighter green, glabrous, limb 5-lobed, 1.6–2.2 cm broad, each lobe yellow-green, upper lobes erect, sparsely ciliate-glandular, lateral and basal lobes patent with prominent veins, 4–6 mm long, 5–8 mm wide; stamens 4, adnate to base of corolla tube for less than 1 mm, exserted beyond mouth about 1.2 cm, filaments linear, 2.1–2.4 cm long, 0.5 mm wide, greenish-yellow to pink, glabrous, anthers oblong, 2.5 mm long, 1 mm wide, reddish and glabrous on back, more or less coherent side by side until dehiscence, staminode not seen; ovary inferior, disc annular, 2 mm across, puberulent,

FIGURE 81.—Holotype of *Conradia gloxinioides* Grisebach and *Gesneria gloxinioides* (Grisebach) Urban, *Wright 3078* (GOET).

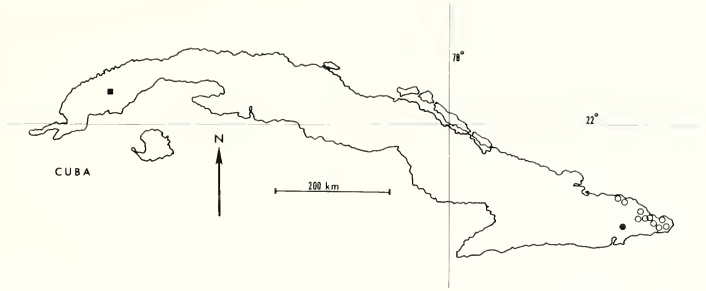

FIGURE 82.—Distribution of *Gesneria* section *Chorisanthera* in Cuba. (*G. gloxinioides* = solid squares; *G. shaferi* subsp. *depressa* = solid circles; *G. shaferi* subsp. *shaferi* = open circles.)

style linear, as long as the stamens at anthesis, 0.5 mm in diameter, glabrous, stigma stomatomorphic, papillate.

Fruits and seeds not seen.

TYPE-COLLECTION.—Piñar del Río, Cuba, *C. Wright 3078* (GOET, holotype, Figure 81; BM, G, GH, K, MO, P, isotypes).

DISTRIBUTION AND ECOLOGY.—*Gesneria gloxinioides* is endemic to western Cuba (Figure 82), habitat unknown. The large campanulate corolla could probably accommodate any of the flower-feeding bats and hummingbird species found in Cuba, and may not be adapted for any particular pollinator.

SPECIMENS EXAMINED.—CUBA. PROVINCE OF PIÑAR DEL RÍO: 1860–1864, *C. Wright 3078* (GOET, holotype of *Conradia gloxinioides* Grisebach; BM, G 2 sheets, GH, K, MO, P, isotypes).

DISCUSSION.—The arrangement of the anthers side by side, found only in a few species of *Gesneria* and only in section *Chorisanthera*, is one of the strong characters that relates *Gesneria gloxinioides* to the other species in this section. This species may be distinguished from other members of section *Chorisanthera* by its densely pilose leaves with glandular-ciliate margins.

46. *Gesneria pumila* Swartz

Gesneria pumila Swartz, Prodr. 90, 1788.

Plants acaulescent, suffruticose to frutescent: stems woody, decumbent, pendent, or erect, to 1 m long, 3–7 mm in diameter, bark rugose, reddish to brownish gray, glabrescent or glabrous, usually verrucose, sometimes resinous, pith reddish; unbranched or branches few from the base.

Leaves alternate, often crowded at stem apices: petioles sulcate, flattened, or nearly terete, 0.2–2.1 cm long, 1–2 mm wide, green to reddish-brown, glandular to densely pilose or glabrous, becoming verrucose with age, sometimes resinous; blade oblanceolate to subspathulate or obovate, occasionally falcate, 1.6–15.1 cm long, 0.6–4.9 cm wide, membranous to coriaceous, sometimes crisped and subbullate, base acute, cuneate to subcordate, margin serrulate, crenate, dentate, to grossly serrate, occasionally ciliate, apex rounded to acute, adaxial surface dark green, pilose to glabrous, if pubescent, with glandular and nonglandular trichomes occasionally with broad bases, sometimes scabrous, glossy or dull, abaxial surface lighter green, pilose to glabrescent with reddish or colorless appressed trichomes along the prominent veins, or glabrous, often verrucose at the veins.

Inflorescences few to many, axillary in a reduced compound dichasium of 1–4 flowers: peduncles terete to subquadrangular, flexuose or curved, 0.1–5.5 cm long, 1 mm wide, green to reddish-brown, densely pilose to glabrous, occasionally with reddish articulate trichomes, resinous and/or glandular; bracts 2, linear-lanceolate to elliptic, green or red, 3–7 mm long, 0.5–1.5 mm wide, cuneate at the base, margin sometimes ciliate, apex acute, upper surface glandular; pedicels terete, 0.3–1.6 cm long, elongating in fruit, 1–1.5 mm in diameter, green to red, pilose to glabrous, sometimes glandular-resinous; floral tube cyathiform to turbinate or nearly spherical, 2–4 mm long, 2–4 mm wide, green to reddish,

pilose with glandular and nonglandular trichomes to glabrous, sometimes resinous; calyx lobes 4–5, erect, aestivation open, basally connate for 1–2 mm, each subulate, lanceolate, elliptic, ensiform to ovate, 0.2–1.2 cm long, 1–5 mm wide, apex acute to acuminate, margin entire to serrulate, often ciliate, outside green to reddish-brown, sparsely pilose to glabrous, occasionally resinous and glandular, inside green or red, glandular-puberulent to glabrous, veins 3, prominent or obscure; corolla narrowly campanulate to campanulate, tube 0.8–3.5 cm long, 2–4 mm wide at base, 0.5–1.2 cm wide at the mouth exterior green to creamy white and reddish at base, to salmon-pink or red, pilose to glabrous, or glandular, interior essentially glabrous, but for a few glandular hairs at the mouth; limb 5-lobed, spreading, 0.8–2.3 cm wide, each lobe semiorbiculate, upper 2 lobes erect, 0.3–1.5 cm wide, lateral and basal lobes reflexed, 0.3–1.2 cm wide, margins entire to dentate, usually glandular-ciliate; stamens 4, rarely 5, adnate to the base of the corolla for less than 1 mm, seldom exserted beyond the limb, filaments linear, curved or straight, 0.8–3.5 cm long, about 1 mm wide, slightly wider at the base, pink to red or rose, becoming lighter at the apex, sparsely pilose to glabrescent; anthers oblong or orbicular-sagittate, 0.5–2.0 mm long, 1–2 mm wide, reddish or white abaxially, arranged side by side and seldom coherent, or connivent in 2 pairs at their apices; ovary inferior, apex sometimes tomentose, disc annular to pentagonal, white to reddish, 1–3 mm wide, style linear, widest at the base, 0.7–3.5 cm long, 1 mm wide, pink to red, glabrescent or glabrous, stigma clavate, stomatomorphic, papillate, white to green or reddish.

Capsule nearly spherical to elliptic, 0.3–1.0 cm long, 2–8 mm wide, green to gray-brown, often inverted at maturity, glabrescent except occasionally pilose along the costae: costae usually obscure; seeds fusiform to rhombic, 0.5–1.0 mm long, 0.5 mm wide, red to brown.

Discussion.—*Gesneria pumila* apparently includes a complex of morphological variants, usually geographically and ecologically distinctive, and considered here as subspecies. These subspecies appear to be stages in the evolution of species, each evolving separately and parallelly or together reticulately. *Gesneria pumila* subsp. *pumila* occurs at both the east and west ends of Jamaica. Ancestors of each of the two populations of the typical subspecies apparently have given rise to other subspecies, *Gesneria pumila* subsp. *neglecta* in the west and subsp. *proctorii* in the east. These two subspecies are similar to each other and different from the typical subspecies in their larger habit and flowers, glabrous and flaky-resinous foliage and inflorescences, and in having only one maturing flower. *Gesneria pumila* subsp. *mimuloides* resembles subsp. *neglecta* and subsp. *proctorii* in its more robust habit and flowers, but has retained the pubescent character and few-flowered trait of the presumed ancestral form.

It appears that plants grown from seed in a greenhouse may vary from the parent wild plant in amount of indument, and sometimes in size (vide *Talpey 14* and *Stone 125*, BH). The distinctiveness of leaf texture between the membranous subsp. *pumila* and the coriaceous subsp. *neglecta* is only apparent from living material.

Chorisanthera tenera Ørsted was based ostensibly on collections from Costa Rica. But no type has been located from that region; however, Ørsted visited Jamaica, as well as Costa Rica and the material he collected may have been mixed with plants from the latter country. From the description the species resembles *Gesneria pumila* to such a large degree that the two species are considered conspecific.

This species is probably visited and effectively pollinated by hummingbirds, one of which, *Mellisuga minima*, has a mean bill length (13 mm) almost equal to the length of the corolla tube. The other hummingbirds found in Jamaica, *Anthracothorax mango* and *Trochilus polytmus*, having longer bills, may also visit *Gesneria pumila*. The hummingbirds may all be attracted by the reddish stamens and corolla base.

The corolla tube of *Gesneria pumila* may be too narrow to accommodate the rostra of flower-feeding bats (Table 6); however, bats may still visit the flowers of *G. pumila* to obtain pollen or nectar with their tongues, since their extensile tongues could probably enter the corolla tube.

46a. *Gesneria pumila* subsp. *mimuloides* (Grisebach) L. Skog, new rank

Conradia mimuloides Grisebach, Fl. Brit. W. Ind. 467, 1862. *Pentarhaphia mimuloides* (Grisebach) Fawcett, Prov. List, Jam. 28, 1893.

Gesneria mimuloides (Grisebach) Urban, Symb. Ant. 2:377, 1901.—Adams, Fl. Pl. Jamaica 679, 1972.

Subshrubs: stems erect to decumbent, to 0.5 m tall, pubescent, apex resinous; branches few.

Leaves alternate: petioles swollen at the base, flattened, 0.5–2.1 cm long, pilose, verrucose; blades 8.5–15.0 cm long, 3.6–4.9 cm wide, submembranous, base subcuneate, margin dentate to grossly serrate, adaxial surface sparsely pilose with articulate trichomes, older leaves glabrescent, abaxial surface with few scattered trichomes, more numerous along the resinous, verrucose, prominent midvein.

Inflorescences 2- or 3-flowered: peduncles subquadrangular, flexuose, 1.2–5.0 cm long, glabrescent; bracts elliptic, base cuneate, surfaces green; pedicels 4–6 mm long, elongating in fruit; floral tube narrowly turbinate, 2–3 mm wide, reddish-green, densely pilose; calyx lobes elliptic-ovate, 0.6–1.0 cm long, 3.0–3.5 mm wide, glabrescent, resinous, margin ciliate; corolla tube 1.0–1.5 cm long, 6–8 mm wide at the mouth, outside white from a reddish base, pilose, inside whitish with a fine pubescence, limb 1.5–2.0 cm wide, each lobe 5–8 mm wide, margins ciliate; staminal filaments 1.2–2.6 cm long, reddish, nearly glabrous, anthers oblong, 1–2 mm long; ovary apex tomentose, style 1.6–3.0 cm long, stigma clavate.

Capsule nearly spherical, 0.8–1.0 cm long, 5–8 mm in diameter, costae obscure.

Type-Collection.—"Moorces Gap, St. Georges," Jamaica, *W. Purdie sn* (K, lectotype, Figure 83*a*; GOET, isolectotype).

Distribution and Ecology.—Plants grow in the Blue Mountains of eastern Jamaica (Figure 84) near Morces Gap on the border of Portland and St. Andrew parishes, at 1350–1750 m altitude, on moist, shaded limestone banks and ledges. *Gesneria pumila* subsp. *mimuloides* produces flowers in February, March, April, June, July, September, and November. This subspecies may be pollinated by bats *Erophylla sezekorni syops, Glossophaga soricina antillarum,* or *Monophyllus redmani redmani,* whose rostra could be accommodated by the corolla. Visits also by the three species of hummingbirds on Jamaica cannot be ruled out.

Specimens Examined.—JAMAICA. Parish of St. Andrew: Vicinity of Cinchona, New Haven Gap to Vinegar Hill, 2–10 September 1906, *N. Britton 168* (NY); Blue Mountains, windward slopes, Cinchona, 2 March 1915, *J. Harris* & *J. Lawrence C15323* (NY), 4 March 1915, *J. Harris* & *J. Lawrence C15351* (US), 13 March 1915, *J. Harris* & *J. Lawrence C15456* (NY); summit cone of John Crow Peak, Blue Mountains, 5500–5750 ft, 24 November 1954, *G. Proctor 9527* (IJ). Parish of Portland: Morces Gap, 5000 ft, April 1906, *F. Børgeson sn* (C); below Morses [sic] Gap, 21 February 1894, *W. Harris sn* (BM, UCWI); Blue Mountains between Morces Gap and Vinegar Hill, 31 March 1916, *J. Perkins 1256* (GH, K); along track between Vinegar Hill and Morces Gap, 4400–4900 ft, *G. Proctor 23762* (BM); Moorces [sic] Gap, St. Georges, March 1844, *W. Purdie sn* (K, lectotype of *Conradia mimuloides* Grisebach; GOET, isolectotype); near Morces Gap, June 1843, *W. Purdie 23* (K). Locality Unknown: "Jamaica," 1838, *J. Macfadyen sn* (K 2 sheets); "Jamaica," 1844, *W. Purdie sn* (K, TCD 2 sheets); "Jamaica," no date, *N. Wilson sn* (K).

Discussion.—Grisebach based *Conradia mimuloides* on two collections from Jamaica: one collected by Purdie and another gathered by McNab (according to Grisebach). From these syntypes, the collection by Purdie has been selected as the lectotype; a collection by McNab of a plant resembling this subspecies has not been located. The Purdie collection is represented by an adequate specimen at Kew and a fragment in the Grisebach herbarium at Göttingen.

Key to the Subspecies of *Gesneria pumila*

1. Leaves, inflorescences, and floral tubes obviously resinous, the resin flaking; plants suffruticose to fruticose, stems erect, rarely decumbent.
   2. Plants glabrous, inflorescences of one maturing flower.
      3. Corolla rose or salmon-pink; calyx lobes serrulate, ovate to elliptic ..... 46c. subsp. ***proctorii,*** new rank
      3. Corolla greenish-white from a pink base; calyx lobes entire, ensiform to elliptic ..... 46b. subsp. ***neglecta,*** new rank
   2. Plants pubescent, inflorescences of 2 or 3 maturing flowers ..... 46a. subsp. ***mimuloides,*** new rank
1. Leaves, inflorescences, and floral tubes not resinous, or rarely, subresinous at apex, resin not flaking; plants acaulescent or if suffruticose, then stems decumbent to pendent ..... 46d. subsp. ***pumila***

FIGURE 83.—Type specimens: *a*, lectotype of *Conradia mimuloides* Grisebach and *Gesneria pumila* subsp. *mimuloides* (Grisebach) L. Skog, new rank, *Purdie sn* (K); *b*, holotype of *Conradia neglecta* Hooker and *Gesneria pumila* subsp. *neglecta* (Hooker) L. Skog, new rank, *Purdie sn* (K).

46b. *Gesneria pumila* subsp. *neglecta* (W. Hooker) L. Skog, new rank

Conradia neglecta W. Hooker, Icon. Pl. 9: pl. 874, 1851.—Grisebach, Fl. Brit. W. Ind. 461, 1862.

Pentarhaphia neglecta (W. Hooker) Hanstein, Linnaea 34: 305, 1865.

Gesneria neglecta (W. Hooker) O. Kuntze, Rev. Gen. 2:473, 1891.—Urb., Symb. Ant. 2:377, 1901.—Adams, Fl. Pl. Jamaica 679, 1972.

Gesneria leiocarpa Urban & N. Britton *in* Urban, Symb. Ant. 7:378, 1912. [Type-collection: Peckham woodland, Jamaica, *W. Harris 10880* (NY, lectotype; NY, UCWI, isolectotypes).]

Shrubs: stems erect, decumbent or pendent, to 1 m tall, glabrous, resinous, pith reddish; unbranched or with few short branches, buds and young leaves covered by yellowish scaly resin.

Leaves alternate: petioles slightly sulcate, 0.9–1.5 cm long; blades occasionally falcate, 3.0–12.5 cm long, 1.1–4.6 cm wide, coriaceous, base acute to cuneate, adaxial surface glabrous, abaxial surface glabrous, resinous, and glandular along the prominent verrucose midvein.

Inflorescences of one maturing flower: peduncles terete, 0.7–1.4 cm long, reddish, glabrous, resinous;

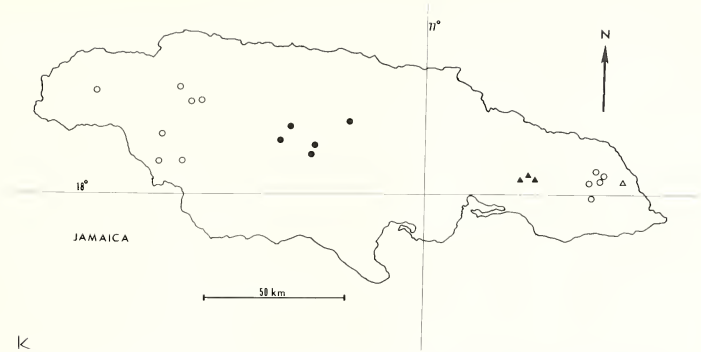

FIGURE 84.—Distribution of *Gesneria* section *Chorisanthera* in Jamaica. (*G. pumila* subsp. *mimuloides* = solid triangles; *G. pumila* subsp. *neglecta* = solid circles; *G. pumila* subsp. *proctorii* = open triangles; *G. pumila* subsp. *pumila* = open circles.)

pedicels 0.6–1.5 cm long, reddish; floral tube narrowly cyathiform, 3–4 mm long, 2.5–3 mm in diameter, green to reddish, glandular, resinous; calyx lobes ensiform to elliptic, 0.7–1.2 cm long, 1.0–2.5 mm wide, margin entire, reddish toward the base, glandular; corolla tube 1.1–1.4 cm long, 3–4 mm wide at base, 6–8 mm wide at mouth, exterior greenish-white from a pink base, glabrous, interior greenish-white from a pink base or rose, glabrous, but for a few scattered hairs at the mouth, limb to 3 cm wide, upper lobes to 1.5 cm broad, lateral lobes to 1.2 cm wide, basal lobe to 1.2 cm broad, margins entire to dentate, glandular; staminal filaments 1.6–2.7 cm long, pink to red near base, becoming lighter near apex, sparsely pubescent, anthers orbicular-sagittate, all coherent side by side; ovary disc annular, white, style 2.5–3.2 cm long, glabrescent, stigma stomatomorphic, white to green, papillate.

Capsule 6–8 mm long, 4 mm in diameter, costae obscure.

TYPE-COLLECTION.—Sandy rocks above Cave Valley, Jamaica, *W. Purdie sn* (K, holotype, Figure 83*b*).

DISTRIBUTION AND ECOLOGY.—*Gesneria pumila* subsp. *neglecta* grows in central Jamaica in the parishes of Trelawny, St. Ann, and Clarendon (Figure 84), at altitudes from 600–850 m, in moist crevices of shaded limestone cliffs and ledges. This subspecies flowers in the field during the months of January, March, September, November, and December; in the greenhouse flowers are produced in the months of October and November. Pollinators may include hummingbirds (Table 5) and at least one bat, *Monophyllus redmani redmani*.

SPECIMENS EXAMINED.—JAMAICA. PARISH OF TRELAWNY: Island View Hill, Wilson Valley district, 1.5 mi N of Warsop, 2000–2200 ft, 26 March 1960, *G. Proctor 20749* (BM); Island View Hill, Wilson Valley district, 1.5 mi N of Warsop, 2000–2200 ft, 29 December 1960, *G. Proctor 21862* (BM); Miss Laura's Hill, between Warsop and St. Vincent, 2000 ft, 5 November 1964, *T. Talpey 20* (BH). PARISH OF ST. ANN: rugged rocks, Pedro district, September 1843, *W. Purdie sn* (K). PARISHES OF ST. ANN AND CLARENDON: Sandy rocks above Cave Valley, December 1843, *W. Purdie sn* (K, holotype of *Conradia neglecta* W. Hooker). PARISH OF CLARENDON: Peckham woodland, 2500–2800 ft, 2 March 1910, *W. Harris 10880* (NY, lectotype of *G. leiocarpa* Urban & N. Britton; NY, UCWI, isolectotypes); Peckham Woods, 2500 ft, 27 December 1917, *W. Harris 12763* (F, GH, K, MO, NY, UCWI, US); Peckham Woods, ca 2500 ft, 25 November 1953, *G. Proctor 8213* (IJ); Peckham Woods, 2500 ft, 7 January 1955, *G. Proctor 9779* (IJ, NY); Peckham Woods, north of Frankfield, below 2500 ft, 23 December 1955, *W. Stearn 21* (A, BM). LOCALITY UNKNOWN: "Jamaica," 1844, *W. Purdie sn* (K); "Jamaica," no date, *W. Purdie sn* (K, TCD).

DISCUSSION.—W. J. Hooker originally described *Conradia neglecta* as being one-flowered, but examination of the type specimen at Kew, collected by W. Purdie in 1843, shows one or more flowers on the peduncles. Observations on a living plant in the greenhouse at Cornell University (G-875)

revealed that the second or later flowers are reduced and may develop if the first flower does not mature or become fertilized, a trait found similarly in other species of *Gesneria*. Sometimes the subordinate flowers on a peduncle develop almost to anthesis then wither and fall following the fertilization of the primary flower.

Gesneria leiocarpa Urban & N. Britton was based on a specimen collected by Harris that lacked flowers. The leaf and fruit characters of the Harris specimen are similar to the type and description of *Gesneria pumila* subsp. *neglecta*, and the material is here considered conspecific. Later collections from the type-locality of *Gesneria leiocarpa* and bearing flowers also agree with *G. pumila* subsp. *neglecta*. The holotype of *G. leiocarpa*, if at Berlin, was destroyed. A duplicate collection at the New York Botanical Garden is selected as lectotype.

46c. *Gesneria pumila* subsp. *proctorii* (Stearn) L. Skog, new rank

Gesneria proctorii Stearn *in* Adams, Fl. Pl. Jamaica 679, 1972 [nom. invalid., without Latin description].
Gesneria proctorii Stearn *in* Skog, Baileya 18:113, 1972.

Shrubs: stems erect, to 3 dm tall, glabrous, resinous; unbranched.

Leaves alternate: petioles nearly terete, 0.8–2.0 cm long; blades 5.0–10.5 cm long, 2–4 cm wide, subcoriaceous, base narrowly cuneate, margin serrulate to serrate, glabrous, midvein verrucose abaxially.

Inflorescences 1-flowered: peduncles terete, reflexed, 1.5–5.6 cm long, reddish to brown, glabrous, verrucose, resinous; bracts 2, lanceolate, 4–7 mm long, 1 mm wide, green, resinous; pedicels recurved, 0.7–1.5 cm long; floral tube ca 4 mm long, 4 mm wide, glabrous, resinous: calyx lobes 4 or 5, each ovate-elliptic, 7–9 mm long, 3–5 mm wide, glabrous, resinous, margin serrulate; corolla tube about 3.5 cm long, 0.5 cm wide at base, ca 1.2 cm wide at mouth, rose or salmon-pink, outside and inside sparsely pilose with patent or appressed articulate trichomes, lobes of the limb about 1.0 cm wide, margin subentire; staminal filaments about 3.0–3.5 cm long, rose, glabrescent; ovary disc annular to pentagonal, style 3.0–3.5 cm long, reddish toward apex, glabrous.

Type-Collection.—East slope of John Crow Mountains, Jamaica, *G. Proctor 5731* (IJ, holotype; US, isotype, Figure 85*a*).

Distribution and Ecology.—Plants of this subspecies grow in eastern Jamaica (Figure 84) in the parish of Portland from 600–900 m in dense mossy thickets or on moist limestone boulders. *Gesneria pumila* subsp. *proctorii* has been collected in flower in the field during April and August. This subspecies because of the large campanulate corolla may be visited by both bats and hummingbirds, and probably by all of the species of these animals available in the local environment; no one animal species appears specifically adapted for visiting *G. pumila* subsp. *proctorii*.

Specimens Examined.—JAMAICA. Parish of Portland: east slope of John Crow Mountains, 2.5 mi SW of Ecclesdown, 2000–3000 ft, among moist limestone boulders, flowers salmon pink, 4 April 1951, *G. Proctor 5731* (IJ, holotype of *Gesneria proctorii* Stearn; US, isotype), *5732* (IJ); uppermost part of Big River, John Crow Mountains, above Spring Valley Estate, 3000 ft, 6 August 1967, *H. Osmaston 5176* (UCWI).

Discussion.—Comparison of the plants included here with others now included in *Gesneria pumila* has shown that this taxon should not be of species rank.

46d. *Gesneria pumila* subsp. *pumila*

Gesneria pumila Swartz, Prodr. 90, 1788.—Sw., Fl. Ind. Occid. 2:1030, 1800.—Lunan, Hort. Jam. 1:322, 1814.—Urb. Symb. Ant. 2:378, 1901.—Adams, Fl. Pl. Jamaica 679, 1972.
Conradia pumila (Swartz) Martius, Nov. Gen. & Sp. 3:38, 1829 & 3:191, 1832.—G. Don. Gen. Syst. 4:650, 1838.—DC., Prodr. 7:526, 1839.—Griseb., Fl. Brit. W. Ind. 461, 1862.
Chorisanthera pumila (Swartz) Ørsted, Cent. Gesn. 35, 1858.
Chorisanthera tenera Ørsted, Cent. Gesn. 35, 1858 [ex. char.] [Type-collection: *A. Ørsted sn*, not seen.]
Pentarhaphia tenera (Ørsted), Hanstein, Linnaea 34:304, 1865.
Pentarhaphia pumila (Swartz) Hanstein, Linnaea 34:305, 1865.
Gesneria tenera (Ørsted) O. Kuntze, Rev. Gen. 2:473, 1891 ("*Gesnera*").

Plants acaulescent or suffruticose: stems woody, decumbent, to 15 cm tall, rarely taller; bark rugose, reddish-brown, glabrescent, verrucose, pith reddish; branching from the base, internodes very short.

Leaves alternate: petioles flattened, 0.2–1.2 cm long, 1–2 mm wide, green to reddish-brown, adaxial surface glandular to densely pilose, becoming verrucose with age, resinous; blades oblanceolate

FIGURE 85.—Type specimens: *a*, isotype of *Gesneria proctorii* Stearn and *Gesneria pumila* subsp. *proctorii* (Stearn) L. Skog, new rank, *Proctor 5731* (US); *b*, holotype of *Gesneria pumila* Swartz, *Swartz sn* (S).

to subspathulate, 1.5–10.6 cm long, 0.8–3.8 cm wide, membranous, sometimes crisped, bullate, base cuneate to subcordate, margin crenate-serrate, ciliate, apex rounded, adaxial surface dark green, pilose to glabrescent with glandular and nonglandular trichomes occasionally with broad bases, glossy or dull, abaxial surface lighter green, pilose to glabrescent with reddish or colorless appressed trichomes along the prominent veins.

Inflorescences few to many, 1- to 3-flowered: peduncles terete, 0.3–3.2 cm long, 1 mm in diameter, green to reddish, sparsely to densely pilose with reddish or colorless articulate trichomes, somewhat resinous; bracts 2, lanceolate, 3–5 mm long, 1 mm wide, green or red, cuneate at the base, margin ciliate, apex acute, adaxial surface glandular; pedicels terete, 0.4–1.6 cm long, 1 mm in diameter, green to red, glandular to pilose; floral tube cyathiform, 2–4 mm long, 2–3 mm wide, green to reddish, pilose with glandular and nonglandular trichomes, to glabrescent; calyx lobes 5, erect, connate at the base for 1 mm, aestivation open, each subulate or lanceolate to elliptic, 2–9 mm long, 1–3 mm wide, green or red outside, sparsely pilose to glabrescent, glandular, inside green or red, glandular, veins obscure, apex acute; corolla narrowly campanulate, tube 0.8–1.6 cm long, 2–4 mm wide at base, 5–8 mm wide at mouth, exterior and interior reddish at the base, then green to creamy white toward the margin, or salmon-pink or reddish, pilose, trichomes more numerous at the mouth, limb 5-lobed, spreading, 0.8–2.2 cm wide, upper two lobes erect,

lateral and basal lobes reflexed, each lobe semiorbiculate, 0.3–1.1 mm wide, margin dentate and ciliate; stamens 4, occasionally 5, adnate to the corolla base for less than 1 mm, seldom exserted beyond the limb, filaments linear, slightly wider at the base, 0.8–2.1 cm long, less than 1 mm wide, red, anthers oblong, 0.5–1.5 mm long, less than 1 mm wide, seldom coherent, arranged side by side, pollen grains (Figure 18*k*) isopolar, prolate, size small (21.4–21.7 μm long at the polar axis, 10.2–10.5 μm wide at the equatorial axis), amb nearly circular, tricolpate, colpi 18.4 μm long, less than 1 μm wide, apocolpia truncate, sexine reticulate, homobrochate, lumina less than 0.5 μm across, muri ca 0.25 μm wide; staminode to 6 mm long, lacking fertile anther; ovary inferior, disc reddish, 1–2 mm wide, style linear, widest at the base, 0.7–2.4 cm long, 1 mm wide, pink, stigma clavate, papillate.

Capsule nearly spherical to elliptic, 3–7 mm long, 2–6 mm wide, green-gray to brown, glabrescent except occasionally pilose along the costae, costae obscure or nearly visible; seeds rhombic, 0.5 mm long, reddish-brown.

Type-Collection.—Jamaica, *O. Swartz sn* (S, holotype, Figure 85*b*; B, BM, C, G-DC, LD, LINN, M, S, UPS, isotypes).

Chromosome Number.—$n = 14$ (*Talpey 14;* Lee, 1966a).

Distribution and Ecology.—Plants grow in western Jamaica (Figure 84) in the parishes of Hanover, Westmoreland, St. James, St. Elizabeth, and Trelawny, and in eastern Jamaica in the parishes of Portland and St. Thomas at elevations of 300–700 m on moist shaded limestone cliffs or ledges. *Gesneria pumila* subsp. *pumila* may produce flowers in the field during all the months of the year except May; in the greenhouse this subspecies produces flowers in April and November.

Specimens Examined.—JAMAICA. Parish of Hanover: Dolphin Head, 1300 ft, 21 December 1960, *C. Adams 8628* (UCWI). Parish of Westmoreland: 1.5 mi NW of Leamington, 1300 ft, 31 January 1961, *C. Adams 8883* (UCWI); Bush Mt. (Bush-mouth) district, ca 1 mi W of Flower Hill PO, ca 1000 ft, 30 October 1952, *G. Proctor 7300* (IJ, NY); Teague Gully, 1000–1300 ft, 8 February 1961, *G. Proctor* & *W. Mullings 22049* (BM, IJ); January 1844, *W. Purdie sn* (K). Parish of St. James: White Rock Hill, ca 1 mi S of Sweet Water, 2000–2200 ft, 2 December 1962, *G. Proctor 22991* (BM, GH, IJ). Parish of St. Elizabeth: Springfield, 1500–1750 ft, 22 March 1964, *G. Proctor 24731* (IJ); near Springfield, 1500 ft, 16 August 1970, *L. Skog 1643* (BH); New Hope, Springfield, 1849, *H. Wullschlägel 952* (GOET, M, W). Parish of Trelawny: Cockpit Country, near Red Mud Hole, ca 6 mi NNW of Accompong, 1100 ft, 27 April 1956, *W. Stearn 954* (BM); Cockpit Country, ca 8 mi N of Quickstep, 7 March 1950, *G. Proctor 4131* (IJ, US); 7 mi NNW of Quickstep, 1500 ft, 18 March 1962, *J. Poulter* in *Adams 10895* (UCWI); Cockpit Country, Troy, 13–18 September 1906, *N. Britton 512* (F, NY); Tyre Woods, 2000 ft, 13 January 1909, *W. Harris 10667* (F, K, NY, UCWI 2 sheets, US). Parish of Portland: spur of John Crow Mountains, opposite Mill Bank, 450–625 m, 18 June 1926, *W. Maxon 9352* (NY, US); Ecclesdown, 1200–2000 ft, 1 March 1961, *C. Adams 9091* (UCWI); Ecclesdown, 1200 ft, 29 March 1961, *C. Adams 9344* (UCWI); John Crow Mountains above Ecclesdown, 900 ft, 8 April 1967, *A. Katzenberger* & *R. Katzenberger 107* (RDJ); west slope of Crown Peak, John Crow Mountains, ca 3000 ft, *G. Proctor 4007* (IJ, US); John Crow Mountains, 1.5–2.5 mi SW of Ecclesdown, 1500–2500 ft, 24 January 1956, *R. Howard, G. Proctor* & *W. Stearn 14801* (A, BM); east slope of the John Crow Mountains, 1.5 mi SW of Ecclesdown, 1500 ft, 21 March 1951, *G. Proctor 5616* (IJ); east slope of John Crow Mountains, 1–1.5 mi SW of Ecclesdown, 1200–1500 ft, 14 January 1955, *G. Proctor 9801* (IJ, NY); SW of Ecclesdown, 1400 ft, 3 November 1964, *T. Talpey 14* (BH); east slope of the John Crow Mountains, ca 1.5 mi SW of Ecclesdown, 1500 ft, 5 February 1969, *R. Weaver 1926* (UCWI); Rodney Hall, 1000 ft, 26 March 1961, *C. Adams 9333* (UCWI); John Crow Mountains, 1500 ft, March 1951, *E. Robertson 113* (UCWI). Parish of St. Thomas: trail from Corn Puss Gap north, 2000 ft, 29 July 1966, *W. Anderson* & *D. Sternberg 3316* (GH, UCWI); Corn Puss Gap, ca 2100 ft, 5 January 1945, *A. Barry sn* (IJ); north slope of Corn Puss Gap, 1750–2000 ft, 1 March 1969, *G. Proctor 29992* (IJ); deep ravine in mountain forest above House Hill, 500–700 m, 6–12 June 1926, *W. Maxon 8863* (NY, US); Cunna Cunna Gap, July 1843, *W. Purdie 221* (K). Locality Unknown: "Jamaica," 1844, *W. Purdie sn* (GH, K, TCD); "Jamaica," 1784–1786, *O. Swartz sn* (S, holotype of *Gesneria pumila* Swartz; B, BM, C, G-DC, LD, LINN, M, S 2 sheets, UPS, isotypes). Cultivated: Cornell University, G-874, 19 April 1966, *M. Stone 125* (BH).

Discussion.—Although *Gesneria pumila* subsp. *pumila* is known from two geographically separated areas in Jamaica, this separation is not strikingly evident in the morphology of the plants. The subspecies, however, does display some variation in the size of plant organs: the flowers of a population in the Cockpit Country of Jamaica are somewhat larger and the peduncles and pedicels longer. This population may be varietally distinct or a result of a response to ecological conditions. The red articulate hairs can be seen in material from both areas.

47. *Gesneria shaferi* Urban

Gesneria shaferi Urban, Symb. Ant. 7:541, 1913.

Plants acaulescent to suffruticose: stems erect, decumbent or pendent, woody, to 2 dm long, 1–4 mm in diameter; bark reddish-brown to gray, rugose, glabrous, sometimes resinous at apex; branches few or none.

Leaves rosulate, crowded at the stem apices: petioles sulcate, sometimes alate at base, nearly sessile to 5 mm long, 1–2 mm wide, reddish-brown, glandular, verrucose to nearly smooth; blades elliptic to oblanceolate or obovate, 1.9–9.4 cm long, 0.6–4.5 cm wide, bullate, young leaves membranous and pilose with appressed articulate trichomes, trichomes sometimes with broad bases, older leaves becoming subcoriaceous and sometimes glabrescent, base acute to cuneate, margin entire or crenate to finely lobulate-serrate toward the acute apex, sometimes ciliate with eglandular trichomes, adaxial surface green, glossy, abaxial surface reddish-brown or green.

Inflorescences of one flower: peduncles terete or subquadrangular, 1–7 mm long, 1 mm in diameter, glabrous; bracts 2, linear-lanceolate, 1–8 mm long, 1–2 mm wide, green or reddish, glabrous-glandular; pedicels terete, 0.3–3.3 cm long, less than 1 mm in diameter, reddish, glabrous or glandular, sometimes resinous; floral tube nearly spherical to turbinate, 5-angled, 2 mm long, 2–3 mm wide, green or reddish, glandular-resinous; calyx lobes 5, connate at the base for about 2 mm, each lobe broadly triangular to lanceolate or ovate, 4–9 mm long, 1–4 mm wide, margin recurved, entire, apex acute to acuminate, green to red, outside glabrous, but glandular, inside pilose to glabrescent, glandular, veins 3–5, prominent; corolla campanulate, gradually expanding from the base, tube 1.0–2.2 cm long, 4 mm wide at the base, 0.8–1.2 cm wide at the mouth, exterior yellow to red with darker veins, sparsely pubescent, interior reddish or yellow, glandular, limb bilabiate, 5-lobed, 1.5–2.4 cm wide, upper lobes erect, connate for one-third of their length, 0.7–1.5 cm long, 0.7–1.5 cm wide, yellow or yellow with reddish veins, margin crenulate to subentire, lateral and basal lobes semiorbiculate, reflexed or patent, 0.6–1.0 cm long, 0.5–1.0 cm wide, yellow with reddish veins to dark red, margin subentire to denticulate or suberose and sometimes ciliate; stamens 4, adnate to base of corolla tube, exserted for 3–8 mm beyond mouth, filaments linear, 1.5–2.2 cm long, yellow to reddish, sparsely pilose or glabrous, anthers rectangular, 1.0–2.0 mm long, 0.6–1.0 mm wide, coherent in 2 pairs by their apices or rarely side by side, staminode 5–8 mm long; ovary inferior, apex tomentose, disc 5-angled, white, style slender, to 2.5 cm long, green or reddish, pilose to glabrescent or glabrous, stigma clavate, green, papillate.

Capsule broadly turbinate, forming a splash cup, 3–7 mm long, 4–9 mm in diameter, brownish-gray, glabrescent, costae 5–15, sometimes obscure; seeds fusiform, about 1 mm long, slightly twisted, black.

Discussion.—*Gesneria shaferi* is composed of two subspecies distinct in leaf trichome quantity and color of corolla, among other characters. The subspecies are geographically separated; subsp. *shaferi* grows near the north coast of Oriente Province of Cuba and subsp. *depressa* occurs near the south coast.

47a. *Gesneria shaferi* subsp. *depressa* (Grisebach) L. Skog, new rank

Conradia depressa Grisebach, Cat. Pl. Cub. 200, 1866.

Pentarhaphia depressa (Grisebach) Gómez de la Maza, Anales Soc. Esp. Hist. Nat. 23:279, 1894.

Gesneria depressa (Grisebach) Urban, Symb. Ant. 2:378, 1901.—Morton *in* Leon & Alain, Fl. de Cuba 4:460, 1957.

Gesneria samuelssonii Urban, Repert. Spec. Nov. Regni Veg. 21:70, 1925. [Type-collection.—Guantánamo, in Monte Libanon, Cuba, *E. Ekman 15823* (S, holotype; NY, S, isotypes).]

Stems decumbent or pendent, to 2 dm long; unbranched.

Leaf blades 1.9–6.5 cm long, 0.6–2.6 cm wide, base acute to cuneate, margin crenate to finely lobulate-serrate, ciliate with nonglandular trichomes, adaxial surface pilose to glabrescent, scabrous, some trichomes with enlarged persistent whitish basal cells, abaxial surface green, pilose only along the prominent veins.

Inflorescences with peduncles subquadrangular, 1–3 mm long, 1–2 mm wide, reddish, glandular, resinous; pedicels 3–5 mm long; floral tube nearly spherical or turbinate, reddish, glandular-resinous; calyx lobes lanceolate, 4–6 mm long, 1–2 mm wide; corolla tube 1.0–1.6 cm long, 0.8–1.1 cm wide at the mouth, yellow from a pinkish base, limb with upper lobes 9 mm wide, lateral and basal lobes 4–6 mm wide, margins denticulate to suberose, gland-

Key to the Subspecies of *Gesneria shaferi*

1. Corolla yellow from a pink base, limb yellow; adaxial leaf trichomes often with broad white bases, leaves scabrous, abaxial surface green ..... 47a. subsp. ***depressa,*** new rank
1. Corolla yellow with red veins becoming dark red at the limb; adaxial leaf trichomes lacking or if present with a few broad white bases, leaves not scabrous, abaxial color reddish-brown ..... 47b. subsp. ***shaferi***

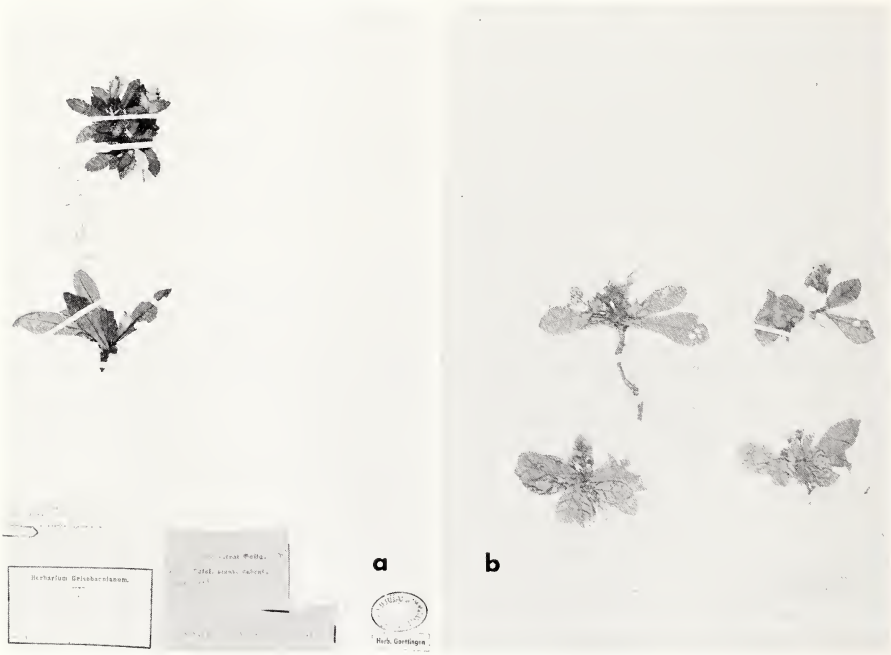

FIGURE 86.—Type specimens: *a*, holotype of *Conradia depressa* Grisebach and *Gesneria shaferi* subsp. *depressa* (Grisebach) L. Skog, new rank, *Wright 3079* (GOET); *b*, isolectotype of *G. shaferi* Urban, *Shafer 8436* (PH).

ular and ciliate; staminal filaments 1.5–2.0 cm long, red; style 2.5 cm long, red, glabrous.

Capsule 3–4 mm long, 4–7 mm in diameter.

TYPE-COLLECTION.—Cuba, *C. Wright 3079* (GOET, holotype, Figure 86*a*; BM, G, GH, K, MO, NY, P, isotypes).

DISTRIBUTION AND ECOLOGY.—This subspecies grows in eastern Cuba (Figure 82) in the eastern part of Oriente Province on Monte Libanon at altitudes from 700–800 m on limestone rocks. *Gesneria shaferi* subsp. *depressa* is known to flower in the field at least during the month of November. Visitors to the flowers may include all species of hummingbirds in Cuba and two species of bats,

Erophylla sezekorni sezekorni and *Monophyllus redmani clinedaphus,* whose rostra could fit into the corolla and may effectively pollinate.

Specimens Examined.—CUBA. Province of Oriente: Guantánamo, in Monte Libanon, near Monterus, 700–800 m, 28 November 1922, *E. Ekman 15823* (S, holotype of *Gesneria samuelssonii* Urban; NY, S, 2 sheets, isotypes). Locality Unknown: "Cuba," 1860–1864, *C. Wright 3079* (GOET, holotype; BM, G 2 sheets, GH, K, MO, NY, P, isotypes).

Discussion.—This subspecies shares a few similar characters with *Gesneria pumila* subsp. *pumila,* particularly in the corolla color and in having leaf trichomes with broad bases; however, the geographical range of *G. shaferi* subsp. *depressa* is in Cuba, and the subspecies of *G. pumila* are all in Jamaica. In morphology more of the characters resemble the typical subspecies of *Gesneria shaferi.*

47b. *Gesneria shaferi* subsp. *shaferi*

Gesneria shaferi Urban, Symb. Ant. 7:541, 1913.—Morton *in* Leon & Alain, Fl. de Cuba 4:461, 1957.

Gesneria lindmanii Urban, Symb. Ant. 9:271, 1924.—Morton *in* Leon & Alain, Fl. de Cuba 4:460, 1957. [Type-collection: El Yunque, Cuba, *E. Ekman 3913* (S, holotype).]

Stems to 9 cm tall.

Leaf blades 1.9–9.4 cm long, 0.9–4.5 cm wide, margin entire or crenate toward the apex, rarely ciliate, adaxial surface not scabrous, abaxial surface reddish-brown.

Inflorescences with peduncles terete, 1–7 mm long; floral tube 5-angled; calyx lobes 4–9 mm long, 3–4 mm wide; corolla tube 1.2–2.2 cm long, 1.0–1.2 cm wide at the mouth, yellow with reddish veins to dark red, limb with upper lobes 0.7–1.5 cm wide, lateral and basal lobes 0.5–1.0 cm wide, margin subentire; staminal filaments 1.5–2.2 cm long, yellow to reddish; style green or reddish, pilose to glabrescent.

Capsule 5–7 mm long, 6–9 mm wide.

Type-Collection.—"Yamurí arriba to Bermejal," Cuba, *J. Shafer 8436* (NY, lectotype; MO, NY, PH (Figure 86*b*), US, isolectotypes).

Distribution and Ecology.—The plants are endemic to Oriente Province of Cuba (Figure 82) on wet serpentine rocks near streams to 600 m elevation. *Gesneria shaferi* subsp. *shaferi* flowers in the field from November through March. This subspecies may be visited by all species of hummingbirds and flower-feeding bats found in Cuba; an adaptation for a single pollinator is not evident.

Specimens Examined.—CUBA. Province of Oriente: Paredones del Río Moa, Moa, 15 November 1945, *J. Acuña 13345* (SV, US); way from charrascos of Peña Prieta to Río de Peña, Toa, 30 December 1953, *Alain Liogier 3627* (NY); Baracoa in rupibus umbros. prope Río Toa, 28 November 1914, *E. Ekman 3688* (S); charrascos at km 5 from Sabanilla to Cajobabo, 17 January 1960, *Alain Liogier, J. Acuña & Ramos 7717* (US); banks of rivulet, in very moist places Vía Azul, km 7 south of Sabanilla, Baracoa, 14 January 1956, *Alain Liogier & C. Morton 5132* (GH); on the Vía Azul between Sabanilla and Cajobabo, at km 7 from Sabanilla, 600 m, 14 January 1956, *C. Morton & Alain Liogier 9083* (BM, US); bank of a rivulet, km 2 south of Sabanilla, Vía Azul, 14 January 1956, *Alain Liogier & C. Morton 5162* (IJ); Baracoa in the valley of Río Macaguanigua, 19 January 1915, *E. Ekman 4327* (F, G, K, NY, S, US); vicinity of Baracoa, 1–7 February 1902, *C. Pollard, E. Palmer & W. Palmer 263* (CU, GH, MO, NY, PH, US); Cooper's Ranch, base of El Yunque Mt, Baracoa, March 1903, *L. Underwood & F. Earle 1174* (NY); El Yunque in rupibus calcareis arduis, 17–18 December 1914, *E. Ekman 3913* (S, holotype of *Gesneria lindmanii* Urban), *3919* (NY); slopes and summit of El Yunque, near Baracoa, 1000–2000 ft, 30–31 January 1902, *C. Pollard & W. Palmer 119* (F, GH, MO, NY, PH, US); El Yunque Mt., Baracoa, March 1903, *L. Underwood & F. Earle 708* (NY); near the top of El Yunque de Baracoa, 520 m, 14 January 1960, *Alain Liogier & J. Acuña 7524* (US); upper valley of Río Navas, 22 March 1910, *J. Shafer 4394* (F, MO, NY, PH, US); Yamurí [sic] arriba to Bermejal, 31 January–1 February 1911, *J. Shafer 8436* (NY, lectotype of *Gesneria shaferi* Urban; MO, NY, PH, US, isolectotypes).

Discussion.—Urban based *Gesneria shaferi* on two collections from Cuba (*Shafer 8436* and *4394*), neither of which was selected as the holotype. Specimens of *Shafer 4394* lack corollas on all of the sheets examined. Thus, to stabilize *Gesneria shaferi, Shafer 8436* has been selected as the lectotype. If there had been specimens of this number at Berlin, they are no longer extant. A specimen from New York is selected as the lectotype sheet.

Appendix 1

Excluded Species

Following the publication in 1829 of *Gesnera* Martius, many species were named in or transferred to the genus which now belong in other genera, notably *Achimenes, Kohleria, Sinningia, Gloxinia,* etc. Included in this Appendix are names that have been referred to *Gesnera, Gesneria,* or to the generic synonyms of the latter, but do not actually belong in *Gesneria* Linnaeus.

In a recent paper, Moore (1973b) transferred the cultivated species of *Rechsteineria* Regel and × *Gloxinera* Weathers to *Sinningia* Nees. Many other species remain as *Rechsteineria* or × *Gloxinera* awaiting a revisionary study of these genera. Those species of *Gesnera* or *Gesneria* placed in *Rechsteineria* or × *Gloxinera* but not subsequently transferred to *Sinningia* are maintained here in *Rechsteineria* or × *Gloxinera,* rather than transferred without a thorough study of the plants involved.

Not all the type specimens of the names included in the following list have been examined, but from descriptions and other information, the following specific names have been excluded from consideration in *Gesneria* Linnaeus. The placement of some species in particular genera is tentative.

Conradia cassioides Persoon ex Bentham *in* A. de Candolle, Prodr. 10:511, 1846, lapsu, pro syn. = *Seymeria cassioides* (Walter ex J. F. Gmelin) S. F. Blake, Rhodora 17:134, 1915. [Scrophulariaceae.]

Conradia fuchsioides Nuttall, J. Acad. Nat. Sci. Philadelphia 7:88, 1834. = *Macranthera flammea* (Bartram) Pennell, Bull. Torrey Bot. Club 40:124, 1913. [Scrophulariaceae.]

Conradia lecontei (Torrey) O. Kuntze, Rev. Gen. 2:459, 1891. = *Macranthera flammea* (Bartram) Pennell, Bull. Torrey Bot. Club 40:124, 1913. [Scrophulariaceae.]

Gesneria acaulis Hortorum ex Hanstein, Mart. Fl. Bras. 8(1): 357, 1864 (*"Gesnera"*), nom. nud. pro syn. = *Sinningia tuberosa* (Martius) H. E. Moore, Baileya 19:40, 1973.

Gesneria acaulis Fl. Mex. ex A. P. de Candolle, Prodr. 7: 536, 1839, nom. nud. pro syn. = *Achimenes erecta* (Lamarck) H. P. Fuchs, Acta Bot. Neerl. 12:15, 1963.

Gesneria acaulis Sessé & Mociño, Pl. Nov. Hisp. ed. 1, 97, 1889, excl. syn. = *Achimenes erecta* (Lamarck) H. P. Fuchs, Acta Bot. Neerl. 12:15, 1963.

Gesneria adenantha Fischer ex Hanstein, Linnaea 29:541, 1859 (*"Gesnera"*) nom. nud. pro syn. = *Gloxinia sylvatica* (Humboldt, Bonpland & Kunth) Wiehler, Selbyana 1:33, 1975.

Gesneria affinis Hortorum Petropolitanus in Herbarium Fischer ex Hanstein, Mart. Fl. Bras. 8(1):379, 1864 (*"Gesnera"*), nom. nud. pro syn. = *Rechsteineria bulbosa* (Ker-Gawler) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria aggregata Ker-Gawler, Bot. Reg. 4: pl. 329, 1818. = *Sinningia aggregata* (Ker-Gawler) Wiehler, Selbyana 1:32, 1975.

Gesneria allagophylla Martius, Nov. Gen. & Sp. 3:36, 1829 (*"Gesnera"*). = *Sinningia allagophylla* (Martius) Wiehler, Selbyana 1:32, 1975.

Gesneria amabilis Hortorum ex L. H. Bailey, Man. Cult. Pl. ed. 1, 695, 1924, nom. nud. pro syn. = *Smithiantha multiflora* (W. Hooker) Fritsch *in* Engl. & Prantl, Nat. Pflanzenfam. 4(3b):176, 1894.

Gesneria atrosanguinea Hortorum ex Lémon, Ann. Fl. Pomone 1836:275, 1836. = *Rechsteineria atrosanguinea* (Hortorum ex Lémon) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria aurantiaca Hanstein, Ind. Sem. Hort. Bot. Berol., App. 1861: 8, 1861 (*"Gesnera"*). = *Rechsteineria aurantiaca* (Hanstein) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria auriculata (W. Hooker) O. Kuntze, Rev. Gen. 2:473, 1891 (*"Gesnera"*). = *Rhytidophyllum auriculatum* W. Hooker, Bot. Mag. 64: pl. 3562, 1837.

Gesneria barbata D. Dietrich, Allg. Gartenzeitung 6:346, 1838. = *Sinningia incarnata* (Aublet) Denham, Baileya 19: 126, 1974.

Gesneria barbata Nees & Martius, Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 11(1):48, 1823. = *Sinningia barbata* (Nees & Martius) Nicholson, Ill. Dict. Gard. 3:436, 1887.

Gesneria berteroana (Martius) O. Kuntze, Rev. Gen. 2:473, 1891 (*"Gesnera"*). = *Rhytidophyllum berteroanum* Martius, Nov. Gen. & Sp. 3:39, 1829 (*"Rytidophyllum"*).

Gesneria betonicifolia Hortorum ex Hanstein, Mart. Fl. Bras. 8(1):355, 1864 (*"Gesnera"*), nom. nud. pro syn. = *Sinningia allagophylla* (Martius) Wiehler, Selbyana 1:32, 1975.

Gesneria bibracteata D. Cameron ex Loudon, Hort. Brit., Suppl. 2:637, 1839 (*"Gesnera"*), nom. nud. = ? *Rechsteineria* sp.

Gesneria blassii Regel, Schweiz. Z. Gartenbau 4:159, 1846 (*"Gesnera"*). = *Rechsteineria blassii* (Regel) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria breviflora Lindley, J. Hort. Soc. London 3:165, 1848 (*"Gesnera"*). = *Kohleria* sp.

Gesneria bulbosa W. Hooker, Bot. Mag. 58: pl. 3041, 1831. = *Sinningia cooperi* (Paxton) Wiehler, Selbyana 1:32, 1975.

Gesneria bulbosa W. Hooker, Bot. Mag. 68: pl. 3886, 1842. = *Sinningia magnifica* (Otto & Dietrich) Wiehler, Selbyana 1:32, 1975.

Gesneria bulbosa Ker-Gawler, Bot. Reg. 4: pl. 343, 1819. = *Rechsteineria bulbosa* (Ker-Gawler) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria bullata Urban & Ekman, Ark. Bot. 22A(5):50, 1926. = *Rhytidophyllum* sp.

Gesneria calcarata Sessé & Mociño, Fl. Mex. ed. 2, 143, 1894. = ? *Achimenes* sp.

Gesneria calycina Sieber ex Steudel, Nom. Bot. ed. 2, 1:680, 1840, nom. nud. = *Besleria lutea* Linnaeus, Sp. Pl., ed. 1, 2:619, 1753.

Gesneria canescens Martius, Nov. Gen. & Sp. 3:36, 1829 ("*Gesnera*"). = *Sinningia canescens* (Martius) Wiehler, Selbyana 1:32, 1975.

Gesneria caracasana Otto & Dietrich, Allg. Gartenzeitung 6: 346, 1838 ("*Gesnera*"). = *Rechsteineria caracasana* (Otto & Dietrich) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria cardinalis Lehmann, Neue Allg. Deutsche Garten-Blumenzeitung 6:454, 1850. = *Sinningia cardinalis* (Lehmann) H. E. Moore, Baileya 19:39, 1973.

Gesneria chelonioides Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 2:392, 1818 (1817). = *Sinningia incarnata* (Aublet) Denham, Baileya 19:126, 1974.

Gesneria chilensis Molina, Sagg. Stor. Nat. Chili. ed. 2, 140, 1810. = *Mitraria coccinea* Cavanilles, Anales Ci. Nat. 3:231, 1801.

Gesneria × *chromatella* Hortorum ex Nicholson, Ill. Dict. Gard. 2:65, 1885. = *Smithiantha* × *hybrida* 'Sulphurea.'

Gesneria cinnabarina (Linden) Galeotti, J. Hort. Prat. Belgique, ser. 2, 1:145, 1857. = *Smithiantha cinnabarina* (Linden ex Hanstein) O. Kuntze, Rev. Gen. 2:978, 1891.

Gesneria clausseniana Brongniart ex Decaisne, Rev. Hort. ser. 3, 1:363, 1847. = *Rechsteineria claussenii* (Brongniart ex Decaisne) Decaisne, Rev. Hort. ser. 3, 2:468, 1848.

Gesneria coccinea Hortorum Germanicus ex Hanstein, Mart. Fl. Bras. 8(1):373, 1864 ("*Gesnera*"), nom. nud. pro syn. = *Sinningia incarnata* (Aublet) Denham, Baileya 19:126, 1974.

Gesneria coccinea Rojas, Cat. Hist. Nat. Corrient. 72, 1897. = ? *Rechsteineria* sp.

Gesneria cochlearis W. Hooker, Bot. Mag. 66: pl. 3787, 1840. = *Rechsteineria cochlearis* (W. Hooker) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria confertifolia Hanstein, Mart. Fl. Bras. 8(1):360, 1864 ("*Gesnera*"). = *Rechsteineria confertifolia* (Hanstein) O. Kuntze, Rev. Gen. 2:474, 1891 ("confertiflora").

Gesneria cooperi Paxton, Paxton's Mag. Bot. 1:224, 1834. = *Sinningia cooperi* (Paxton) Wiehler, Selbyana 1:32, 1975.

Gesneria cooperiana Hortorum Woburnensis ex Lehmann, Neue Allg. Deutsche Garten- Blumenzeitung 6:454, 1850, nom. nud. = *Sinningia cooperi* (Paxton) Wiehler, Selbyana 1:32, 1975.

Gesneria cordata W. Baxter ex Loudon, Hort. Brit. ed. 3, Suppl. 3:554, 1850 ("*Gesnera*"), nom. nud. = ?*Rechsteineria* sp.

Gesneria coruscans Paxton, Paxton's Mag. Bot. 16:194, 1849 ("*Gesnera*"). = *Rechsteineria coruscans* (Paxton) O. Kuntze, Rev. Gen. 2:474, 1891 [as *R. corruscans* (Hanstein) O. Kuntze].

Gesneria corymbosa Sieber ex Steudel, Nom. Bot. ed. 2, 1:681, 1840, nom. nud. = *Nautilocalyx melittifolius* (Linnaeus) Wiehler, Phytologia 27:307, 1973.

Gesneria corymbosa Swartz, Prodr. 89, 1788. = *Pheidonocarpa corymbosa (Swartz)* L. Skog.

Gesneria crenulata A. de Candolle ex A. P. de Candolle, Prodr. 7:524, 1839, nom. nud. pro syn. = *Rhytidophyllum crenulatum* A. P. de Candolle, Prodr. 7:524, 1839 ("*Rytidophyllum*").

Gesneria cumanensis (Hanstein) O. Kuntze, Rev. Gen. 2:473, 1891 ("*Gesnera*"). = *Rhytidophyllum cumanense* (Hanstein) L. Skog.

Gesneria cynocephala De Von ex Morren, Hort. Belge 3:320, 1836. = ?

Gesneria dentata Hornschuch, Allg. Gartenzeitung 2:354, 1834 ("*Gesnera*"). = *Rechsteineria dentata* (Hornschuch) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria deppeana Schlechtendal & Chamisso, Linnaea 5:110, 1830. = *Moussonia deppeana* (Schlechtendal & Chamisso) Hanstein, Linnaea 34:284, 1865.

Gesneria discolor Lindley, Bot. Reg. 26: pl. 63, 1841 ("*Gesnera*"). = *Rechsteineria discolor* (Lindley) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria donkelaariana Lemaire, Jard. Fleur. 4: pl. 382, 1854. = × *Gloxinera donkelaariana* (Lemaire) H. E. Moore, Gentes Herb. 8:397, 1954.

Gesneria donklarii Hortorum ex Hooker, Bot. Mag. 84: pl. 5070, 1858. = × *Gloxinera donkelaariana* (Lemaire) H. E. Moore, Gentes Herb. 8:397, 1954.

Gesneria douglasii Lindley, Trans. Hort. Soc. London 7:62, 1826. = *Rechsteineria douglasii* (Lindley) O. Kuntze, Rev. Gen. 2:474. 1891 [as *R. douglasii* (Loddiges) O. Kuntze].

Gesneria douglasii Martius, Nov. Gen. & Sp. 3:33, 1829 ("*Gesnera*"). = *Rechsteineria* sp.

Gesneria earlei Urban & Britton, Symb. Ant. 7:380, 1912. = *Rhytidophyllum earlei* (Urban & Britton) Morton, Brittonia 9:23, 1957.

Gesneria eggersii J. D. Smith, Bot. Gaz. (Crawfordsville) 61: 384, 1916 ("*Gesnera*"). = *Rechsteineria* sp.

Gesneria × *egregia* Hortorum ex Lemaire, Ill. Hort. 4:129, 1857, nom. nud. pro syn. = × *Heppiantha naegelioides* (Lemaire) H. E. Moore, Gentes Herb. 8:399, 1954.

Gesneria ekmanii Urban, Ark. Bot. 17(7):55, 1922. = *Rhytidophyllum* sp.

Gesneria elatior Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 2:393, 1818 (1817). = *Rechsteineria elatior* (Humboldt, Bonpland & Kunth) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria eliptica Ramírez Goyena, Fl. Nicar. 2:606, 1911. = ? *Rechsteineria* sp.

Gesneria elliptica W. Hooker, Bot. Mag. 72: pl. 4242, 1846. = *Rechsteineria elliptica* (W. Hooker) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria elongata Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 2:396, 1818 (1817). = *Kohleria trianae* (Regel) Hanstein, Linnaea 34:442, 1865.

Gesneria eriantha Bentham, Pl. Hartweg. 228, 1846. = *Kohleria eriantha* (Bentham) Hanstein, Linnaea 34:442, 1865.

Gesneria erubescens Hanstein, Ind. Sem. Hort. Bot. Berol., App. 1861:8, 1861 ("*Gesnera*"). = *Rechsteineria erubescens* (Hanstein) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria × *exoniensis* Hortorum ex Dombrain, Fl. Mag. (London) 7: pl. 381, 1868 ("*Gesnera*"). = *Smithiantha 'Exoniensis.'*

Gesneria fascialis W. Hooker, Bot. Mag. 65: pl. 3659, 1838 ("*Gesnera*") sphalm. = *Rechsteineria faucialis* (Lindley) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria faucialis Lindley, Bot. Reg. 21: pl. 1785, 1835 ("*Gesnera*"). = *Rechsteineria faucialis* (Lindley) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria flacourtifolia Hortorum ex Hanstein, Mart. Fl. Bras. 8(1):355, 1864 ("*Gesnera*") nom. nud. pro syn. = *Sinningia allagophylla* (Martius) Wiehler, Selbyana 1:32, 1975.

Gesneria flavescens Hanstein, Ind. Sem. Hort. Bot. Berol., App. 1861:8, 1861 ("*Gesnera*"). = *Rechsteineria flavescens* (Hanstein) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria fragilis Poeppig *in* Poeppig & Endlicher, Nov. Gen. & Sp. 3:7, 1840 ("*Gesnera*"). = *Sinningia sceptrum* (Martius) Wiehler, Selbyana 1:32, 1975.

Gesneria fruticulosa Glaziou, Bull. Soc. Bot. France 58, Mém. 3:514, 1911 ("*Gesnera*"), nom. nud. = *Rechsteineria fruticulosa* Glaziou ex Hoehne, Sellowia 10:66, 1958.

Gesneria gardneri W. Hooker, Bot. Mag. 70: pl. 4121, 1844. = *Vanhouttea gardneri* (W. Hooker) Fritsch, Bot. Jahrb. Syst. 29, Beibl. 65:14, 1900.

Gesneria gerardiana Hortorum ex Lemaire, Fl. Serres Jard. Eur. 2(4): sub pl. 4, 1846, nom. nud. pro syn. = *Smithiantha geroltiana* (Kunth & Bouché) O. Kuntze, Rev. Gen. 2: 978, 1891.

Gesneria geroltiana Kunth & Bouché, Ind. Sem. Hort. Bot. Berol. 1844:11, 1844. = *Smithiantha geroltiana* (Kunth & Bouché) O. Kuntze, Rev. Gen. 2:978, 1891.

Gesneria glaucophylla Nicholson, Ill. Dict. Gard. 2:66, 1885 ("*Gesnera*"). = *Rechsteineria* sp.

Gesneria gollmeriana Hanstein, Ind. Sem. Hort. Bot. Berol., App. 1861:7, 1861 ("*Gesnera*"). = *Rechsteineria gollmeriana* (Hanstein) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria gracilis (Brongniart ex Regel) Hanstein, Linnaea 34: 272, 1865 ("*Gesnera*"). = *Rechsteineria gracilis* (Brongniart ex Regel) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria grandis Hortorum ex Hanstein, Mart. Fl. Bras. 8(1): 355, 1864 ("*Gesnera*") nom. nud. pro syn. = *Sinningia allagophylla* (Martius) Wiehler, Selbyana 1:32, 1975.

Gesneria grandis Sprengel, Syst. Veg. ed. 16, 2:838, 1825 ("*Gesnera*"). = *Rhytidophyllum auriculatum* W. Hooker, Bot. Mag. 64: pl. 3562, 1837.

Gesneria grandis Swartz, Prodr. 89, 1788. = *Rhytidophyllum grande* (Swartz) Martius, Nov. Gen. & Sp. 3:39, 1829 & 3:196, 1832.

Gesneria guazumifolia Bentham, Pl. Hartweg. 147, 1846 ("*Gesnera*"). = *Kohleria guazumifolia* (Bentham) Regel, Gartenflora 3:348, 1854.

Gesneria guianensis Bentham, London J. Bot. 5:360, 1846. = *Rechsteineria schomburgkiana* (Kunth & Bouché) O. Kuntze, Rev. Gen. 2:474, 1891 ("schomburgkii").

Gesneria hahnii Hortorum Paris ex Baillon, Bull. Mens. Soc. Linn. Paris 1:719, 1887. = *Kohleria* sp.

Gesneria herbertiana Lemaire, Fl. Serres Jard. Eur. 2(4): sub pl. 4, 1846, nom. nud. pro syn. = *Smithiantha geroltiana* (Kunth & Bouché) O. Kuntze, Rev. Gen. 2:978, 1891.

Gesneria hirsuta Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 2:394, 1818 (1817). = *Kohleria hirsuta* (Humboldt, Bonpland & Kunth) Regel, Flora 31:250, 1848.

Gesneria hondensis Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 2:395, 1818 (1817). = *Kohleria hondensis* (Humboldt, Bonpland & Kunth) Regel, Flora 31:250, 1848.

Gesneria hookeri Decaisne ex Planchon, Fl. Serres Jard. Eur. 7:167, 1851–1852. = *Sinningia verticillata* (Vellozo) H. E. Moore, Baileya 19:40, 1973.

Gesneria hookeri Hanstein, Linnaea 34:276, 1865 ("*Gesnera*"). = *Reschsteineria hookeri* (Hanstein) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria houttei De Von ex Morren, Hort. Belge 3:320, 1836. = *Rechsteineria* sp.

Gesneria houttei Dumortier, Bull. Acad. Roy. Sci. Bruxelles 3:362, 1836. = *Sinningia magnifica* (Otto & Dietrich) Wiehler, Selbyana 1:32, 1975.

Gesneria ignorata Kunth & Bouché, Ind. Sem. Hort. Bot. Berol. 1848:13, 1848 ("*Gesnera*"). = *Kohleria ignorata* (Kunth & Bouché) Regel, Bot. Zeitung (Berlin) 9:893, 1851.

Gesneria inaequalis Bentham, Pl. Hartweg. 230, 1846. = *Kohleria* sp.

Gesneria incurva Bentham, Bot. Voy. Sulphur. 131, 1845. = *Kohleria* sp.

Gesneria lasiantha Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 1:300, 1832 ("*Gesnera*"). = *Moussonia deppeana* (Schlechtendal & Chamisso) Hanstein, Linnaea 34:284, 1865.

Gesneria lateritia Lindley, Bot. Reg. 23: pl. 1950, 1837. = *Rechsteineria lateritia* (Lindley) O. Kuntze, Rev. Gen. 2: 474, 1891.

Gesneria lateritia Paxton, Paxton's Mag. Bot. 9:245, 1842 ("*Gesnera*"). = *Sinningia cardinalis* (Lehmann) H. E. Moore, Baileya 19:39, 1973.

Gesneria latifolia Martius ex Otto & Schlechtendal, Verh. Vereins Beförd. Gartenbaues Königl. Preuss. Staaten 5:219, 1829 ("*Gesnera*"). = *Rechsteineria macrostachya* (Lindley) L. B. Smith, J. Wash. Acad. Sci. 45:200, 1955.

Gesneria lehmannii J. D. Smith, Bot. Gaz. (Crawfordsville) 41:384, 1916 ("*Gesnera*"). = *Rechsteineria* sp.

Gesneria leopoldi Scheidweiler ex Planchon, Fl. Serres Jard. Eur. 7:167, 1851. = *Rechsteineria leopoldii* (Scheidweiler ex Planchon) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria leptopus Gardner, London J. Bot. 4:129, 1845. = *Vanhouttea gardneri* (W. Hooker) Fritsch, Bot. Jahrb. Syst. 29, Beibl. 65:14, 1900.

Gesneria leucomalla (Hanstein) O. Kuntze, Rev. Gen. 2:473, 1891 ("*Gesnera*"). = *Rhytidophyllum leucomallon* Hanstein, Linnaea 34:312, 1865.

Gesneria lindeniana Brongniart, Rev. Hort. ser. 3, 1:363, 1847.

= *Sinningia incarnata* (Aublet) Denham, Baileya 19:126, 1974.

Gesneria lindleyi W. Hooker, Bot. Mag. 64: pl. 3602, 1837. = *Sinningia claybergiana* H. E. Moore, Baileya 19:39, 1973.

Gesneria linkiana Kunth & Bouché, Ind. Sem. Hort. Bot. Berol. 1848:13, 1848. = *Kohleria longifolia* (Lindley) Hanstein, Linnaea 29:524, 1858.

Gesneria lobulata Hortorum Botanicum Berolinensis ex Hanstein, Mart. Fl. Bras. 8(1):377, 1864 ("*Gesnera*"). = *Sinningia macrorrhiza* (Dumortier) Wiehler, Selbyana 1:32, 1975.

Gesneria lomensis Urban, Repert. Spec. Nov. Regni Veg. 21: 70, 1925. = *Rhytidophyllum lomense* (Urban) Morton, Brittonia 9:23, 1957.

Gesneria longiflora Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 2:396, 1818 (1817). = *Kohleria longiflora* (Humboldt, Bonpland & Kunth) Hanstein, Linnaea 34:442, 1865.

Gesneria longiflora Fl. Mex. ex A. P. de Candolle, Prodr. 7: 536, 1839, nom. nud. pro syn. = *Achimenes longiflora* A. P. de Candolle, Prodr. 7:536, 1839.

Gesneria longiflora Sessé & Mociño, Pl. Nov. Hisp. ed. 1, 97, 1889. = *Achimenes longiflora* A. P. de Candolle, Prodr. 7:536, 1839.

Gesneria longifolia Lindley, Bot. Reg. 27, Misc. 92, 1841 ("*Gesnera*"). = *Kohleria longifolia* (Lindley) Hanstein, Linnaea 29:524, 1858.

Gesneria longipes Bentham, Pl. Hartweg. 229, 1846. = *Kohleria longipes* (Bentham) Hanstein, Linnaea 34:442, 1865.

Gesneria longirostris Martius ex Hanstein, Mart. Fl. Bras. 8(1):380, 1864 ("*Gesnera*"), nom. nud. pro syn. = *Sinningia magnifica* (Otto & Dietrich) Wiehler, Selbyana 1:32, 1975.

Gesneria macrantha Hortorum Berolinensis ex Walpers, Ann. Bot. Syst. 2:1066, 1852, nom. nud. pro syn. = *Sinningia cardinalis* (Lehmann) H. E. Moore, Baileya 19:39, 1973.

Gesneria macrantha Lemaire, Hort. Universel 6:127, 1845. = *Rechsteineria lateritia* (Lindley) O. Kuntze, Rev. Gen. 2: 474, 1891.

Gesneria macrantha Sprengel, Syst. Veg. ed. 16, 1825 ("*Gesnera*"). = *Rechsteineria* sp.

Gesneria macrorrhiza Dumortier, Bull. Acad. Roy. Sci. Bruxelles 3:361, 1836. = *Sinningia macrorrhiza* (Dumortier) Wiehler, Selbyana 1:32, 1975.

Gesneria macrostachya Lindley, Bot. Reg. 14: pl. 1202, 1828. = *Rechsteineria macrostachya* (Lindley) L. B. Smith, J. Wash. Acad. Sci. 45:200, 1955.

Gesneria maculata Martius, Nov. Gen. & Sp. 3: pl. 215, 1829 ("*Gesnera*"), nom. nud. pro syn. = *Rechsteineria* sp.

Gesneria maculata Hanstein, Mart. Fl Bras. 8(1):361, 1864 ("*Gesnera*"). = *Sinningia verticillata* (Vellozo) H. E. Moore, Baileya 19:40, 1973.

Gesneria maculata Mociño & Sessé ex A. P. de Candolle, Prodr. 7:532, 1839. = *Kohleria lanata* Lemaire, Ill. Hort. 8:287, 1861.

Gesneria maculata Sessé & Mociño, Pl. Nov. Hisp. ed. 1, 97, 1889. = *Kohleria lanata* Lemaire, Ill. Hort. 8: pl. 287, 1861.

Gesneria magnifica Otto & Dietrich, Allg. Gartenzeitung 1: 265, 1833 ("*Gesnera*"). = *Sinningia magnifica* (Otto & Dietrich) Wiehler, Selbyana 1:32, 1975.

Gesneria marchii Wailes ex W. Hooker, Bot. Mag. 66: pl. 3744, 1839 ("*Gesnera*"). = *Rechsteineria marchii* (Wailes ex W. Hooker) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria melittifolia Brongniart, Rev. Hort. ser. 3, 1:363, 1847. = *Rechsteineria* sp.

Gesneria merckii H. Wendland, Allg. Gartenzeitung 6:49, 1838 ("*Gesnera*"). = *Rechsteineria merckii* (H. Wendland) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria mollis Hortorum Berolinensis ex Kunth, Ind. Sem. Hort. Bot. Berol. 1848:14, 1848. = *Kohleria ignorata* (Kunth & Bouché) Regel, Bot. Zeitung (Berlin) 9:893, 1851.

Gesneria mollis Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 2:395, 1818 (1817). = *Kohleria mollis* (Humboldt, Bonpland & Kunth) Hanstein, Linnaea 29:528, 1859 ("molle").

Gesneria montevidensis Hortulanorum ex Decaisne, Rev. Hort. ser. 3, 2:468, 1848, nom. nud. pro syn. = *?Rechsteineria* sp.

Gesneria mortonii Wiehler, Baileya 18:4, 1971. = *Pheidonocarpa corymbosa* subsp. *cubensis* (Morton) L. Skog.

Gesneria × *naegelioides* Hortorum ex Nicholson, Ill. Dict. Gard. 2:66, 1885 ("*Gesnera*"). = × *Achimenantha naegelioides* (Van Houtte) H. E. Moore, Baileya 19:36, 1973.

Gesneria × *nigrescens* Hortorum ex Nicholson, Ill. Dict. Gard. 2:66, 1885 ("*Gesnera*"). [This garden hybrid cannot presently be assigned to a genus.]

Gesneria nigrina Linnaeus ex Jackson, Index Linn. Herb. 80, 1912, nom. nud. = *Melasma scabrum* Bergius, Descr. Pl. Cap. Bonae Spei. 162, 1767. [Scrophulariaceae.]

Gesneria nitida Hortorum ex Hanstein, Mart. Fl. Bras. 8(1): 355, 1864 ("*Gesnera*"), nom. nud. pro syn. = *Sinningia allagophylla* (Martius) Wiehler, Selbyana 1:32, 1975.

Gesneria oblongata Hortulanorum Young ex W. Hooker, Bot. Mag. 66: sub pl. 3725, 1839, nom. nud. pro syn. = *Kohleria trianae* (Regel) Hanstein, Linnaea 34:442, 1865.

Gesneria oblongata Hortorum Berolinensis ex Hanstein, Linnaea 34:284. ("*Gesnera*") nom. nud. pro syn. = *Moussonia deppeana* (Schlechtendal & Chamisso) Hanstein, Linnaea 34:284, 1865.

Gesneria oblongata Paxton, Paxton's Mag. Bot. 6:103, 1839. = *Kohleria* sp.

Gesneria onacaensis Rusby, Descr. S. Amer. Pl. 123, 1920. = *Rhytidophyllum onacaense* (Rusby) L. Skog, new combination.

Gesneria organa Hortulanorum ex Decaisne, Rev. Hort. ser. 3, 2:462, 1848, nom. nud. pro syn. = *Vanhouttea gardneri* (W. Hooker) Fritsch, Bot. Jahrb. Syst. 29, Beibl. 65:14, 1900.

Gesneria oxyphylla A. P. de Candolle, Prodr. 7:531, 1839. = *Gloxinia sylvatica* (Humboldt, Bonpland & Kunth) Wiehler, Selbyana 1:33, 1975.

Gesneria palustris Hortorum ex Hanstein, Mart. Fl. Bras. 8(1):355, 1864 ("*Gesnera*"), nom. nud. pro syn. = *Sinningia allagophylla* (Martius) Wiehler, Selbyana 1:32, 1975.

Gesneria palustris Hortorum ex Regel, Gartenflora 4:247, 1855, nom. nud. pro syn. = *Sinningia sceptrum* (Martius) Wiehler, Selbyana 1:32, 1975.

Gesneria paluviensis Hortorum ex Hanstein, Mart. Fl. Bras. 8(1):355, 1864 ("*Gesnera*") nom. nud. pro syn. = *Sinningia allagophylla* (Martius) Wiehler, Selbyana 1:32, 1975.

Gesneria pardina Decaisne ex Planchon, Fl. Serres Jard. Eur. 7:167, 1851–1852. = *Sinningia verticillata* (Vellozo) H. E. Moore, Baileya 19:40, 1973.

Gesneria pardina W. Hooker, Bot. Mag. 74: pl. 4348. = *Vanhouttea salviifolia* (Gardner) O. Kuntze, Rev. Gen. 2:478, 1891.

Gesneria pendulina Lindley, Bot. Reg. 12: pl. 1032, 1827. = *Rechsteineria pendulina* (Lindley) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria petiolaris Bentham, Bot. Voy. Sulphur. 131, 1845. = *Kohleria longifolia* var. *petiolaris* (Bentham) Morton, Publ. Field Mus. Nat. Hist., Bot. Ser. 18:1180, 1938.

Gesneria petiolaris (A. P. de Candolle) O. Kuntze, Rev. Gen. 2:473, 1891 ("*Gesnera*"). = *Rhytidophyllum* sp.

Gesneria picta W. Hooker, Bot. Mag. 75: pl. 4431, 1849. = *Kohleria tubiflora* (Cavanilles) Hanstein, Linnaea 34:442, 1865.

Gesneria pilosa Glaziou, Bull. Soc. Bot. France 58, Mém. 3: 513, 1911 ("*Gesnera*"), nom. nud., = *Amasonia hirta* Bentham, Ann. Nat. Hist. 2:451, 1839. [Verbenaceae.]

Gesneria pilosa Hortorum ex Lemaire, Fl. Serres Jard. Eur. 3:223, 1847, nom. nud. pro syn. = *Columnea aureonitens* W. Hooker, Bot. Mag. 73: pl. 4294, 1847.

Gesneria plumeriana (A. P. de Candolle) O. Kuntze, Rev. Gen. 2:473, 1891 ("*Gesnera*"). = *Rhytidophyllum* sp.

Gesneria polyantha A. P. de Candolle, Prodr. 7:528, 1839. = *Rechsteineria polyantha* (A. P. de Candolle) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria polyantha W. Hooker, Bot. Mag. 69: pl. 3995, 1843. = *Rechsteineria discolor* (Lindley) O. Kuntze, Rev. Gen. Pl. 2:474, 1891.

Gesneria prasinata Ker-Gawler, Bot. Reg. 5: pl. 428 1820. = *Paliavana prasinata* (Ker-Gawler) Bentham *in* Bentham & Hooker, Gen. Pl. 2:1003, 1876.

Gesneria pulchella Hortorum ex Hanstein, Mart. Fl. Bras. 8(1):355, 1864 ("*Gesnera*") nom. nud. pro syn. = *Sinningia allagophylla* (Martius) Wiehler, Selbyana 1:32, 1975.

Gesneria pulchella Swartz, Prodr. 90, 1788. = *Achimenes erecta* (Lamarck) H. P. Fuchs, Acta Bot. Neerl. 12:15, 1963.

Gesneria punctata Hortorum ex Hanstein, Linnaea 34:273, 1865 ("*Gesnera*"), nom. nud. pro syn. = *Rechsteineria gracilis* (Brongniart ex Regel) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria punctata Hortulanorum ex Decaisne, Rev. Hort. ser. 3, 2:466, 1848, nom. nud. pro syn. = *Rechsteineria gracilis* (Brongniart ex Regel) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria punctata H. Jacquin, Ann. Fl. Pomone 1837:254, 1837. = *Rechsteineria* sp.

Gesneria purpurea Lindley, Paxton's Fl. Gard. 3: pl. 76, 1853 ("*Gesnera*"). = *Sinningia verticillata* (Vellozo) H. E. Moore, Baileya 19:40, 1973.

Gesneria × *pyramidalis* Hortorum ex Nicholson, Ill. Dict. Gard. 2:66, 1885 ("*Gesnera*"). = *Rechsteineria* sp.

Gesneria quadrifolia Warszewicz ex Hanstein, Linnaea 29:541, 1859 ("*Gesnera*"), nom. nud. pro syn. = *Gloxinia sylvatica* (Humboldt, Bonpland & Kunth) Wiehler, Selbyana 1:33, 1975.

Gesneria quaterniflora Fl. Mex. ex A. P. de Candolle, Prodr. 7:528, 1839, nom. nud. pro syn. = *Moussonia deppeana* (Schlechtendal & Chamisso) Hanstein, Linnaea 34:284, 1865.

Gesneria reflexa Knowles & Westcott, Fl. Cab. 2:65, 1838. = *Rechsteineria reflexa* (Knowles & Westcott) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria × *refulgens* Hortorum ex Nicholson, Ill. Dict. Gard. 2:66, 1885 ("*Gesnera*"). = *Smithiantha* 'Refulgens.'

Gesneria regalis L. H. Bailey, Man. Cult. Pl. ed. 1, 695, 1924, nom. nud. pro syn. = *Smithiantha zebrina* (Paxton) O. Kuntze, Rev. Gen. 2:978, 1891.

Gesneria regeliana Warszewicz ex Planchon, Fl. Serres Jard. Eur. 9:213, 1853, nom. nud. pro syn. = *Kohleria warszewiczii* (Regel) Hanstein, Linnaea 34:441, 1865.

Gesneria regina Hortorum ex L. H. Bailey, Stand. Cycl. Hort. 3169, 1917, nom. nud. pro syn. = *Sinningia regina* Sprague, Gard. Chron. Ser. 3, 36:87, 1904.

Gesneria rhynchocarpa Bentham, Bot. Voy. Sulphur. 131, 1845. = *Kohleria tubiflora* (Cavanilles) Hanstein, Linnaea 34:442, 1865.

Gesneria robusta Hortorum ex Semaine Hort. 3:71, 1899 ("*Gesnera*"). = *Smithiantha* 'Robusta.'

Gesneria rubricaulis Kunth & Bouché, Ind. Sem. Hort. Bot. Berol. 1847: 12, 1847. = *Kohleria rubricaulis* (Kunth & Bouché) Hasskarl, Bonplandia 8:97, 1860.

Gesneria rugata Scheidweiler *in* Otto & Dietrich, Allg. Gartenzeitung 15:226, 1847 ("*Gesnera*"). = *Kohleria* sp.

Gesneria rupestris Martius ex R. Graham, Edinburgh New Philos. J. 24:193, 1838. = *Sinningia tuberosa* (Martius) H. E. Moore, Baileya 19:40, 1973.

Gesneria rupicola Martius, Nov. Gen. & Sp. 3:30, 1829 ("*Gesnera*"). = *Rechsteineria rupicola* (Martius) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria rupincola (C. Wright) Urban, Symb. Ant. 2:382, 1901. = *Rhytidophyllum rupincola* (C. Wright) Morton, Brittonia 9:22, 1957.

Gesneria rutila Lindley, Bot. Reg. 14: pl. 1158, 1828. = *Sinningia incarnata* (Aublet) Denham, Baileya 19:126, 1974.

Gesneria salviifolia Gardner, London J. Bot. 4:129, 1845. = *Vanhouttea salviifolia* (Gardner) O. Kuntze, Rev. Gen. 2:478, 1891.

Gesneria sartorii Liebmann, Ind. Sem. Hort. Bot. Haun. 1853: 20, 1853. = *Kohleria* sp.

Gesneria scabra Sprengel, Syst. Veg. ed. 16. 2:838, 1825 ("*Gesnera*"). = *Rhytidophyllum berteroanum* Martius, Nov. Gen. & Sp. 3:39, 1829 ("*Rytidophyllum*").

Gesneria sceptroides Hanstein, Ind. Sem. Hort. Bot. Berol., App. 1861:7, 1861 ("*Gesnera*"). = *Rechsteineria sceptroides* (Hanstein) O. Kuntze, Rev. Gen. 2:474, 1891 ("sceptrodes").

Gesneria sceptrum Martius, Nov. Gen. & Sp. 3:32, 1829 ("*Gesnera*"). = *Sinningia sceptrum* (Martius) Wiehler, Selbyana 1:32, 1975.

Gesneria schiedeana (A. P. de Candolle) W. Hooker, Bot. Mag. 71: pl. 4152, 1845. = *Kohleria schiedeana* (A. P. de Candolle) Hanstein, Linnaea 29:518, 1859.

Gesneria schomburgkiana Kunth & Bouché, Ind. Sem. Hort.

Bot. Berol. 1844:11, 1844. = *Rechsteineria schomburgkiana* (Kunth & Bouché) O. Kuntze, Rev. Gen. 2:474, 1891 ("schomburgkii").

Gesneria seemannii W. Hooker, Bot. Mag. 76: pl. 4504, 1850. = *Kohleria seemannii* (W. Hooker) Hanstein, Linnaea 26: 203, 1854.

Gesneria selloi Hortorum ex G. Don, Sweet's Hort. Brit. ed. 3, 527, 1839, nom. nud. pro syn. = *Rechsteineria lateritia* (Lindley) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria sellovii Martius, Nov. Gen. & Sp. 3:36, 1829 ("*Gesnera*"). = *Rechsteineria sellovii* (Martius) O. Kuntze, Rev. Gen. 2:474, 1891 ("selloi").

Gesneria spicata Hortorum ex Hanstein, Mart. Fl. Bras. 8(1): 355, 1864 ("*Gesnera*") nom. nud. pro syn. = *Sinningia allagophylla* (Martius) Wiehler, Selbyana 1:32, 1975.

Gesneria spicata Hortorum Berolinensis ex Hanstein, Mart. Fl. Bras. 8(1):371, 1864, ("*Gesnera*"), nom. nud. pro syn. = *Sinningia stricta* (W. Hooker & Arnott) Wiehler, Selbyana 1:33, 1975.

Gesneria spicata Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 2: 393, 1818 (1817). = *Kohleria spicata* (Humboldt, Bonpland & Kunth) Ørsted, Cent. Gesn. 27, 1858.

Gesneria splendens L. H. Bailey, Man. Cult. Pl. ed. 1, 695, 1924, nom. nud. pro syn. = *Smithiantha zebrina* (Paxton) O. Kuntze, Rev. Gen. 2:978, 1891.

Gesneria splendens Van Houtte ex Hanstein, Mart. Fl. Bras. 8(1):374, 1864 ("*Gesnera*"). = *Rechsteineria splendens* (Van Houtte ex Hanstein) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria splendidissima Regel, Cat. Pl. Hort. Aksakov. 63, 1860, nom. nud. = *Rechsteineria* sp.

Gesneria stachydifolia Bentham, Pl. Hartweg. 230, 1846. = *Sinningia incarnata* (Aublet) Denham, Baileya 19:126, 1974.

Gesneria stachyfolia Hanstein, Linnaea 34:263, 1865 ("*Gesnera*"), sphalm. = *Sinningia incarnata* (Aublet) Denham, Baileya 19:126, 1974.

Gesneria stricta W. Hooker & Arnott, J. Bot. (Hooker) 1:280, 1834. = *Sinningia stricta* (W. Hooker & Arnott) Wiehler, Selbyana 1:33, 1975.

Gesneria sulcata Rusby, Mem. Torrey Bot. Club 4:237, 1895 ("*Gesnera*"). = *Rechsteineria sulcata* (Rusby) Fritsch, Bot. Jahrb. Syst. 50:436, 1913.

Gesneria suttoni Booth ex Lindley, Bot. Reg. 19: pl. 1637, 1833 ("*Gesnera*"). = *Rechsteineria suttonii* (Booth ex Lindley) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria sylvatica Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 2:393, 1818 (1817) ("silvatica"). = *Gloxinia sylvatica* (Humboldt, Bonpland & Kunth) Wiehler, Selbyana 1:33, 1975.

Gesneria tenella Fl. Mex. ex A. P. de Candolle, Prodr. 7:536, 1839, nom. nud. pro syn. = *Achimenes erecta* (Lamarck) H. P. Fuchs, Acta Bot. Neerl. 12:15, 1963.

Gesneria tenella Hortorum ex Hanstein, Mart. Fl. Bras. 8(1): 366, 1864 ("*Gesnera*"), nom. nud. pro syn. = *Sinningia aggregata* (Ker-Gawler) Wiehler, Selbyana 1:32, 1975.

Gesneria tetraphylla Hortorum ex Hanstein, Mart. Fl. Bras. 8(1):359, 1864 ("*Gesnera*"), nom. nud. pro syn. = *Rechsteineria leopoldii* (Scheidweiler ex Planchon) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria tomentosa N. Jacquin, Select. Am. 179, pl. 175: fig. 64, 1763 (excl. syn.). = *Rhytidophyllum crenulatum* A. P. de Candolle, Prodr. 7:524, 1839.

Gesneria tomentosa Linnaeus, Sp. Pl. ed. 1, 2:612, 1753 (pro parte, excl. syn. Plum.). = *Rhytidophyllum tomentosum* (Linnaeus) Martius, Nov. Gen. & Sp. 3:39, 1829 & 3:196, 1832.

Gesneria tomentosa Mociño ex A. P. de Candolle, Prodr. 7: 528, 1839, nom. nud. pro syn. = *Moussonia deppeana* (Schlechtendal & Chamisso) Hanstein, Linnaea 34:284, 1865.

Gesneria trianaei (Regel) Herincq, Horticulteur Franç. 5:30, 1863. = *Kohleria trianae* (Regel) Hanstein, Linnaea 34:442, 1865.

Gesneria tribracteata Otto & Dietrich, Allg. Gartenzeitung 2: 194, 1834. = *Rechsteineria* sp.

Gesneria triflora W. Hooker, Bot. Mag. 73: pl. 4342, 1847. = *Kohleria tubiflora* (Cavanilles) Hanstein, Linnaea 34:442, 1865.

Gesneria triflora Martens & Galeotti, Bull. Acad. Roy. Sci. Bruxelles 9(2):33, 1842. = *Moussonia triflora* (Martens & Galeotti) Hanstein, Linnaea 34:286, 1865.

Gesneria trifoliata Martens, Linnaea 18:165, 1845. = *Rechsteineria trifoliata* (Martens) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria tuberosa Martius, Nov. Gen. & Sp. 3:29, 1829 ("*Gesnera*"). = *Sinningia tuberosa* (Martius) H. E. Moore, Baileya 19:40, 1973.

Gesneria tubiflora Cavanilles, Ic. & Descr. Pl. 6:61, 1801. = *Kohleria tubiflora* (Cavanilles) Hanstein, Linnaea 34:442, 1865.

Gesneria tubiflora Endlicher *in* Harting., Parad. Vindob. pl. 64, 1844–1847. = *Sinningia tubiflora* (W. Hooker) Fritsch *in* Engl. & Prantl, Nat. Pflanzenfam. 4(3b): 182, 1894.

Gesneria tubiflora Grisebach, Abh. Königl. Ges. Wiss. Göttingen 24:263, 1879. = *Sinningia tubiflora* (W. Hooker) Fritsch *in* Engl. & Prantl, Nat. Pflanzenfam. 4(3b):182, 1894.

Gesneria tweediana Hortorum ex Hanstein, Mart. Fl. Bras. 8(1):396, 1864 ("*Gesnera*"), nom. nud. pro. syn. = *Paliavana prasinata* (Ker-Gawler) Bentham *in* Bentham & Hooker, Gen. Pl. 2:1003, 1876.

Gesneria ulmifolia Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 2:394, 1818 (1817). = *Heppiella ulmifolia* (Humboldt, Bonpland & Kunth) Hanstein, Linnaea 29:512, 1858.

Gesneria umbellata Decaisne, Fl. Serres Jard. Eur. 7:167, 1851–1852. = *Rechsteineria umbellata* (Decaisne) Hjelmqvist, Bot. Not. 1937:297, 1937.

Gesneria ? uniflora Mociño & Sessé ex A. P. de Candolle, Prodr. 7:532, 1839. = *Achimenes longiflora* A. P. de Candolle, Prodr. 7:536, 1839.

Gesneria vargasii A. P. de Candolle, Prodr. 7:527, 1839. = *Rechsteineria vargasii* (A. P. de Candolle) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria vauthieri A. P. de Candolle, Prodr. 7:530, 1839. = *Rechsteineria vauthieri* (A. P. de Candolle) O. Kuntze, Rev. Gen. 2:474, 1891.

Gesneria velutina Willdenow ex A. P. de Candolle, Prodr. 7: 528, 1839, nom. nud. pro syn. = *Kohleria trianae* (Regel) Hanstein, Linnaea 34:442, 1865.

Gesneria velutina Poeppig ex Hanstein, Linnaea 34:290, 1865 ("*Gesnera*"), nom. nud. pro syn. = *Kohleria* sp.

Gesneria ventricosa Hortorum Berolinensis ex Hanstein, Linnaea 29:529, 1859 ("*Gesnera*"), nom. nud. pro syn. = *Kohleria ventricosa* (Hanstein) Hanstein, Linnaea 34:441, 1865.

Gesneria verdi Hortorum ex Hanstein, Mart. Fl. Bras. 8(1): 396, 1864. ("*Gesnera*"), nom. nud. pro syn. = *Paliavana prasinata* (Ker-Gawler) Bentham *in* Bentham & Hooker, Gen. Pl. 2:1003, 1876.

Gesneria verticillata Cavanilles, Ic. & Descr. Pl. 6:62, 1801. = *Heppiella verticillata* (Cavanilles) Cuatrecasas, Anales Ci. Univ. Madrid 4:259, 1935.

Gesneria verticillata W. Hooker, Bot. Mag. 54: pl. 2776, 1827. = *Sinningia verticillata* (Vellozo) H. E. Moore, Baileya 19: 40, 1973.

Gesneria verticillata Hortorum ex Hanstein, Mart. Fl. Bras. 8(1):366, 1864 ("*Gesnera*"), nom. nud. pro syn. = *Sinningia aggregata* (Ker-Gawler) Wiehler, Selbyana 1:32, 1975.

Gesneria vestita Bentham, Bot. Reg. 31, Misc. 19, 1845 ("*Gesnera*") = *Kohleria vestita* (Bentham) Hanstein, Linnaea 34:442, 1865.

Gesneria warmingii Hiern, Vidensk. Meddel. Dansk. Naturhist. Foren. Kjøbenhavn 1877–1878:90, 1877–1878 ("*Gesnera*"). = *Rechsteineria warmingii* (Hiern) Hjelmqvist, Bot. Not. 1937:297, 1937.

Gesneria warszewiczii Bouché & Hanstein, Ind. Sem. Hort. Bot. Berol., App. 1861:9, 1861 ("*Gesnera*"). = *Sinningia warszewiczii* (Bouché & Hanstein) H. E. Moore, Baileya 19:40, 1973.

Gesneria xanthophylla Poeppig *in* Poeppig & Endlicher, Nov. Gen. & Sp. 3:7, 1840 ("*Gesnera*"). = *Anodiscus xanthophyllus* (Poeppig) Mansfeld, Repert. Spec. Nov. Regni Veg. 36: 124, 1934.

Gesneria zebrina Paxton, Paxton's Mag. Bot. 8:271, 1841 ("*Gesnera*"). = *Smithiantha zebrina* (Paxton) O. Kuntze, Rev. Gen. 2:978, 1891.

Pentarhaphia corymbosa (Swartz) Hanstein, Linnaea 34:307, 1865. = *Pheidonocarpa corymbosa* (Swartz) L. Skog.

Pentarhaphia cumanensis Hanstein, Linnaea 34:300, 1865. = *Rhytidophyllum cumanense* (Hanstein) L. Skog, new combination.

Appendix 2

Numerical List of Taxa

Pheidonocarpa

1. *P. corymbosa* (Swartz) L. Skog
   a. subsp. *corymbosa*
   b. subsp. *cubensis* (Morton) L. Skog

Gesneria

Section 1. Pentarhaphia

2. *G. aspera* Urban & Ekman
3. *G. binghamii* Morton
4. *G. brevifolia* Urban
5. *G. clarensis* N. Britton & P. Wilson
6. *G. cubensis* (Decaisne) Baillon
   a. var. *cubensis*
   b. var. *truncata* (Alain) L. Skog
7. *G. glandulosa* (Grisebach) Urban
8. *G. haitiensis* L. Skog
9. *G. harrisii* Urban
10. *G. heterochroa* Urban
11. *G. hypoclada* Urban & Ekman
12. *G. jamaicensis* N. Britton
13. *G. lanceolata* Urban & Ekman
14. *G. odontophylla* Urban & Ekman
15. *G. parvifolia* Alain
16. *G. pulverulenta* Alain
17. *G. salicifolia* (Grisebach) Urban
    a. var. *ferruginea* (C. Wright) L. Skog
    b. var. *salicifolia*
    c. var. *spathulata* L. Skog
18. *G. ventricosa* Swartz
    a. subsp. *cymosa* (Urban) L. Skog
    b. subsp. *ventricosa*
19. *G. wrightii* Urban

Section 2. Stenochonanthe

20. *G. scabra* Swartz
    a. var. *fawcettii* (Urban) L. Skog
    b. var. *scabra*
    c. var. *sphaerocarpa* (Urban) L. Skog
    d. var. *viridicalyx* L. Skog

Section 3. Lachnoblaste

21. *G. decapleura* Urban

Section 4. Myrmekianthe

22. *G. duchartreoides* (C. Wright) Urban

Section 5. Gesneria

23. *G. brachysepala* Urban
24. *G. citrina* Urban
25. *G. humilis* Linnaeus
26. *G. pauciflora* Urban

Section 6. Physcophyllon

27. *G. acaulis* Linnaeus
    a. var. *acaulis*
    b. var. *glabrata* Urban
28. *G. barahonensis* Urban
29. *G. christii* Urban
30. *G. cuneifolia* (A. P. de Candolle) Fritsch
31. *G. hybocarpa* Urban & Ekman
32. *G. libanensis* Linden ex Morren
33. *G. pedicellaris* Alain
34. *G. purpurascens* Urban
35. *G. reticulata* (Grisebach) Urban

Section 7. Dittanthera

36. *G. alpina* (Urban) Urban
37. *G. calycina* Swartz
38. *G. calycosa* (W. Hooker) O. Kuntze
39. *G. clandestina* (Grisebach) Urban
40. *G. exserta* Swartz
41. *G. fruticosa* (Linnaeus) O. Kuntze
42. *G. onychocalyx* L. Skog
43. *G. pedunculosa* (A. P. de Candolle) Fritsch

Section 8. Duchartrea

44. *G. viridiflora* (Decaisne) O. Kuntze
    a. subsp. *acrochordonanthe* L. Skog
    b. subsp. *quisqueyana* (Alain) L. Skog
    c. subsp. *sintenisii* (Urban) L. Skog
    d. subsp. *viridiflora*

Section 9. Chorisanthera

45. *G. gloxinioides* (Grisebach) Urban
46. *G. pumila* Swartz
    a. subsp. *mimuloides* (Grisebach) L. Skog
    b. subsp. *neglecta* (W. Hooker) L. Skog
    c. subsp. *proctorii* (Stearn) L. Skog
    d. subsp. *pumila*
47. *G. shaferi* Urban
    a. subsp. *depressa* (Grisebach) L. Skog
    b. subsp. *shaferi*

Appendix 3

List of Exsiccatae

(Numbers in parentheses refer to species numbers in systematic treatment and in Appendix 2)

Abbott, W., 294(44b); 457(44b); 1173(6a); 1182(6a); 2087(35); 2623(35)
Acuña, J., 6768(44d); 6787(10); 9712(10); 12720(22); 13345(47b); 13346(44d); 13347(22); 13348(17c); 14940(25); sn(25); sn(47b); sn(44d)
Acuña, J., & Alain Liogier, 15686(25); 15687(17a); sn(25); sn(17a)
Acuña, J., Alain Liogier & M. Lopez F., sn(22)
Acuña, J., & Darlington, sn(44d)
Acuña, J., & Diaz Barreto, 17355(17b); 17379(34); 17384(22); 17453(25)
Acuña, J., & Maza, 19352(25)
Acuña, J., C. Morton & Alain Liogier, 20118(17a)
Acuña, J., Pino, Alonso & Venning 19422(17b)
Acuña, J., & J. Roig, sn(17a); sn(25)
Acuña, J., & F. Zayas, 19786(22)
Adams, C., 5570(27a); 5821(40); 6476(27a); 6967(1a); 7283(40); 7545(27a); 8451(27b); 8628(46d); 8883(46d); 9091(46d); 9096(37); 9333(46d); 9343(37); 9344(46d); 10197(38); 10700 (36); 10910(40); 11471(27a); 12212(40); 12644(27a); 12745 (27a); 13097(38)
Alain Liogier (Brother Alain), 1185(25); 2360(17a); 3181(22); 3223(44d); 3230(44d); 3627(47b); 3647(32); 3879(17a); 4322 (25); 4434(25); 4491(25); 6651(44d); 9069(43); 9593(44c); 9581(30); 10071(44c); 10086(44c); 10187(30); 10685(43); 11028(35); 11204(44b); 11234(35); 11710(44b); 11866(44b); 12584(44b); 12965(35); 13078(44b); 13672(16); 13864(15); 13871(16); 13949(35); 14321(6b); 14494(6a); 14507(6a); 15386(44b); 15537(6a); 15543(44b); 16150(33); 16154(33); 17372(6a); 17752(35); 17913(16); 18024(44b); 18118(15); 18132(16); 18467(33); 18513(41); 18526(6a)
Alain Liogier & J. Acuña, 1134(17a); 7524(47b); 7533(34); 7541(34); 7543(35); 7546(34); 7609(35); 7626(22); 7696(34); 7707(22); 7710(22)
Alain Liogier, J. Acuña & M. Lopez F., 7402(32); 7406(6a); 7441(10)
Alain Liogier, J. Acuña & Ramos, 7717(47b)
Alain Liogier & Bro. Clemente, 899(22)
Alain Liogier, J. Jiménez & E. Marcano, 14635(44b)
Alain Liogier & E. Killip, 2010(25)
Alain Liogier & M. Lopez F., 4640(22); 4802(22); 7105(1b); 7130(41); 7151(35); 7178(34); 7179(22); 7247(35); 7318(22)
Alain Liogier & C. Morton, 5082(17b); 5092(34); 5101(34); 5129(22); 5132(47b); 5140(22); 5162(47b)
Alexander, R. (later Prior), sn(27a); sn(40)
Allard, H., 17795(35); 18902(35)
Ambrose, J., 121(30)
Anderson, A., sn(18a)
Anderson, W. & D. Sternberg, 3316(46d)
Arnoldo, Frater, 778(18b); 3260(18b)
Armstrong, Dr., sn(40)

Bailey, L., 705(27a); 12433(25); 15153(34)
Baker, C., 3832(25)
Barkley, F., 22J236(27a)
Barry, A., sn(40); sn(46d)
Basilio Augusto, Bro., 736(35)
Beard, J., 404(18b)
Beard, P., 1107(18b); 1341(18a)
Beaupertuis, sn(18b)
Bengry, R., sn(20d); sn(40)
Bertero, C., 873(18b); 2183(27a); sn(18b); sn(40)
Bijhouwer, J., 428(25)
Bingham, C., 7247(3)
Blain, J., 50(25)
Boldingh, I., 471B(18b); 479aB(18b); 1758B(18b); 1783B(18b)
Box, H., 1921(18b)
Børgesen, F., sn(46a)
Boynton, K., 8221(44c)
Britton, E., 5102(30)
Britton, E., & D. Marble, 662(30); 666(43); 2254(43)
Britton, N., 150(36); 168(46a); 512(46d); 677(9); 733(27a); 1000(27b); 2487(27a); 2500(27a); 2720(27a); 3452(40); 3732 (27b); 3941(39); 8583(30); 8594(30)
Britton, N., & E. Britton, 5087(44d); 7525(30); 7938(43); 7976(24); 8791(30); 9003(43); 9093(43)
Britton, N., E. Britton & K. Boynton, 8184(30)
Britton, N., E. Britton & M. Brown, 5915(43); 6534(43)
Britton, N., E. Britton & J. Cowell, 9723(25); 9765(25)
Britton, N., E. Britton & C. Gager, 7216(25); 7220(25); 7358 (25); 7359(25)
Britton, N., E. Britton & W. Hess, 2735(30); 2745(43)
Britton, N., E. Britton & P. Wilson, 4695(25); 14241(25)
Britton, N., & Bruner, 7601(44c)
Britton, N., & J. Cowell, 124(18b); 403(43); 1458(30); 2012(30); 2042(30); 2209(44c); 4192(26); 12771(6a)
Britton, N., J. Cowell & S. Brown, 4546(26)
Britton, N., F. Earle & C. Gager, 6740(25); 6889(25)
Britton, N., & A. Hollick, 2214(20b); 2804(27a)
Britton, N., F. Stevens & W. Hess, 2442(26); 2561(43)
Britton, N., & P. Wilson, 5270(44d); 5274(25)
Britton, N., P. Wilson & Bro. Leon, 14127(25)
Brown, S., 68(27b); 205(38); 239(27b)
Browne, P., sn(27a)
Buch, W., 765(35)
Bucher, G., 10529(3)
Burrowes, W., 13047(40)

Caldwell, H., & C. Baker, 7029(25)
Caley, G., sn(18a)
Calvino, M., in Leon 22385(25)
Calvino, M., & E. Manueli, 7988(25)
Campbell, E., 6136(40); 6246(40)
Carabia, J., 3527(32)
Christ, H., 1888(29)
Churchill, J., sn(27a)
Clark, R., sn(1a); sn(30); sn(26); sn(35); sn(40)
Clemente, Bro., 2956(32); 5089(44d); 6998(25)
Clemente, Bro., Alain Liogier & Bro. Chrysogone, 4066(22)
Cooley, G., 8233(18a); 8573(18b)
Cornman, I., sn(38)
Cowell, J., 802(30)
Cowles, H., 223(30)
Crawford, J., 662(38); 668(38); 832(27a)
Crosby, M., H. Hespenheide & W. Anderson, 1171(27a); 410 (27a)

Davidse, G., 2660(35)
Davidse, G., & E. Conroy, 3270(27a)
Distin, H., sn(27a)
Don, G., sn(25)
Duke, J., 7045(43)
Duss, Pere, 329(18b); 330(18b); 3275(18b); 4071(18b); 4543(18b)

Edmondo, Bro., 7(6a)
Eggers, H., 469(18b); 469b(18b); 731(18b); 3764(40); 4892(25); 6662(18a); sn(18a)
Ekman, E., H132(35); H198(41); 1538(44d); H1550(2); 1598(10); H1877(11); H1973(41); 1993(25); 2115(22); H2429(41); H2972 (35); 3324(25); 3350(44d); 3564(22); 3611(22); 3622(17b); 3636(34); 3653(34); 3688(47b); 3697(17b); H3711(35); 3730 (22); 3753(35); H3809(21); 3813(22); 3912(35); 3913(47b); 3919(47b); 3953(22); 4296(22); 4327(47b); 4328(34); H4382 (31); H4719(21); H5003(6a); 5022(6a); 5331(44d); H5457(35); H5475(29); H5480(29); H5503(6a); H5728(44b); 5738(22); H6332(21); H6517(29); H6629(29); 6822(22); 8055(44d); 7080(44d); 7384(6a); 7405(32); H7572(44a); H7851(35); H7861 (13); H7923(35); 8090(10); H8192(29); 8741(10); 8745(44d); 9061(22); 9146(6a); 9148(32); H9236(44a); H9328(6a); 9528 (22); 9615(25); 10110(6a); 10112(32); 10194(14); 10243(25); 10257(22); 10270(6a); 10282(32); 10342(44d); 10500(17a); H10776(23); 11134(25); H11334(41); H11526(41); H11544(35); H11755(6a); H11827(41); 12496(25); H12577(44b); 12760(4); 13226(25); H13511(6a); H13738(6a); 13984(44d); 14382(44d); 14705(3); 14705b(3); 14706a(3); 14811(44d); H14926(6a); 15113(32); H15344(6a); H15523(6a); 15823(47a); 15918(22); 16020(22); 16231(5); 17311(25); 17314(17a); 18521(44d); 18683(25); 18933(44d)
Ernst, W., 1061(18b); 1616(18b)
Euphrasen, B., sn(18b)

Fawcett, W., 7986(40); 8127(27a); sn(27a)
Forsström, J., sn(18b)
Fosberg, F., 42635(1a); 42920(27a)
Fredholm, A., 3172(27a)
Fuertes, M., 1049(28); 1399b(28); 1411b(35); 1860(21); 1925(21); 1926(6a)

Garber, A., 59(43)
Garnier, M., sn(30); sn(18a)
Gastony, G., 113(39)
Gleason, H., & O. Cook, G-41(43)
Goll, G., 225(43); 459(43)
Goods, sn(40)
Gower, W., sn(27a)
Greville, R., sn(18a)
Grosourdy, R. de, Cat. n.13(43)
Guilding, L., 20(18a), sn(18a)

Hahn, L., 362(18b)
Hanson, C., sn(27a); sn(40)
Harris, J., & J. Lawrence, C15129(36); C15323(46a); C15324 (36); C15351(46a); C15394(36); C15456(46a); C15470(36)
Harris, W., 5547(40); 6136(40); 6322(27b); 6453(27a); 7547(36); 8415(27b); 8485(27a); 8670(9); 8723(46b); 8886(27a); 9003 (27a); 9066(9); 9124(40); 9178(38); 9249(20b); 9621(1a); 9883 (20a); 9956(20c); 10026(27a); 10053(1a); 10559(27a); 10667 (46d); 10880(46b); 11184(9); 11427(1a); 12004(38); 12314(1a); 12361(20c); 12374(12); 12509(12); 12763(46b); 12782(9); sn(27a); sn(36); sn(46a)
Harris, W., & N. Britton, 10559(27a); 10679(39)
Hart, J., 1136(40); 1219(27a); sn(27a)
Hartweg, C., 1551(27a)
Heller, A., 4559(43)
Hespenheide, H., 923(27a)
Hess, W., 3431(43); 4137(30)
Hioram, Bro., 8(32); 1380(25); 2310(44d); 14076(32); sn(30)
Hioram, Bro., & Bro. Angel, 1510(32)
Hioram, Bro., & Bro. Btiste, 1380(25)
Hitchcock, A., sn(27a); sn(36)
Hodge, W., 835(18b); 1185(18b)
Hodge, W., & B. Hodge, 1551(18b)
Hogg, T., sn(27b)
Holdridge, L., 85(44c); 2184(35)
Howard, R., 4480(25); 5209(44d); 5716(25); 6123(22); 6464(44d); 11140(18a); 11741(18b); 11912(18b); 12017(27a); 12192(35); 12283(6b); 15663a(18b); 15663b(18b); 17252(44c)
Howard, R., Briggs, Kamb, Lane & Ritand, 148(25)
Howard, R., G. Cooley & R. Weaver, 17646(18a); 17871(18a)
Howard, R., & E. Howard, 8120(16); 15175(18b); 15195(18b)
Howard, R., & L. Nevling, 15372(43); 15775(35)
Howard, R., & G. Proctor, 13444(27a)
Howard, R., G. Proctor & W. Stearn, 14780(42); 14797(27a); 14801(46d)
Hucter, G., (44d)
Hunnewell, F., 15356(27a)
Hunnewell, F., & L. Griscom, 14385(27a); 14386(27a); sn(27a)

Imray, J., 40(18b); 87(18b); 193(18b)

Jack, J., 5951(25); 8035(25); 8067(25); 8111(44d)
Jackson, B., sn(1a)
Jiménez, J., 2563(33); 2607(35); 3240(16); 3728(44b); 4209(44b)

Johnson, D., sn(40)
Johnston, J., 922(43); 957(30); 974(24)

Katzenberger, A., & R. Katzenberger, 107(46d); 108(37); 112 (38); 113(27b)
Kidder, N., sn(27a)
Killip, E., 448(27a); 13579(25); 43050(25); 43088(25); 44616(25); 45830(25); 45270(25)
Kohaut, F., sn[Sieber, Flor. Martin. No. 394](18b); sn[Sieber, Flor. Mixta No. 407](18b)
Kramer, K., 1691(27b); 1718(38); 1750(20c)
Krauss, C., 399(18b); sn(18b)

Lamarck Herbarium, 198(29)
Lambert Herbarium, sn(18b)
Lane, W., 84(27a); 443(27a)
Lehmann, F., 982(40)
Leon, Bro., 948(25); 4410(25); 4426(5); 4957(17a); 9821(44d); 11990(17b); 11685(1b); 11812(1b); 12180(35); 16808(25); 16960(25); 17249(34); 17322(17b); 17579(17b); 17971(22); 19045(25); 19142(22); 19236(22); 19510(32); 19830(22); 19973 (22); 20408(22); 22389(44d)
Leon, Bro., & Alain Liogier, 17971(22); 19236(22)
Leon, Bro., & Bro. Charles, 4957(17a)
Leon, Bro., & Bro. Clemente, 6504(5); 20153(22)
Leon, Bro., Bro. Clemente & Alain Liogier, 22639(22)
Leon, Bro., Bro. Clemente & R. Howard, 20408(22)
Leon, Bro., Bro. Clemente & M. Roca, 9821(44d)
Leon, Bro., & Bro. Marie-Victorin, 17748(1b)
Leon, Bro., Bro. Marie-Victorin & Bro. Clemente, 20931(22)
Leon, Bro., & M. Roca, 7992(5)
Leonard, E., & G. Leonard, 14245(35); 14248(35); 14472(35)
Leva, L., 37(18b); 38(30); 39(27a)
Lewis, C., sn(38)
L'Herminier, F., sn(18b)
Linden, J., 1702(44d); 1833(32); 1841(6a); 2076(6a)
Lloyd, F., 468(18b); 806(18b)
Lopez F., M., 84(22); 273(22); 1111(32); 1787(32); 1979(32); 2573(22); 2690(44d); 2760(44d); 2838(6a); 2850(6a); 2854(32); 2873(32)
Luna, A., 116(5); 217(25)

M. B., sn(30)
Macfadyen, J., sn(27a); sn(27b); sn(40); sn(37); sn(46a)
Marble, D., 242(27a); 709(27b); 856(27a)
Marcano, E., 5036(44b); 5207(35); 4518(16); 5261(16); 5274(35)
Marcano, E., & J. Jiménez, 3656(35); 5051(44b); 5088b(44b); 5121(35); 5131(44b)
Marcano, E., J. Jiménez & Alain Liogier, 5619(44b)
Marcano, E., & T. Talpey, 5394(35); 5428(35); 5435(41)
March, W., 1197(27a); 1516(40)
Marie-Victorin, Bro., 21339(3)
Marie-Victorin, Bro., & Alain Liogier, 21440(22)
Marie-Victorin, Bro., & Bro. Clemente, in Leon 22093(22)
Masson, F., sn(18b); sn(40)
Matos, P., in Leon 17579(17b)
Maxon, W., 2105(27a); 8863(46d); 9153(39); 9352(46d); 10424 (27a); 10449(27a); 10485(27a)
Maxon, W., & E. Killip, 785(27a); 976(40); 1351(40); 1460(27a)
Maxwell, I., sn(40)
McKee, H., 10616(24); 10617(30); 10619(43)
McNab, G., sn(27a); sn(40)
Meagher, M., 189(30); 295(35)
Meisner Herbarium, sn(6a)
Miller, G., 1244(35); 1479(38); sn(44b)
Millspaugh, C., 1927(27a)
Moore, H., 7172(30); sn(30)
Morley, B., 83(40); 387(1a)
Morton, C., 4110(25); 4283(25); 5299(18a); 5479(18a); 5673(18a); 6027(18a); 6287(18a); 9477(44d); 9669(32); 9714(6a); 9773(25); 9825(17a); 9918(25); 9927(25); 10308(44d); 10309(25); 10310 (44d); 10446(25)
Morton, C., & J. Acuña, 3276(22); 3492(3); 3627(44d)
Morton, C., & Alain Liogier, 8992(22); 9023(34); 9038(34); 9046(44b); 9077(22); 9083(47b); 9089(22); 9121(22); 9154(1b)
Morton, C., Alain Liogier, & M. Lopez F., 8759(32)
Nash, G., 196(35)
Nash, G., & N. Taylor, 1353(35)
Nicolson, D., 2065(18b)
Norman, C., 188(40)

Osmaston, H., 5004(20b); 5176(46c)
Otero, J., 356(30); 422(43); 618(44c); 771(44c)

Palmer, W., & J. Riley, 153(25); 520(25)
Parker, C., sn(18a)
Pavon Herbarium, sn(30); sn(43)
Peele, J., 635(30); 408(30)
Perkins, J., 487a(27a); 1025(27a); 1256(45a)
Perrottet, G., 230(18b); sn(18b)
Plée, A., 409(43); 866(43)
Poeppig, E., sn(25)
Pollard, C., & W. Palmer, 119(47b); 137(35)
Pollard, C., E. Palmer & W. Palmer, 42(34); 263(47b)
Ponthieu, de, sn(18b)
Porten, A. van der, sn(1a); sn(40)
Poulter, J., in Adams 10895(46d)
Poulter, J., et al., & C. Adams, 10893(20d)
Powell, D., 140(27a); 1642(27a); 1669(20b)
Prior, R. (earlier Alexander), 558(40); 559(40); 560(27a)
Proctor, G., 4007(46d); 4131(46d); 4896(20b); 5616(46d); 5682 (37); 5731(46c); 5732(46c); 6428(27a); 6614(27a); 6926(27a); 7273(20b); 7300(46d); 7635(37); 7684(40); 7870(40); 8148(27a); 8213(46b); 8287(40); 8496(40); 9445(36); 9526(36); 9527(46a); 9619(36); 9770(9); 9779(46b); 9799(42); 9800(37); 9801(46d); 9841(40); 10024(38); 10050(20b); 10205(1a); 11228(38); 11424 (40); 11732(12); 11781(40); 15684(38); 15756(20d); 16357(25); 16403(25); 16641(20b); 17856(18b); 19228(18b); 20688(38); 20749(46b); 20845(20c); 20856(20d); 21443(27a); 21517(38); 21750(18b); 21862(46b); 22125(37); 22145(27a); 22160(27a); 22238(20c); 22762(27a); 22965(40); 22974(9); 22991(46d); 23137(20b); 23313(40); 23762(46a); 24271(27a); 24429(40); 24493(27a); 24513(40); 24731(46d); 24755(9); 25618(12); 25623(9); 25912(18a); 26320(9); 26617(27b); 26688(20b); 26844(40); 27755(39); 27785(39); 28559(27a); 29306(27a); 29329(27a); 29991(39); 29992(46d); 31212(40); 31232(38)

Proctor, G., & W. Mullings, 22001(38); 22049(46d)
Proctor, G., & W. Stearn, 11451(36); 11859(27a); 11923(27a)
Purdie, W., 23(46a); 221(46d); 635(38); sn(9); sn(20b); sn(27a); sn(38); sn(40); sn(46a); sn(46b); sn(46d)

Quesnay, M. du, 257(27a)
Questel, A., 5111(18b); sn(18b)

Ramage, G., sn(18b)
Rehder, A., sn(36); sn(40)
Richard, L., 48(27a); sn(18b)
Ridley, H., sn(27a)
Riedle, A., sn(43)
Robbins, R., 1513(27a); 1514(40); 1516(27a); 1517(27a)
Robertson, E., 113(46d); 2996(1a); 3220(40); 5374(27b)
Rohr, J. von, sn(18b)
Roig, J., 5054(6a); 14224(27a)
Roig, J., J. Acuña & Naranjo, sn(25)
Roig, J., & G. Bucher, 53(10); 59(10)
Rothrock, J., 87(27a)
Ryan, J., sn(18b)

Sagra, R. de la, 647(25); 816(6a); 907(3); sn(25)
Sargent, F., 131(30); B131(44c); 613(26); 703(24); 710(43); 3235(24); 3248(30)
Schomburgk, R., sn(35)
Schubert, B., & H. Winters, 312(43); 401(44c); 406(44c)
Schubert, B., H. Winters & I. Vélez, 329(43)
Senn, H., 331(25)
Shafer, J., 187(18b); 3201(22); 3527(44c); 3916(34); 4202(47b); 4394(47b); 7695(25); 7755(17b); 7786(34); 7838(17b); 7984(34); 8012(41); 8135(22); 8171(22); 8420(22); 8436(46b); 8547(32); 8949(44d); 11171(25); 11956(25); 12000(25); 12002(25); 12165(25); 12254(25)
Shafer, J., & Bro. Leon, 13601(25)
Shakespear, R., sn(36); sn(40)
Shillingford, C., 191(18b)
Sintenis, P., 44(43); 327(26); 1343(35); 1484(44c); 2311(43); 2314(43); 2950(43); 3153(43); 5332(44c); 5335(44c); 5782(43); 5832(43); 5827(30); 5829(30); 5845(30); 5910(43); 5935(30); 6096(30); 6568(30); 6590(24); 6755(43); sn(30)
Skelding, A., 6705(40); 5450(40); in Adams 10857(27a); sn(40)
Skog, L., 1406(43); 1408(24); 1409(33); 1410(27a); 1411(30); 1412(35); 1413(35); 1415(33); 1516(44c); 1517(35); 1539(26); 1586(35); 1542(26); 1544(26); 1583(18b); 1589(33); 1593(44b); 1606(35); 1620(1a); 1623(39); 1630(40); 1633(27a); 1634(27a); 1642(27b); 1643(46d); 1731(27b); 1737(41); 1749(33); 1751(16); 1817(18b); 1819(33); 1829(41); sn(33)
Skog, L., & G. Proctor, 1636(9); 1639(20c); 1640(12)
Skog, L., & J. Skog, 1644(35); 1687a(44c); 1688(43); 1704(26); 1705(43); 1706(43); 1707(30); 1715(30); 1716(24)
Skog, L., T. Talpey & D. Pfister, 1608(29); 1610(25); 1615(41); 1616(8)
Sloane, H., Horti Sicci 3:27(27a)
Smith, H., & G. Smith, 55(18a)
Smith, L., A. Hodgdon & F. Gonzales, 3248(25)
Spetzman, L., & J. Diaz Colon, 23(43)
Squire, F., sn(18b)
Stahl, A., 605b(30); 675(43); sn(43)
Stearn, W., 3(1a); 4(9); 21(46b); 62(40); 100(36); 155(27a); 246(27a); 350(27b); 411(40); 442(12); 446(20c); 469(27a); 491(40); 510(27a); 546(27a); 552(27a); 694(1a); 712(27a); 954(46d)
Stehlé, H., 565(18b); 568(18b); 2261(18b); 1637(18b)
Stehlé, H., & M. Stehlé, 5173(18b)
Stern, W., & D. Wasshausen, 2401(18b)
Stevens, F., & W. Hess, 3257(43); 3716(26); 4694(30); 4872(26); 5154(30); 5163(24)
Stevenson, J., 547(43)
Stevenson, J., & J. Johnston, 2060(30)
Stoffers, A., 3172(18b); 3248(18b); 3605(18b); 4255(18b)
Stone, M., 117(35); 123(30); 125(46d); 126(20c); 130(24); 132(33); 134(40); 197(18b); 215(30); 216(27a); 234(27a); 235(29); 350(35); 412(43)
Suringar, W., sn(18b)
Swartz, O., sn(1a); sn(18b); sn(20b); sn(27a); sn(37); sn(38); sn(40); sn(41); sn(46d)

Talpey, T., 11a(30); 11b(30); 12(35); 13(37); 14(46d); 15(27a); 16(12); 17(20c); 18(27b); 19(9); 20(46b); 22(40); 23(44c); 25(35); 26(43); 27(30); 28(24); 30(26); 33(33); 34(44b); 35(35); 41(24); 43(29); 62(43); 63(30); 64(30); 71(41); 77(35); 81(16); 92(35); 94(41); 5120(33)
Talpey, T., & J. Jiménez, 5120(33)
Thompson, W., 7986(40)
Türckheim, H. von, 5381(18b)
Tussac, F. de, sn(40)

Underwood, L., & F. Earle, 235(34); 622(35); 690(35); 708(47b); 1062(35); 1174(47b)
Underwood, L., & R. Griggs, 803(30)

Valenzuela, J., sn(25)
Valeur, E., 569(35)
Van Hermann, H., 42(25); 332(25); 1848(25)
Van Houtte, Hort. sn(6a)
Vélez, I., 1606(24); 3673(43)
Vivaldi, J., 72–8(44c)

Wagner, R., 353(35); 412(43); 464(44c); 640(43); 1233(24); 1234(43); 1664(43)
Wall, E., sn(27a)
Weaver, R., 1926(46d)
Webster, G., 4079(3); 5570(42); 13627(38)
Webster, G., J. Ellis & K. Miller, 8087(27a); 8416(9); 8421(27b); 9411(18b); 9455(18b)
Webster, G., & G. Proctor, 5317(40)
Webster, G., & K. Wilson, 5017(27a)
Wight, A., 130(27a)
Wilbur, R., E. Dunn, H. Hespenheide & D. Wiseman, 7871(18b)
Wiles, J., sn(27a); sn(40)
Wilson, K., & W. Murray, 594(27a)
Wilson, N., 463(37); sn(39); sn(40); sn(46a)
Wilson, P., & Bro. Leon, 2847(25); 11617(25)
Wolle, J., sn(27a)

Wrbna, F., sn(18b)
Wright, C., 377(32); 382(6a); 647(25); 354(44d); 355(25); 355a (25); 1335(32); 3072(19); 3073(3); 3074(17b); 3075(7); 3076 (6a); 3077(25); 3078(45); 3079(47a); 3080(32); 3080(34); 3081 (35); 3643(17a); sn(17a); sn(22); sn(35)
Wright, W., sn(27b); sn(38)
Wullschlägal, H., 952(46d); 957(27b); sn(27b)
Wydler, H., 453(30)
Wynter, L., 5669(27a)

Yuncker, T., 17404(40); 17781(27a); 18215(27a); 18349(1a); 18541(37)

Without collector, sn(40)

Literature Cited

Adams, C. D.
1972. *Flowering Plants of Jamaica.* 848 pages. Mona, Jamaica: University of the West Indies.

Allen, G. M.
1939. *Bats.* x + 368 pages. Cambridge, Massachusetts: Harvard University Press.

Ashton, P. S.
1969. Speciation among Tropical Forest Trees: Some Deductions in the Light of Recent Evidence. *Biological Journal of the Linnean Society,* 1:155–196.

Baillon, H.
1888. Gesnériacées. Volume 10, pages 59–112, in *Histoire des Plantes.* Paris: Librairie Hachette & Cie.

Baker, H. G.
1961. The Adaptation of Flowering Plants to Nocturnal and Crepuscular Pollinators. *Quarterly Review of Biology,* 36:64–73.

Baker, H. G., R. W. Cruden, and I. Baker
1971. Minor Parasitism in Pollination Biology and Its Community Function: The Case of *Ceiba acuminata. Bioscience,* 21:1127–1129.

Baker, H. G., and B. Harris
1957. The Pollination of *Parkia* by Bats and Its Attendant Evolutionary Problems. *Evolution,* 11:449–460.

Baker, H. G., and P. D. Hurd, Jr.
1968. Intra-floral Ecology. *Annual Review of Entomology,* 13:385–414.

Banks, H. P.
1970. *Evolution and Plants of the Past.* x + 170 pages. Belmont, California: Wadsworth Publishing Company.

Bentham, G.
1844–1846. *The Botany of the Voyage of H.M.S. Sulphur.* 195 pages. London: Smith, Elder & Co.
1876. Gesneriaceae. Volume 2, pages 990–1025, *in* Bentham & Hooker, *Genera Plantarum.* London: Reeve & Co.

Biebl, R., and H. Germ
1950. *Praktikum der Pflanzenanatomie.* vi + 220 pages. Vienna: Springer Verlag.

Bond, J.
1961. *Birds of the West Indies.* xxiv + 456 pages. Boston: Houghton-Mifflin Co.

Britton, N. L., and P. Wilson
1925. Gesneriaceae. Volume 6, part 2, pages 203–207, *in* New York Academy of Sciences, *Scientific Survey of Porto Rico and the Virgin Islands.* New York.

Brown, W. H.
1938. The Bearing of Nectaries on the Phylogeny of Flowering Plants. *Proceedings of the American Philosophical Society,* 79:549–595.
1956. *Sinningia eumorpha. Botanical Magazine,* 171: plate 278.

Burtt, B. L.
1962. Studies in the Gesneriaceae of the Old World. XXIV: Tentative Keys to the Tribes and Genera. *Notes from the Royal Botanic Garden, Edinburgh,* 24:205–220.

Candolle, A. de
1880. *La Phytographie.* xxiv + 484 pages. Paris: G. Masson.

Candolle, A. P. de
1839. *Prodromus systematis naturalis regni vegetabilis.* Volume 7, pages 331–801. Paris: Fortin, Masson et Soc.

Clayberg, C. D.
1964. Freeze Pollen to Make Crosses Out of Season. *The Gloxinian,* 14 (1):18–20.

Cockrum, E. L., and B. J. Hayward
1962. Hummingbird Bats. *Natural History,* 71 (8):38–43.

Cook, O. F., and G. N. Collins
1903. Economic Plants of Porto Rico. *Contributions from the United States National Herbarium,* 8:57–269.

Cronquist, A.
1968. *The Evolution and Classification of Flowering Plants.* x + 396 pages. New York: T. Nelson & Sons.

Cutter, E.
1969. *Plant Anatomy: Experiment and Interpretation.* Part I, vii + 168 pages. Reading, Massachusetts: Addison-Wesley Publishing Co.

Davis, G. L.
1966. *Systematic Embryology of the Angiosperms.* viii + 528 pages. New York: J. Wiley & Sons.

Decaisne, J.
1846. Monographie du Genre *Pentarhaphia,* et Description d'un Nouveau Genre de Plantes Appartenant a la Famille des Gesnériacées. *Annales des Sciences Naturelles, Botanique,* series 3, 6:96–111.

Denham, D. E.
1968. The Identity of *Gesneria pedunculosa* [Gesneriaceae]. *Baileya,* 16:1–4.

Don, G.
1838. Gesneriaceae. Volume 4, pages 643–665, in *A General History of the Dichlamydeous Plants.* London.

Duliot, H. L.
1889. Recherches sur le Périderme. *Annales des Sciences Naturelles, Botanique,* series 7, 10:325–396.

Duss, R. P.
1897. Flore Phanérogamique des Antilles Françaises. *Annales de l'Institut Botanico-Géologique Colonial de Marseille,* 3 (1896):1–656.

Eames. A. J.
1961. *Morphology of the Angiosperms.* 518 pages. New York: McGraw-Hill Book Co.

Eberle, P.
1956. Cytologische Untersuchungen an Gesneriaceen.

Chromosoma, 8:85–316.

Elbert, G.
1973. The Fabulous Gesnerias. *The Gloxinian,* 23(5):4–7.

Endlicher, S. L.
1836–1850. *Genera Plantarum.* 1x + 1483 pages. Vienna.

Erdtman, G.
1952. *Pollen Morphology and Plant Taxonomy: Angiosperms.* xii + 539 pages Stockholm: Almqvist & Wiksell.

Esau, K.
1960. *Anatomy of Seed Plants.* xvi + 376 pages. New York: J. Wiley & Sons.
1965. *Plant Anatomy.* 2nd edition, xx + 767 pages. New York: J. Wiley & Sons.

Faegri, K., and L. van der Pijl
1966. *The Principles of Pollination Ecology.* ix + 248 pages. New York: Pergamon Press.
1971. *The Principles of Pollination Ecology.* 2nd edition, xii + 291 pages. New York: Pergamon Press.

Fries, R. E.
1903. Beiträge zur Kenntnis der Ornithophilie in der Südamerikanischen Flora. *Arkiv för Botanik,* 1: 389–440.

Fritsch, K.
1893–1894. Gesneriaceae. Part 4, section 3b, pages 133-185, *in* Engler & Prantl, *Die natürlichen Pflanzenfamilien.* Leipzig: Verlag Engelmann.

Goldmann, J.
1848. Entwicklungsgeschichte des Pollens von *Gloxinia maculata* l'Herit. *Botanische Zeitung,* Berlin, 6:873.

Grant, K. A., and V. Grant
1968. *Hummingbirds and Their Flowers.* vii + 115 pages. New York: Columbia University Press.

Grant, V.
1963. *The Origin of Adaptations.* viii + 606 pages. New York: Columbia University Press.
1971. *Plant Speciation.* x + 435 pages. New York: Columbia University Press.

Grisebach, A. H. R.
1859–1864. *Flora of the British West Indian Islands.* xvi + 789 pages. (Gesneriaceae, pages 459–466) London.
1860–1862. Plantae Wrightianae e Cuba Orientali. *Memoirs of the American Academy of Arts and Science,* new series, 8:153–192, 503–536.
1866. *Catalogus Plantarum Cubensium.* 301 pages. Leipzig: Engelmann.

Haberlandt, G.
1914. *Physiological Plant Anatomy.* xv + 777 pages. London: Macmillan Co.

Hall, E. R., and K. R. Kelson
1959. *The Mammals of North America.* Volume 1, xxx + 546 pages. New York: Ronald Press.

Hanstein, J.
1854. Die Gesneraceen des Königlichen Herbariums und der Gärten zu Berlin, nebst Beobachtungen über die Familie im Ganzen. I. Abschnitt. *Linnaea,* 26: 145–216.
1856. Die Gesneraceen des Königlichen Herbariums und der Gärten zu Berlin, nebst Beobachtungen über die Familie im Ganzen. II. Abschnitt, Erstes Stück. *Linnaea,* 27:693–785.
1859. Die Gesneraceen des Königlichen Herbariums und der Gärten zu Berlin, nebst Beobachtungen über die Familie in Ganzen. II. Abschnitt, Zweites Stück. *Linnaea,* 29:497–592.
1865. Die Gesneraceen des Königlichen Herbariums und der Gärten zu Berlin, nebst Beobachtungen über die Familie im Ganzen. II. Abschnitt, Drittes Stück. *Linnaea,* 34:225–462.

Harborne, J. B.
1966. Comparative Biochemistry of Flavonoids-II: 3-desoxyanthocyanins and Their Systematic Distribution in Ferns and Gesnerads. *Phytochemistry,* 5: 589–600.

Harris, B. J., and H. G. Baker
1958. Pollination of *Kigelia africana* Benth. *Journal of the West African Science Association,* 4:25–30.

Herincq, F.
1848. Plantes Nouvellement Introduites in Horticulture. *Revue Horticole,* series 3, 2:322–325.
1852. *Chorisanthera atrosanguinea. Horticulteur Français,* 2:1.

Hitchcock, A. S.
1934. *Location of Type Specimens.* 19 pages. Mimeographed. Washington: Smithsonian Institution.

Holmgren, P. K., and W. Keuken
1974. Index Herbariorum. Part I: The Herbaria of the World. 6th edition. *Regnum Vegetabile,* 92: vii + 1–397.

Hooker, W. J.
1851. *Conradia neglecta* Hook. *Icones Plantarum,* 9: plate 874.

Howard, R. A.
1959. The Vascular Anatomy of the Petiole as a Taxonomic Character. *Proceedings of the IXth International Botanical Congress (Montreal), Abstracts,* 2: 171.
1962. The Vascular Structure of the Petiole as a Taxonomic Character. Volume 3, pages 7–13, *in* J. C. Garnaud (editor), *Advances in Horticultural Sciences and Their Applications.* New York: Pergamon Press.

Humboldt, F. H. A. von, A. J. Bonpland, and C. S. Kunth
1816. *Nova Genera et Species Plantarum.* Volume 1, folio edition, xlviii + 302 pages, 96 plates; quarto edition, lx + 377 pages. 96 plates. Paris.
1817–1818. *Nova Genera et Species Plantarum.* Volume 2, folio edition, 324 pages, 92 plates; quarto edition, 406 pages, 92 plates. Paris.

Hutchinson, J.
1959. Dicotyledons. In *The Families of Flowering Plants.* 2nd edition. Volume 1, xi + 510 pages. Oxford: Clarendon Press.

ICBN
1972. See Stafleu, F. A., et al.

Ivanina, L. I.
1965. Application of the Carpological Method to the Taxonomy of Gesneriaceae. *Botanicheskii Zhurnal*, 50:29–43. [English translation in *Notes from the Royal Botanic Garden, Edinburgh*, 26:383–403.]

Johansen, D. A.
1940. *Plant Microtechnique*. xi + 523 pages. New York: McGraw-Hill Book Co.

Kaisila, J.
1966. The Egyptian Fruit Bat, *Rousettus aegyptiacus* Geoffr. (Megachiroptera, Pteropodidae) Visiting Flowers of *Bombax malabaricum*. *Annales Zoologici Fennici*, 3:1–3.

Katzenberger, R.
1966. Potpourri. *Gesneriad Saintpaulia News*, 3 (4):32.

Knuth, P.
1906–1909. *Handbook of Flower Pollination*. Translated by J. R. A. Davis. 3 volumes. Oxford: Oxford University Press.

Kölreuter, J. G.
1761–1766. Vorläufige Nachricht von Einigen das Geschlecht der Pflanzen Betreffenden Versuchen und Beobachtungen. 266 pages. Leipzig.

Koopman, K. F.
1958. Land Bridges and Ecology in the Bat Distribution Off the Coast of South America. *Evolution*, 12:429–439.

Koopman, K. F., and E. E. Williams
1951. Fossil Chiroptera Collected by H. E. Anthony in Jamaica, 1919–1920. *American Museum Novitates*, 1519:1–29.

Kufferath, H.
1914. Contribution a l'Etude de la Flore Algologique du Luxemborg Méridional. II: Chlorophycées (exclus. Desmidiacées), Flagellates et Cyanophycées. *Anales de Biologie Lacustre*, 7:231–271.

Kuntze, C. E. O.
1891. *Revisio Generum Plantarum*. Volume 2, pages 375–1011. Leipzig.

Lavallée, A.
1864. *Hericquia floribunda*, Dne. *Horticulteur Français*, 1864:177–180.

Lawrence, G. H. M.
1951. *Taxonomy of Vascular Plants*. xiii + 823 pages. New York: Macmillan Co.

Lee, R. E.
1962. Chromosome Numbers in the Gesneriaceae. *Baileya*, 10:33–45.
1964. Additional Chromosome Numbers in the Gesneriaceae. *Baileya*, 12:159.
1966a. Additional Chromosome Numbers in the Gesneriaceae. *Baileya*, 14:35–36.
1966b. Additional Chromosome Numbers in the Gesneriaceae. *Baileya*, 14:142.
1968 [1967]. Additional Chromosome Numbers in the Gesneriaceae. *Baileya*, 15:118.

Lemaire, C.
1846. *Rhytidophyllum floribundum* Ch. L. *Flore des Serres et des Jardins de l'Europe*, 2: sub plate 178.

Lewis, D.
1966. The Genetic Integration of Breeding Systems. Pages 20–25 *in* J. G. Hawkes (editor), *Reproductive Biology and Taxonomy of Vascular Plants*. Oxford: Pergamon Press.

Lindley, J.
1827. *Gesneria Douglasii*. *Botanical Register*, 13: plate 1110.

Linnaeus, C.
1753. *Species Plantarum*. 1200 pages. Stockholm.
1754. *Genera Plantarum*. 5th edition, 500 pages. Stockholm.
1759. *Systema Naturae*. 10th edition, volume 2, pages 825–1384. Stockholm.

Linsbauer, K.
1930. *Die Epidermis*. viii + 284 pages. Berlin: Borntraeger.

Liogier, A. H.
1968. Novitates Antillanae III. *Brittonia*, 20:148–169.
1971a. Novitates Antillanae IV. *Memoirs of the New York Botanical Garden*, 21 (2):107–157.
1971b. Novitates Antillanae V (1). *Phytologia*, 22:163–174.
1973. Novitates Antillanae VI (1). *Phytologia*, 25:265–280.

Little, E. L., Jr., R. O. Woodbury, and F. H. Wadsworth
1974. *Trees of Puerto Rico and the Virgin Islands*. Volume 2, xiv + 1024 pages. Washington.

Macior, L. W.
1971. Co-evolution of Plants and Animals—Systematic Insights from Plant-Insect Interactions. *Taxon*, 20: 17–28.

Martius, C. F. P. von
1829–1832. *Nova Genera et Species Plantarum*. Volume 3, pages 1–198, plates 201–300. Munich.

McNab, B. K.
1971. The Structure of Tropical Bat Faunas. *Ecology*, 43:259–267.

Meeuse, B. J. D.
1961. *The Story of Pollination*. 243 pages. New York: Ronald Press.

Metcalfe, C. R., and L. Chalk
1950. *Anatomy of the Dicotyledons*. 2 volumes, lxiv + 1500 pages. Oxford: Clarendon Press.

Moller, W.
1932. Das Epithel der Speiseröhrenschleimhut der Blutenbesuchender Fledermaus *Glossophaga soricina* im Vergleich zu Insektenfressenden Chiroptera. *Zeitschrift für Mikroskopisch-Anatomische Forschung*, 29:637–653.

Moore, H. E., Jr.
1973a. A Synopsis of the Genus *Codonanthe* [Gesneriaceae]. *Baileya*, 19:4–33.
1973b. Comments on Cultivated Gesneriaceae. *Baileya*, 19: 35–41.

Moore, H. E., Jr., and R. E. Lee
1968 [1967]. The Broadening Basis of Classification in the Gesneriaceae. *Baileya*, 15:97–108.

Morren, C.
1846. *Gesnera libanensis. Annales de la Société Royale d'Agriculture et de Botanique de Gand*, 2:361.

Morton, C. V.
1957a. Some West Indian Gesneriaceae. *Brittonia*, 9:18–24.
1957b. Gesneriaceae. Volume 4, pages 451–472, *in* Leon & Alain, *Flora de Cuba*. Habana: P. Fernandez y Cia.

Morton, C. V., and D. Denham
1972. Lectotypifications of Some Generic Names of Gesneriaceae. *Taxon*, 21:669–678.

Moseley, H. N.
1879. *Notes by a Naturalist on the "Challenger."* xvi + 620 pages. London.

Mott, R.
1972. Soil vs. Soilless Mixes. *The Gloxinian*, 22 (6):5–8, 22.

Müller, H.
1883. *The Fertilisation of Flowers*. Translated by D. A. W. Thompson. x + 669 pages. London: Macmillan Co.

Nevling, L. I., Jr.
1969. The Ecology of an Elfin Forest in Puerto Rico, 5: Chromosome Numbers of Some Flowering Plants. *Journal of the Arnold Arboretum*, 50:99–103.

Novick, A.
1969. *The World of Bats*. 171 pages. New York: Holt, Rinehart & Winston.

Nuttall, T.
1834. Indigenous Plants of the United States. *Journal of the Academy of Natural Sciences of Philadelphia*, 7:88–89.

Ørsted, A. S.
1858. *Centralamericas Gesneraceer, et Systematisk, Plantegeographisk Bidrag til Centralamerikas Flora*. 78 pages, 11 plates. Copenhagen.
1861. Centralamericas Gesneraceer, et Systematisk, Plantegeographisk Bidrag til Centralamerikas Flora. *Det Kongelige Danske Videnskabernes Selskabs Skrifter*, Raekke 5, 5:77–152, 11 plates.

Osburn, W.
1865. Notes on the Cheiroptera of Jamaica. *Proceedings of the Zoological Society of London*, 1865:61–85.

Pijl, L. van der
1969. *Principles of Dispersal in Higher Plants*. vii + 153 pages. New York: Springer Verlag.

Plumier, C.
1703. *Nova Plantarum Americanarum Genera*. 52 pages, 40 plates. Paris.
1755–1760. *Plantarum Americanarum Fasciculus Primus (-Decimus)*. 262 pages, 262 plates. Amsterdam and Leiden.

Pomrencke, W.
1892. Vergleichende Untersuchungen über den Bau des Holzes Einiger Sympetaler Familien. *Arbeiten aus dem Königlichen Botanischen Garten zu Breslau*, 1:41–69, 1 plate.

Rafinesque-Schmaltz, C. S.
1825. *Neogenyton*. 4 pages. Lexington, Kentucky.

Rolfe, J.
1893. Flora of St. Vincent and Adjacent Islets. *Royal Botanic Gardens, Kew, Bulletin of Miscellaneous Information*, 1893 (81):231–296.

Sachs, M.
1915. *Anatomisch-Systematische Untersuchungen über die Blattstruktur bei den Gesnerioideen und Einigen Triben der Cyrtandroideen*. Dissertation, University of Erlangen, 54 pages. Munich: Höfling.

Schnizlein, A.
1843–1870. *Iconographia Familiarum Naturalium Regni Vegetabilis*. 4 volumes. Bonn: M. Cohen & Sohn.

Schuchert, C.
1935. *Historical Geology of the Antillean-Caribbean Region or the Lands Bordering the Gulf of Mexico and the Caribbean Sea*. xxvi + 811 pages. New York: J. Wiley & Sons.

Schwartz, A., and J. K. Jones, Jr.
1967. Bredin-Archbold-Smithsonian Biological Survey of Dominica. 7: Review of Bats of the Endemic Genus *Monophyllus*. *Proceedings of the United States National Museum*, 124 (3635):1–20.

Sessé y Lacasta, M. de, and J. M. Mociño
1894. *Flora Mexicana*. 2nd edition, xi + 240 pages. Mexico: Secretaría de Fomento.

Sinclair, C. B., and D. B. Dunn
1961. Surface Printing of Plant Leaves for Phylogenetic Studies. *Stain Technology*, 36:299–304.

Skog, L. E.
1972a [1971]. Two New Species of *Gesneria* [Gesneriaceae] from Jamaica and Haiti. *Baileya*, 18:113–117, 1 figure.
1972b. Growing *Gesneria* and *Rhytidophyllum*. *The Gloxinian*, 22 (6):19–21.
1972c. *A Study of the Tribe Gesnerieae and a Revision of Part of Gesneria L. (Gesneriaceae-Gesnerioideae)*. Ph.D. Thesis, Cornell University, Ithaca, New York. vi + 362 pages, 108 plates.
In press. A Note on *Chorisanthera* [Gesneriaceae] and Its Orthographic Variants. *Baileya*.

Skog, L. E., and T. E. Talpey
1971. Rediscovery of *Gesneria humilis*. *The Gloxinian*, 21 (3):7–9.

Sloane, H.
1696. *Catalogus Plantarum quae in Insula Jamaica Sponte Proveniunt*. 232 pages. London.
1707–1725. *A Voyage to the Islands Madera, Barbados, Nieves, S. Christophers and Jamaica*. 2 volumes, cliv + 499 pages, 285 plates. London.

Solbrig, O. T.
1970. *Principles and Methods of Plant Biosystematics*. xiii + 226 pages. London: Macmillan Co.

Solereder, H.
1908. *Systematic Anatomy of the Dicotyledons*. Translated by L. A. Boodle and F. E. Fritsch. Volume 1, xii + 644 pages. Oxford: Clarendon Press.

Sprengel, C. K.
1793. *Das Entdeckte Geheimniss der Natur im Bau und in der Befructung der Blumen*. 444 pages. Berlin.
Stafleu, F. A.
1967. Taxonomic Literature. *Regnum Vegetabile*, 52: xx + 1–556.
Stafleu, F. A., et al. (editors)
1972. International Code of Botanical Nomenclature. *Regnum Vegetabile*, 82:1–426.
Stearn, W. T.
1957. An Introduction to the Species Plantarum and Cognate Botanical Works of Carl Linnaeus, pages 1–176, in facsimile edition of Linnaeus' *Species Plantarum*, volume 1. London: Ray Society.
1969. The Jamaican Species of *Columnea* and *Alloplectus* (Gesneriaceae). *Bulletin of the British Museum (Natural History), Botany*, 4:181–236.
Stebbins, G. L.
1950. *Variation and Evolution in Plants*. xix + 643 pages. New York: Columbia University Press.
1971. Adaptive Radiation of Reproductive Characteristics in Angiosperms, II: Seeds and Seedlings. *Annual Review of Ecology and Systematics*, 2:237–260.
Stehlé, H.
1962. Tubiflorées de l'Ordre des Polémoniales Nouvelles ou Rares des Antilles Françaises: Notes Taxonomiques et Écologiques, (27e) Contribution. *Bulletin de la Société Botanique de France*, 109:30–31.
Swartz, O.
1788. *Nova Genera & Species Plantarum seu Prodromus*. x + 152 pages. Stockholm.
1797–1806. *Flora Indiae Occidentalis*. 3 Volumes, 2018 pages, 29 plates. Erlangen.
Takhtajan, A. L.
1969. *Flowering Plants, Origin and Dispersal*. x + 310 pages. Edinburgh: Oliver & Boyd.
Talpey, T. E.
1966. *Gesneria cuneifolia*, popular member of the genus *Gesneria*. *The Gloxinian*, 16(1):11–16.
Tamsitt, J. R.
1967. Niche and Species Diversity in Neotropical Bats. *Nature*, 213:784–786.
Trelease, W.
1881. The Fertilization of *Salvia splendens* by Birds. *American Naturalist*, 15:265–269.
Underwood, L. M.
1905. A Summary of Charles Wright's Explorations in Cuba. *Bulletin of the Torrey Botanical Club*, 32: 291–300.
Urban, I.
1898–1928. *Symbolae Antillanae*. 9 Volumes. Berlin: Borntraeger.
Vogel, S.
1969a. Chiropterophilie in der Noctropischen Flora. Neue Mitteilungen II. *Flora*, 158(B):185–222.
1969b. Chiropterophilie in der Neotropischen Flora. Neue Mitteilungen III. *Flora*, 158(B):289–323.
Walker, E. P.
1968. *Mammals of the World*. 2nd edition, volume 1, xlviii + 644 pages. Baltimore: Johns Hopkins Press.
Wallace, G. J.
1963. *An Introduction to Ornithology*. 491 pages. New York: Macmillan Co.
Weber, A.
1971. Zur Morphologie des Gynoeceums der Gesneriaceen. *Österreichische Botanische Zeitschrift*, 119:234–305.
1973. Über die "Stipeln" von *Rhytidophyllum* Mart. (Gesneriaceae). *Österreichische Botanische Zeitschrift*, 121:279–283.
Welty, J. C.
1963 [1962]. *The Life of Birds*. 546 pages. New York: Knopf.
Werth, E.
1915. Kurzer Überblick über die Gesamtfrage der Ornithophilie. *Botanische Jahrbucher für Systematik, Pflanzengeschichte und Pflanzengeographie*, 53:314–378.
Wiehler, H.-J.
1970. *Studies in the Morphology of Leaf Epidermis, in Vasculature of Node and Petiole, and in Intergeneric Hybridization in the Gesneriaceae-Gesnerioideae*. M.S. Thesis, Cornell University, Ithaca, New York. xi + 220 pages.
1971. *Gesneria Mortonii*, a New Name for *Heppiella cubensis* [Gesneriaceae]. *Baileya*, 18:1–5.
1972 [1971]. Chromosome Numbers in Some American Gesneriaceae. *Baileya*, 18:118–120.
Wille, A.
1954. Muscular Adaptations of the Nectar-eating Bats (Subfamily Glossophaginae). *Transactions of the Kansas Academy of Sciences*, 57:315–325.
Wilson, C. L.
1974a. Floral Anatomy in Gesneriaceae. I: Cyrtandroideae. *Botanical Gazette*, 135:247–256.
1974b. Floral Anatomy in Gesneriaceae. II: Gesnerioideae. *Botanical Gazette*, 135:256–268.
Winge, Ö.
1917. The Chromosomes: Their Number and General Importance. *Comptes-Rendus des Travaux du Carlsberg Laboratoriet*, 13:131–275.

Index

(New names and new combinations in italics)

× Achimenantha naegelioides, 161
Achimenes, 158
  erecta, 158, 162, 163
  longiflora, 161, 163
Amasonia hirta, 162
Anodiscus xanthophyllus, 164
Anthracothorax dominicus, 26–28, 30, 86
  mango, 26, 30, 41, 148
  viridis, 26, 30
Apis mellifera, 27
Arbol de navidad, 135
Archilochus colubris, 26, 30

Bignoniaceae, 30
Besleria lutea, 159
Bombax malabaricum, 30
Brachyphylla, 30
  cavernarum, 27, 31, 32, 135
  nana, 27, 32, 144
  pumila, 27, 32, 122, 128, 132, 134

Calyptae helenae, 26, 30, 88
Canelon, 52
Caryophyllaceae, 33
Chiroptera, 29
Chlorostilbon maugaeus, 26, 30, 93
  ricordii, 26, 30, 88
  swainsonii, 26, 30, 86
Chorisanthera, 4, 5, 44, 146
  hispida, 4, 102
  pumila, 4, 44, 152
  tenera, 4, 148, 152
Clavellina, 95
Codonanthe, 18
Codonophora, 3
  grandiflora, 3
  lanceolata, 3
Codonoraphia, 4, 5, 44, 46
  albiflora, 134
  calycosa, 44, 46, 125
  catalpiflora, 128
  craniolaria, 131
  lessertiana, 128
  parviflora, 128
Coerebidae, 28
Coleoptera, 27
Columnea, 17
  aureonitens, 162
Conradia, 3–5, 36, 43, 46, 98
  section Chorisanthera, 3, 4, 6, 145
  section Dittanthera, 3, 4, 121
  section Synanthera, 3, 6, 90
  calycina, 123
  calycosa, 125–127
  cassioides, 158
  celsioides, 94, 95
  clandestina, 124, 127, 128
  corrugata, 113, 115
  craniolaria, 131
  cuneifolia, 4, 109
  depressa, 155, 156
  exserta, 128
  floribunda, 113
  fuchsioides, 158
  gloxinioides, 146, 147
  hispida, 102, 104
  humilis, 46, 90, 94, 98
  lecontei, 158
  libanensis, 102, 113, 115, 118, 119
  mimuloides, 148–150
  neglecta, 4, 150, 151
  pedunculosa, 3, 134–137
    var. β lutea, 134
    var. α pallida, 134
  pumila, 4, 94, 152
  reticulata, 109, 119, 120
    β obovata, 119, 120
  scabra, 83
  sloanei, 4, 102, 104
  verrucosa, 54, 57
  ventricosa, 76
    β ?angustior, 76, 77
Craniolaria fruticosa, 2, 131, 132
Cyanophaia bicolor, 26
Cyrtandroideae, 1

Digitalis folio oblongo serrato . . ., 2
Diptera, 27
Drepanididae, 28
Duchartrea, 4, 5, 43
  sintenisii, 142
  viridiflora, 43, 143–145

Erophylla bombifrons bombifrons, 27, 32, 135
  bombifrons santacristobalensis, 27, 32, 141
  sezekorni sezekorni, 27, 32, 157
  sezekorni syops, 27, 32, 149
Eugesnereae, 3, 36
Eulampis jugularis, 26

Flor de cueva, 110

Gesneria [Gesnera], 1–7, 9–11, 13, 18, 19, 22, 24–32, 34–36, 38–40, 43–46, 51, 52, 54, 56, 57, 94, 97, 98, 112, 120, 127, 134, 146, 147, 158
section *Chorisanthera,* 45, 100, 145, 147, 151
section Codonoraphia, 121
section Conradia, 6, 46, 90
section *Dittanthera,* 18, 45, 87, 121, 122, 125, 136
section Duchartrea, 18, 39, 45, 87, 94, 96, 137, 138, 141
section Gesneria, 18, 45, 90, 91, 93, 94, 96, 100
section *Lachnoblaste,* 45, 85, 87, 122
section *Myrmekianthe,* 45, 86, 89, 122, 138
section Pentarhaphia, 6, 18, 29, 45, 46, 48, 51, 77, 78, 80, 85, 87, 90, 122
section *Physcophyllon,* 29, 45, 90, 93, 100, 105, 111, 115, 145
section *Stenochonanthe,* 45, 46, 80, 81
acaulis, 2, 4, 8, 11, 13, 15, 16, 24, 30–33, 35, 37, 54, 100–105, 107, 109, 113, 119, 158
var. acaulis, 20, 21, 23, 35, 37, 102, 103, 105
var. *glabrata,* 19, 20, 22, 23, 29, 34, 35, 37, 101, 103, 105, 107
var. grandifolia, 102, 104
acuminata, 94, 97, 98
adenantha, 158
affinis, 158
aggregata, 158
albiflora, 134, 137
allagophylla, 158
alpina, 7, 23, 122, 123, 125, 128
amabilis, 158
amplo digitatis folio tomentoso, 2
angustior, 76
arborescens, amplo flore fimbriato & maculoso, 2, 132
aspera, 45, 46, 48, 49, 59, 67
atrosanguinea, 158
aurantiaca, 158
auriculata, 158
barahonensis, 93, 101, 106, 107, 116, 119
barbata, 158
berteroana, 158
betonicifolia, 158
bibracteata, 158
biflora, 134, 136
binghamii, 47, 49–51, 80
blassii, 158
bonaoana, 54–56
brachysepala, 45, 90–93
bracteosa, 87, 89
breviflora, 158
brevifolia, 46, 50–52
bulbosa, 158
bullata, 159
calcarata, 159
calcicola, 54–56
calycina, 3, 22, 23, 123, 125, 126, 159
calycosa, 7, 10, 16–18, 21–23, 30–32, 35, 37, 123–127
var. alpina, 122–124
canescens, 159
caracasana, 159
cardinalis, 159
catalpiflora, 128
celsioides, 94, 97
chelonioides, 159
chilensis, 159
christii, 11, 13, 19, 23, 24, 28, 33, 37, 93, 101, 107–109, 113, 116, 117
× chromatella, 159
cinnabarina, 159
citrina, 7, 13, 19, 22, 30, 35, 37, 38, 56, 91, 92, 94, 100
clandestina, 12, 18, 21, 32, 37, 123–125, 127, 128
clarensis, 47, 51–53, 62, 67
var. turquinensis, 61, 62
clausseniana, 159
coccinea, 159
cochlearis, 159
confertifolia, 159
cooperi, 159
cooperiana, 159
cordata, 159
coruscans, 159
corymbosa, 25, 40, 42, 43, 128, 159
craniolaria, 3, 131
crenulata, 159
cubensis, 30, 43, 47, 51–57, 61, 65, 67, 69
var. cubensis, 48, 54–56
var. *truncata,* 17, 48, 53, 54, 57
cumanensis, 159
cuneifolia, 4, 7, 16, 19, 21–24, 30, 32, 35–37, 100, 101, 109–112, 121, 137
cv. El Yunque, 121
cv. Quebradillas, 112
var. disjuncta, 119, 121
var. obovata, 119
cymosa, 74, 75
cynocephala, 159
decapleura, 30, 85, 86, 133
dentata, 159
deppeana, 159
depressa, 155
discolor, 159
dolichostyla, 54–57
domingensis, 54, 56
donkelaariana, 159
donklarii, 159
douglasii, 159
duchartreoides, 17, 23, 30, 54, 86–90, 145
earlei, 159
eggersii, 159
× egregia, 159
ekmanii, 159
elatior, 159
eliptica, 159
elliptica, 159
elongata, 159
eriantha, 159
erubescens, 159
exogonia, 134, 136
× exoniensis, 160
exserta, 3, 7, 13, 32, 36, 37, 79, 121–123, 125, 128–131, 136

fascialis, 160
faucialis, 160
fawcettii, 81, 82
ferruginea, 70
filisepala, 67, 69
fimbriata, 131
flacourtifolia, 160
flavescens, 160
fragilis, 160
fruticosa, 2, 7–9, 12, 16, 19, 25, 32, 34, 35, 37, 44, 67, 85, 123, 131–133
fruticulosa, 160
gardneri, 160
gerardiana, 160
geroltiana, 160
gibberosa, 71
glandulosa, 46, 51, 57–59
glaucophylla, 160
gloxinioides, 32, 39, 145–147
gollmeriana, 160
gracilis, 160
grandis, 3, 160
guazumifolia, 160
guianensis, 160
hahnii, 160
haitiensis, 12, 37, 45, 47–49, 59, 60, 67
harrisii, 11, 12, 37, 47, 60–62, 65
herbertiana, 160
herminieri, 76
heterochroa, 23, 47, 51, 58, 61–63
heteroclada, 54–56
hirsuta, 160
hispida, 102
hondensis, 113, 160
hookeri, 160
houttei, 160
humilis, 2, 3, 7, 8, 10–12, 16, 19–24, 30, 33, 35, 37, 44–46, 90, 91, 93–98, 100
humilis, flore flavescente, 2, 97
hybocarpa, 93, 101, 112, 113
hypoclada, 47, 48, 63, 64
ignorata, 160
inaequalis, 160
incisa, 94, 97, 98
incurva, 50, 160
jamaicensis, 37, 47, 61–65
lanceolata, 47, 48, 65, 66
lasiantha, 160
lateritia, 160
latifolia, 160
lehmannii, 160
leiocarpa, 150–152
leopoldii, 160
leptopus, 160
lessertiana, 128
leucomalla, 160
libanensis, 4, 13, 22, 33, 43, 57, 101, 113–115, 118, 119
var. corrugata, 113
lindeniana, 160
lindleyana, 76
lindleyi, 160
lindmanii, 157
linkiana, 160
lobulata, 161
lomensis, 161
longiflora, 76, 161
longifolia, 161
longipes, 161
longirostris, 161
lopezii, 113, 114
macrantha, 161
macrorrhiza, 161
macrostachya, 161
maculata, 161
magnifica, 161
marchii, 161
melittifolia, 161
merckii, 161
mimuloides, 149
mollis, 161
montana, 76
montevidensis, 161
mornincola, 54, 55, 69
mortonii, 25, 43, 161
× naegelioides, 161
neglecta, 150
× nigrescens, 161
nigrina, 161
nipensis, 87, 89
nitida, 161
norlindii, 87, 89
oblongata, 161
odontophylla, 47, 48, 52, 65–67
onacaensis, 39, 76, 161
onychocalyx, 17, 123, 125, 128, 129, 133, 134
organa, 161
oxyphylla, 161
pachyclada, 87, 89
palustris, 161
paluviensis, 161
pardina, 161
parviflora, 128
parvifolia, 46, 48, 49, 67, 68
pauciflora, 7, 19, 21, 25, 30, 32, 37, 91, 94, 98–100
pedicellaris, 8, 11, 13, 14, 16, 19, 20, 22, 28–30, 33, 35, 37, 93, 101, 115–117
pedunculosa, 3, 8, 11, 16–19, 21, 22, 30, 32, 35–37, 56, 123, 131, 134–137
pendulina, 162
petiolaris, 162
picta, 162
pilosa, 162
plumeriana, 162
polyantha, 162
portoricensis, 109
prasinata, 3, 162
proctorii, 152, 153
pulchella, 162

pulverulenta, 13, 19, 21, 30, 35, 37, 45, 47, 48, 67–69
pumila, 3, 4, 31–33, 44, 145–149, 152–154, 157
  subsp. *mimuloides*, 16, 32, 148–151
  subsp. *neglecta*, 4, 6, 8, 22, 32, 37, 148–152
  subsp. *proctorii*, 148, 149, 151–153
  subsp. pumila, 21, 37, 148, 149, 151–154, 157
punctata, 162
purpurascens, 33, 58, 101, 112, 115, 117–119
purpurea, 162
× pyramidalis, 162
quadriflora, 128
quadrifolia, 162
quaterniflora, 162
quisqueyana, 140, 141
reflexa, 162
× refulgens, 162
regalis, 162
regeliana, 162
regina, 162
reticulata, 6–8, 13, 28, 32, 33, 35, 37, 49, 93, 101, 106, 111, 115, 119–121, 137
rhynchocarpa, 162
robusta, 162
rubricaulis, 162
rugata, 162
rupestris, 162
rupicola, 162
rupincola, 162
rutila, 162
salicifolia, 47, 58, 59, 69–71, 73
  var. *ferruginea*, 47, 51, 70–72
  var. salicifolia, 51, 70, 71
  var. *spathulata*, 51, 70–72
salviifolia, 162
samuelssonii, 155, 157
sartorii, 162
saxatilis, 67, 69
scabra, 3, 80–83, 162
  var. *fawcettii*, 24, 30, 81, 82
  var. scabra, 30, 81–83
  var. *sphaerocarpa*, 15, 19, 20, 22, 29, 34, 35, 37, 65, 81–84
  var. *viridicalyx*, 81, 82, 84, 85
sceptroides, 162
sceptrum, 162
schiedeana, 162
schomburgkiana, 162
scopulorum, 54, 55
seemannii, 162
selloi, 163
sellovii, 163
shaferi, 32, 145, 155–157
  subsp. *depressa*, 11, 33, 147, 155–157
  subsp. shaferi, 147, 155–157
sintenisii, 140, 142, 143
sphaerocarpa, 83, 84
spicata, 163
splendens, 163
splendidissima, 163
stachydifolia, 163
stachyfolia, 163
stricta, 163
subalata, 54, 55
sulcata, 163
suttoni, 163
sylvatica, 163
sylvicola, 140, 141
tenella, 163
tenera, 152
tetraphylla, 163
tomentosa, 2, 3, 36, 45, 46, 163
trianaei, 163
tribracteata, 163
triflora, 79, 163
trifoliata, 163
truncata, 53, 57
tuberosa, 163
tubiflora, 163
tweediana, 163
ulmifolia, 163
umbellata, 163
uniflora, 163
vargasii, 163
vauthieri, 163
velutina, 163
ventricosa, 3, 4, 7, 12, 16, 24, 25, 30, 43, 45–47, 72–76, 79, 98, 137, 163
  f. montana, 76
  f. obovata, 76
  f. ovata, 76, 77, 79
  subsp. *cymosa*, 74, 75, 78
  subsp. ventricosa, 19, 20, 23, 35, 37, 74, 76–79
  var. γ obovata, 76
  var. β ovata, 76
verdi, 164
verrucosa, 54, 57
verticillata, 164
vestita, 164
viridiflora, 30, 90, 137–139, 143, 144
  subsp. *acrochordonanthe*, 138–141
  subsp. *quisqueyana*, 7, 14, 16, 18, 19, 22, 32, 35, 37, 138–141
  subsp. *sintenisii*, 19, 20, 32, 35–37, 94, 137–139, 142, 143
  subsp. viridiflora, 21, 22, 32, 62, 87, 96, 138, 139, 144
  var. acutifolia, 144, 145
  var. colorata, 144
  var. obovata, 144, 145
warmingii, 164
warszewiczii, 164
wrightii, 47, 51, 73, 79, 80
xanthophylla, 164
yumuriensis [yamuriensis], 117–119
zebrina, 164
Gesneriaceae, 1, 5, 7, 9, 18, 22, 24, 28, 29, 32–36
Gesnerieae [Gesnereae], 1–6, 19, 22, 24–26, 29, 33, 34, 36, 38–40, 143
  subtribe Conradieae, 3, 36
  subtribe Pentarhaphieae, 36
  subtribe Rhytidophylleae, 36

Gesnerioideae, 1, 6, 7
Glaucis hirsuta, 26, 30, 74
Glossophaga, 30
  soricina antillarum, 27, 31, 32, 130, 149
Glossophaginae, 29
× Gloxinera, 158
  donkelaariana, 159
Gloxinia, 158
  calycina, 123
  lindleyi, 123
  sylvatica, 158, 161–163

× Heppiantha naegelioides, 159
Heppiella, 6, 9, 25, 38, 40
  corymbosa, 40, 42
  cubensis, 40, 43
  ulmifolia, 163
  verticillata, 164
Herincquia [Henrincquia], 4, 5, 43
  floribunda, 43, 113
Hymenoptera, 27

Kigelia, 30
Kohleria, 158
  eriantha, 159
  guazumifolia, 160
  hirsuta, 160
  hondensis, 160
  ignorata, 160, 161
  lanata, 161
  longiflora, 161
  longifolia, 160, 161
    var. petiolaris, 162
  longipes, 161
  mollis, 161
  rubricaulis, 162
  schiedeana, 162
  seemannii, 162
  spicata, 163
  trianae, 159, 161, 163
  tubiflora, 162, 163
  ventricosa, 163
  vestita, 164
  warszewiczii, 162

Lepidoptera, 27
Leptonycteris nivalis, 30

Macranthera flammea, 158
Marchantia, 33, 100
Martynia fruticosa, 131
Melasma scabrum, 161
Mellisuga minima, 26, 30, 41, 42, 81, 148
Mitella, 33
Meliphagidae, 28
Microchiroptera, 29
Mitraria coccinea, 159
Monophyllus cubanus ferreus, 141
  redmani, 31
  redmani clinedaphus, 27, 32, 157
  redmani portoricensis, 27, 32, 135
  redmani redmani, 27, 32, 149, 151
Moussonia deppeana, 159–163
  triflora, 163

Nautilocalyx melittifolius, 159
Nectariniidae, 28
Nidulariales, 33

Ophianthe, 4, 5, 44
  libanensis, 4, 44, 113
Orthorhynchus cristatus, 26, 30, 93

Paliavana, 3
  prasinata, 162–164
Pentarhaphia [Pentaraphia], 3–5, 7, 36, 43, 46
  section Codonoraphia, 5, 121
  section Duchartrea, 5, 137
  section Eupentarhaphia, 5, 6, 46
  section Synanthera, 5
  section Vaupellia, 5, 121
  acaulis, 102
  albiflora, 134, 136
  calycina, 123
  calycosa, 125
  catalpiflora, 128, 131
  celsioides, 94
  clandestina, 127
  corrugata, 113
  ?corymbosa, 42, 164
  craniolaria, 131
  cubensis, 54, 55
    var. β corollae limbo regulari, 54
  cumanensis, 164
  cuneifolia, 109
  depressa, 155
  duchartreoides, 87–89
  exserta, 76, 128
  ferruginea, 70, 72
  floribunda, 113
  florida, 76, 77, 79
  glandulosa, 57, 58
  gloxinioides, 146
  herminieri, 76, 77
  hispida, 102
  humilis, 94
  incurva, 49, 50
  lessertiana, 128, 131
  libanensis, 102, 113
  lindleyana, 76, 78
  longiflora, 3, 7, 43, 46, 74, 76, 134, 137
    var. lindleyana, 76
  mimuloides, 148
  montana, 76, 77
  neglecta, 150
  parviflora, 128, 131
  pedunculosa, 134
  pumila, 152

reticulata, 119
β obovata, 119
salicifolia, 71, 73
scabra, 83
sloanei, 102
swartzii, 76
tenera, 152
triflora, 73, 79, 80
ventricosa, 76
verrucosa, 54, 55
viridiflora, 144
Pentarhaphieae, 5
Pentarrhaphis, 43
Pheidonocarpa, 6, 7, 10, 11, 22, 24, 25, 36, 38–40
corymbosa, 7–9, 13, 22, 35, 37, 40, 41, 43, 159, 164
subsp. corymbosa, 21, 41, 42
subsp. *cubensis,* 41, 43, 161
Phyllonycterinae, 29
Phyllonycteris aphylla, 27, 32, 122, 127, 128, 134
poeyi, 27, 32, 144
Phyllostomidae, 29, 31, 32

Quercus, 131

Rapunculo affinis anomala vasculifera . . ., 2, 103, 104
Rechsteineria, 17, 158
atrosanguinea, 158
aurantiaca, 158
blassii, 158
bulbosa, 158, 159
caracasana, 159
claussenii, 159
cochlearis, 159
confertifolia, 159
coruscans, 159
dentata, 159
discolor, 159, 162
douglasii, 159
elatior, 159
elliptica, 159
erubescens, 159
faucialis, 160
flavescens, 160
fruticulosa, 160
gollmeriana, 160
gracilis, 160, 162
hookeri, 160
lateritia, 160, 161, 163
leopoldii, 160, 163
macrostachya, 160, 161
marchii, 161
merckii, 161
pendulina, 162
polyantha, 162
reflexa, 162
rupicola, 162
sceptroides, 162
schomburgkiana, 160, 162
sellovii, 163
splendens, 163
sulcata, 163
suttonii, 163
trifoliata, 163
umbellata, 163
vargasii, 163
vauthieri, 163
warmingii, 164
Rhytidophylleae, 4, 36
subtribe Eurhytidophylleae, 4
Rhytidophyllum [Rytidophyllum], 3–7, 9–11, 13–15, 18, 19, 22, 24, 25, 34–36, 38–40, 45, 46, 76, 138
acuñae, 11
auriculatum, 9, 10, 13, 14, 17, 19, 27, 28, 33, 35, 37, 38, 158, 160
berteroanum, 3, 11, 13, 16, 27, 28, 35, 37, 46, 158, 162
bicolor, 39
crenulatum, 159, 163
cumanense, 159, 164
earlei, 25, 159
floribundum, 4, 113
grande, 7, 8, 23, 30, 35, 37, 39, 138, 160
lanatum, 11
leucomallon, 8, 11, 13, 19, 35, 37, 38, 160
lomense, 25, 161
onacaense, 15, 161
plumerianum, 7
rupincola, 25, 162
tomentosum, 2, 7–11, 13, 15, 20–24, 29, 31, 33–38, 104, 105, 163
Rousettus aegyptiacus, 30

Sagina, 33
Saxifragaceae, 33
Scrophulariales, 1, 9
Sericotes holosericeus, 26, 30, 100
Seymeria cassioides, 158
Sinningia, 17, 158
aggregata, 56, 158, 163, 164
allagophylla, 158, 160–163
barbata, 158
calycina, 123
canescens, 159
cardinalis, 159–161
claybergiana, 160
cooperi, 158, 159
incarnata, 158–160, 162, 163
macrorrhiza, 161
magnifica, 158, 160, 161
regina, 162
sceptrum, 160–162
stricta, 163
tuberosa, 158, 162, 163
tubiflora, 163
verticillata, 160–162, 164
warszewiczii, 164
Smithiantha cinnabarina, 159
geroltiana, 160
× hybrida cv. Sulphurea, 159

multiflora, 158
zebrina, 162–164
cv. Exoniensis, 160
cv. Refulgens, 162
cv. Robusta, 162
Spanish Tea, 135

Trochilidae, 28, 30
Trochilus polytmus, 26, 30, 41, 81, 148
Tupa acuminata, 134

Vanhouttea gardneri, 160, 161
salviifolia, 162
Vaupellia, 4, 44, 125
calycina, 4, 5, 44, 123

Yerba parrera, 110

☆ U.S. GOVERNMENT PRINTING OFFICE: 1975—586–384/43

Publication in *Smithsonian Contributions to Botany*

Manuscripts for serial publications are accepted by the Smithsonian Institution Press, subject to substantive review, only through departments of the various Smithsonian museums. Non-Smithsonian authors should address inquiries to the appropriate department. If submission is invited, the following format requirements of the Press will govern the preparation of copy.

Copy must be typewritten, double-spaced, on one side of standard white bond paper, with 1½" top and left margins, submitted in ribbon copy with a carbon or duplicate, and accompanied by the original artwork. Duplicate copies of all material, including illustrations, should be retained by the author. There may be several paragraphs to a page, but each page should begin with a new paragraph. Number consecutively all pages, including title page, abstract, text, literature cited, legends, and tables. The minimum length is 30 pages, including typescript and illustrations.

The *title* should be complete and clear for easy indexing by abstracting services. Taxonomic titles will carry a final line indicating the higher categories to which the taxon is referable: "(Leguminosae: Faboideae)." Include an *abstract* as an introductory part of the text. Identify the *author* on the first page of text with an unnumbered footnote that includes his professional mailing address. A *table of contents* is optional. An *index*, if required, may be supplied by the author when he returns page proof.

Two *headings* are used: (1) text heads (boldface in print) for major sections and chapters and (2) paragraph sideheads (caps and small caps in print) for subdivisions. Further headings may be worked out with the editor.

In *taxonomic keys*, for easy reference, number the taxa and their corresponding headings throughout the text; do not incorporate page references in the key.

In *synonymy* use the long form (taxon, abbreviated author, abbreviated journal or book title, volume, part if necessary, page, year) with no reference at the end of the paper under "Literature Cited" or use the short form (taxon, author, date: page) with a full reference at the end of the paper under "Literature Cited." Begin each taxon at the left margin with subsequent lines indented about three spaces. Within an entry, use a period-dash (.—) to separate each supplementary reference. Enclose with square brackets any annotation in, or at the end of, the entry. For *references within the text*, use the author-date system: "(Jones, 1910)" and "Jones (1910)." If the reference is expanded, abbreviate the data: "Jones (1910: 122, pl. 20: fig. 1)."

Simple *tabulations* in the text (e.g., columns of data) may carry headings or not, but they should not contain rules. Formal *tables* must be submitted as pages separate from the text, and each table, no matter how large, should be pasted up as a single sheet of copy.

Use the *metric system* instead of, or in addition to, the English system.

Illustrations (line drawings, maps, photographs, shaded drawings) can be intermixed throughout the printed text. They will be termed *Figures* and should be numbered consecutively; however, if a group of figures is treated as a single figure the components should be indicated by lowercase italic letters on the illustration, in the legend, and in text references: "Figure 9*b*." If illustrations (usually tone photographs) are printed separately from the text as full pages on a different stock of paper, they will be termed *Plates*, and individual components should be lettered (Plate 9*b*) but may be numbered (Plate 9: figure 2). Never combine the numbering system of text illustrations with that of plate illustrations. Submit all legends on pages separate from the text and not attached to the artwork. An instruction booklet for the preparation of illustrations is available from the Press on request.

In the *bibliography* (usually called "Literature Cited"), spell out book, journal, and article titles, using initial caps with all words except minor terms such as "and, of, the." For capitalization of titles in foreign languages, follow the national practice of each language. Underscore (for italics) book and journal titles. Use the colon-parentheses system for volume, number, and page citations: "10(2): 5-9." Spell out such words as "figures," "plates," "pages."

For *free copies* of his own paper, a Smithsonian author should indicate his requirements on "Form 36" (submitted to the Press with the manuscript). A non-Smithsonian author will receive 50 free copies; order forms for quantities above this amount with instructions for payment will be supplied when page proof is forwarded.