

A MONOGRAPH OF THE AMERICAN SPECIES OF THE GENUS *HALENIA*¹

CAROLINE K. ALLEN

*Formerly Missouri Botanical Garden Special Fellow in Botany,
Henry Shaw School of Botany of Washington University*

INTRODUCTION

Frequent attempts to determine recent collections of *Halenia*, especially from Central and South America, have revealed the need for a comprehensive taxonomic treatment of the American species of the genus. Incidental determination of isolated species in herbaria, which furnish scanty material, has led to error and the duplication of species has resulted. Few of these fragmentary treatments are provided with adequate descriptions, and still fewer are accompanied by illustrations. The present paper is a monographic study of the American species of *Halenia*. The first portion is devoted to the North and Central American representatives of the genus and the second to those of South America.

The writer at this time wishes to express her appreciation to Dr. George T. Moore, Director of the Missouri Botanical Garden, where this work has been carried on, for the privilege of using the facilities afforded by the herbarium, library, and laboratory. It is with pleasure, indeed, that she also acknowledges the courteous assistance and helpful criticism offered by Dr. J. M. Greenman, under whose personal supervision the study was begun and completed.

For the loan of specimens for study the writer is especially indebted to the curators of the herbaria of the following institutions: Gray Herbarium of Harvard University, New York Botanical Garden, Philadelphia Academy of Natural Sciences, United States National Herbarium, Field Museum of Natural History, the Dudley Herbarium of Stanford University, Brooklyn Botanic Garden, Iowa Agricultural College, Natural History Mu-

¹ An investigation carried out at the Missouri Botanical Garden in the Graduate Laboratory of the Henry Shaw School of Botany of Washington University, and submitted as a thesis in partial fulfillment of the requirements for the degree of doctor of philosophy in the Henry Shaw School of Botany of Washington University.

Issued April 29, 1933.

seum of Vienna, Botanical Museum of Stockholm, the Delessert Herbarium at Geneva, Royal Botanic Gardens, Kew, and the British Museum of Natural History.

Particularly does the writer wish to express her gratitude to Mr. R. I. Cratty, of the Iowa State College, for the loan of specimens from the Parry Herbarium deposited there; to the curator of the Herbarium of the Botanical Garden of Madrid, for supplying a photograph of the type of *Swertia cucullata*; and to the curator of the Herbarium of the Jardin des Plantes, Paris, for photographs of the types of Humboldt, Bonpland and Kunth.

In connection with visits to various herbaria, the author desires to acknowledge the courtesy and kindly assistance of Dr. Ernst Gilg and Dr. Robert Pilger, of the Botanical Garden at Berlin-Dahlem; Dr. Walter Robyns of the Botanical Garden, Brussels; and Mr. Spencer Savage, in charge of the Linnaean Herbarium, of the Linnaean Society of London. Thanks are due also to Dr. George E. Nichols, Director of the Marsh Botanical Garden, Yale University, for his kindness in procuring seeds of *Halenia*; to Miss Nell C. Horner, Librarian of the Missouri Botanical Garden, and Dr. John H. Barnhart, of the New York Botanical Garden, for assistance in bibliography; to Dr. Roland V. La Garde, of the Missouri Botanical Garden, for preparation of photographs; and to the George F. Cram Company, for permission to use the copyright outline maps of North and South America.

HISTORY OF THE GENUS

Linnaeus in the 'Amoenitates Academicae,'¹ which appeared in 1751, published short descriptions of two genera of the Gentianaceae, namely, *Swertia*, consisting of five species, and *Gentiana*, of twenty-three. Under *Swertia* Linnaeus listed the spurred gentian with the following description.

"4. *Swertia* corollis quadrifidis quadricornibus.

Amoen. acad. 2. p. 344.

Habitat in Sibiria, Gmelin; Canada, Kalm."

This was apparently the only species of spurred gentian he had

¹ Linnaeus, Amoen. Acad. 2: 344. 1751.

ever seen, and, it being closely related to the *Swertia* he knew, he placed it in that group, giving it the specific name *corniculata* or "horn-tipped," as distinct from the others.

Gmelin, in his 'Flora Sibirica,'² published in 1769, referred to this as being synonymous with his genus *Tetragonanthus*, which he had described or mentioned in a previous book or manuscript, and which he evidently based upon specimens collected by G. H. Stellar. This work contains a brief description, but a good illustration of *Swertia*.

On account of the presence of spurs on the corolla, Börckhausen,³ in 1796, segregated *Swertia corniculata* from the Linnaean genus *Swertia* and called it *Halenia* after Jonas Halen. Although the latter had included a short description of it in a previously published dissertation on Kamtchatka plants, Börckhausen must be considered the author of the genus. He cited as a synonym *Swertia corniculata* Linnaeus, but changed the binomial name to *Halenia sibirica*.

The name *Swertia*, however, persisted for some time in literature, the generic descriptions becoming more elaborate and detailed with each publication. Ruiz and Pavon described and illustrated *Swertia umbellata* from Peru⁴ in 1802. Michaux included the genus in his 'Flora Boreali-Americana'⁵ appearing the following year, and Humboldt, Bonpland and Kunth,⁶ described six new species from Mexico and South America in 1818. A few species, together with a new variety, were published in 'Linnaea' by Schlechtendal and Chamisso⁷ in 1830. But it was not until Grisebach began his extensive study of the Gentianaceae that any attempt was made to bring together the species of the world. As a result, when his 'Observationes'⁸ appeared in 1836, followed in 1839 by the 'Genera et Species Gentianearum,'⁹ many of the existing names fell to synonymy.

Grisebach divided *Halenia* into two main divisions: the first,

² Gmelin, Fl. Sib. 4: 114. 1769.

³ Börckhausen in Roemer, Arkiv für Botanik 1¹: 25. 1796.

⁴ Ruiz & Pavon, Fl. Peruv. 3: 21. pl. 242. 1802.

⁵ Michaux, Fl. Bor.-Am. 1: 97. 1803.

⁶ Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. Pl. 3: 174. 1818.

⁷ Schlechtendal & Chamisso in Linnaea 5: 122. 1830.

⁸ Grisebach, Obs. Gent. 36. 1836.

⁹ Grisebach, Gen. & Sp. Gent. 322-328. 1839.

with spurs ascending and spreading; the second, with spurs pendulous to incurved. He devoted careful attention to the descriptions, synonymy, affinities, differentiating characters, and habitat of each species mentioned. The collector and type were given in each case. He also separated from the *Swertia* of Humboldt, Bonpland and Kunth two species, *brevicornis* and *parviflora*, and founded on them a new genus *Exadenus* distinguished by the presence of pits at the base of the corolla, instead of spurs, and by central placentation. This abolished the *Swertia* of Humboldt, Bonpland, and Kunth, which was based on *Swertia corniculata* Linnaeus, and left the non-spurred *Swertia* originally described by Linnaeus a genus entirely distinct from our present *Halenia*.

Hooker's 'Flora,'¹⁰ published in 1840, contained good illustrations of *Halenia deflexa* with the varieties *Brentoniana* and *heterantha*.

Nearly a decade elapsed before any significant study was done on the genus as a whole. Bentham,¹¹ in 1839-1840, in describing Hartweg's plants from Mexico added two new species, *multiflora* and *decumbens*. Martens and Galeotti in 1844 in their "Enumeration of Mexican plants collected by Galeotti"¹² described, along with other new *Halenia* species, two new species of *Exadenus*. Walpers' 'Repertorium'¹³ contains reference to *Exadenus*, but Weddell in 1859¹⁴ merged the two genera. He considered the group as a whole to consist of two main subdivisions, the first being that group with spurs, and the second the spurless species. The former he subdivided into section 1—ovary unilocular; section 2—ovary bilocular, and the corolla having small spurs. Here he placed the two original species of *Exadenus* Grisebach which were based on the species of *Swertia* Humboldt, Bonpland & Kunth, namely, *parviflora* and *brevicornis*, but neglected to transfer the species described by Martens and Galeotti. The second subdivision, without spurs, he also divided into two sections, on the presence of a uni- or bilocular ovary.

¹⁰ Hooker, Fl. Bor.-Am. 2: 67. pl. 155-6. 1840.

¹¹ Bentham, Pl. Hartw. 24. 1839; 67. 1840.

¹² Martens & Galeotti in Bull. Acad. Brux. 11¹: 370. 1844.

¹³ Walpers, Rep. Bot. Syst. 6: 508. 1846-47.

¹⁴ Weddell, Chlor. And. 2: 74. 1859.

His argument for combining the two genera was based on the fact that the two characters, the bilocular ovary and the short spurs do not always coincide. In this work, he described five new South American species based on collections of Triana, Funck & Schlim, Goudot, Purdie, etc.

At the time of the publication of Bentham and Hooker's 'Genera Plantarum,'¹⁵ 1876, there were about twenty-five recognized species of *Halenia* from the whole world.

Hemsley, in 'Biologia Centrali-Americana,'¹⁶ which appeared in 1882, referred the *Exadenus* Martens and Galeotti to *Halenia*. Gilg in Engler and Prantl's 'Natürlichen Pflanzenfamilien'¹⁷ recognized the validity of the generic name *Halenia* and included a careful description and good illustrations.

Sessé & Mociño's 'Flora'¹⁸ contains a description of *Swertia cucullata* which has escaped the notice of succeeding monographers, and has not been transferred to *Halenia*. A photograph of the type specimen kindly furnished by Dr. E. Balguerías, Curator of the Botanical Garden at Madrid, reveals the fact that it is without question *Halenia brevicornis* Griseb., though it is rather difficult to determine whether or not it is the species proper or one of its many forms.

From this time until the monographic treatment of South American species was published by Gilg¹⁹ in 1916, several species and varieties of Mexican and Central American *Halenia* were published. *Halenia Rothrockii* Gray,²⁰ now *Halenia recurva*, in 1876 was based on plants collected in Arizona by Dr. J. T. Rothrock. G. Don, in 1838, in the 'General History of the Dichlamydeous Plants'²¹ included a description of the existing species of *Halenia*, making several new combinations from the species of Humboldt, Bonpland and Kunth.²² Some of his species were taken from the manuscript of D. Don, thus appearing in

¹⁵ Bentham & Hooker, Gen. Pl. 2: 817. 1876.

¹⁶ Hemsley, Biol. Cent.-Am. Bot. 2: 351. 1882.

¹⁷ Gilg in Engler & Prantl, Nat. Pflanzenfam. 4²: 89. 1895.

¹⁸ Sessé & Mociño, Flora Mexicana, 73. 1894.

¹⁹ Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, pp. 93-122. 1916.

²⁰ Gray in Proc. Am. Acad. 11: 84. 1876.

²¹ Don, G. Gen. Hist. 4: 177. 1838.

²² Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. Pl. 3: 174. 1818.

publication for the first time. Kuntze,²³ in 1891, revived the generic name *Tetragonanthus* Gmelin. He has been followed by a few later taxonomists, among whom are Britton,²⁴ Small,²⁵ Rydberg,²⁶ and others. However, *Halenia* was placed on the list of *nomina conservanda*, and thus must be regarded as the correct name in accordance with the International Rules of Botanical Nomenclature. *Halenia crassiuscula* Robinson and Seaton²⁷ appeared in 1893. Britton,²⁸ in 1894, reduced *H. Brentoniana* Grisebach to a variety of *Tetragonanthus deflexus*, while in 1899 Fernald²⁹ placed *H. heterantha* Grisebach under *Halenia deflexa* var. *heterantha*. Other new species and new combinations appeared in rapid succession, due to the extensive collecting done during the period from 1890 to about 1920, by Conzatti, Pringle, Purpus, and others in Mexico, and Weberbauer in South America. Among these newly published species were: *Halenia candida* Ramirez,³⁰ 1895; *H. chlorantha* Greenman,³¹ 1905; *H. bella*, *H. caespitosa* Gilg,³² 1906; *H. Conzattii* Greenman,³³ 1912; *H. guatemalensis* Loesener, and *H. plantaginea* var. *latifolia* Loesener³⁴ (now *H. guatemalensis* var. *latifolia* (Loesener) Allen) 1913.

The type species up to this time had been called *H. sibirica*, the name given it by Börckhausen. However, according to the rules of priority, *sibirica* should give way to the older name *corniculata* used by Linnaeus. Accordingly, Druce³⁵ in 1914 revived *corniculata* which is at present the accepted name for the type species of *Halenia*. Britton and Brown in the 'Illustrated Flora,'³⁶ reduced Grisebach's species *Brentoniana* and *heterantha* to varieties of *deflexa*.

²³ Kuntze, Rev. Gen. Pl. 2: 431. 1891.

²⁴ Britton, Manual, 734. 1901.

²⁵ Small, Fl. Southeastern U. S. 931. 1913.

²⁶ Rydberg, Fl. Rocky Mts. 666. 1922.

²⁷ Robinson & Seaton in Proc. Am. Acad. 28: 113. 1893.

²⁸ Britton in Mem. Torrey Bot. Club 5: 261. 1894.

²⁹ Fernald in Rhodora 1: 37. 1899.

³⁰ Ramirez in Inform. Secret. Foment. Mexic. (Excurs. Mont. Ajusco). 34. 1895.

³¹ Greenman in Proc. Am. Acad. 41: 240. 1905.

³² Gilg in Fedde, Rep. Spec. Nov. 2: 52. 1906.

³³ Greenman in Publ. Field Mus. Bot. 2: 335. 1912.

³⁴ Loesener in Verh. Bot. Ver. Brandenb. 55: 182. 1913.

³⁵ Druce in Rept. Bot. Exch. Cl. Brit. Isles 3: 419. 1914.

³⁶ Britton & Brown, Ill. Fl. 3: 15. 1913.

Gilg,³⁷ in 1916, monographed the South American representatives of the genus, adding several new species. At that time, the herbarium at Berlin contained as complete a series of South American plants as were to be found anywhere, but, in some cases at least, the material was too inadequate to determine the limits of variation of certain of the species proposed. Hence, some of the species recognized, studied in the light of subsequent collections, have fallen into synonymy. Gilg created three main divisions:

- A. *Nectaria parva vel obsoleta, rarius extrinsecus breviter semigloboso-prominentia. Folia manifeste carnosio-subcoriacea.*
- B. *Nectaria haud calcariformia, sed extrinsecus ad basin corollae alte globoso- vel coniformi-prominentia. Folia semper tenuiter herbacea.*
- C. *Nectaria extrinsecus calcaria manifeste evoluta formantia.*

Division A contains the largest known *Halenia*, native of South America only, which in inflorescence, flower, and leaf habit, shows affinities with the western species of *Swertia* and *Frasera* as well. Plants in division A are very distinct and occur in Colombia and Venezuela. These Gilg apparently considered the most primitive.

In division B we find the *brevicornis-parviflora* complex. Gilg considered *H. brevicornis* (HBK.) Don a valid species known only from South America, and *parviflora* a native of Mexico; he further described a new species *erythraeoides* from Venezuela which agrees in every respect with the *parviflora* type from Mexico.

Division C is subdivided according to the length of spurs; here again, confusion has occurred, as is apt to be the case when herbarium material is scanty and field work impossible. From a limited experience in the field with a North American species, the author can state with conviction that it is possible for two plants belonging to the same species, growing side by side, to vary not only in form but in size as well. It has been found also that the spur character is inconstant. Axillary flowers and those blooming late in the season frequently possess shorter spurs or no spurs at all. If this character is so variable in one species, it

³⁷ Gilg in Engl. Bot Jahrb. 54: Beibl. 118, p. 93. 1916.

is reasonable to suppose that the same situation may obtain in other species. Only close attention to ecological detail and a wealth of material not yet available from South America can enable the monographer to delimit species from these little-known regions even with a fair degree of accuracy.

Briquet,³⁸ in 1931, described several new species which will be treated below.

GROSS MORPHOLOGY

Habit.—The American species of the genus *Halenia* are glabrous, strictly herbaceous, or somewhat ligneous annuals or perennials. They may be of caespitose habit, as is illustrated by *H. caespitosa*, or coarse, fleshy, foliose plants with single stems, 5 or more dm. high, as in *H. hygrophila* and related species, or scapose with the basal leaves disposed in a rosette, as in *H. plantaginea*, or slender, graceful, simple or branching plants 1.5–6 dm. high, as in *H. brevicornis* and its varieties. As a whole, the genus is not colorful, the flowers being various shades of yellow and yellow-green, except in the northernmost species, which has purple flowers.

Roots.—The root system of the North American species is fibrous, with a persistent, slender tap-root, frequently more or less woody in texture, though typically that of an annual or perennial in cross-section. In the South American species the root is, for the most part, ligneous and thick.

Stems.—The stems are simple or branched, usually erect, though they may be decumbent, as in *Halenia decumbens* and *H. Weddelliana*. They are of two types, mostly foliose as in *H. deflexa* and *Schiedeana*, or scapose as in *H. plantaginea*. The stems often continue underground for a short distance, sending out erect, flowering stems at irregular intervals. These may be angular or terete; if the former they are often slightly winged, due to the decurrence of the leaves, and usually faintly striate.

Leaves.—The leaves are opposite and decussate, or infrequently whorled as in *H. verticillata*, either entirely cauline or disposed in a rosette, sessile or petiolate. The petioles exhibit the same characteristics as the stem, the decurrence of the calyx-lobes

³⁸ Briquet in *Candollea* 4: 317. 1931.

frequently being apparent. Where both petiolate and sessile leaves occur on the same plant, the basal leaves have petioles often equal to or longer than the blade, and the petioles become decreasingly shorter toward the summit of the stem, the uppermost leaves being sessile. The leaves are entire, 1-, 3- or 5-nerved, and range from ovate to obovate or spatulate, or lanceolate to linear, varying from .5 to 8 or 10 cm. in length and up to 6 cm. in width. The leaves of the North American species are, on the whole, thin and herbaceous, whereas in the South American species they are frequently coarse, fleshy, or coriaceous.

Inflorescence.—The inflorescence consists of terminal or axillary cymes of varying density. The flowers occur on short pedicels at the tip of a stem or branch in a compact cluster or head, as in *H. brevicornis*, or they may be borne loosely on long pedicels at the tip of a branch or at a node, as in *H. Schiedeana*. In the Central American and the more primitive of the South American species, the inflorescence is usually a spicate, racemose, or more or less umbellate cyme. A pair of small, linear, foliaceous bracts is usually present at the base of the inflorescence, often bearing tiny, undeveloped buds in their axils. Frequently the bracts approximate the leaves in size and structure, and in *H. involucrata* they form an involucre almost entirely enveloping the inflorescence.

Calyx.—The calyx is persistent, foliaceous, 4-parted, and the segments united only at the extreme base and arranged in pairs; the inner pair represents an inner cycle, the second an outer cycle. The segments may be caudate as in the type species, *H. corniculata*, or spatulate, obovate, elliptic, lanceolate-linear, or linear, with intergradations, with obtuse, acute, acuminate, mucronate or apiculate tips. The tips very rarely are reflexed, as in *H. Schiedeana*. The length of the calyx varies from one-third to nearly equal that of the corolla. The calyx-segments are from 1- to 3-nerved, often reticulately veined at the tip, and both surfaces are often papillate. Squamellae are usually found on the inner surface of the calyx-segments at their base (see fig. 1). They vary in size, shape, number, and position on the lobes, and

are usually distinguishable only under the dissecting lens after the herbarium specimens have been boiled. Squamellae occur in many of the *Contorti* both on the calyx and the corolla-lobes. Engler and Prantl³⁹ have referred to similar structures in several genera of the Gentianaceae as discs.

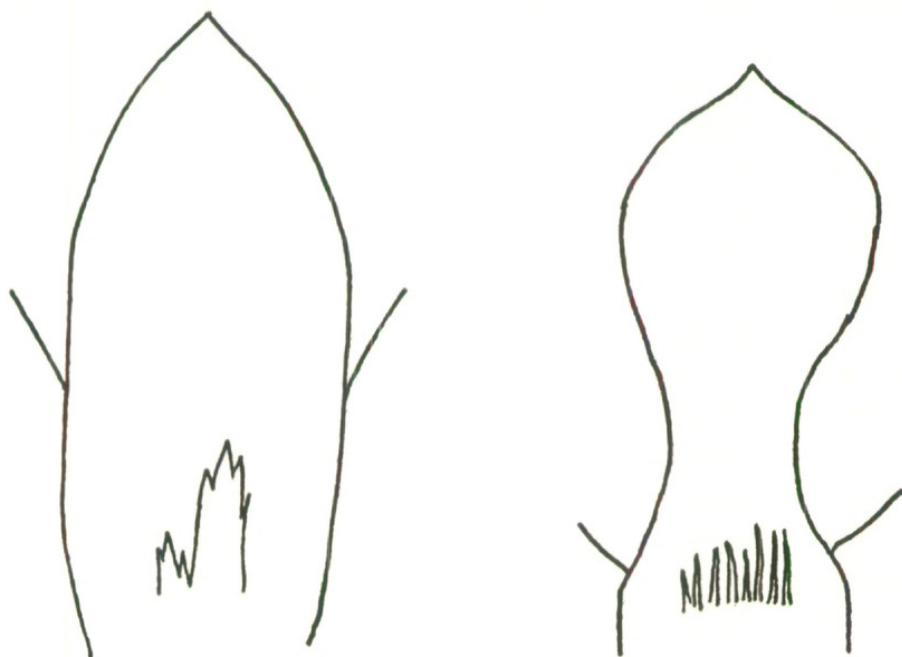


Fig. 1. Types of squamellae found on the calyx in the genus *Halenia*.

Corolla.—The corolla is marcescent, campanulate, 4-lobed, white, yellow, yellow-green, green, or purple, ranging in length from 5 mm. to nearly 3 cm. The lobes are triangularly ovate or obovate, acute, acuminate, apiculate, mucronate or obtuse, often auriculate, with an entire, erose, or crisped margin, and frequently papillate on both surfaces. The veining of the dextrorsely convolute lobes may or may not be reticulate. The corolla-tube varies from one-fourth to three-fourths the length of the entire corolla. At or near the base of the tube, opposite each lobe, is a tubercle which may be merely a slight swelling in the lower portion of the tube, as in *H. brevicornis*, or a definite

³⁹ Gilg in Engler & Prantl, *Nat. Pflanzenfam.* 4²: 89. 1895.

spur longer than the corolla, as in *H. guatemalensis* (pls. 8–11). It frequently happens that the corolla lacks spurs entirely in the axillary flowers or in those occurring late in the season, as, for example, in *H. deflexa* and other species. Not only in *Halenia* is this situation apparent, but it is recalled that in other normally spurred plants, for example, *Linaria canadensis*, spurs are frequently absent. Therefore it has seemed advisable to discontinue *heterantha* as a variety of *H. deflexa*, since the occurrence of these spurless forms is more or less frequent within the genus. Gilg noted that in certain species of *Halenia*, for example, *H. brevicornis*, etc., the flowers on the main stalk are normally large and wide open, while below, on the same stem, they are definitely smaller, apparently not opening at all or else very slightly. The structure is similar, with the exception of the absence of spurs. The ovary in these abnormal flowers contains fewer seeds, and the capsule is much reduced in size. This would indicate, according to Gilg, a gradual reduction of chasmogamous flowers which depend on insect pollination, to more or less cleistogamous flowers. The shape of the spurs varies exceedingly, from slender to very thick and broad, or from spreading and ascending to pendulous and incurved. Intergrading forms are frequent. The spurs are frequently conspicuously veined and apparently glandular.

Stamens.—The stamens are equal in number to, and are borne alternate with, the lobes of the corolla at or near the summit of the tube. The filaments are adnate to the corolla, and the anthers are often enfolded in the bud by the margins of the corolla-lobe. The anthers are versatile, deltoid, ovate or oblong, often mucronate and papillate. The filaments are usually linear, but they may become more or less dilated and, rarely, papillate. The pollen grains are constant for the genus, being more or less tetrahedrally spherical, and having three pores.

Pistil.—The pistil is sessile. The stigma is usually sessile and cleft to expose the two inner stigmatic surfaces; the lobes may be truncate or ovate. The ovary is bicarpellate, the margins of each carpel being infolded and becoming the region of attachment for the numerous ovules.

Fruit.—The fruit is a flattened, lanceolate to lanceolate-

obovate capsule, frequently subfalcate, and usually exserted. It is unilocular at maturity, though in the young state it appears to be more or less two-celled. The fruit dehisces septicidally along the inner surface of each locule tip.

Seed.—The seeds vary in shape, being globose to ovoid or elliptic, often flattened. The surface is reticulate in the majority of the South American species and in the *brevicornis* complex, except for var. *latifolia*. The remaining species show the surface of the seeds to be minutely granular instead of reticulate. They vary in size from 0.5 to 1 mm. in diameter, and in color from dull greenish-brown and yellow-brown to dark, shiny brown, the latter usually being typical of those with reticulate surface. The age of the plant and the conditions attending its collection no doubt have their influence on the color, size, and, to some extent, the texture of the seed-coat.

FLORAL ANATOMY

The major portion of the anatomical investigation of the Gentianaceae, particularly the Menyanthoideae, has been concerned with the stem and leaf structure. The most complete anatomical data is found in Gilg's treatment of the Gentianaceae in 'Die Natürlichen Pflanzenfamilien.'⁴⁰ Solereder's 'Systematic Anatomy of the Dicotyledons'⁴¹ gives very little additional information. Since that time more attention has been given to floral morphology as a separate study. Stolt,⁴² in 1921, made an exhaustive cytological survey of the flowers of several genera, among which was included *Halenia elliptica*, an Asiatic species having affinities with *Halenia deflexa* of North America. Incidentally, Stolt inserted a diagram of the transverse section through the ovary, which indicates clearly the vascular system of that portion of the flower.

In order to make the present monograph as complete as possible, anatomical study was undertaken. Fresh flowers of *Halenia deflexa*, a species with both spurred and spurless forms, were obtained by the author in Vermont and preserved in 70 per cent

⁴⁰ Gilg in Engler & Prantl, Nat. Pflanzenfam. 4²: 50. 1895.

⁴¹ Solereder, Systematic Anatomy of the Dicotyledons 1: 548-550. 1908.

⁴² Stolt in K. Svensk. Vet.-Akad. Handl. 61¹⁴: 1-56. 1921.

alcohol. The pickled material was dehydrated and embedded in paraffin following the butyl alcohol method outlined by Zirkle,⁴³ sectioned at 10 μ , and stained with crystal violet and erythrosin. The accompanying drawings (pl. 12) were made with the aid of a "Promi" microscopic drawing and projecting apparatus. The xylem has been cross-hatched in order to differentiate it from the other vascular elements.

Transverse sections of the spurred form of *Halenia deflexa* show that the vascular system of the pedicel is an amphiphloic siphonostele (pl. 12, fig. 1). Approaching the receptacle, the stele enlarges and assumes a rhombic form (fig. 2). The decurrence of the outer lobes of the calyx is apparent. Shortly thereafter (fig. 3), the midribs (a) of the two outer calyx-lobes leave the receptacular stele (r). They migrate outward, and from either, two lateral traces (a') are given off (fig. 4). At this point, four lacunae (z) appear, prior to the severing of the calyx from the receptacle. In the succeeding illustration (fig. 5) these lacunae (z) merge into two crescent-shaped fissures, and the midribs of the two inner calycine lobes (b) leave the stele.

In fig. 6 the calyx-tube is entirely free from the receptacle, and in the axil of each potential lobe are visible 4-8 minute emergences or squamellae (e). The stele has again assumed a more or less rhombic shape, but from the 4 angles, traces (c) depart centrifugally, soon resolving into the midrib (n) and two laterals (c') destined to supply each of the 4 corolla-lobes (fig. 7).

The disruption of the residual vascular cylinder is continued, and the 4 staminal traces (f) are fully differentiated. At this interval the corolla-tube is virtually free from the receptacle.

In the succeeding illustration (fig. 8) lacunae appear at m, the ovary at this point appearing bilocular. The residual stele consists of two roughly semi-circular masses with a concentration of lignified elements (l) at either end. The calyx-lobes are free, and sections near the tip of the reflexed spurs are found, the origin of which is to be described.

In the following illustration (fig. 9) the origin of the spurs is apparent, and a cleft (y) is visible, indicating the sinus. Simultaneously, 4 protrusions occur on the inner surface of the corolla,

⁴³ Zirkle in Science, N. S. 71: 103. 1930.

below the sinus, preparatory to the severing of the staminal filaments (f). The ventral traces (l) and dorsal (k) are discernible. The ovules (o) are evident, showing their position in the axils of the placentae (p).

In the final stage, taken from a section through the tip of the flower (fig. 10), the differentiation of the corolla-lobes and the isolation of the staminal filaments (f) are complete. The placentae (p) have diminished in size.

The spurless form shows a similar vascular system except for the absence of spurs, the presence of fewer ovules, and finally, a more pronounced dorsal trace (k), after the cessation of ovular production.

GEOGRAPHICAL DISTRIBUTION

The accompanying maps show three centers of distribution of the species of *Halenia* in America. The first (figs. 2, 4) extends from Labrador and Newfoundland, south to New York and west to British Columbia and Montana. The one species and its variety found in this area grow in moist or dry situations in calcareous, slaty, or alluvial soil, in open woods or fields, on stream banks or along the sea-shore, usually in the shade. The habit varies with the habitat. This distribution follows closely the northern region of glaciation, and coincides with the usual distribution areas of herbaceous species common in that territory. This same species has been collected three times in the State of Mexico, but has not been reported from the intervening region, a fact that might suggest a previously more continuous distribution of the species from the northern Rockies along the mountain ranges to the Mexican Sierras.

The second area comprises a region extending from the Chiricahua Mountains of New Mexico and Arizona, southward to Costa Rica in Central America. Here are a few wide-spread mountain species; but for the most part, they are endemics occurring in volcanic areas (fig. 3).

The third large center of distribution is the northern part of South America, where the genus is represented by a relatively large number of endemic species (fig. 5).

All of the North and Central American species, with the

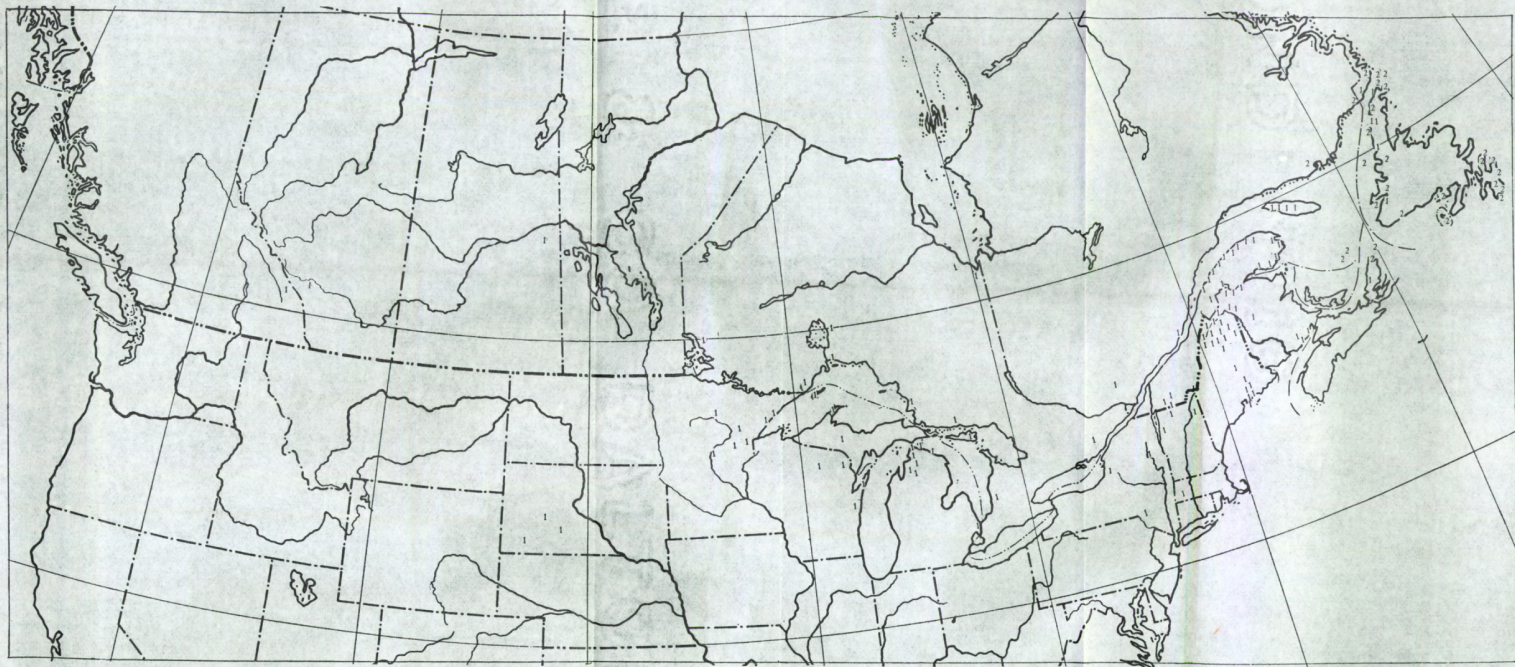


Fig. 2. Map of southern Canada and northern United States, showing the geographical distribution of the species of *Halenia*: 1 = *H. deflexa*; 2 = *H. deflexa* var. *Brentoniana*.



Fig. 3. Map of southern United States, Mexico, and Central America showing the geographical distribution of *Halenia*.

- 14. *H. brevicornis*
- 19. var. *chihuahuensis*
- 18. var. *divergens*
- 15. var. *latifolia*
- 17. var. *micranthella*

- 16. var. *multiflora*
- 20. var. *ovata*
- 21. var. *Tuerckheimii*
- 29. *H. caleoides*
- 6. *H. Conzattii*

- 4. *H. crassiuscula*
- 13. *H. decumbens*
- 25. *H. guatemalensis*
- 30. var. *latifolia*
- 12. *H. nudicaulis*

- 5. *H. Palmeri*
- 8. *H. plantaginifolia*
- 9. f. *grandifolia*
- 22. *H. platyphylla*
- 10. *H. Pringlei*

- 3. *H. recurva*
- 26. *H. rhyacophila*
- 28. var. *procumbens*
- 27. var. *macropoda*
- 11. *H. Schiedeana*

- 24. *H. Shannonii*
- 23. f. *compacta*

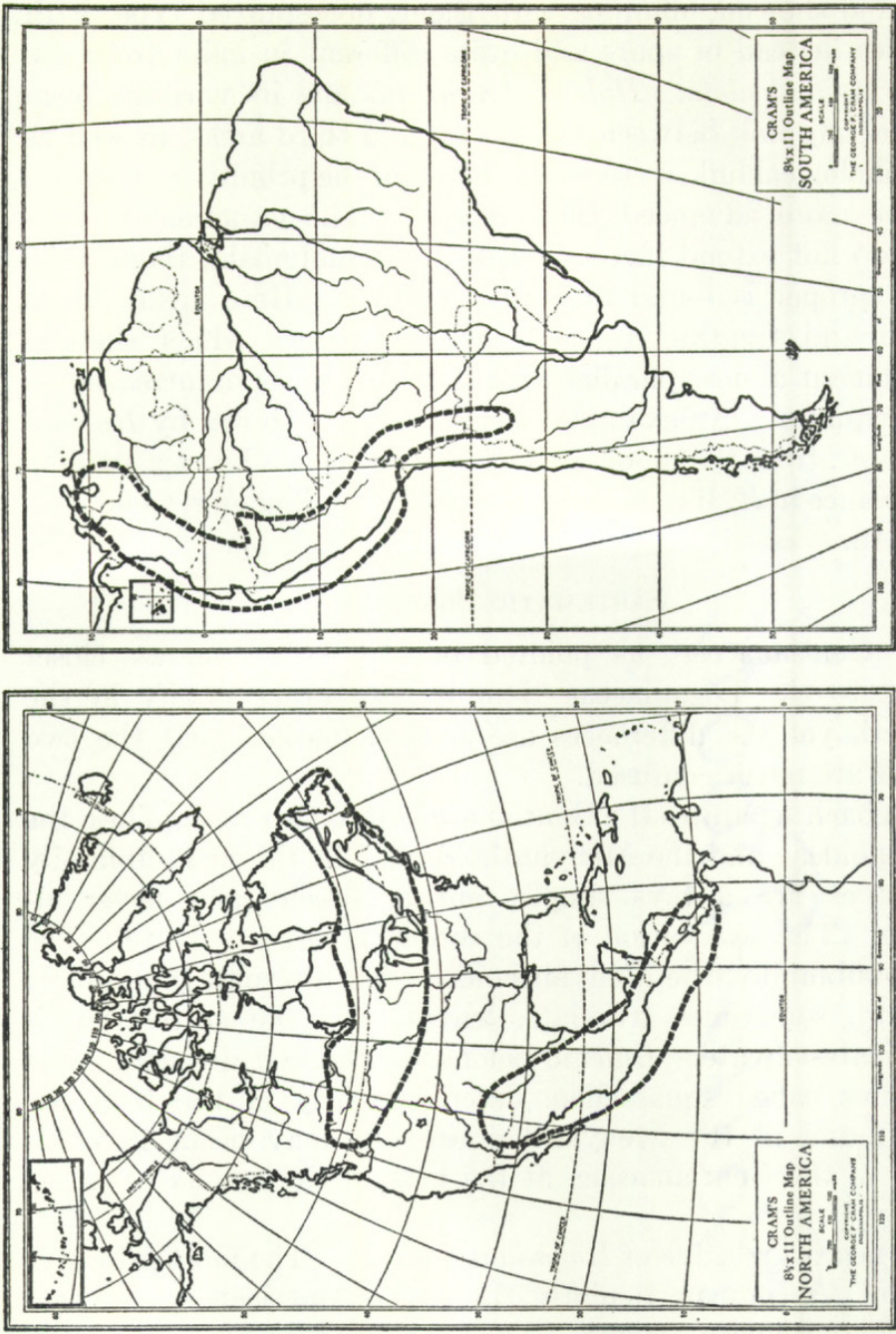


Fig. 4

Fig. 5

Maps of North and South America, showing the principal areas of distribution of *Halenia*. (Maps reproduced by permission of the George F. Cram Company).

exception of *Halenia alata* and *H. brevicornis* and its varieties, are spurred forms which show a definite relationship to one another. Those from South America are of two types: spurred type, similar to the North American species (excluding *brevicornis* and

alata) and showing affinities with them; non-spurred type, with tubercles instead of spurs and quite different in habit from the *brevicornis* and *alata*. *Halenia brevicornis* and its varieties form a connecting link between the second and third areas, as well as a morphological link, so to speak, between the primitive *Swertiella* and the more advanced *Haleniastrum*. The varieties of *brevicornis* do not extend further south than Guatemala, though the species proper is found in South America. Here again, as in Mexico and Central America, exist endemics which show a development almost parallel with that which has occurred north of the equator. An example of this is clearly shown by *Halenia decumbens*, from the mountains of Mexico, which bears a striking resemblance to *H. Weddelliana*, a species from Ecuador, Colombia, and Peru.

SYSTEMATIC POSITION

The Gentianaceae, as pointed out by Gilg,⁴⁴ shows closer affinity to the Loganiaceae than to any other family in the Contorti, yet the differences are so well marked that the two families are never confused.

Grisebach separates the Gentianaceae into two subfamilies, the Gentianoideae and the Menyanthoideae. In the first subfamily the leaves are always simple, entire, sessile, and never alternate. The aestivation of the corolla is never valvate. The second subfamily, the Menyanthoideae, has alternate and mostly petiolate, sometimes trifoliate, leaves, and the aestivation is induplicate-valvate. *Halenia* belongs to the first division. The structures called squamellae, described early in the text, are never found in the Menyanthoideae but may occur in other genera of the Gentianaceae, at the base of the corolla or calyxlobes.

The nearest relative of *Halenia* is *Swertia*. The most primitive forms of *Halenia*, particularly the South American species, are often confused with *Swertia*. The primitive members of *Halenia*, instead of the definitely spurred corolla typical of the majority of the species of the genus, possess small, knob-like protuberances or nectaries which upon casual examination might pass unnoticed

⁴⁴ Gilg in Engler & Prantl, Nat. Pflanzenfam. 4²: 50. 1895.

or be taken for the nectaries which are structurally distinct and characteristic of *Swertia*. More detailed study reveals the fact that the depressions or spurs of *Halenia* are without the marginal fringe which is always conspicuous in *Swertia* (fig. 6). *Halenia* never has a corona, but in *Swertia* it is frequently present. The corolla-lobes of *Halenia* are dextrorsely convolute in the bud, whereas the reverse is the case in *Swertia*. Anatomical study discloses other generic differences.

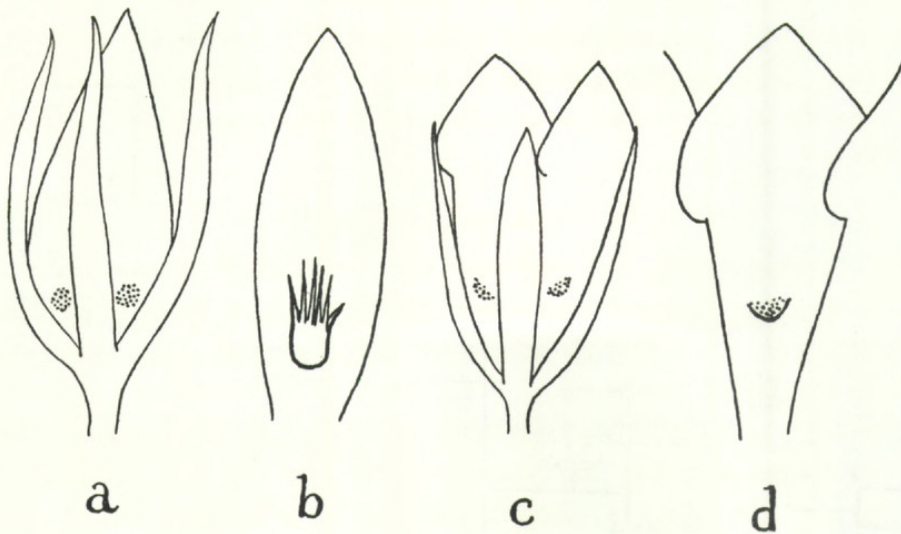


Fig. 6. *Swertia perennis* L.: a, bud; b, interior surface of petal. *Halenia brevicornis* (HBK.) Don: c, bud; d, interior surface of petal.

Within the genus itself two rather distinct sections are apparent. The more primitive, which was mentioned above as being near *Swertia* and possibly originating from it, may be called tentatively *Swertiella*. It contains those species from South America which were considered by Gilg as being most primitive. *Halenia alata* of Mexico also belongs to this section. The *Swertiellae* may be characterized by the absence of spurs or the presence of small tubercles or prominences at the base of the corolla, which are not visible usually from the outside. They are coarse, fleshy, foliose plants, and for the most part with dense inflorescences. The second section, *Haleniastrum*, is more advanced and is readily recognized by the presence of spurs of varying

length and shape. Both herbaceous and more or less woody types comprise this section.

An interesting discussion of the phylogeny of the Gentianaceae was presented by T. H. Huxley⁴⁵ before the Linnaean Society of London, April 7, 1887. Confining his study to the structure of the corolla, he separated the family into two groups; the first division *Permelitae* was segregated mainly on the presence of a series of nectarial cells on the inner surface of the cup. The *Permelitae* were again divided into four groups with various

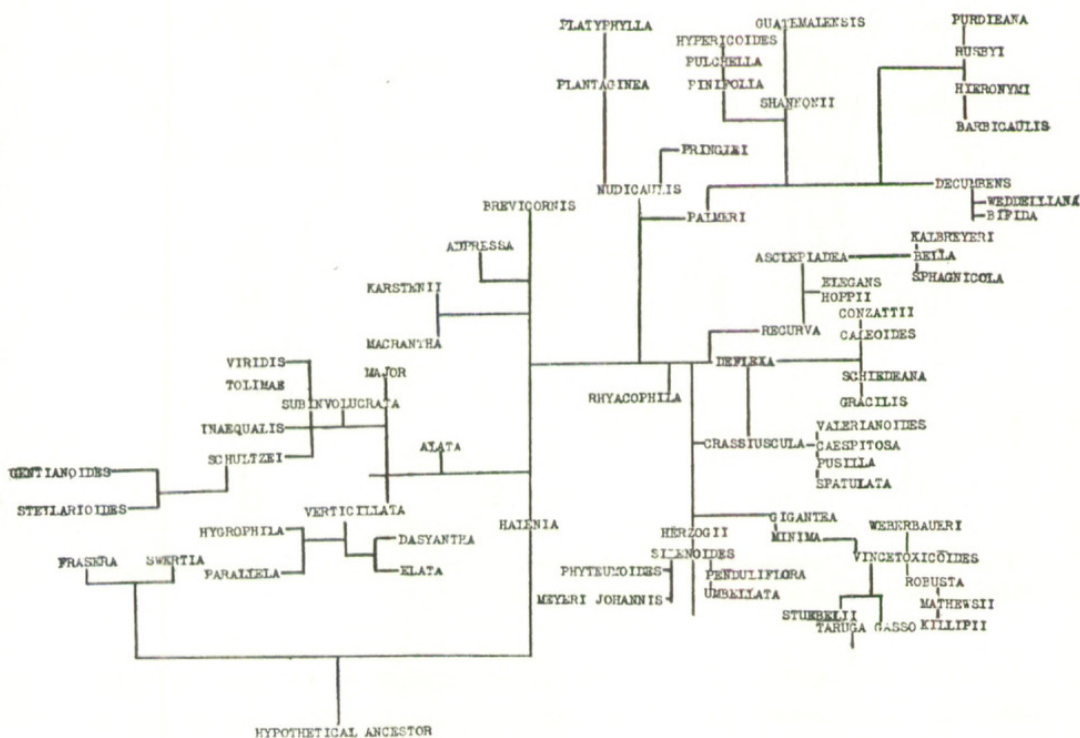


Fig. 7. Chart showing the probable phylogenetic relationship of species of *Halenia*.

modifications of floral structure. The first, *Actinanthæ*, which he considered the most primitive and the least differentiated, contained among other elements, *Exadenus*. The latter was included as a transitional stage on account of its rudimentary spurs, leading to the second division, the *Keratanthe*, containing only one genus *Halenia*, which represents an extreme modification of the *Exadenus* type. The third related division, the *Lophanthæ*,

⁴⁵ Huxley, T. H. Jour. Linn. Soc. Bot. 24: 101. 1887.

depicts another outgrowth of the *Actinanthæ* type, but with filamentous appendages or fimbriae. *Swertia* and *Frasera* fall into this category.

Text-figure 7 shows the probable relationship of the various species of *Halenia*, according to the author's interpretation.

For the sake of convenience, in the taxonomic treatment of the genus, the North and South American species are taken up separately in each section.

ABBREVIATIONS

In the citations of specimens examined the following abbreviations have been used to denote the various herbaria from which specimens were used for study.

- ANSP = Herbarium of the Academy of Natural Sciences of Philadelphia.
BG = Botanical Garden, Berlin.
BB = Brooklyn Botanical Garden.
BM = British Museum of Natural History, London.
B = Herbarium of the Botanical Garden, Brussels.
C = Herbarium of the University of Chicago, deposited in the Field Museum of Natural History.
CAS = Herbarium of the California Academy of Sciences.
D = Dudley Herbarium of Leland Stanford Jr. University.
DH = Delessert Herbarium of Geneva.
F = Herbarium of the Field Museum of Natural History.
G = Gray Herbarium of Harvard University.
HP = Herbarium of H. Pittier, Director de Museo Comercial, Caracas, Venezuela.
HJP = Herbarium of the Jardin des Plantes, Paris.
IAC = Herbarium of the Iowa Agricultural College.
K = Herbarium of the Royal Botanic Gardens, Kew.
L = Linnaean Herbarium, Linnaean Society of Botany, London.
M = Herbarium of the Missouri Botanical Garden.
MU = Herbarium of the University of Missouri.
NY = Herbarium of the New York Botanical Garden.
P = Parry Herbarium deposited at the Iowa Agricultural College.
S = Herbarium of the Botanical Museum, Stockholm.
SM = Herbarium of the State Museum, Albany, New York.
UC = Herbarium of the Botanical Museum of the University of Copenhagen.
US = United States National Herbarium.
V = Herbarium of the Natural History Museum, Vienna.

TAXONOMY

Halenia Börckh. in Roemer, *Arkiv für Botanik* 1¹: 25. 1796; Ruiz & Pavon, *Fl. Peruv.* 3: 21, *pl.* 242, *fig.* 1. 1802; Endl. *Gen. Pl.* 601. 1836–40; Grisebach, *Obs. Gent.* 36. 1836; G. Don, *Gen.*

Hist. 4: 177. 1838; Grisebach, Gen. & Sp. Gent. 322. 1839; Dietrich, Syn. Pl. 2: 918. 1840; Hooker, Fl. Bor.-Am. 2: 67, pl. 155-6. 1840; Grisebach in DC. Prodr. 9: 128. 1845; Grisebach in Linnaea 22: 45. 1849; Weddell, Chlor. And. 2: 74. 1859; Benth. & Hooker, Gen. Pl. 2: 817. 1876; Hemsl. Biol. Cent.-Am. Bot. 2: 351. 1882; Baillon, Hist. Pl. 10: 142. 1891; Gilg in Engler & Prantl, Nat. Pflanzenfam. 4²: 89. 1895; Conzatti, Fl. Syn. Mexico, 174. 1897; Rouy, Ill. Pl. Eur. 17: pl. 412. 1902; Gilg in Fedde, Rep. Spec. Nov. 2: 52. 1906; Robinson in Gray's Manual, ed. 7. 659. 1908; Britton & Brown, Ill. Fl. 3: 15, fig. 3365. 1913; Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 93. 1916; Johnson, Tax. Fl. Pl. 488. fig. 340. 1931; Briquet in Candollea 4: 317. 1931; Rydberg, Fl. Cent. N. Am. 636. 1932.

Tetragonanthus Gmelin, Fl. Sib. 4: 114, pl. 53. 1769; Kuntze, Rev. Gen. Pl. 2: 431. 1891; Britton, Manual, 734. 1901; Small, Fl. Southeastern U. S. 931. 1913; Rydberg, Fl. Rocky Mts. 666. 1922.

Swertia Linnaeus, Amoen. Acad. 2: 344. 1751; Jussieu, Gen. Pl. 158. 1791; Michaux, Fl. Bor.-Am. 1: 97. 1803; Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. Pl. 3: 174. 1818; Kunth, Syn. Pl. 2: 266. 1823; Schlechtendal & Chamisso in Linnaea 5: 122. 1830.

Ceratia Persoon, Syn. Pl. 1: 287. 1805; Hedw. Gen. 181. 1806.

Exadenus Grisebach, Obs. Gent. 36. 1836; Gen. & Sp. Gent. 322. 1839; in DC. Prodr. 9: 128. 1845.

Glabrous caulescent annual, biennial, or perennial herbs. Root fibrous, varying from typically herbaceous to extremely ligneous. Leaves membranaceous or fleshy, opposite, entire, sessile or petiolate, usually 3-5-veined, veins frequently submerged in fleshy type. Inflorescence a terminal or axillary, subumbellate, or rarely racemose or spicate cyme. Calyx 4-parted, foliaceous, linear, lanceolate, ovate or spatulate, usually papillate, often bearing small squamellae at the base of each lobe. Corolla 4-parted, white, yellow, green, or purple, marcescent, campanulate, the tube of varying length; the lobes dextrorsely convolute, elliptic to ovate, obtuse to acute or apiculate, entire, crisped or erose, frequently auriculate and papillate. Stamens

4, included, adnate to the corolla-tube at varying heights, and alternate with the corolla-lobes; filaments linear, occasionally somewhat dilated; anthers 2-celled, ovate, oblong or subtriangular, versatile. Carpels 2, sessile, the edges being infolded to form a parietal placenta bearing many ovules; stigma sessile, composed of two oblong or ovate lobes, the inner surfaces of which are stigmatic. Fruit a compressed capsule, lanceolate to ovate, often subfalcate, septicidially dehiscent from the tip. Seeds globose or slightly flattened, brown or greenish tan, granular or reticulate.

Type species: *H. corniculata* (L.) Druce in Rept. Bot. Exch. Cl. Brit. Isles 3: 419. 1914.

SYNOPSIS OF THE SECTIONS OF THE GENUS

- Plants usually coarse with fleshy leaves, rarely slender with thin, herbaceous leaves; stem usually leafy; spurs absent, or present as very small inconspicuous protuberances, frequently obscured by calyx; distribution chiefly South America.....1. *Swertiella*
 Plants usually slender, with thin, herbaceous leaves; stem leafy or scapose; spurs present; distribution North and South America.....2. *Haleniastrum*

SECTION 1. SWERTIELLA

KEY TO NORTH AMERICAN SPECIES AND VARIETIES

1. Leaves mostly radical; stem more or less scapose.....1. *H. alata*
1. Leaves mostly cauline; stem not scapose.
 2. Leaves ovate, less than 1.2 cm. long.....2f. *H. brevicornis* var. *ovata*
 2. Leaves not ovate, longer than 1.2 cm.
 3. Pedicels filiform, slender, elongate; habit decidedly spreading.....
 -2g. *H. brevicornis* var. *Tuerckheimii*
 3. Pedicels stouter than filiform, shorter.
 4. Corolla without distinct spurs.
 5. Inflorescence strict.....2c. *H. brevicornis* var. *micranthella*
 5. Inflorescence compact.
 6. Leaves linear, slender.....2. *H. brevicornis*
 6. Leaves ovate to lanceolate, coarse....2a. *H. brevicornis* var. *latifolia*
 4. Corolla with small, but distinct spurs.
 5. Spurs thick, conical, more or less pendulous.....
 -2b. *H. brevicornis* var. *multiflora*
 5. Spurs blunt, spreading, squarrose....2e. *H. brevicornis* var. *chihuahuensis*
 5. Spurs slender, divergent.....2d. *H. brevicornis* var. *divergens*

1. *H. alata* (Mart. & Gal.) Hemsl. Biol. Cent.-Am. Bot. 2: 351. 1882.

Exadenus alatus Mart. & Gal. Bull. Acad. Brux. 11¹: 372. 1844; Walper's Rep. Bot. Syst. 6: 508. 1846-7.

Tetragonanthus alatus Kuntze, Rev. Gen. Pl. 2: 431. 1891.

Small perennial with 1-2 simple erect slightly winged stems, about 0.5-1 dm. high; numerous radical leaves, up to 3.5 cm. long and .4 cm. broad, crowded, attenuate into long petioles, oblanceolate, obtuse, 3-nerved; lower cauline leaves almost twice the length of the radical, subsessile; upper linear, obtuse, sessile; inflorescence consisting of a few (4-6) terminal flowers on 4-winged pedicels; calyx foliaceous, slightly shorter than corolla, segments oblong, 3-nerved, papillate, acute; corolla yellow, subrotate, up to .6 cm. long, tube about one-half as long as the entire corolla; corolla-lobes ovate, obtuse; filaments linear; anthers ovate; capsule broadly ovate; seeds yellow-brown, globose, granular.

Distribution: rocky forests of southern Mexico.

Specimens examined:

VERA CRUZ: in forests and on trachytic rocks on Mt. Orizaba, alt. 2250-3000 m., June-Oct. 1840, *Galeotti 7221* (BG, B TYPE, DH, K, V); Mt. Orizaba, alt. 3000-3125 m., Aug. 1838, *Linden 934* (DH, K).

2. *H. brevicornis* (HBK.) G. Don, Gen. Hist. 4: 177. 1838; Wedd. Chlor. And. 2: 77. 1859; Hemsl. Biol. Cent.-Am. Bot. 2: 352. 1882; Gilg in Engler & Prantl, Nat. Pflanzenfam. 4²: 89. 1895.

Swertia brevicornis HBK. Nov. Gen. & Sp. Pl. 3: 174. 1818.

S. parviflora HBK. Nov. Gen. & Sp. Pl. 3: 174. 1818.

S. parviflora var. α *angustifolia* Sch. & Cham. in Linnaea 5: 122. 1830.

S. cucullata Sessé & Mociño, Fl. Mex. 79. 1894.

Halenia parviflora G. Don, Gen. Hist. 4: 177. 1838; Wedd. Chlor. And. 2: 77. 1859; Hemsl. Biol. Cent.-Am. Bot. 2: 352. 1882.

H. paucifolia Hemsl. Biol. Cent.-Am. Bot. 2: 352. 1882.

H. erythraeoides Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 105. 1916.

Exadenus parviflorus Griseb. Gen. & Sp. Gent. 322. 1839.

E. brevicornis Griseb. l. c. 323.

E. paucifolius Mart. & Gal. Bull. Acad. Brux. 11¹: 372. 1844.

Tetragonanthus paucifolius Kuntze, Rev. Gen. Pl. 2: 431. 1891.

T. parviflorus Kuntze, l. c.

T. brevicornis Kuntze, l. c.

Annual, 1.5–4.5 dm. high; root slender; stems erect, slender, usually simple below and branched above, sometimes branched from the base, slightly angled, and striate; leaves sessile, subconnate, lower linear to lanceolate, up to 3 cm. long, .4 cm. broad, usually prominently uninerviate, upper shorter, narrower, up to 2 cm. long, linear; inflorescence compact cymose clusters, pedicels erect, 1.8 cm. or less in length; calyx-segments lanceolate, approximately one-half to two-thirds the length of the corolla, usually 3-nerved; corolla .4–.8 cm. long, tube one-half or slightly more the length of the entire corolla; corolla-lobes broadly to narrowly ovate, acute, more or less auriculate; spurs merely small depressions near the base of the corolla-tube, usually not visible to the naked eye; stamens about .2 cm. long, attached usually near the middle of the tube; filaments linear, anthers usually deltoid; ovary lanceolate, about .5 cm. long; seeds minute, ovoid to subglobose, brownish, finely reticulate.

Distribution: chiefly in mountains, from Mexico, southward to Peru.

Specimens examined:

MEXICO:

SAN LUIS POTOSI: Oct. 1879, *Schaffner 421* (BG, BM, F, NY, UC, US); region of San Luis Potosi, alt. 1500–2000 m., 1878, *Parry & Palmer 600* (ANSP, BM, F, G, IAC, K, M, NY, US).

VERA CRUZ: Mt. Orizaba, alt. 1875 m., 1841–43, *Liebmann 10775* (UC); same locality and date, alt. 2500 m., *Liebmann 10778* (UC); same locality, 1840, *Galeotti 7219* (B TYPE of *Exadenus paucifolius*, DH); “in dumetis prope Jalapam,” 1830, *Schiede & Deppe 247a* (BG TYPE of *Swertia parviflora* var. α *angustifolia*, BM, M).

GUANAJUATO: near city Guanajuato, alt. 1650 m., *Humboldt & Bonpland* (BG TYPE not seen, HJP, M photo.).

PUEBLA: vicinity of Puebla, ravines, Hacienda Alamos, route Vera Cruz, alt. 2170 m., Nov. 5, 1907, *Arsène 2098* (G, M, US); mountains, Esperanza, Aug. 1907, *Purpus 2697* (BG, BM, CAS, F, M, US); Chinantha, alt. 1750–2000 m., May 1841, *Liebmann 10776* (NY, UC).

MEXICO: La Cima, alt. 2500 m., “Jajalpa,” alt. 1500 m., Aug. 1904, *Kuntze 23783* (NY); Volcan de Toluca, *Heller 401* (V).

CHIAPAS: 1864–70, *Ghiesbreght 137* (G, K, NY); *Ghiesbreght 618* (G, K, M).

MEXICO WITHOUT LOCALITY: *Tate* (DH); Oct. 8, 1897, *Berlandier 1207 ex 13* (DH); *Berlandier 1207* (V); *Pavon* (DH); *Wawra 425* (V).

CENTRAL AMERICA:

COSTA RICA: “in monte Reventado,” alt. 2250 m., coll. of 1847, *Oersted 10779* (UC).

NICARAGUA: El Viejo, *Oersted* (M).

2a. *H. brevicornis* var. *latifolia* (Sch. & Cham.) Allen, n. comb.

Swertia parviflora var. β *latifolia* Sch. & Cham. in *Linnaea* 5: 122. 1830.

Exadenus parviflorus var. β *latifolius* Griseb. Gen. & Sp. Gent. 322. 1839; in DC. Prodr. 9: 128. 1845.

Halenia parviflora var. *latifolia* Hemsl. Biol. Cent.-Am. Bot. 2: 351. 1882.

A more sturdy plant than the species, attaining a height of 6 dm.; leaves larger than species, 1.5–4 cm. long, .3–1.5 cm. broad, acute or obtuse, lowermost smaller, ovate, rotund, and with longer petioles; inflorescence frequently less compact than that of species and with longer pedicels; calyx-segments lanceolate, foliaceous, one-half to two-thirds the length of the corolla, papillate, 3-nerved; corolla .6–.8 cm. long, tube about equalling the ovate, frequently papillate, auriculate lobes; spurs short, consisting of very slight angular protrusions from the extreme base of the corolla-tube, giving the corolla a square appearance.

Distribution: mountains of Mexico.

Specimens examined:

VERA CRUZ: "in dumetis prope Jalapam," 1830, *Schiede & Deppe 247b* (BG TYPE of *Swertia parviflora* var. β *latifolia* Sch. & Cham., BM, M, S, V); same locality, coll. of 1833, *Beyrich* (S); region of Orizaba, Oct. 20, 1866, *Bourgeau 3126* (BG, B, K, S, UC, US).

PUEBLA: Manzanilla, alt. 2250 m., Nov. 24, 1908, *Arsène 1703* (B, US); Barrancas, Hacienda Alamos, route Vera Cruz, alt. 2170 m., Dec. 10, 1907, *Arsène* (M, US); Boca del Monte, alt. 2300 m., Nov. 16–19, 1907, *Arsène* (US).

MORELOS: Lecima, Sierra de Ajusco, Aug. 18, 1896, *Harshberger 137* (ANSP, G, US).

TLAXCALA: Chiautempan, alt. 2250 m., Nov. 10, 1908, *Arsène 1711* (B, US).

MEXICO: Ajusco Mountains, 1905, *Lemmon & Lemmon* (CAS); Valley of Mexico, *Lemmon* (CAS); Ixtaccihuatl, Jan. 1903, *Purpus* (CAS); Salto de Agua, Nov. 1905, *Purpus 1762* (CAS, F, G, M, US); Sierra de las Cruces, alt. 2375 m., Sept. 12, 1904, *Pringle 13120* (BG, F, G, K, S, UC, US); Eslava, *Salazar* (US); near Salazar, Sept. 14, 1903, *Rose & Painter 7026* (US); Désierto Viejo, near Mexico, Sept. 6, 1865, *Bourgeau 799* (BG, B, DH, G, K, NY, S, UC, US).

MICHOACAN: vicinity of Morelia, alt. 2500 m., Oct. 26, 1911, *Arsène 5610* (M, US).

MEXICO WITHOUT LOCALITY: *Berlandier 1207* (DH); 1832, *Alaman* (DH).

2b. *H. brevicornis* var. *multiflora* (Benth.) Allen, n. comb.

Halenia multiflora Benth. Pl. Hartw. 24. 1839.

Plant more sturdy than the species, frequently branched above, rarely branched at the base, 4.5 dm. or less high; leaves up to 1.3–2.5 cm. long, .2–.9 cm. broad, obtuse or acute, ovate to

narrowly lanceolate, frequently faintly 3-nerved, midvein always prominent; inflorescence usually densely flowered, though compactness of arrangement varies; mature corolla with small thick rounded pendant spurs at its base.

Distribution: in mountains of Mexico.

Specimens examined:

SAN LUIS POTOSI: in mountains of San Miquelito, Aug. 1877, *Schaffner 38* (G); Alvarez, Sept. 28–Oct. 3, 1902, *Palmer 160* (CAS, F, G, M, NY, UC, US); *Parry & Palmer 600b* (IAC, M).

ZACATECAS: on the Sierra de los Morones, near Plateado, Sept. 1, 1897, *Rose 2732* (US).

JALISCO: "in pinetis Bolaños," 1839, *Hartweg 210* (BM, DH, G, K, NY, V); Sierra Madre, west of Bolaños, Sept. 15–17, 1897, *Rose 2962* (US); banks of ravines near Guadalajara, alt. 1250 m., Oct. 21, 1903, *Pringle 11636* (BG, F, G, K, US); hills near Guadalajara, Oct. 14, 1889, *Pringle 2735* (C, IAC); Rio Blanco, Oct. 1886, *Palmer 680* (G, NY, US); same locality and date, *Palmer 683* (G).

GUERRERO: between Ajusinapa and Petatlan, alt. 1250–1750 m., Dec. 14, 1894, *Nelson 2126* (US).

OAXACA: Sierra de San Felipe, alt. 2000 m., Oct. 13, 1894, *Smith 665a* (M, NY, US); same locality, alt. 1800 m., Aug. 15, 1898, *Conzatti & Gonzalez 878* (G); San Pedro Nolasco, alt. 1875 m., Oct. 1840, *Galeotti 1490* (B, DH).

2c. *H. brevicornis* var. *micranthella* (Briq.) Allen, n. comb.

Halenia micranthella Briq. in *Candollea* 4: 320. 1931.

Plant 1.5–6 dm. high; leaves linear-lanceolate, often obtuse, 3-nerved, the lower long-petiolate, the upper linear, sessile; inflorescence usually less compact, but more strict, than in the species, and the stem and pedicels more erect; the nodes of the inflorescence approximately equidistant, giving the appearance of a narrow raceme; corolla campanulate, but more narrowed at the base than in the species; calyx-segments usually one-half the length of the corolla; corolla-lobes broadly ovate, acuminate, auriculate; spurs reduced to minute depressions, frequently not visible to the naked eye; anthers usually broadly ovate; filaments varying, usually linear, rarely dilated.

Distribution: mountains of Mexico.

Specimens examined:

HIDALGO: El Chico, near Pachuca, Sept. 1905, *Purpus 1761* (CAS, F, G, M, NY, US); wet meadows, Sierra de Pachuca, alt. 2450 m., Aug. 13, 1898, *Pringle 6964* (ANSP, BG, B, CAS, DH, F, G, IAC, K, M, NY, S, US, V); same locality, Sept. 8, 1899, *Pringle 7943* (BG, F, G, K, M, NY).

MEXICO: Sierra de Ajusco, Nov. 9, 1903, *Pringle 11842* (BG, F, G, K, S, UC, US); near Ozumba, alt. 2000 m., Nov. 3, 1902, *Pringle 11329* (G, UC, US).

SOUTH MEXICO WITHOUT LOCALITY: July 1841, *Liebmman 10777* (UC).

Briquet based his new species on *Pringle 6964*. This is cited in the original publication as 1964, but this is merely a typographical error. The Pringle specimens are about 12 cm. high. The additional material cited above undoubtedly belongs to the same species based on *Pringle 6964*, but for the most part it consists of plants over 15 cm. in height.

It is possible that there are two distinct plants under *Purpus 1761*, but since the variation in the *brevicornis* complex, as a whole, is so pronounced, these differences have been considered as variations typical of the variety. Hence, all sheets of *Purpus 1761* have been determined as var. *micranthella*.

2d. *H. brevicornis* var. *divergens*⁴⁶ Allen, n. var.

Similar to var. *multiflora* but with more slender spurs which diverge, making the corolla broader at the base than at the tip.

Distribution: central Mexico.

Specimens examined:

MICHOACAN: Loma Sta. Maria, vicinity of Morelia, alt. 2000 m., Sept. 4, 1910, *Arsène 55* (F); vicinity of Morelia, near La Huerta, alt. 1950 m., Sept. 1, 1910, *Arsène* (M TYPE, US); Loma Sta. Maria, alt. 2050 m., Sept. 19, 1910, *Arsène* (M, US); same locality, alt. 1950 m., Sept. 4, 1910, *Arsène 5957* (K, M, S, US); same locality, Oct. 28, 1910, *Arsène 5864* (K, M, US).

VERA CRUZ: Orizaba, 1853, *Müller* (NY).

MEXICO WITHOUT LOCALITY: 1858, *Sumichrast* (DH).

2e. *H. brevicornis* var. *chihuahuensis*⁴⁷ Allen, n. var.

Similar to var. *multiflora* but with lower leaves always elliptic-ovate, about 1 cm. long, increasing in length and acuteness and decreasing in width as they approach the summit of the stem; inflorescence more loosely arranged, and spurs more blunt but not quite so pronounced as in *multiflora*; calyx-segments three-fourths the length of the corolla, and usually narrower.

⁴⁶ *H. brevicornis* var. *divergens* Allen, var. nov.—Differt a var. *multiflora* calcaribus tenuioribus divergentibus latioribus basi quam summo.—MICHOACAN: vicinity of Morelia, near La Huerta, alt. 1950 m., Sept. 1, 1910, *Arsène* (M TYPE, US).

⁴⁷ *H. brevicornis* var. *chihuahuensis* Allen, var. nov.—Differt a var. *multiflora* foliis inferioribus semper elliptico-ovatis ca. 1 cm. longis, prope summum caulis longitudine augmentibus et latitudine deminuentibus; inflorescentia laxiora; calcaribus obtusis; calycis segmentibus $\frac{3}{4}$ corollae longitudini adaequantibus, plerumque angustioribus.—CHIHUAHUA: pine plains, base of the Sierra Madre, Sept. 26, 1888, *Pringle 1664* (BG, BM, B, CAS, DH, M TYPE, S, V).

Distribution: mountains of Chihuahua, Mexico.

Specimens examined:

CHIHUAHUA: pine plains, base of the Sierra Madre, Oct. 4, 1887, *Pringle 1830* (ANSP, CAS, F, G, K, NY, US); same locality, Sept. 26, 1888, *Pringle 1664* (BG, BM, B, CAS, DH, M TYPE, S, V); mesa, west of Hop Valley, Sierra Madre Mountains, alt. 1750 m., Sept. 17, 1903, *Jones* (BM, M, US); southwestern Chihuahua, Aug.-Nov., 1885, *Palmer 403* (ANSP, G, IAC, K, NY, US).

2f. *H. brevicornis* var. *ovata*⁴⁸ Allen, n. var.

Plant 5-6 dm. high; stems erect, simple below, bearing short floriferous branches only at tip; leaves about 12 pairs, shortly petiolate, frequently bearing buds in the axis; lower leaves broadly ovate, usually with a prominent midvein, reticulate, less than .5 cm. long, .3-.4 cm. broad, abruptly acuminate; middle cauline leaves ovate, 1-1.2 cm. long, .7-.8 cm. broad, acuminate; upper leaves up to 1.5 cm. long, lanceolate; inflorescence and flowers similar to *multiflora* type, but spurs more slender, slightly incurved, and divaricate.

Distribution: known only from type locality.

Specimens examined:

MEXICO: Tepic, Jan. 5-Feb. 6, 1892 *Palmer* (US TYPE).

2g. *H. brevicornis* var. *Tuerckheimii* (Briq.) Allen, n. comb.

Halenia Tuerckheimii Briq. in *Candollea* 4: 317. 1931 (dedicated to H. von Tuerckheim).

Slender graceful stem, loosely branching, up to 6 dm. high; leaves lanceolate to linear-lanceolate or elliptic, about 1 cm. long, .5 cm. broad, lower cauline leaves becoming more acute, faintly 3-nerved, midvein prominent; middle cauline leaves 3 cm. or less long, .5 cm. broad; inflorescence in loose, terminal or axillary, few-flowered cymes, each flower borne on a long slender attenuate pedicel; first flowers with very small, though definitely formed, spurs, at the base of the corolla-tube; later and usually axillary flowers of more slender habit and without spurs.

⁴⁸ *H. brevicornis* var. *ovata* Allen, var. nov.—Planta 5-6 dm. alta; caulibus erectis, infra simplicibus modo summo ramos breves floriferos gerentibus; foliis ca. 12 geminis, breve petiolatis, saepe in axibus gemmas gerentibus; foliis inferioribus late ovatis, medio-nervo plerumque prominenti, reticulatis, minusquam .5 cm. longis, .3-.4 cm. latis, abrupte acuminatis, foliis mediis caulinis 1-1.2 cm. longis, .7-.8 cm. latis, ovatis, acuminatis; foliis superioribus usque ad 1.5 cm. longis, lanceolatis; inflorescentia et floribus *multiflorae* similibus sed calcaribus tenuioribus, parvulum incurvatis divaricatisque.—MEXICO: Tepic, Jan. 5-Feb. 6, 1892, *Palmer* (US TYPE).

Distribution: known only from type locality.

Specimens examined:

GUATEMALA: "Alta Verapaz, Fichtenwälder bei San Joaquin," alt. 1000 m., Dec. 1907, von Tuerckheim 2041 (F, DH, G, NY, US, V).

From an examination of the types of *Halenia brevicornis*, *H. parviflora*, *H. multiflora*, and *Exadenus paucifolius*, etc., it appears that this group presents a complex, all members of which show variation in habit and spurs, which can not be considered specific differences but differences of degree. Careful perusal of the specimens available discloses the fact that nearly every locality produces some variation in the species. Thus, Chihuahua gives rise to a definitely spurred form, while Guatemalan material presents an entirely different aspect habitally. Ecological experiments, as well as field work, would doubtless prove highly valuable as a supplement to the taxonomic treatment of this complex. At present there is no distinction which warrants the retention of these as distinct entities. To draw a line between these forms mentioned and treat them specifically would complicate further an already confused situation. Therefore it has seemed advisable to draw attention to these differences, or variations from the specific form, by relegating them to the status of variety of form, with the note that this is merely an arbitrary disposal, that intergradation is existent and that environment is in a large measure responsible for the variation found within the species.

KEY TO THE SOUTH AMERICAN SPECIES

1. Leaves always thin, herbaceous; stem and branches more or less slender.
 2. Plant slender; flowers in anthesis less than 1 cm. long.
 3. Stem usually branched above, sparingly leafy; basal rosette absent. 2. *H. brevicornis*
 3. Stem not branched above, leafy; leaves adpressed; basal rosette present. 3. *H. adpressa*
 2. Plant coarse; flowers in anthesis usually more than 1 cm. long.
 3. Nodes 8 or less; leaves not apiculate. 4. *H. macrantha*
 3. Nodes 12 and more; leaves apiculate. 5. *H. Karstenii*
1. Leaves more or less fleshy; stem and branches coarse.
 2. Upper leaves of inflorescence subinvolute and bearing flowers. 6. *H. subinvolute*
 2. Upper leaves of inflorescence not subinvolute.
 3. Rosette usually present; stem-leaves linear-lanceolate.
 4. Plant usually less than 30 cm. high; leaves not more than 5 cm. long.
 5. Calyx-lobes minutely hirtellous.

- 6. Plant usually less than 20 cm. high, or if more than 20 cm. high, flowers in axils of all cauline leaves. 7. *H. inaequalis*
- 6. Plant 10–30 cm. high; flowers in axils of upper leaves only. 8. *H. viridis*
- 5. Calyx-lobes not hirtellous.
 - 6. Stem-leaves less than 3 pairs, linear. 9. *H. Schultzei*
 - 6. Stem-leaves more than 3 pairs, lanceolate to linear-lanceolate.
 - 7. Cauline leaves less than 2 cm. long. 10. *H. gentianoides*
 - 7. Cauline leaves more than 2 cm. long. 11. *H. stellarioides*
- 4. Plant usually more than 30 cm. high; leaves more than 5 cm. long.
 - 5. Inflorescence verticillate; leaves ternate. 12. *H. verticillata*
 - 5. Inflorescence not verticillate; leaves not ternate.
 - 6. Nodes more than 12. 13. *H. foliosa*
 - 6. Nodes less than 12.
 - 7. Root-stalk swollen, conspicuously larger than stem.
 - 8. Flowers more than 1.5 cm. long, 8–10 mm. broad. 14. *H. dasyantha*
 - 8. Flowers less than 1.3 cm. long, 5–7 mm. broad. 15. *H. elata*
 - 7. Root-stalk not swollen, scarcely larger than stem.
 - 8. Plant less than 30 cm. high. 16. *H. Tolimae*
 - 8. Plant more than 30 cm. high.
 - 9. Inflorescence elongate, spicate; calyx-venation conspicuous. 17. *H. hygrophila*
 - 9. Inflorescence spreading; calyx-venation prominently ribbed. 18. *H. parallela*
 - 3. Rosette absent; stem-leaves ovate to ovate-lanceolate. 19. *H. major*

2. *Halenia brevicornis* (HBK.) G. Don, Gen. Hist. 4: 177. 1838.

For synonymy and description, see North American species, page 140 of this work.

Specimens examined:

SOUTH AMERICA:

VENEZUELA: Trujillo & Mérida, alt. 1300–4900 m., 1842, *Linden 456* (DH).

COLOMBIA: Bogota, Dec. 19, 1853, *Holton 19 (464)* (NY); Dept. Cundinamarca, moist grassy loam, southwest of Sibate, alt. 2600–2800 m., Oct. 13–15, 1917, *Pennell 2434* (M, NY, US); Dept. Antioquia, La Sierra, Medellin, alt. 2000 m., Jan. 4, 1931, *Archer 1348* (M); Dept. El Cauca, open banks near Rio Cauca, Coconuco to Popayan, alt. 2000–2500 m., June 18, 1922, *Killip 6889* (US); field, near Rio San Andreas, Calaguuala, Coconuco, alt. 2500–2800 m., June 18, 1922, *Pennell 7154* (ANSP, G, NY, US); field, north of Coconuco, alt. 2300–2500 m., June 11, 1922, *Pennell & Killip 6480* (ANSP).

ECUADOR: near Quito, coll. of 1859, *Jameson* (DH, G, NY, UC, V).

PERU: steep grassy slopes, Mito, alt. 3000 m., April 8–18, 1923, *Macbride 3431* (F, M); 1840, *Mathews 3133* (DH).

Attention should be called to the fact that the *Swertia brevicornis* of Humboldt, Bonpland & Kunth, which Gilg has relegated

to synonymy, is a very short much-branched specimen, differing markedly in habit from the *S. parviflora* HBK. A close examination of the type of the former reveals the fact that the terminal branch has been broken off. Subsequent lateral offshoots give an entirely different appearance habitally. This situation is apparent also in the specimens collected by Oersted in Central America, which Gilg in 1915 labeled *H. parviflora*.

3. *H. adpressa*⁴⁹ Allen, n. sp.

Perennial, .5–2.5 dm. high; root coarse; stem usually solitary, erect, slender; basal leaves in dense rosette, oblanceolate, 1–1.5 cm. long, .3 cm. broad; cauline leaves 5–6 pairs, sessile, lanceolate, 1–1.5 cm. long, .2–.3 cm. broad, acute; inflorescence a several-flowered cyme, pedicels 2 cm. long; calyx-lobes lanceolate, .4–.6 cm. long, .15 cm. broad, obsoletely 3-nerved, midvein prominent; corolla .7–.9 cm. long, yellow, tube slightly less than one-half the length of the entire corolla; lobes ovate, auriculate, papillate, apiculate; spurs thick or slender, pendulous, more or less divergent, giving the flower a triangular appearance just preceding anthesis; stamens approximately .4 cm. long; filaments linear, anthers oval; capsule lanceolate; seeds ovoid.

Distribution: known only from Colombia.

Specimens examined:

COLOMBIA: Dept. Santander, Páramo de las Vegas, alt. 3700–3800 m., Dec. 20–21, 1926, Killip & Smith 15679 (M TYPE, NY, US).

Species very similar to *H. brevicornis*.

4. *H. macrantha* Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 105. 1916.

Perennial herb, 5–6 cm. high, with root curved-erect, ligneous,

⁴⁹ *H. adpressa* Allen, sp. nov.—Herba perennis, usque ad 2.5 dm. alta; radice crassa; caule plerumque solitario, erecto, tenui; foliis basalibus in rosula densa, oblanceolatis, 1–1.5 cm. longis, .3 cm. latis; foliis caulinis 5–6 geminis, sessilibus, lanceolatis, 1–1.5 cm. longis, .2–.3 cm. latis, acutis; inflorescentia multiflorifera cyma, pedicellis 2 cm. longis; calycis lobis lanceolatis, .4–.6 cm. longis, .15 cm. latis, obsolete 3-nerviis, medio-nervo prominenti; corolla .7–.9 cm. longa, flava, tubo $\frac{1}{2}$ totae corollae longitudini parum subaequant; corollae lobis ovatis, auriculatis, papillatis, apiculatis; calcaribus crassis vel tenuibus, gibbis, pendulis, plus minusve divaricatis; staminibus ca. .4 cm. longis; filamentis linearibus, antheris ovalibus; capsula lanceolata; seminibus ovoideis.—COLOMBIA: Dept. Santander, Páramo de las Vegas, alt. 3700–3800 m., Dec. 20–21, 1926, Killip & Smith 15679 (M TYPE, NY, US).

rather elongate, covered with the blackish remains of marcescent leaves; flowering stem single, erect, internodes 4–5 cm. long, with no rosette leaves before anthesis; leaves herbaceous, acute, 3-nerved veins sunken above, prominent below; lower cauline leaves oblanceolate, gradually narrowed into a long but broad petiole, 6–7 cm. long, .5–1.5 cm. broad; upper leaves lanceolate to ovate-lanceolate, broadly sessile, about 3 cm. long; inflorescence an apical 3-flowered cyme, solitary in axils of the uppermost euphylloid leaves; pedicels of apical flowers 3 cm. long, those of laterals 2 cm.; calyx-lobes oblanceolate, 1–1.3 cm. long, 3-nerved, acute; corolla about 1.5 cm. long, green, tube about one-third the length of the entire corolla; lobes ovate to broadly ovate, very acute, somewhat apiculate; spurs large, globose, conical, calluses about .3 cm. long at the base of the tube.

Distribution: Colombia.

No specimens examined, but description compiled from original publication. (TYPE, *Kalbreyer* 702, BG).

5. *H. Karstenii* Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 105. 1916.

Biennial or perennial herb up to 5 dm. high; root branched; stems simple, covered with leaf-bases for 7–8 cm. at intervals of less than .4 cm., internodes up to 4–5 cm. long; leaves in pairs at the nodes, sessile, lanceolate, narrowed at base, 2–5.5 cm. long, up to .9 cm. broad, 3-nerved, veins excurrent, forming a mucro; inflorescence 4–12 flowers in terminal and axillary cymes, pedicels erect, up to 4 cm. long; calyx-lobes lanceolate, .6–.8 cm. long, .2–.25 cm. broad, acuminate, 3-nerved, papillate; corolla about 1 cm. long, tube not quite one-half the length of the entire corolla; lobes ovate, subrotund, erose at apex; spurs midway up the corolla tube, small, scarcely noticeable, glandular convex depressions in the corolla; stamens about .3 cm. long, at the orifice of the tube; filaments linear, anthers oval, acute; capsule 15–18 cm. long, ovate; seeds ovoid, light brown, wrinkled.

Distribution: páramos of Bogota.

Specimens examined:

COLOMBIA: Páramo de Bogota, *Karsten* (V TYPE).

6. *H. subinvoluta* Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 99. 1916.

Perennial herb, about 2 dm. high; root multifibrous; subterranean stem vertical, short, thick, flowering stem erect, loosely leafy; leaves thickly herbaceous or somewhat fleshy, 3-nerved, veins sub-parallel, deeply sunken above, prominent below; basal leaves linear-lanceolate, gradually narrowed at the base into narrow petiole, 4–5 cm. long, .4–.5 cm. broad; lower cauline leaves similar to basal leaves; upper cauline leaves broadly sessile, lanceolate or lanceolate-ovate to ovate, 2–4 cm. long, .6–1 cm. broad; inflorescence terminal or axillary, almost sessile 3-flowered cymes, peduncles .3–.6 cm. long; floral leaves sheathing inflorescence and longer than flowers; calyx-lobes oblong-ovate, about 1 cm. long, up to .3 cm. broad, 5-nerved, minutely hirtellous, acute; corolla about 1 cm. long, tube about one-third or less the length of the entire corolla; lobes oblong-ovate, .7 cm. long, .3–.35 cm. broad, subrotund, erose at apex; spurs scarcely prominent blackish maculations at the base of the tube; stamens about .2 cm. long; anthers ovate-oblong; filaments linear.

Distribution: Venezuela.

Specimens examined:

VENEZUELA: high mountains of Trujillo and Mérida, alt. 1300–4900 m., 1842, *Linden 437* (DH TYPE).

7. *H. inaequalis* Wedd. Chlor. And. 2: 78. pl. 53 C. 1859; Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 99. 1916.

Herb 1.5–2(–3) dm. high; stem solitary, erect, loosely leafy, with internodes about 4–5 cm. long, and inflorescence comprising the upper third of the stem, or stem short, leafy, with internodes equidistant, 1–2 cm. long, arising in axil of every leaf; radical leaves petiolate, lanceolate to oblanceolate, 2–3 cm. long; upper cauline leaves sessile, lanceolate to elliptic, minutely hirtellous; flowers disposed in small loose pedunculate cymules; peduncles erect or slightly nodding, 1–2 cm. long; calyx-lobes lanceolate or oblong-lanceolate, acute, margin minutely hirtellous; corolla scarcely 1 cm. long, exceeding the calyx by one-fourth its length; lobes ovate, acute; spurs inconspicuous.

Distribution: known only from Venezuela.

Specimens examined:

VENEZUELA: Páramo de Timotes, Mérida, alt. 3800 m., Sept. 4, 1921, *Jahn 558* (HP, US); same locality, alt. 3600 m., Jan. 21, 1922, *Jahn 839* (HP, US); Mérida, alt. 3000 m., 1846, *Funck & Schlim 901* (DH TYPE).

Funck & Schlim 1148 is cited by Weddell in the original publication of the species, but Gilg has placed this number under *H. viridis*.

8. *H. viridis* (Griseb.) Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 100. 1916.

Gentiana viridis Griseb. in Linnaea 22: 43. 1849; Wedd. Chlor. And. 2: 62. 1859.

H. inaequalis Wedd. Chlor. And. 2: 78. 1859; Gilg, *l. c.*

Perennial herb, 1–3 dm. high; stem solitary, erect, thick, simple, internodes 4–5 cm. long; basal leaves in rosette, more or less coriaceous, sessile, lanceolate, subequal, up to 6 cm. long, .4 cm. broad, minutely hirtellous, 3-nerved; cauline leaves 3–4 pairs, approximately 5 cm. long; inflorescence a narrow racemiform cyme arising in the middle of the stem, with simple 3–5-flowered cymules; pedicels erect before anthesis, cernuous after, about 2.5 cm. or less long; calyx-lobes oblong-lanceolate, minutely hirtellous, about .4–.5 cm. long, nerved; corolla about 1 cm. long, greenish, tube about one-third the length of the entire corolla; lobes elliptic-lanceolate, rather obtuse, somewhat erose at apex; spurs inconspicuous; stamens .5 cm. long; anthers ovate; capsule oblong-lanceolate.

Distribution: known only from Venezuela.

Specimens examined:

VENEZUELA: Sierra Nevada, Mérida, alt. 3300 m., 1846, *Funck & Schlim 1148* (DH TYPE); Laguna Mucuy, Cabeceras del Saisay, Mérida, 4200–4300 m., April 19, 1930, *Gehriger 92a* (HP).

9. *H. Schultzei*⁵⁰ Gilg, n. sp.

Caespitose mat-like perennial, about 3 dm. high; root tough, fibrous; stems one or more, erect, simple, slender, internodes 5–7

⁵⁰ *H. Schultzei* Gilg, sp. nov.—Herba perennis, caespitosa, ca. 3 dm. alta; radice lenta, fibrata; caulibus 1–multis, simplicibus, tenuibus, internodiis 5–7 cm. longis; foliis basalibus in rosula densa, in petiolis longis tenuibus attenuatis, ad basin dilatatis, lineari-lanceolatis, ca. 5 cm. longis, .5 cm. latis, nerviis, acutis; foliis caulinis plerumque 2 geminis, sessilibus, linearibus, plerumque ca. 1.5 cm. longis, nerviis, acutis; inflorescentia pauco-florifera cymis terminalibus lateralibusque, pedicellis tenuibus, 1–1.5 cm. longis, ad apicem recurvatis; calycis lobis lanceolatis, ca. .6 cm. longis, acutis; corolla latissime campanulata, ca. 1.3 cm. longa, flava; corollae lobis ovatis, obtusis, marginibus erosis vel crispis; calcaribus inconspicuis.—(TYPE, *Schultze 1304*, BG).

cm. long; basal leaves in dense rosette, narrowed into long slender petioles, dilated at base, linear-lanceolate, about 5 cm. long, .5 cm. broad, nerved, acute; stem-leaves usually 2 pairs, sessile, linear, usually about 1.5 cm. long, nerved, acute; inflorescence few-flowered in terminal and lateral cymes, pedicels slender, 1–1.5 cm. long, recurved at tip; calyx-lobes lanceolate, about .6 cm. long, acute; corolla very broadly campanulate, about 1.3 cm. long, yellow; corolla-lobes ovate, rather obtuse, erose or crisped margins; spurs not discernible.

Distribution: Colombia.

No specimens examined, but description compiled from photograph. (TYPE, *Schultze 1304*, BG).

10. *H. gentianoides* Wedd. Chlor. And. 2: 78. *pl. 53B*. 1859.

Perennial herb, up to 3 dm. high; root more or less thick, ligneous; stems sterile or flowering, long, loosely leafy; basal leaves in a dense rosette, petiolate; cauline leaves 2–6 pairs, subsessile, lanceolate, acute, 3-nerved; inflorescence lateral or terminal, small racemiform cymes, peduncles more or less resupinate; calyx-lobes oblong, up to .7 cm. long, papillate, acuminate, prominently 3-nerved; corolla about 1 cm. long, tube approximately one-third the length of the entire corolla; lobes ovate, rotund, crenulate-erose; spurs reduced to inconspicuous glandular areas not visible to the naked eye; stamens approximately .4 cm. long; filaments linear, anthers ovate, acuminate; capsule lanceolate.

Distribution: páramos of Colombia.

Specimens examined:

COLOMBIA: Páramo de Bogota, *Karsten* (V); same locality, *Goudot* (BG TYPE, M photo, V); same locality, *Triana 1964* (DH, V); same locality, Jan. 17, 1854, *Holton 467* (DH, G); Guasca, 1919, *Ariste-Joseph 4423* (US).

11. *H. stellarioides* Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 100. 1916.

Perennial? herb, up to 3 dm. high; flowering stem erect, loosely leafy, internodes 4–7 cm. long; basal leaves lacking; cauline leaves sessile, lanceolate to linear-lanceolate, 2.5–3.5 cm. long, gradually decreasing toward the summit, .4–.5 cm. broad, acute, 3-nerved; inflorescence lateral or terminal, 5–7-flowered cymes, pedicels more or less erect, up to 1.5 cm. long; calyx-lobes lance-

olate or oblong-lanceolate, about .8 cm. long, .25 cm. broad, acute, 3-nerved, or nerves obsolete; corolla about 1 cm. long, tube about one-third the length of the entire corolla; lobes ovate-oblong, upper margin subcrenulate, acute; spurs semi-globose callous prominences at the base of the tube.

Distribution: páramos of Colombia.

No specimens examined, but description compiled from original publication and photograph. (TYPE, *Lehmann 3080*, BG).

12. *H. verticillata* Gilg in Engl. Bot. Jahrb. **54**: Beibl. 118, p. 103. 1916.

Annual herb, slender, up to 1 m. high; root fibrous; stem .5 cm. thick, becoming black, covered with the remains of early leaves, densely leafy at the middle or just below the middle of the stem, internodes up to 8 cm. long; basal leaves in dense whorls for a varying distance up the stem, connate, sessile, linear-lanceolate, 10 cm. or less long, .8 cm. broad, acuminate, 5-nerved, fleshy; cauline leaves in 7-8 whorls of 3, lanceolate (extreme upper subtending inflorescence, ovate-lanceolate), 5-nerved, 5-6 cm. long, gradually decreasing in length toward the summit, with corresponding increase in width; flowers numerous, disposed in 3-5 verticillate, axillary and terminal cymose clusters; pedicels erect, up to 3.5 cm. long; calyx-lobes oblong-lanceolate, papillate on under surface of veins and entire upper tip, up to 1.0 cm. long, .2-.35 cm. broad, acuminate to acute, 5-nerved, veins parallel, becoming confluent at tip; corolla apple-green or yellowish-green, up to 1.7 cm. long, tube about one-third the length of the entire corolla; lobes broadly ovate, subrotund, erose and papillate at tip; spurs sub-globose glandular prominences at the base of the corolla.

Distribution: wet páramos about volcanos, Colombia.

Specimens examined:

COLOMBIA: "Cauca am Vulkan," Sotará, 3500 m., *Lehmann 6190* (BG TYPE, F); Dept. of El Cauca, Mt. Pan de Azucar, alt. 3500-3700 m., June 16, 1922, *Pennell 7052* (ANSP, G, NY, S, US).

13. *H. foliosa* Gilg in Engl. Bot. Jahrb. **54**: Beibl. 118, p. 101. 1916.

Biennial herb (?), up to 8 dm. high; root stout (?); flowering stems 1-many, erect, simple, few or no leaves at base, lower internodes 1-1.5 cm. long, upper 5-7 cm. long; numerous pairs

of lower cauline leaves, thickly herbaceous, gradually narrowed toward the base but dilated again at base, lanceolate, 3–5 cm. long, about 1 cm. broad, acute, 3–5 nerved; upper cauline leaves herbaceous, gradually narrowed toward the base and broadly sessile, ovate-elliptic, 3–5 cm. long, about 1 cm. broad, acute to very acute, 5-nerved, veins parallel, sunken above, prominent below; terminal and axillary, loosely arranged, many-flowered elongate cymes, comprising a thyrsoïd inflorescence 10 cm. long, pedicels about 2.5 cm. long; small upper leaves shorter than the inflorescence; calyx-lobes ovate-oblong, .7–.8 cm. long, .3 cm. broad, acute or very acute, 3-nerved; corolla about 1.3 cm. long, tube about one-fourth the length of the entire corolla; spurs semi-globose protuberances at the base of the tube.

Distribution: páramos of Colombia.

Specimens examined:

COLOMBIA: Dept. of Bolívar-Antioquia, Páramo de Chaquiro, alt. 3000–3200 m., Feb. 23, 1918, Pennell 4268 (NY, US). (TYPE not seen, Stübel 276, BG, M photo).

14. *H. dasyantha* Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 103. 1916.

Perennial herb, (1.5–)3–7 dm. high; root thick; stem erect, simple, more than .5 cm. thick, fleshy, brown in dried specimens, faintly striate, covered with remains of marcescent leaves, 2–5 internodes up to 10 cm. long; basal leaves in a dense rosette, broadly elliptic, up to 10 cm. long, nearly 2 cm. broad, acute, 5-nerved; 3–5 pairs of cauline leaves, sessile, dilated at base, oblong-lanceolate, 4–10 cm. long, their length gradually decreasing toward the summit, 1–2 cm. broad, acute, 5-nerved; inflorescence axillary and terminal, many-flowered racemose cymes, usually 10 cm. long; pedicels erect, for most part up to 3.5 cm. long; calyx-lobes ovate to ovate-lanceolate, papillate, up to 1 cm. long, .4–.5 cm. broad, acute to abruptly acuminate, 3-nerved; squamellae frequently scale-like lobed bodies; corolla 1.5–2 cm. long, pale greenish-yellow, tube nearly equal in length to the entire corolla; lobes ovate, subrotund, erose at apex, somewhat papillate; spurs small subglobose prominences at the base of the corolla-lobes, almost obscured by the calyx; stamens approximately .4 cm. long, attached at the summit of the tube; filaments linear, anthers ovate-oval; stigma reflexed; capsule up to 2 cm. long; seeds elliptical, reticulate.

Distribution: moist grassy páramos, or dry open woods, Colombia.

Specimens examined:

COLOMBIA: Dept. of Caldas, Páramo del Quindio, alt. 3700–4200 m., Aug. 15–20, 1922, *Pennell & Hazen 9997* (ANSP, NY, US); Dept. of Tolima, Páramo de Ruiz, alt. 3500–3800 m., Dec. 16–17, 1917, *Pennell 3001* (NY, M, US); Dept. of Cauca, Páramo de Buena Vista, Huila group, Central Cordillera, alt. 3000–3600 m., Jan. 1906, *Pittier 1111* (US). (TYPE not seen, *Lehmann 2065*, BG, M photo.).

This species is very similar to *H. elata* but is, on the whole, a larger and coarser plant. Since the material is scanty and the geographical location different, *H. dasyantha* has for the present been maintained as a distinct species.

15. *H. elata* Wedd. Chlor. And. 2: 78. 1859.

Perennial, up to 5 dm. high; stem thick, coarse, erect, loosely leafy; numerous basal leaves in dense rosette, broadly lanceolate, attenuate into petiole, dilated at base, 7–10 cm. long, approximately 1 cm. broad, 5-nerved, acuminate; cauline leaves more or less sessile, shorter, lanceolate, acute; inflorescence numerous loose terminal and lateral cymes, peduncles up to 3 cm. long; calyx-lobes oblong-lanceolate to ovate-lanceolate, .7–.8 cm. long, 3-nerved, papillate, acute; corolla hardly one-fourth more than the length of the calyx, tube slightly more than one-half the length of the entire corolla; lobes ovate, obtuse; spurs inconspicuous tubercles at the extreme base of the corolla; stamens .6 cm. long; anthers narrowly ovate, filaments linear.

Distribution: in the Sierra Nevada of Santa Marta, Venezuela.

Specimens examined:

VENEZUELA: Sierra Nevada de Santa Marta, Caracas, 1844, *Funck 415* (DH TYPE).

16. *H. Tolimae* Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 101. 1916.

Perennial herb, 2.5–3 dm. high; root thick; root-stalk thick, densely covered with remains of marcescent leaves; one to few flowering stems, thick, erect, simple for the most part, very narrowly winged, internodes 3–6 cm. long; basal leaves arranged in rosette, slightly narrowed into long broad petioles, dilated at the base, lanceolate, 5–8 cm. long, up to .5–.6 cm. broad, 3–5-nerved, acute; stem-leaves 2–3 at a node, sessile, broadly lanceolate, 4–6 cm. long, .6–.7 cm. broad, their size gradually decreasing toward the summit, 3–5 subparallel veins, sunken above,

prominent below, reticulate; inflorescence few-flowered (5–7) cymes, axillary and terminal; pedicels more or less resupinate, up to 3 cm. long, the central one longer; calyx-lobes ovate to ovate-oblong, papillate, .7–.9 cm. long, .25–.35 cm. broad, subacuminate, 3-nerved; corolla up to 1.3 cm. long, light greenish-yellow, tube slightly less than one-third the length of the entire corolla; lobes ovate, erose and papillate at the tip; spurs glandular subglobose protuberances at the base of the tube, obscured by the calyx; stamens approximately .4 cm. long; filaments linear, anthers ovate; capsule lanceolate, apiculate, 2 cm. long; seed ovoid-elliptical, very minutely reticulate, pale tan.

Distribution: grassy páramos of Colombia.

Specimens examined:

COLOMBIA: Dept. of Caldas, Páramo del Quindio, alt. 4100–4400 m., Aug. 15–20, 1922, *Pennell & Hazen 9841* (ANSP, G, NY, US); (TYPE not seen, *Stübel 228*, BG, M photo.); bare loam slopes below snow, same locality and date, alt. 4300–4500 m., *Pennell & Hazen 9894* (ANSP, NY, S, US).

This last-cited specimen has leaves broader than those of the type, but is similar otherwise. *H. Tolimae* appears to be closely related to *H. elata*.

17. *H. hygrophila* Gilg in Engl. Bot. Jahrb. **54**: Beibl. 118, p. 102. 1916.

Biennial herb, about 6 dm. high; root ligneous; subterranean root-stalk covered with darkened leaf-bases; flowering stem fleshy, erect, simple, 1 cm. thick, faintly winged, internodes up to 8 cm. long; 30–40 basal leaves in a dense rosette, linear, up to 12 cm. long, .5–.9 cm. broad, acute, 5-nerved; cauline leaves yellow-green, 3–4 pairs, the lower lanceolate, the upper subtending the inflorescences, ovate-lanceolate, sessile, 5–7 cm. long, gradually decreasing in size toward the summit, approximately .8–1.2 cm. broad, 7-nerved, parallel veins confluent at tip; inflorescence terminal and axillary in upper stem-leaves, in dense many-flowered cymes, giving spicate appearance, pedicels erect, up to 3 cm. long; calyx-lobes ovate-oblong to ovate, papillate, .9–1.0 cm. long, narrowly acute, 5-nerved, reticulate; corolla up to 1.5 cm. long, yellowish-green, tube approximately one-third the length of the entire corolla; lobes ovate, erose at apex; spurs angular sac-like prominences at the extreme base of the corolla lobes, obscured by calyx; stamens approximately .7 cm. long, attached at the orifice of the tube; filaments linear,

anthers broadly oblong, apiculate; capsule lanceolate; seeds elliptic, pale tan, reticulate.

Distribution: páramos of Andes, Colombia.

Specimens examined:

COLOMBIA: Páramo of Guanacas, Central Andes of Popayan, 3000–3600 m., *Lehmann 7860* (F, G, BG TYPE, M photo, US).

18. *H. parallela*⁵¹ Allen, n. sp.

Perennial herb, up to 6 dm. high; root-stalk thick; flowering stem single, erect, simple, or branched above, striate, lower internodes 1–1.5 cm. long, upper 4–6 cm. long; numerous basal leaves in rosette, almost sheathing, lanceolate, 3–5-nerved, about 9 cm. long, 1 cm. broad; cauline leaves about twelve pairs, more remote toward the apex, sessile, lanceolate to elliptic, 4–6 cm. long, gradually decreasing toward the summit, approximately 1 cm. broad, 3–5 subparallel veins sunken above, prominent below; inflorescence 1 or more many-flowered axillary and terminal cymes, pedicels more or less erect, up to 3.5 cm. long, the lateral somewhat shorter than the terminal; calyx-lobes ovate, papillate, .7–.9 cm. long, .4 cm. broad, attenuately acute, prominently 5–7-nerved, veins subparallel; corolla about 1.3 cm. long, probably greenish?, tube about one-fourth the length of the entire corolla; lobes broadly ovate, slightly papillate, crisped toward the tip, abruptly acuminate; spurs large globose protuberances at the base of the tube, obscured by calyx; stamens nearly .5 cm. long, attached at the orifice of the tube; filaments linear, anthers oblong; capsule lanceolate.

⁵¹ *H. parallela* Allen, sp. nov.—Herba perennis, usque ad 6 dm. alta; radice crassa; caule florifero solitario, erecto, simplice vel supra ramoso, striato; internodiis inferioribus 1–1.5 cm. longis, superioribus 4–6 cm. longis; foliis basalibus multis, in rosula densa, fere vaginantibus, lanceolatis, 3–5-nerviis, ca. 9 cm. longis, 1 cm. latis; foliis caulinis ca. duodecem geminis, ad apicem remotioribus, sessilibus, lanceolatis vel ellipticis, 4–6 cm. longis, sensim sursum decrescentibus, ca. 1 cm. latis, 3–5-nerviis, nervis subparallelis, supra immersis, infra prominentibus; inflorescentia cymis 1- vel pluro-floriferis axillaribus et terminalibus; pedicellis plus minusve erectis, usque ad 3.5 cm. longis, lateralibus terminalibus brevioribus; calycis lobis ovatis, papillatis, .7–.9 cm. longis, .4 cm. latis, attenuate acutis, prominente 5–7-nerviis, nervis subparallelis; corolla ca. 1.3 cm. longa, forte viridula, tubo ca. $\frac{1}{4}$ totae corollae longitudini adaequanti; lobis late ovatis, parum papillatis, ad apicem crispis abrupte acuminatis; calcaribus magnis globosis gibbis ad basin tubi calyce obscuratis; staminibus ca. .5 cm. longis, tubi summo adjunctis; filamentis linearibus, antheris oblongis; capsula lanceolata.—VENEZUELA: Páramo de La Negra, Mérida, Dec. 1927, *Gutzwiller 32* (HP TYPE, US).

Distribution: Venezuela.

Specimens examined:

VENEZUELA: Páramo de La Negra, Mérida, Dec. 1927, *Gutzwiller 32* (HP TYPE, US).

Species near *H. foliosa* and *H. hygrophila*.

19. *H. major* Wedd. Chlor. And. 2: 79. 1859.

Annual probably, up to 6 (?) dm. high; (root not seen); stem erect, simple below, branched above, loosely leafy, very narrowly winged and striate; leaves sessile, subconnate, broadly elliptic, 2–7 cm. long, .5–2 cm. broad, somewhat abruptly acuminate, 3–5-nerved; inflorescence terminal and axillary 3–6-flowered subumbelliform cymes, pedicels 4 cm. long, usually erect, frequently nodding at apex; calyx-lobes oblanceolate to subspatulate, up to .8 cm. long, .25 cm. wide, 3-nerved, midvein very prominent; corolla 1.0–1.3 cm. long, tube almost one-half the length of the corolla; lobes ovate, erose at apex; spurs small upcurved conical protrusions almost at the orifice of the tube; stamens approximately .5 cm. long, at the orifice of the tube; filaments linear; anthers not seen; capsule ovate, 1.3–1.6 cm. long; seeds oval, brown-black, wrinkled.

Distribution: shrub zone, mountain bases, Colombia.

Specimens examined:

COLOMBIA: Dept. of El Cauca, Mt. Pan de Azucar, alt. 3300–3600 m., June 16, 1922, *Pennell 7034* (ANSP, NY, US); Dept. of Cundinamarca, Sibate, alt. 2700–2800 m., Oct. 13–15, 1917, *Pennell 2438* (M, US); Dept. of Caldas, Cerro Tatama, alt. 3400–3700 m., Sept. 8–10, 1922, *Pennell 10575* (US). (TYPE not seen, *Goudot*, HJP).

SECTION 2. *HALENIASTRUM*

KEY TO NORTH AMERICAN SPECIES AND VARIETIES

1. Spurs spreading to ascending.
 2. Plant less than 2.5 dm. high.
 3. Biennial; flowers white; distribution Mexico.....20. *H. crassiuscula*
 3. Annual; flowers purple; distribution Canada.....23a. *H. deflexa* var. *Brentoniana*
 2. Plant more than 2.5 dm. high.
 3. Spurs, if present, about $\frac{1}{2}$ the length of the corolla.....21. *H. Pringlei*
 3. Spurs less than $\frac{1}{2}$ the length of the corolla.
 4. Annuals; leaves mostly cauline.
 5. Stem-leaves linear.....22. *H. recurva*
 5. Stem-leaves lanceolate to ovate.....23. *H. deflexa*
 4. Perennials; leaves mostly radical.
 5. Strict, many-flowered, spike-like inflorescence.
 6. Stem erect.....24. *H. rhyacophila*
 6. Stem procumbent.....24a. *H. rhyacophila* var. *procumbens*

- 5. Loose, broad, few-flowered inflorescence.....
.....24b. *H. rhyacophila* var. *macropoda*
- 1. Spurs pendulous to incurved.
- 2. Leaves not apiculate or very rarely so; calyx-segments not mucronulate.
- 3. Basal rosette absent; leaves mostly cauline.
- 4. Habit erect; leaves less than 3 cm. long.
- 5. Leaves linear.....25. *H. Palmeri*
- 5. Leaves lanceolate or ovate.
- 6. Calyx-lobes mostly obtuse, appressed.....26. *H. Conzattii*
- 6. Calyx-lobes acute, reflexed.....27. *H. Schiedeana*
- 4. Habit prostrate; leaves 5-12 cm. long.....28. *H. caleoides*
- 3. Basal leaves present, cauline few or none.
- 4. Spurs incurved, $\frac{1}{2}$ or less than $\frac{1}{2}$ the length of the corolla.
- 5. Sterile branches present; leaves numerous.....29. *H. platyphylla*
- 5. Sterile branches absent; leaves less than 15.
- 6. Flowers 1.5 cm. or less long.
- 7. Flowers less than 1 cm. long; spurs rudimentary...30. *H. nudicaulis*
- 7. Flowers more than 1 cm. long; spurs $\frac{1}{3}$ - $\frac{1}{2}$ the length of the
corolla.....31. *H. plantaginea*
- 6. Flowers more than 1.5 cm. long...31a. *H. plantaginea* f. *grandiflora*
- 4. Spurs spreading, about $\frac{1}{2}$ the length of the corolla.
- 5. Stems always erect.
- 6. Leaves linear.....32. *H. Shannonii*
- 6. Leaves elliptical.....32a. *H. Shannonii* f. *compacta*
- 5. Stems more or less decumbent.....33. *H. decumbens*
- 2. Leaves conspicuously apiculate; calyx-segments mucronulate.
- 3. Plant more than 2 dm. high.....34. *H. guatemalensis*
- 3. Plant less than 2 dm. high.....34a. *H. guatemalensis* var. *latifolia*

**20. *H. crassiuscula* Robinson & Seaton in Proc. Am. Acad.
28: 113. 1893.**

Small caespitose biennial of dense habit, slightly fleshy; stems erect, 0.4-1.0 dm. high, narrowly winged, much branched; radical leaves broadly oblanceolate to elliptic, 2 cm. long, obtuse, attenuate into long petiole nearly equalling the blade, 3-nerved; cauline leaves 1-3 pairs, narrowly oblanceolate to oblong, narrowed at the base; inflorescence dense compact umbellate cyme; flowers terminal or axillary, pedicellate, after anthesis slightly nodding, not at all resupinate; calyx-segments lanceolate to oblanceolate, .45-.6 cm. long, obtuse, papillate, 3-nerved; corolla white, up to 1.5 cm. long, about .5 cm. broad at base, tube .35-.4 cm. long; lobes oblong-elliptic, acute; spurs .4 cm. long, arising slightly below the midpoint of the tube, slender, spreading, and curved upwards; stamens .25 cm. long, anthers ovate; filaments linear; capsule lanceolate, frequently subfalcate, acute, 1.4 cm. long; seeds globose, light yellow-brown, granular.

Distribution: bare alpine summits, Mexico.

Specimens examined:

MEXICO: Nevado de Toluca, bare alpine summits, alt. 3500 m., Sept. 2, 1892, *Pringle 4229* (ANSP, BG, BM, B, CAS, C, DH, F, G TYPE, IAC, K, M, NY, S, US, V); Ixtaccihuatl, wet meadows, alt. 3000-3250 m., March-July 1903, *Purpus 318* (CAS, M, US); Popocatepetl, Aug. 7-8, 1901, *Rose & Hay 5999* (US).

21. *H. Pringlei* Robinson & Seaton in Proc. Am. Acad. 28: 113. 1893.

Halenia candida Ramirez in Inform. Secret. Foment. Mexico (Excurs. Mont. Ajusco), 34. 1895; Estud. Hist. Nat. 102. 1904.

Biennial, of glaucous aspect; root thick, tough, ligneous; stem usually solitary, occasionally caespitose, simple or nearly so, scape-like, slender, erect, 1-2.5 dm. high; leaves less than 3 cm. long, radical leaves elliptic to narrowly oblanceolate, faintly 3-nerved, attenuate below into slender petioles, usually as long as the leaf-blade and persistent; cauline leaves 1-2 pairs, sessile, short, sublinear, 1.5-3 cm. long, about .3 cm. broad; flowers disposed in terminal, or occasionally lateral, few-flowered umbelliform cymes, pedicels less than 2 cm. long, usually about .8 cm.; calyx-lobes oblong-spatulate, .3-.5 cm. long, acuminate, 3-nerved; corolla white, .8-1.5 cm. long, spurless in the majority of cases; when spurs present, slender, spreading, and curved-ascending, 1.5-1.8 cm. from tip to tip, with prominent veins and glandular tips; corolla-tube up to .2 cm. long; corolla-lobes elliptic, acuminate; stamens .2-.35 cm. long; anthers narrowly ovate, minutely papillate, filaments linear, slightly uncinate; capsule lanceolate, acute, exserted; seeds subglobose, yellow-brown, granular.

Distribution: springy meadows of central and south Mexico.

Specimens examined:

MEXICO: springy alpine meadows, Sierra de las Cruces, alt. 2450 m., Aug. 28, 1904, *Pringle 13121* (BG, C, UC, G, K, US); same locality, Aug. 23, 1892, *Pringle 4209* (ANSP, C, CAS, DH, F, G TYPE, IAC, K, M, NY, S, US, V); same locality, June 1895, *Altamirano 908* (US).

SOUTH MEXICO: without locality, 1920-21, *Reiche 36* (BG).

The habit of this species is very similar to that of *H. nudicaulis*. The Pringle specimens cited above were collected in August, and the plants are smaller and grow less luxuriantly than the single specimen collected in June by Altamirano. The specimens collected later in the season very rarely possess spurs, while the

earlier plants show a distinctly spurred corolla. This condition is shown in other species to a somewhat less extent, and is in all probability traceable to variation in environmental conditions.

22. *H. recurva* (Sm.) Allen, n. comb.

Swertia recurva Smith in Rees, *Cyclopedia* 34: sub *Swertia*. 1819.

Halenia Rothrockii Gray in Proc. Am. Acad. 11: 84. 1876; Rothrock, Rept. Wheeler Exped. 195, pl. 21. 1878; Hemsl. Biol. Cent.-Am. Bot. 2: 353. 1882.

Tetragonanthus Rothrockii Heller, Cat. N. Am. Pl. 6. 1898, and ed. 2, 16. 1900.

Annual, 2.5–5 dm. high; stem simple, often branched above; basal leaves less than 3.5 cm. long, .6 cm. broad, elliptic-lanceolate to spatulate; cauline leaves remote, lance-linear, 1.5–4 cm. long, about .35 cm. broad, obscurely 3-nerved, midrib prominent below; inflorescence a loosely flowered subumbellate cyme; flowers on slender pedicels, .5–3 cm. long, often in sevens; calyx lobes lanceolate, elongate-acute, up to .6 cm. long, uninerviate, papillate; corolla bright-yellow, about 1–1.2 cm. long, tube less than one-half the length of the entire corolla; corolla-lobes ovate, subacuminate, delicately veined, papillate; spurs curved, horizontal or ascending, up to 1.6 cm. from tip to tip; anthers broadly oblong, mucronate, papillate; filaments slightly obovate; capsule ovate-lanceolate; seeds yellow-brown, subglobose-ovoid, granular.

Distribution: southern United States and Mexico.

Specimens examined:

UNITED STATES:

ARIZONA: Mt. Graham, alt. 2250 m., Sept. 1874, *Rothrock* 733 (ANSP, F, IAC, M, US); same locality, Aug. 1874, *Rothrock* (G, NY); Chiricahua Mts., Sept. 22. 1931, *Jones* 28603 (M); Barfoot Park, Chiricahua Mts., alt. 2000–2050 m., rolling andesitic, recently lumbered pine land, Sept. 8, 1906, *Blumer* 1359 (BG, D, G, K, M, NY, US, V); same locality, alt. 2480 m., Sept. 22–23, 1914, *Eggleston* 10774 (US); Apache Pass, Chiricahua Mts., Sept. 1881, *Lemmon & Lemmon* (CAS); Hermitage, Chiricahua Mts., Sept. 1881, *Lemmon & Lemmon* (CAS); Rucker Valley, Chiricahua Mts., Sept. 1881, *collector unknown* 1874 (CAS, DH, F, SM); White Mts., Aug. 1873, *Lour* (F); summit of White Mts. (Springerville-Fort Apache Road), Apache Reservation, alt. 2270–2880 m., Aug. 29, 1919, *Eggleston* 15781 (F); Riverside Ranger Station, Greer, Apache Forest, alt. 2700 m., Aug. 24, 1920, *Eggleston* 17137 (NY, US); grassy flats near Brinkley's Ranch, White Mts., Aug. 5, 1915, *Ellis* 20 (US); Riggs Flat, Pinaleno Mts., alt. 2000 m., Sept. 23, 1917, *Shreve* 5373 (G); Columbia Trail, Pinaleno Mts., alt. 2500 m., Sept. 13, 1914, *Shreve* 4312 (CAS, US).

NEW MEXICO: Mogollon Mts., on or near the west fork of the Gila River, Socorro Co., alt. 2125 m., Aug. 14, 1903, *Metcalf* 501 (M, NY); swampy ground, divide of Mogollon Mts., Sept. 7, 1881, *Rusby* 264 (ANSP, BM, CAS, F, K, M, NY, US); same locality, Aug. 1881, *Rusby* (IAC, NY).

MEXICO:

CHIHUAHUA: Mt. Mohinora, Sept. 1, 1898, *Nelson* 4868 (G, US); cool slopes, Sierra Madre, alt. 1750–2375 m., Sept. 27, 1888, *Pringle* 1663 (BG, BM, B, CAS, DH, M, NY, S, V); same locality, Sept. 24, 1887, *Pringle* 1329 (ANSP, BG, C, G, K, NY, US); Meadow Valley, Sierra Madre Mts., alt. 1750 m., Sept. 17, 1903, *Jones* (S); Sierra Madres, near Colonia Garcia, alt. 2000 m., Sept. 6, 1899, *Townsend & Barber* 309 (BB, F, DH, G, M, NY, US); Escalon, *Mutis* (L).

COAHUILA: Sierra Madre, 40 m. south of Saltillo, July 1880, *Palmer* 839 (ANSP, G, K, US).

DURANGO: Barranca, below Sandia Station, alt. 1625 m., Oct. 13, 1905, *Pringle* 13588 (G, S, UC, US); Sierra de Candela, alt. 3000 m., Aug. 27, 1903, *Endlich* 53 (BG).

JALISCO: Sierra de Tequila, alt. 2000 m., July 5, 1893, *Pringle* 5465 (G).

The name *Swertia recurva* Smith was given to the specimen collected by Mutis and sent to Linnaeus, now preserved in the herbarium of the Linnaean Society of London. The description published in Rees' 'Cyclopedia' was inadequate, and later the specific name *recurva* was placed under *deflexa*, the well-known northern species. Since few of the succeeding monographers ever saw the original *Swertia recurva* Sm., it is not strange that the error persisted. Over fifty years later, Gray described *Halenia Rothrockii* as a new species. A careful examination of both specimens reveals the fact that they are identical, in which event the correct specific name is *recurva*.

23. *H. deflexa* (Sm.) Griseb. Gen. & Sp. Gent. 324. 1839; Hook. Fl. Bor.-Am. 2: 67. pl. 155. 1840; Dietrich, Syn. Pl. 2: 918. 1840; Torr. Nat. Hist. N. Y. 2²: 110. 1843; Robinson in Gray, Man. ed. 7, 659. 1908; Johnson, Tax. Fl. Pl. 488. fig. 340. 1931; Louis-Marie, Fl. Man. Prov. Queb. 214, pl. 68, fig. 11. 1931.

Swertia deflexa Smith in Rees, Cycl. 34: sub *Swertia*. 1819.

S. corniculata Michx. Fl. Bor.-Am. 1: 97. 1803.

S. americana Spreng. Syst. 1: 661. 1825.

S. Michauxiana G. Don, Gen. Hist. 4: 177. 1838; Schl. & Cham. in Linnaea 5: 122. 1830.

Halenia Michauxiana G. Don, Gen. Hist. 4: 177. 1838.

H. heterantha Griseb. Gen. & Sp. Gent. 325. 1839.

H. reflexa Griseb. in DC. Prodr. 9: 135. 1845, sphalm.

Tetragonanthus deflexus Kuntze, Rev. Gen. Pl. 2: 431. 1891; Heller, Cat. N. Am. Pl. 6. 1898, and ed. 2, 161. 1900; Britt. Man. 734. 1901; Britt. & Brown, Ill. Fl. 3: 15, fig. 3365. 1913; Small, Fl. Southeastern U. S. 931. 1913.

T. heteranthus Heller, Muhlenbergia 1: 2. 1900.

T. heterantherus Heller, Cat. N. Am. Pl. ed. 2, 161. 1900, sphalm.

T. deflexus heteranthus Britt. Man. 735. 1901.

Annual, 1–9 dm. high; stem simple or branched above, quadrangular; leaves 3–5-nerved, basal oblong-spatulate, 1–2 cm. long, petiolate; cauline leaves oblong-lanceolate to ovate, acuminate, 1–5 cm. long, .5–2 cm. broad; internodes 6–8 cm. long; flowers disposed in a terminal or axillary, loose umbelliform verticillate cyme; calyx .4–.8 cm. long, segments ovate-lanceolate, acuminate, papillate; corolla purple, .8–1.4 cm. long, lobes lanceolate to ovate, acute, papillate, tube about equalling the limb; spurs .3–.5 cm. long, slender, cylindrical, obtuse, curved-spreading, deflexed at apex, glandular, frequently lacking in lower flowers or in flowers blooming late in the season; stamens slightly uncinat; anthers ovate, filaments linear; capsule lanceolate; seeds oblong-ovoid, greenish-brown, granular.

Distribution: cool damp woods, from Labrador to New York, west to British Columbia and Montana; also in central Mexico.

Specimens examined:

(?) LABRADOR: Caribou Island, 1870, *Macfarlane* (BB); same locality, *Martin* (G); without locality, *Rothrock* (F).

NEWFOUNDLAND: calcareous rocks and talus, entrance to Port Saunders Harbor, Ingornachoix Bay, Aug. 1, 1910, *Fernald, Wiegand & Kittredge* 3911 (G); Chimney Cove, Aug. 16, 1896, *Waghorne* (DH, G, M); without locality, *Banks* (G); *Brenton* (K).

NOVA SCOTIA: hills between northeast Margaree and Grand Etang, Cape Breton, Aug. 13, 1906, *Robinson* 384 (NY).

NEW BRUNSWICK: Fredericton, Aug. 1881, *Bailey* (US); Drury's Cove, St. Johns, Aug. 18, 1873, *Boott* (G); Falls, Aroostook River, Aug. 17, 1901, *Churchill* (M); Charlo, Restigouche, July 30, 1894, *Fowler* (US); Sugar Loaf, Restigouche, Bass River, Aug. 3, 4, 1873, *Fowler* (M); same locality and collector, Aug. 1, 1882 (F); St. Johns, July 12, 1877, *Fowler* (ANSP); Eel River, York Co., July 20, 1882, *Hay* (ANSP); open woods, Connors, July 20, 1908, *Mackenzie* 3618 (M, NY, US); dry fields, Rothesay, St. Johns, *Mathew* (BG); Saint Francis Parish, July 29, 1900, *Williams* (CAS, G).

QUEBEC: St. Anne des Monts, Gaspé Co., Aug. 16, 1881, *Allen* (NY); wet woods, Rivière du Loup, *Canby* (F); woods, Lake Memphremagog, July 22, 1902, *Churchill* (G); wet woods about Georgeville, Lake Memphremagog, Aug. 1, 2, 20, 1914,

Churchill (F, G, K, M, NY, US); Carleton, Bonaventure Co., July 23, 24, 27, 1904, *Collins, Fernald & Pease 4261* (G); cool wooded banks, between Baldé and the Baie des Chaleurs, Bonaventure River, Bonaventure Co., Aug. 5, 6, 8, 1904, *Collins, Fernald & Pease* (G); Rivière du Loup, Aug. 1902, *Eggleston 3051* (DH, K, M, NY, S, US); St. Anne des Monts, July 15, 1923, *Eames* (SM); slaty soil, Rimouski, July 18, 1907, *Fernald 1151* (G); alluvial wooded banks, Rivière Ste. Anne des Monts, Gaspé Co., July 16, 1906, *Fernald & Collins 244* (K, NY, UC, US); wood-road along Rivière Cap Chat, Matane Co., Aug. 18, 1923, *Fernald, Dodge & Smith 25986* (G); Matane, near the St. Lawrence, Gaspé, Aug. 6, 1904, *Forbes* (G); Little Metis, Aug. 7, 1906, *Fowler* (G); Anticosti, Aug. 1, 1861, *Hyatt, Shaler & Verrill* (G); Rivière du Loup, Aug. 15, 1892, *Kennedy* (ANSP, G); Mt. Albert, Gaspé, Aug. 1882, *Macoun* (NY); wet rocks, Salt Lake, Anticosti, Aug. 11, 1883, *Macoun* (BM); Anse à Persil, Rivière du Loup, July 1913, *Marie-Victorin 28* (G, NY, SM, US); Baie Girard (Lake Temiscaming), Abitibi, June 27, 1918, *Marie-Victorin 8349* (US); "Lac Sale: dans la prairie naturelle près de la maison du garde," Anticosti, July 23, 1927, *Marie-Victorin & Rolland-Germain 27159* (G); "Rivière Vaureal: talus calcaires," Anticosti, July 31, 1925, *Marie-Victorin, Rolland-Germain & Louis-Marie 21076* (G); "Le long de la Rivière Sainte Anne des Monts; à 10 milles de l'embouchure, Gaspésie," Aug. 3, 1923, *Marie-Victorin, Brunel, Rolland-Germain & Rousseau 17663* (G); Notre Dame de Lac, Temiscouata Co., July 9, 1903, *Moore 1211* (G); same locality, July 30, 1887, *Northrup 69* (NY); Georgeville, July 28, 1902, *Pease 1081* (G); abundant along shores of Lake Memphremagog, Georgeville, July 31, 1902, *Pease 1082* (G); Notre Dame du Lac, Temiscouata Co., July 9, 1903, *Pease 2384* (G); Georgeville, July 31, 1902, *Pease 2910* (G); Rivière du Loup, St. Lawrence, 1860, *Pickering* (G); Lower St. Lawrence, Aug. 6, 1879, *Pringle* (US); shore of St. Lawrence, Temiscouata, Aug. 7, 1879, *Pringle* (F, G, IAC, M, US); banks of Grand River, Gaspé Co., June 20-July 10, 1903, *Richards* (G); "Cap à l'original: clairière; dans un bois de conifères, Comté de Rimouski, Bic," July 19, 1927, *Rousseau 30711* (G, M); "Cap aux Corbeaux: dans un bois de conifères; sur le conglomérat. Bic, Comté de Rimouski," July 14, 1927, *Rousseau 26646* (M); "Ile Bayfield (Sandy Island), Archipel de St. Augustin," Labrador Peninsula, Saguenay Co., July 21, 1915, *St. John 90688* (G); roadside, Lac du Saumon, Matane Co., Aug. 15, 1923, *Svensen & Fassett 2096* (G, SM); Anticosti, *Verrill* (F); damp grassy open meadow, Pointe Nouvelle, Hope Township, Bonaventure Co., July 30, 1902, *Williams & Fernald* (G); Bic, July 16, 1910, *Williamson 1422* (ANSP, NY).

ONTARIO: banks of the Maitland River, 1836 *Goderiels* (DH); Moose Factory, Hudson's Bay, July 1, 1881, *Haydon* (K); same locality, 1880, *Haydon* (K); between Moose Factory and Rupert's House, southern end of Hudson's Bay, June 12, 1860, *Drexler* (G); Sand River, Aug. 24, 1928, *Heinburger* (COP); Pic River, Lake Superior, *Loring* (G); Lake Huron, Aug. 3, 1871, *Macoun 2239* (DH); Whitefish Island, Lake Huron, Aug. 28, 1901, *Macoun 300* (NY); "Lake Region and Ontario," July 29, 1874, *Macoun 1191* (K); damp woods, Lake Nipigon, July 10, 1884, *Macoun* (BM); Salt, July 29, 1891, *Morton* (D); damp soil, Gray (mile 229 of Algoma Central Ry.), June 23, 1921, *Pease 18030* (G); shaded bank, Burnt Rock Pool, Agawa R., June 21, 1921, *Pease 18058* (G); moss-grown fissures of Laurentian rocks along Onaman River, Thunder Bay District, 1912, *Pulling* (G); Minaki, July 25, 1915, *Thompson 31* (M); swamp, New Hanbury, Aug. 14, 1899, *Umbach* (BG, US); vicinity of Fort William, dry banks, Aug. 5, 1912, *Williamson 2090* (ANSP); same locality, July 15, 1869, *Macoun* (K).

MAINE: Penobscot River, 1836, *Bailey* (NY); Katahdin, woods near Mountain, *Blake* (C, F); swamp woods, *Chute* (F); gravelly thicket, Boundary Lake, St. Francis River Valley, Aroostook Co., Aug. 12, 1902, *Eggleston & Fernald* (G); Brookline (Naskeag Point), *Faxon* (G); open woods, Fort Kent, Aug. 4, 1907, *Fellows* (US); moist banks, Aroostook Co., Aug. 25, 1893, *Fernald* (DH); wooded gravelly river-bank, Island Falls, valley of Mattawamkeag, Aroostook Co., Sept. 6, 1897, *Fernald* (G); wooded river-bank, Van Buren, Aroostook Co., Sept. 18, 1900, *Fernald* (G); damp, wooded slope, Hampden, Penobscot Co., Sept. 8, 1916, *Fernald & Long 14392* (ANSP); argillaceous ledges, Old Town, July 27, 1916, *Fernald & Long 14390* (ANSP, F, SM, US); damp, gravelly woods, Houlton, Aroostook Co., Aug. 26, 1897, *Fernald* (G); low woods, Orono, July 29, 1890, *Fernald* (ANSP, NY); moist banks, along St. Johns River, St. Francis, Aug. 25, 1893, *Fernald 87* (ANSP, C, CAS, G, K, NY, M, US); Bangor, *Hallowell* (BB, IAC); in woods on banks of Penobscot, Oldtowne, 1828, *Oakes* (G); banks of the Wassataquoik River, 1847, *Porter* (M); Seven Islands, Township 13, Ranges 14–15, river-bank, July 25, 1917, *St. John & Nichols 2449* (NY, US); banks of Wassataquoik, Aug. 1847, *Thurber* (F, G, NY); roadside ledge, Frenchville, Aug. 12, 1901, *Williams* (G); Ashland, Fort Kent Road, "Winterville," Aug. 9, 1901, *Williams* (G); on Allagash River, at "Eliza Hole," Aroostook Co., July 28, 1900 *Williams* (G); in loam, borders of spruce woods, Portage Lake, Aug. 9, 1901, *Williams, Robinson & Fernald 58* (ANSP, BG, B, CAS, D, DH, F, G, IAC, K, M, NY, SM, UC, US); banks of the Wassataquoik, common on the Penobscot and its tributaries, Aug. 1847, *Young* (G, NY, UC).

NEW HAMPSHIRE: open pastures, Lombard Hill, Colebrook, Coos Co., July 20, 1917, *Fernald & Pease 16624* (G).

VERMONT: Charlotte, July 28, 1881, *Hosford* (US); same locality and collector, Aug. 3, 1879 (C, F, G, IAC, M); same locality and collector, Aug. 13, 1878 (COP, G); sandy woods, Salem Lake, Derby, Sept. 3, 1931, *Pinkerton & Allen* (M); maple woods, West Woodstock, July 30, 1928, *Kittredge* (M).

MASSACHUSETTS: banks of Manhan River, Southampton, 1830, *Chapman* (M, NY).

NEW YORK: Trenton Falls, Aug. 9, 1883, *Haberer* (CAS, US); same locality, Aug. 18, 1902, *Haberer 601* (G, SM); Fairfield, Herkimer Co., *Hadley* (SM); without locality or date, *Hadley 1* (NY); Sylvan Beach, July 20, 1914, *House 5643* (SM); banks of the Hudson River, North Creek, Warren Co., Sept. 29, 1927, *House 15688* (G, SM); Cocheton, Aug. 1, 1887, *Poggenburg* (NY); Trenton Falls, Aug. 18, 1902, *Peck* (SM); Trenton Falls, Aug. 29, 1868, *Schaffer* (ANSP); Cocheton, July 1887, *Schrenk* (NY, SM).

MICHIGAN: St. Helena Island in northern Lake Michigan, July 19, 1886, *Arnold* (BB); Mackinac, July 17, 1881, *Boyce* (IAC); without locality, Aug. 28, 1892, *Dodge 352* (?) (M); near Port Huron, Aug. 16, 1892, *Dodge* (BB, F, G, US); same locality, Aug. 16, 1895, *Dodge* (US); Keweenaw Co., July 4, 1888, *Farwell 249* (UC); low grounds, Keweenaw Co., Aug. 1890, *Farwell 770* (G); Big Stone Bay, Emmet Co., piney-aspen woods, July 31, 1925, *Gates 14156* (S); weeds in trail in *Thuja* bog, Reese's, Douglas Lake, Cheboygan Co., June–Aug. 1917, *Gates & Gates 10716* (F, M); same locality, Aug. 12, 1916, *Gates & Gates 9768* (BB); Cedar Swamp, Boyne Falls, July 27, 1878, *Hill 179* (F); Isle Royale, July 21, 1889, *Holway* (IAC, NY); Cedar Swamp, Cheboygan, Aug. 20, 1890, *Kofoed* (G, M); moist soil in wet places, Grayling, July 28, 30, 1903, *Mell & Knopf* (M); Mackinac Island, July 28, 29, 1898, *Millspaugh 82* (F); Lake Superior, *Parry* (NY); Mackinac Island, 1888, *Puckner* (CAS); on Isle Royale and south shore of Lake Superior, Keweenaw Point, 1862, *Robbins 102*

(G, M); Keweenaw Point, 1863, *Robbins 95* (MU); without locality, Aug. 1887, *Root* (F); Chandler's Falls of the Escanaba River, Aug. 27, 1892, *Wheeler* (US); Thunder Bay Island, July 18, 1895, *Wheeler* (US); same locality and collector, Aug. 12, 1895 (NY); Harbor Springs, Aug. 10, 1890, *Wheeler* (F); Isle Royale, woods, mainland, Aug. 15-16, 1912, *Williamson 2218* (ANSP).

WISCONSIN: Pike River Falls, sandy pine woods, Aug. 18, 1884, *Hasse* (ANSP, NY); Menominee River banks, July 1892, *Schuetz* (F); Lake Superior, Aug. 23, 1893, *Harper* (M); Minah R., Door Co., July 27, 28, 29, 31, 1887, *Schuetz* (F, G, K, NY, US); Europe Lake, Ellison Bay, Door Co., July 18, 1918, *Stanton 19* (M); Cato Rapids, 1874, *Swezey 17* (US).

ILLINOIS: Grand Detour, *Porter* (BB); same locality, Aug. 5, 1865, *Smith* (ANSP); same locality, Aug. 5, 1866, *Smith 5026* (BB).

MINNESOTA: pine woods, Lake Itaska, July 1891, *Aiton* (BB, NY, US); Benedict, Norway-Jack pine forest, July 10, 1914, *Bergman 2948* (NY); dry pine lands, Itaska Co., Aug. 1891, *Burglehaus* (M); Duluth, July 11, 1877, *Hall* (BB); Grand Marais, shore of the Bay and Lighthouse Point, Lake Superior, Aug. 9, 1920, *Rydberg 9619* (NY); Lake Itaska, pine woods, July 1891, *Sandberg* (CAS, F); Two Harbors, July 1, 1891, *Sandberg 457* (US); Grand Rapids, Aug. 6, 1891, *Sandberg 719* (US); woods and shores, Lake Co., shady woods, Itaska Lake, *Sandberg 1151* (F, US); Duluth, 1887, *Vasey* (US); north shore, Lake Superior, 1890, *Wheeler & Jones 1054* (G); Fond du Lac, July 19, 1889, *Woods* (US).

SOUTH DAKOTA: slate schist, under willows, North Rapid Ranger Station, alt. 1400 m., Black Hills National Forest, July 12, 1908, *Murdock 3072* (F, G, NY); woods south of Box Elder Creek, Lawrence Co., Aug. 3, 1924, *Over 16145* (US); Custer, alt. 1375 m., Aug. 15, 1892, *Rydberg 878* (NY, US); Nashy, Black Hills, July 25, 1912, *Visher 1557* (NY).

SASKATCHEWAN: 1857-8, Palliser's Brit. N. Am. Exped., *Bourgeau* (BG, G); Cumberland House Fort, *Drummond* (G, K).

MONTANA: Columbia Falls, *Mrs. J. J. Kennedy 38* (NY); same locality, July 17, 1892, *Williams 903* (C, NY, US).

ALBERTA: Rocky Mt. House, forest floor, open, Nordegg Distr., Sept. 24, 1928, *Brinkman 3678* (NY).

BRITISH COLUMBIA: Kicking Horse Valley, near Field, alt. 1000 m., July 21, 1906, *Brown 667* (ANSP, G, NY, US); Field, July 14, 1904, *Farr* (K); same locality, Aug. 18, 1909, *Olson* (G); between Field and Emerald Lake, Aug. 20, 1904, *Macoun 68734* (?) (NY); Ottertail, July 13, 1904, *Williamson* (ANSP).

CANADA WITHOUT LOCALITY: 1838, *Franklin & Douglas* (DH); "foret près de Fort Ellice" (rare), Aug. 26, 1857, *Bourgeau* (K); "Terra Hudsonica," 1837, *Grisebach* (BG); June 1849, *Leston* (DH); *MacNab* (K); 1869, *Macoun 77* (US); *Percival* (ANSP).

MEXICO: Très Marias Mts., alt. 2375 m., Morelos, Dec. 16, 1907, *Pringle 13971* (US); Rincón, alt. 2300 m., Morelia, April 1909, *Arsène 37* (US).

The Rothrock specimen listed from Labrador is from an early collection made before the Canadian boundaries were permanently established. No definite locality is given, and it is probable that Labrador is incorrect and that the plant actually came from a point further south. This is the case of the specimen collected

by Macfarlane and that by Martin as well, both, according to the label, from Caribou Island, Labrador. Caribou Island is now included in Nova Scotia. For this reason, it is doubtful if the area of distribution of the species proper extends as far north as Labrador.

23a. *H. deflexa* var. *Brentoniana* Gray, Syn. Fl. N. Am. ed. 2, 2¹: 127. 1886.

Halenia Brentoniana Griseb. Gen. & Sp. Gent. 325. 1839; Dietrich, Syn. Pl. 2: 918. 1840; Hook. Fl. Bor.-Am. 2: 67. pl. 156. 1840.

Tetragonanthus deflexus var. *Brentonianus* Britt. in Mem. Torr. Bot. Club 5: 261. 1894; Britt. & Brown, Ill. Fl. 3: 15. 1913.

T. Brentonianus Heller, Cat. N. Am. Pl. 6. 1898; Muhlenbergia 1: 2. 1900.

Low plant, 0.3–1.5 dm. high; stem erect, much branched, nodes more approximate than in the species; leaves 3–5-nerved, the radical leaves similar to species, upper subsessile, oblong-lanceolate; inflorescence a 3-flowered cyme with the center flowers on long pedicels; corolla purple, .8–1.0 cm. long, tube .3–.5 cm. long; corolla-lobes ovate, acuminate, delicately veined, papillate; spurs broad or slender and subhorizontal; calyx .5–.7 cm. long, segments elliptical, acuminate, 3-veined, papillate; stamens approximately .2 cm. long; anthers broadly ovate; filaments linear.

Distribution: Labrador, southward to Nova Scotia and Quebec.

Specimens examined:

LABRADOR: Red Bay, Sept. 7, 1891, *Bowdoin College* 290 (G); on the gneiss plain, in sand, Blanc Sablon, Str. Belle Isle, July 30, 1910, *Fernald & Wiegand* 3909 (G, K, NY); damp sand, Forteau, Belle Isle, July 30, 1910, *Fernald, Wiegand & Kittredge* 3910 (G); 1842, *Loring* (G); Battle Harbor, July 5, 1926, *Sewall & Weed* (F); Aug. 10, 1895, *Stearns* (US); hills, Forteau, Aug. 8, 1893, *Waghorne* (G, M, US); Battle Harbor, Aug. 6, 1913, *Williamson* 559 (ANSP, NY); same locality, *Williamson* 547 (ANSP, NY); on dry sandy hillside, under 100 m., Cartwright, Sandwich Bay, July 31, 1926, *Woodworth* 357 (G).

NEWFOUNDLAND: "lieux humides où secs et découverts à près du Pain de Suève, St. Pierre," Aug. 19, 1901, *Louis-Arsène* 365 (NY); "lieux humides où secs, découverts où boisés, mais plus généralement sans les bois où sous les buissons, St. Pierre, Pain de Suève," Aug. 26, 1901, *Louis-Arsène* 403 (G); 1776, *Banks* (BM); without locality or date, *Brenton* 144a? (K); Bay St. George, dry sandy field along shore, Aug. 12, 1908, *Eames & Godfrey* 8030 (ANSP, G, K); turf slopes of slaty hills, Little Quirpon, Quirpon Harbor, Aug. 6, 1925, *Fernald & Long* 23950 (G, UC); boggy limestone barrens, Capstan Point, Flower Cove, Str. Belle Isle, July 28, 1924, *Fernald, Long*

& Dunbar 26982 (G); turf limestone shore, sandy cove, Ingornachoix Bay, Aug. 9, 1924, *Fernald, Long & Dunbar 26983* (G, K); dry peaty barren, near Biscay Bay, Avalon Peninsula, Aug. 16, 1924, *Fernald, Long & Dunbar 26984* (G); by rills on seepy silicious slope of Joan Hill, Bay Bulls, Avalon Peninsula, Aug. 21, 1924, *Fernald, Long & Dunbar 26985* (G); in turf on granite ledges, Gaultois southern coast, Aug. 29, 1924, *Fernald, Long & Dunbar 26986* (G); peaty and gravelly open slopes, French or Tweed Island, Bay of Islands, Sept. 2, 1926, *Fernald, Long & Fogg 381* (G); wet moss and peat on gneiss hills near sand bank west of Burges, Distr. of Burges and LaPoile, Sept. 9, 1926, *Fernald, Long & Fogg 382* (G); grassy fields overlying conglomerate limestones and calcareous sandstones, Cowhead, Silurian coastal region north of St. Paul's Bay, July 22, 1910, *Fernald & Wiegand 3908* (G, US); wet mossy, turf slopes of sandstone and arenaceous slate hills back of Carbonear, shores of Conception Bay, Avalon Peninsula, Aug. 6, 7, 1911, *Fernald & Wiegand 6081* (ANSP, BG, G, K, NY, UC); damp sandy shores, St. Georges, Aug. 13, 1910, *Fernald, Wiegand & Kittredge 3912* (G); springy swale and turf upper border of strand, Anse aux Sauvages, Pistolet Bay, Aug. 11, 1925, *Fernald, Wiegand & Long 28951* (G); wet soil, top of exposed cliff, Belle Isle, Sept. 16, 1901, *Howe* (F); same locality, *Howe & Lang 1298, 1403* (G, NY); Port à Port, hillside on Cape St. George, 2 miles west, July 29, 1921, *Mackenzie & Griscom 10411* (G); Green Gardens, Cape St. George, July 25, 1922, *Mackenzie & Griscom 11135* (G); without locality, *Morison* (K); barrens, Flower Cove, Aug. 10, 1920, *Priest* (G); rocky hills, St. Johns, Aug. 1-19, 1894, *Robinson & Schrenk 180* (ANSP, BG, C, DH, G, K, NY, M, US); Barren Islands, Aug. 20, 1903, *Sornborger* (G, NY, US); Salmonier, Aug. 1885, *Thaxter* (G); dry turf, roadside, Old Perlican, Trinity Bay, Aug. 5, 1914, *Torrey 35* (G); Harbor Grace, Aug. 6, 1911, *Williamson 501* (ANSP); same locality, July 1, 1911, *Williamson 601* (NY).

NOVA SCOTIA: damp soil of sea bluffs, Torbay, Aug. 22, 1901, *Howe* (F); exposed grassy seabuff, Money Point, Cape North, Cape Breton Island, Sept. 3, 1916, *Nichols 1901* (G); Grand Etang, Cape Breton, on exposed headland, Aug. 14, 1906, *Robinson 410* (NY).

QUEBEC: "sur les hauteurs des coteaux: Ile du Havre-aux-Maisons. Iles de la Madeleine," Aug. 14, 1919, *Marie-Victorin & Rolland-Germain 9647* (F, G); "Cap-aux-Meules, Ile de l'Etang-du-Nord. Iles de la Madeleine," Aug. 11, 1919, *Marie-Victorin & Rolland-Germain 9881* (G); "Natashquan: Ile à Charles, à l'entrée du Havre; sur le gneiss laurentien, Gulf St. Laurent," July 20, 1924, *Marie-Victorin & Rolland-Germain 18482* (ANSP, G); "Ile Kécarponi, Archipel de Kécarpoui, turf shore, Labrador Peninsula, Saguenay Co.," Aug. 11, 1915, *St. John 90687* (G); Natashquan River, Saguenay Co., July 24-Aug. 10, 1912, *Townsend* (G).

CANADA WITHOUT LOCALITY: 1828, *Despaux* (DH).

24. *H. rhyacophila*⁵² Allen, n. sp.

Perennial with one to several erect floriferous stems, 2.5-6 dm. high, somewhat branched, slightly winged, internodes extremely

⁵² *H. rhyacophila* Allen, sp. nov.—Perennis, caulibus 1-multis, erectis, floriferis, 2.5-6 dm. altis, aliquid ramosis, parvulum alatis; internodiis inferioribus, brevissimis (.5-2 cm.); ramis brevibus sterilibus foliosis radice saepe ascendentibus; foliis basilibus saepe in rosula densa, lanceolatis usque ellipticis, acutis, in petiolis longis attenuatis, 3-5-nerviis, medio-nervo prominenti, marginibus plus minusve undulatis,

short (.5–2 cm.) on lower portion of stem; short sterile leafy branches frequently arising from the root-stalk; basal leaves often in a dense rosette, lanceolate to elliptic, about 7 cm. long, acute, attenuate into long petioles, 3–5-nerved, with prominent midvein, margins more or less undulate; cauline leaves linear to linear-lanceolate, sessile or subsessile, acute, 1.5–3.5 cm. long; inflorescence pedunculate, terminal or axillary, loose, open, racemose, cymose, frequently of spike-like appearance; calyx .55–.9 cm. long, one-half to nearly three-fourths the length of the corolla; lobes 3-nerved, lanceolate, more or less attenuately acute, papillate; corolla .7–1.5 cm. long, .5–.8 cm. broad, tube one-third or less the length of the entire corolla; corolla-lobes oval to ovate or obovate, acute to acuminate, margin crisped, usually papillate; spurs one-fourth to one-third the length of the entire corolla, slightly ascending; stamens .3–.5 cm. long; anthers oblong to oval; filaments linear; capsule broadly lanceolate, up to 1.5 cm. long; seeds elliptical, granular, brownish.

Distribution: known only from Costa Rica.

Specimens examined:

COSTA RICA: Potrero del Alto, Volcan Poas, alt. 2461 m., Aug. 31, 1890, *Pittier 2975* (US); same locality, Aug. 1896, *Tonduz 10865* (US); *Pittier & Tonduz 10805* (B); "région supérieure du Cerro de Buena Vista," alt. 3000 m., Jan. 1891, *Pittier 3499* (B); "près du sommet del'Irazu," alt. 3000 m., July 10, 1891, *Tonduz 4316* (B); "près du sommet de les pelouses," Dec. 12, 1888, *Pittier 744* (B); Volcan Irazu, Dec. 31, 1910, *Cristan* (US); same locality, alt. 2275 m., 1923, *Lankester 670* (US); same locality, Aug. 4–5, 1920, *Rovlee & Stork 899* (NY, US); same locality, alt. 2250 m., March 1894, *Smith 4888* (F, G, US); same locality, alt. 2500 m., June 25, 1874, *Kuntze 2356* (K, NY); same locality, 1845–8, *Oersted 10772* (UC); in monte Reventado, alt. 2250 m., 1845–8, *Oersted 10773* (UC); *Warscewicz 216* (BG).

Pittier 2975 and *Oersted 10772*, *10773* are not typical, since it is evident that the main axis has been broken, resulting in the

ca. 7 cm. longis; foliis caulinis linearibus vel lineari-lanceolatis, sessilibus subsessilibusve, acutis, 1.5–3.5 cm. longis; inflorescentia terminali axillari, laxa, pedunculata, racemosa, cymosa, saepe spicata; calyce .55–.9 cm. longo, $\frac{1}{2}$ usque ad ca. $\frac{3}{4}$ corollae longitudini adaequanti; lobis trinerviis, lanceolatis, plus minusve attenuate acutis, papillatis; corolla .7–1.5 cm. longa, .5–.8 cm. lata, tubo $\frac{1}{3}$ vel minus totae corollae longitudini adaequanti; corollae lobis ovalibus usque ovatis vel obovatis, acutis usque acuminatis, plerumque papillatis, margine crispo; calcaribus $\frac{1}{4}$ usque ad $\frac{1}{3}$ corollae longitudini adaequantibus, parvulum ascendentibus; staminibus .3–.5 cm. longis; antheris oblongis vel ovalibus; filamentis linearibus; capsula late lanceolata, usque ad 1.5 cm. longa; seminibus ellipticis, fulvis, granosis.—COSTA RICA: Potrero del Alto, Volcan du Poas, alt. 2461 m., Aug. 31, 1890, *Pittier 2975* (US TYPE).

formation of short stunted floral branches. Specimens collected by Friedrichstahl, now preserved at Kew and Geneva, are also possibly abnormal plants of *H. rhyacophila*.

24a. *H. rhyacophila* var. *procumbens*⁵³ Allen, n. var.

Stems 1-several, decumbent, the central larger, bearing most of the flowers; basal leaves few; foliose branches with very short internodes, sterile or bearing few flowers at tip; inflorescence erect, more or less strict and spike-like, many-flowered, similar to that of species; corolla greenish-white.

Distribution: Costa Rica.

Specimens examined:

COSTA RICA: wet thickets on the southern slopes of Volcan de Turrialba, near the Finca del Volcan de Turrialba, alt. 2000-2400 m., Feb. 22, 1924, *Standley 35285* (US TYPE).

The generally procumbent appearance of this specimen may be due to the fact that it was found growing in wet thickets.

24b. *H. rhyacophila* var. *macropoda*⁵⁴ Allen, n. var.

Stems 1-several, slightly branching, nodes remote; sterile branches frequently short, leafy, with short internodes; basal leaves few, lanceolate-elliptic, extremely acuminate, with long narrow petioles, 3-nerved; upper leaves broadly lanceolate, acuminate; inflorescence a loose racemose cyme; flowers usually borne on very long slender pedicels, more or less pendulous; corolla greenish-white; seeds oblong-ovoid, granular, wrinkled, yellow-brown. In other respects similar to species.

⁵³ *H. rhyacophila* var. *procumbens* Allen, var. nov.—Caulibus 1-compluribus, decumbentibus, centrali majori paucos flores gerenti foliis basalibus paucis; ramis foliosis, internodiis brevissimis, sterilibus vel summo paucos flores gerentibus; inflorescentia simile speciei, erecta, plus minusve stricta, spicata, multo-florifera; corolla viridi-candida.—COSTA RICA: wet thickets on the southern slopes of Volcan de Turrialba, near the Finca del Volcan de Turrialba, alt. 2000-2400 m., Feb. 22, 1924, *Standley 35285* (US TYPE).

⁵⁴ *H. rhyacophila* var. *macropoda* Allen, var. nov.—Caulibus 1-compluribus, parvulum ramosis, nodiis remotis; ramis saepe brevibus, foliosis, sterilibus, internodiis brevibus; foliis basalibus paucis, lanceolato-ellipticis, acuminatissimis, petiolis longis, angustis, 3-nerviis; foliis superioribus late lanceolatis, acuminatis; inflorescentia laxa, racemoso-cymosa; floribus plerumque pedicellis longissimis tenuibus, plus minusve pendentibus; corolla viridi-candida; seminibus oblongo-ovatis, granosis, rugosis, flavo-fulvis.—COSTA RICA: Volcan Poas, alt. 2678 m., Jan. 30, 1922, *Greenman & Greenman 5994* (M TYPE).

Distribution: Costa Rica.

Specimens examined:

COSTA RICA: common in wet forests on the southern slope of Volcan de Turrialba, near the Finca del Volcan de Turrialba, alt. 2000–2400 m., Feb. 22, 1924, *Standley 35141* (US); upper regions of the Volcan de Turrialba, alt. 2500–3400 m., Jan. 1, 1899, *Pittier 13076* (US); Volcan Poas, alt. 2678 m., Jan. 30, 1922, *Greenman & Greenman 5994* (M TYPE); lava fields, Irazu, 1854–55, *Hoffmann 119* (BG).

The last specimen cited from Mount Poas is more rigid than those from Turrialba, and the inflorescence is more open, but there is no doubt that it is the variety.

25. *H. Palmeri* Gray in Proc. Am. Acad. 21: 401. 1886.

Tetragonanthus Palmeri Kuntze, Rev. Gen. Pl. 2: 431. 1891.

Plant about 3–5 dm. high; stems simple or branched, striate; cauline leaves linear, sessile, faintly 3-nerved; lower leaves lanceolate, faintly 3-nerved, obtuse; inflorescence thyrsoïd, many-flowered; calyx-segments .4–1.2 cm. long, lanceolate, acute, 3-nerved, midrib prominent, margin papillate; corolla 1–2.2 cm. long, yellow, tube .7–1.0 cm. long; corolla-lobes broadly ovate, acute, slightly auriculate, papillate; spurs tapering, incurved, $\frac{1}{4}$ the length of the entire corolla; anthers oblong; filaments linear, slightly uncinate; capsule about 15 cm. long, lanceolate, attenuate, subfalcate; seeds globose, dark brown, granular.

Distribution: mountains of northern and central Mexico.

Specimens examined:

MEXICO:

CHIHUAHUA: sixty miles south of Guadalupe y Calvo, Sierra Madres, alt. 1875–2125 m., Aug. 1898, *Nelson 4798* (K, US); Sierra Madres, near Colonia Garcia, alt. 1875 m., Sept. 4, 1899, *Townsend & Barber 303* (BG, BM, DH, F, G, M, NY, US); Marsh Lake, alt. 1750 m., Sept. 19, 1903, *Jones* (BM, D, M, US); without locality, Aug.–Nov. 1885, *Palmer 359* (ANSP, BM, G, IAC, K, NY, US).

DURANGO: without locality and date, *Garcia 410* (US).

26. *H. Conzattii* Greenm. in Publ. Field Mus. Bot. 2: 335. 1912; Briq. in Candollea 4: 318. 1931.

Erect branching herb, 2.5–3.7 dm. high; stem terete or angular, rather coarse; leaves sessile, lanceolate, ovate, subacute, 1–4 cm. long, 0.5–1 cm. broad, 3-nerved; basal leaves ovate-elliptic with petioles nearly equalling the blade; inflorescence terminal or seemingly axillary, but actually terminal on short branches less than 1 cm. long, pedicels up to nearly 2 cm. long; calyx-segments spatulate, 3-nerved, papillate; corolla .8–1.2 cm. long, .4–.65 cm.

broad, green or yellow-green; lobes .3-.5 cm. long, ovate, acute, papillate; spurs slender, incurved, .2 cm. long; stamens .2-.5 cm. long; anthers broadly ovate; filaments linear; capsule 1.1-1.8 cm. long, lanceolate, subfalcate; seeds globose-ovoid, yellow-brown, granular.

Distribution: State of Oaxaca, Mexico.

Specimens examined:

OAXACA: Sierra de San Felipe, alt. 2500 m., Sept. 15, 1894, *Pringle 4908* (ANSP, BG, CAS, D, DH, G, IAC, K, M, NY, US, V); Cerro San Felipe, alt. 2375-2750 m., 1894, *Nelson 1115* (G, US); same locality and date, *Nelson 1164* (US); same locality, alt. 2000 m., Sept. 20, 1908, *Conzatti 2295* (F); same locality, alt. 2500 m., Sept. 1, 1894, *Smith 236* (M); 18 miles southwest of the city of Oaxaca, alt. 1875-2375 m., Sept. 10-20, 1894, *Nelson 1340* (US); cerro Grande de Huancillila, distrito de Nochistlan, alt. 2520 m., Oct. 13, 1921, *Conzatti 4265* (US); Cumbre de Ixtepec, 1842, *Liebmann 10771* (UC); Mont Tanga, 2000 m., 184-, *Galeotti 1489* (B).

MEXICO, WITHOUT LOCALITY: *Jurgensen 812* (DH, K).

27. *H. Schiedeana* (Schl. & Cham.) Griseb. Gen. & Sp. Gent. 327. 1839; DC. Prodr. 9: 130. 1845; Hemsl. Biol. Cent.-Am. Bot. 2: 353. 1882.

Swertia Michauxiana Schl. & Cham. in Linnaea 5: 122. 1830, excl. syn.

Tetragonanthus Schiedeanus Kuntze, Rev. Gen. Pl. 2: 431. 1891.

Halenia chlorantha Greenm. in Proc. Am. Acad. 41: 240. 1905.

Annual, 2-6.5 dm. high; stems erect, simple below, frequently branched above, narrowly winged; basal leaves ovate, 2 cm. long, 1.5 cm. broad, length of petioles equalling that of blade, gradually decreasing toward the summit; cauline leaves petiolate, ovate to broadly lanceolate, 3-6 cm. long, 1.5-2 cm. broad, 3-5-nerved, acute; inflorescence terminating the stem and branches in several-flowered cymose clusters; pedicels erect, 1.5 cm. or less in length; calyx-segments lanceolate-elliptic, conspicuously papillate, approximately .5 cm. long, 3-nerved, lateral veins near the margin, usually strongly reflexed; corolla .8-1.1 cm. long, greenish; tube nearly equalling the obovate abruptly acuminate papillate lobes; spurs .2-.3 cm. long, tapering, tips glandular, nearly parallel with the tube, slightly incurved; stamens .2 cm. long; filaments linear; capsule oblong, subfalcate, 1.2 cm. long; seeds globose, yellow-brown, granular.

Distribution: wet woods of Central Mexico.

Specimens examined:

MEXICO: Cerro de Colorado, Aug. 1828-9, *Schiede & Deppe 248* (BG TYPE).

HIDALGO: wet woods near Trinidad Iron Works, alt. 1425 m., July 11, 1904, *Pringle 8939* (ANSP, BG, BM, C TYPE of *H. chlorantha*, CAS, DH, K, M, NY, S, UC, US, V).

VERA CRUZ: Chiconguiaco, Sierra Madre, Aug. 1912, *Purpus 6011* (CAS).

28. *H. caleoides*⁵⁵ Allen, n. sp.

Perennial with thick leafy angled, more or less decumbent stem, bearing short leafy branches at central nodes and more elongate floral branches above; leaves conspicuously decurrent on stem; lower cauline leaves about 12 cm. long, lanceolate-elliptic, acute, 3-nerved; midvein prominent, attenuate into broad petiole about 2.5 cm. long; upper cauline leaves subsessile or very slightly petiolate, lanceolate, acute, 3-nerved; inflorescence a subumbellate axillary or terminal cyme; flowers on angled, rather pendulous peduncles, less than 2 cm. long; calyx about equalling the corolla; segments lanceolate, acuminate, reticulately veined at tip, papillate; corolla about 1.2 cm. long, greenish, tube about equalling the lobes; lobes broadly triangular, apiculate, papillate, margin crisped; spurs pendulous, shorter than the corolla; anthers ovate-oblong, filaments linear; capsule immature.

Distribution: Guatemala.

Specimens examined:

GUATEMALA: vicinity of Agua, alt. 2700-3000 m., March 22, 1905, *Maxon & Hay 3675* (US TYPE); "wasservulcan bei Santa Maria," alt. 3000-4000 m., *Scherzer* (V).

29. *H. platyphylla*⁵⁶ Allen, n. sp.

⁵⁵ *H. caleoides* Allen, sp. nov.—Perennis, caule crasso, folioso, angulato, plus minusve decumbenti, centralibus nodis ramos breves foliosos, et supra ramos elongatiores floriferos gerenti; foliis conspicue decurrentibus; foliis inferioribus caulinis ca. 12 cm. longis, lanceolato-ellipticis, acutis, 3-nerviis, medio-nervo prominente, in petiolis latis attenuatis, ca. 2.5 cm. longis; foliis superioribus caulinis subsessilibus vel parvulum petiolatis, lanceolatis, acutis, 3-nerviis; inflorescentia cymosa, subumbellata, axillari terminalive; floribus in pedunculis angulatis, aliquam pendentibus, minusquam 2 cm. longis; calyce corollae subaequantis, segmentibus lanceolatis, acuminatis, summo reticulato-nerviis, papillatis; corolla ca. 1.2 cm. longa, viride; tubo lobis subaequantis; lobis late triangularibus, apiculatis, papillatis, margine crispo; calcaribus pendulis, corolla brevioribus; antheris ovato-oblongis, filamentis linearibus; capsula immatura.—GUATEMALA: vicinity of Agua, alt. 2700-3000 m., March 22, 1905, *Maxon & Hay 3675* (US TYPE).

⁵⁶ *H. platyphylla* Allen, sp. nov.—Perennis erectus, ca. 3.5 dm. altus, 1-2 caulibus floriferis globo denso foliorum basalium in verticillis in caulibus brevibus caespitosis

Erect perennial, about 3.5 dm. high; 1-2 flowering stems, arising from a dense bushy rosette of basal leaves borne in whorls on short caespitose sterile stems springing from a heavy ligneous root; stems narrowly winged, more or less erect; basal leaves elliptic to lanceolate, petioles persistent, longer than blade, acuminate, prominently 3-nerved; 1-several pairs of cauline leaves, the upper subtending 1-2 flowers, with increasingly shorter petioles the more remote the nodes from the base; inflorescence usually a terminal subumbellate cyme, with pedicels of varying length up to 2 cm.; calyx foliaceous, oblanceolate-ovate, acuminate, two-thirds to three-fourths the length of the corolla, margin crisped, 3-nerved, reticulate at tip, papillate; corolla 1.3 cm. long, tube about one-half the length of the entire corolla; lobes ovate, margins more or less crisped, acute; slender spurs, about one-third the length of the corolla, tips incurved and pendulous; filaments linear; capsule lanceolate; seeds immature.

Distribution: known only from the type locality.

Specimens examined:

GUATEMALA: Volcan de Agua, Dept. Zacatepequez, alt. 2875 m., April 1890, *Smith 2170* (G TYPE, US).

30. *H. nudicaulis* Mart. & Gal. in Bull. Acad. Brux. 11¹: 371. 1844; Hemsl. Biol. Cent.-Am. Bot. 2: 352. 1882.

Halenia Purpusi Brandegees, Zoe 5: 235. 1906.

Halenia scapiformis Briq. in Candollea 4: 322. 1931.

Perennial, 1.4-3 dm. high, often branched from or near the base; root ligneous; stem angled; radical leaves elliptic to lanceolate, 2-10 cm. long, attenuate into a long persistent petiole,

sterilibus gestorum ascendentibus, ex radice crasso ligneo aptis; caulibus anguste alatis, plus minusve erectis; foliis basalibus ellipticis usque lanceolatis, petiolis persistentibus, longioribus quam lamina, acuminatis, prominente trinerviis, 1-pluribus geminis foliorum caulinorum, superioribus 1-2 flores subtendentibus, petiolis deinceps brevioribus remotioribus a basi nodiis; inflorescentia plerumque terminali, subumbellata, cymosa, pedicellis usque 2 cm. longis; calyce folioso, oblanceolato-ovato, acuminato, $\frac{2}{3}$ usque $\frac{3}{4}$ corollae longitudini adaequanti, margine crispo, ad apicem 3-nerviis, reticulatis, papillatis; corolla 1.3 cm. longa, tubo $\frac{1}{2}$ totae corollae longitudini adaequanti; lobis ovatis, marginibus plus minusve crispis, acutis; calcaribus tenuibus, acuminis incurvatis pendentibusque, circa $\frac{1}{3}$ corollae longitudini adaequantibus; filamentis linearibus; capsula lanceolata; seminibus immaturis.—GUATEMALA: Volcan de Agua, Dept. Zacatepequez, alt. 2875 m., April 1890, *J. D. Smith 2170* (G TYPE, US).

3-nerved, midvein prominent; cauline leaves linear to broadly elliptic, 1-2 pairs, more or less reduced; inflorescence cymose, 4-6 terminal or axillary flowers on pedicels .2-1.5 cm. long; calyx-segments oblong, .2-.5 cm. long, 3-nerved, acute to abruptly acuminate; corolla .7-1 cm. long, white, tube .25-.4 cm. long, with minute protuberances or reduced, apparently glandular, incurved spurs about midway up the tube; corolla-lobes ovate-oblong, often mucronate; stamens approximately .2 cm. long, uncinat; stigmatic surfaces reflexed; capsule lanceolate, exserted, slightly curved; seeds globose, brown, granular.

Distribution: subalpine meadows of southern Mexico.

Specimens examined:

VERA CRUZ: Mt. Orizaba, alt. 2500 m., July 1841, *Liebmann 10778* (BG, UC); same locality, alt. 2500-2750 m., Aug. 1840, *Galeotti 7220* (B TYPE, DH, V).

PUEBLA: Chinanthe, alt. 1750-2000 m., May 1841, *Liebmann 10776* (BG, UC); same locality, 1841-3, *Liebmann* (NY).

MEXICO: Ixtaccihuatl, Oct. 1905, *Purpus 1760* (BG, CAS, F, G, M, US); Popocatepetl, Sept. 1908, *Purpus 3070* (BG, BM, CAS, DH, F, G, M, NY, US); Lecima, Sierra de Ajusco, Aug. 18, 1896, *Harshberger 137* pp. (ANSP).

OAXACA: Mont Tanga, alt. 2000-2250 m., July 1840, *Galeotti 1488* (B, DH); near Reyes, alt. 1875-2600 m., Oct. 17, 1894, *Nelson 1748* (US); vicinity of Cerro San Felipe, alt. 2375-2750 m., 1894, *Nelson 1096* (G, US); northwest summit of Mt. Zempoaltepec, alt. 2500-2750 m., July 5-13, 1894, *Nelson 652* (US); same locality, alt. 2850 m., *Nelson 636* pp. (US).

SOUTH MEXICO: without locality: *Liebmann 10774* (UC); *Ehrenberg 608* (BG); Sierra San Pedro Nolasco, 1843-4, *Jurgensen 811* (DH, K).

31. *H. plantaginea* (HBK.) Griseb. Gen. & Sp. Gent. 327. 1839; Dietrich, Syn. Pl. 2: 918. 1840; Griseb. in DC. Prodr. 9: 130. 1845; Wedd. Chlor. And. 2: 75. 1859; Hemsl. Biol. Cent.-Am. Bot. 2: 352. 1882; Conzatti, Fl. Syn. Mex. 174. 1897.

Swertia plantaginea HBK. Nov. Gen. & Sp. Pl. 3: 175. 1818; Kunth, Syn. Pl. 2: 266. 1823.

Halenia elongata D. Don ex G. Don, Gen. Hist. 4: 177. 1838.

H. nutans Mart. & Gal. in Bull. Acad. Brux. 11¹: 371. 1844.

Tetragonanthus plantagineus Kuntze, Rev. Gen. Pl. 2: 431. 1891.

Perennial, 1.5-3.5 dm. high; stems 1-many, narrowly winged, erect, simple below, frequently bearing short floriferous branches above; basal leaves numerous, in a rosette, lanceolate, elliptic to ovate, 3-nerved, 2-5 cm. long, .5-1 cm. broad, obtuse to acute,

or apiculate, petioles persistent; cauline leaves 1–2 pairs, sessile, linear to lanceolate, 2–3 cm. long, the upper usually subtending floriferous branches; inflorescence a terminal or axillary cyme, individual floral clusters of varying density, pedicels slender, slightly curved, .5–2.2 cm. long; calyx-segments lanceolate-elliptic, acute to abruptly acuminate, papillate, one-third to one-half the length of the corolla, 3-nerved; corolla yellow, campanulate, extremely narrowed at the base, 1–1.5 cm. long, tube not quite equalling the lobes; lobes ovate, obtuse to acute; spurs extremely slender, appressed, incurved at tip, one-third to one-half the length of the entire corolla; filaments linear; anthers ovate; capsule elliptical, subfalcate, 1.5–1.8 cm. long, .5 cm. broad; seeds subglobose, brown, granular.

Distribution: mountains of Mexico.

Specimens examined:

VERA CRUZ: pine forests, Citlaltepēt, alt. 2750–3000 m., Sept. 1907, *Purpus 2766* (BG, BM, CAS, F, G, M, NY, US); Mt. Orizaba, alt. 3250 m., Sept. 1841, *Liebmann 10780* (UC); same locality, July 25–26, 1901, *Rose & Hay 5730* (US); same locality, Sept. 28, 1828, *Schiede & Deppe 246* (BG, BM, M, V); same locality, Aug. 6, 1891, *Seaton 205* (C, G, NY, US); same locality, *Galeotti 7222* (B TYPE of *H. nutans*, V).

OAXACA: "in summo monte San Felipe," July, April 1834, *Andrieux 226* (DH, G, K, V).

HIDALGO: Sierra de Pachuca, July 21–22, 1901, *Rose & Hay 5569* (US); same locality, alt. 2500 m., Aug. 22, 1902, *Pringle 11033* (BG, F, G, K, M, NY, US); between Pachuca and Real del Monte, Aug. 31, 1903, *Rose & Painter 6665* (G, US); Real del Monte, *Coulter 939* (BM, G, K, NY).

MEXICO: Monte de Rio Frio, road from Mexico City to Pueblo, alt. 4000 m., July 31, 1929, *Mexia 2693* (US, M).

MICHOACAN: "In monte Jorullo," alt. 3000 m., *Humboldt & Bonpland* (BG TYPE of *Swertia plantaginea*).

SOUTH MEXICO, WITHOUT LOCALITY: *D. Don* (K TYPE of *H. elongata*); coll. of 1845, *Woefflin* (NY); *Wawra 424, 952* (V); coll. of 1830, *Karwinsky 122* (V).

31a. *H. plantaginea* f. *grandiflora*⁵⁷ Allen, n. forma.

Similar to species, but a larger more sturdy plant with heavier root system, frequently more than 6 stems, usually branched

⁵⁷ *H. plantaginea* f. *grandiflora* Allen, forma nov.—Similis speciei, sed herba major, robustior, radice crassiori, caulibus saepe plusquam sex, plerumque supra ramosis; foliis basalibus multis, petiolis longis, tenuibus, persistentibus, plerumque lanceolatis, 3–5-nerviis, obtusis acutisve; inflorescentia multo-florifera plerumque densiori majorive quam speciei; corolla 1.2–2.5 cm. longa, latiora et dilatiora summo quam speciei; calcaribus totae corollae ca. $\frac{1}{3}$ longitudini adaequantibus; calyce ca. $\frac{1}{2}$ vel minus corollae longitudini adaequantibus.—MEXICO: Nevado de Toluca, Sept. 2, 1892, *Pringle 4224* (ANSP, BG, BM, B, C, CAS, G, M TYPE, NY, K, S, US).

above; numerous basal leaves for the most part lanceolate, 3–5-nerved, obtuse or acute, petioles long, slender, persistent; inflorescence many-flowered, usually more dense than the species; flowers larger; corolla 1.2–2.5 cm. long, broader than in the species and more expanded at the tip; spurs approximately one-third the length of the entire corolla; calyx approximately one-half or less than one-half the length of the corolla.

Distribution: mountains of Mexico.

Specimens examined:

MEXICO:

MEXICO: near Salazar, Sept. 14, 1903, *Rose & Painter 7025* (US); Nevado de Toluca, Oct. 16, 1903, *Rose & Painter 7964* (NY, US); same locality, Oct. 15, 1903, *Rose & Painter 7910* (US); same locality, Sept. 2, 1892, *Pringle 4224* (ANSP, BG, BM, B, C, CAS, DH, G, M TYPE, NY, K, S, US, V); same locality, *Heller 391* (V); Cerro de San Miguel, Nov. 1912, *Salazar* (US); Sierra de las Cruces, Sept. 14, 1903, *Pringle* (UC); near Orizaba, alt. 2500–3000 m., Aug. 1838, *Linden 935* (K).

OAXACA: Sierra de San Felipe, alt. 2500 m., June 23, 1894, *Pringle 4720* (ANSP, BG, B, BM, CAS, DH, G, IAC, K, M, NY, S, UC, US, V).

MORELIA: Loma La Huerta, Nov. 1911, *Arsène* (DH, US).

MICHOACAN: Anganguero, 1837, *Hartweg 347* (BG, BM, DH, NY).

The form *grandiflora* appears to be only a variation, due merely to habitat, moisture, or some nutritional factor. It has no distinctive geographical distribution. It may be noted that the specimens cited from Hidalgo under the species are all alike in having slightly more round basal leaves, though aside from this character, they could not be distinguished from the type specimen of *plantaginea*.

32. *H. Shannonii* Briq. in Candollea 4: 321. 1931.

Erect plant, less than 2 dm. high; stems mostly simple, angled, frequently more than one arising from the base; leaves somewhat fleshy with sunken veins; basal leaves narrowly oblanceolate, petiolate, acute, 3.5–7 cm. long, .3–.6 cm. broad, 3-nerved; cauline leaves 2–3 pairs, oblanceolate to lanceolate, acute, sessile, 3-nerved; inflorescence axillary or terminal, several-flowered sub-umbellate cymes, pedicels .7–2.5 cm. long, curved at tip, angled; calyx foliaceous, one-half to two-thirds the length of the corolla; calyx-segments oblong-elliptic, .6–.9 cm. long, abruptly acuminate, reticulate, 3-nerved, papillate; corolla nearly 1.5 cm. long, tube almost one-half the length of the entire corolla; lobes ovate, obtuse to acutish, margins irregularly crenulate, papillate; spurs

divaricate, slightly incurved, pointed; anthers ovate, filaments linear; capsule immature.

Distribution: volcanic regions of Guatemala.

Specimens examined:

GUATEMALA: Volcan de Agua, Dept. Zacatepequez, alt. 2000 m., June 1892, *Shannon 3630* (US); same locality, alt. 3100 m., Aug. 1892, *Shannon 3613* (G, DH TYPE, M, K, US); same locality, alt. 3400–3752 m., March 22, 1905, *Pittier 39* (US); Volcan de Fuego, 1861, *Salvin & Godman 311, 249* (K); same locality, alt. 3000 m., Nov. 17, 1873, *Salvin* (K).

32a. *H. Shannonii* f. *compacta*⁵⁸ Allen, n. forma.

Stem shorter than in species; leaves broader than in species, elliptic, acuminate; inflorescence similar to species but less open, more clustered; flowers on shorter pedicels.

Distribution: known only from type locality.

Specimens examined:

GUATEMALA: mountains above Chiantla, Huehuetenango, May 29, 1906, *Cook 45* (US TYPE).

33. *H. decumbens* Benth. Pl. Hartw. 67. 1840; Griseb. in DC. Prodr. 9: 130. 1845; Hemsl. Biol. Cent.-Am. Bot. 2: 351. 1882, excl. syn.

Halenia longicornu Mart. & Gal. in Bull. Acad. Brux. 11¹: 370. 1844; Hemsl. Biol. Cent.-Am. Bot. 2: 352. 1882.

H. apiculata Mart. & Gal. Bull. Acad. Brux. 11¹: 371. 1844.

Tetragonanthus decumbens Kuntze, Rev. Gen. Pl. 2: 431. 1891.

T. longicornis Kuntze, Rev. Gen. Pl. 2: 431. 1891.

Perennial, 1.5–3.5 dm. high; stems more or less decumbent, frequently short sterile branches arising from the root with a dozen or more leaves clustered at the tip; fertile branches ascending, simple, striate, angled; basal leaves with long petioles, almost equalling the blade, elliptical to broadly elliptical-oval, 3 cm. or less in length, .6–1.2 cm. broad, midrib prominent, faintly 3-nerved, subacute; 1–5 pairs of cauline leaves, with petioles increasingly shorter toward the tip, the upper sessile, subconnate, elliptical to lanceolate, 1–2.5 cm. long, .4–.8 cm. broad, very faintly 3-nerved, acute, midrib prominent; inflores-

⁵⁸ *H. Shannonii* f. *compacta* Allen, forma nov.—Caule breviori quam speciei; foliis latioribus, ellipticis, acuminatis; inflorescentia simili speciei sed densiore, confertiora; floribus in brevioribus pedicellis.—GUATEMALA: Chiantla, Huehuetenango, May 29, 1906, *Cook 45* (US TYPE).

cence terminal or axillary in upper pair of leaves, forming a several-flowered cymose cluster; upper pedicels erect, 2 cm. or less long, the lower frequently pendulous, usually shorter, 4-angled; calyx-segments oblong to elliptic, acute or abruptly acuminate, 3-nerved, papillate, over one-half the length of the corolla excluding the spurs; corolla 1–1.5 cm. long, lobes elliptic-oval, delicately veined, papillate, margin slightly crisped or apiculate; corolla-tube slightly more than one-half the length of the entire corolla; spurs .5–.7 cm. long, .2 cm. broad at the base, tapering at the tip, spreading, descending and incurved; stamens about .2 cm. long; anthers ovate, filaments linear; capsule .8–1 cm. long, .3–.5 cm. broad, broadly elliptical; seeds subglobose, depressed, brownish, granular.

Distribution: mountains of Mexico.

Specimens examined:

MEXICO:

OAXACA: "in monte Pelado, dictionis Oaxacacae," 1841, *Hartweg 494* (BM, DH, K TYPE, NY, V); from Monte Pelado and on Tanetze, east-northeast from Oaxaca, July, 1845, *Jurgensen 386* (DH, K); "cordillera, Cerra San Felipe, hautes montes," alt. 2000–2375 m., April–Sept. 1840, *Galeotti 7166* (B TYPE of *H. longicornu*, DH TYPE of *H. apiculata*, K, M fragment, V); northwest slope of Mt. Zempoaltepec, alt. 2000–2500 m., July 10, 1894, *Nelson 698* (US); same locality, June 1842, *Liebmann 10770* (UC); summit of Mt. Zempoaltepec, alt. 2800 m., July 9, 1894, *Nelson 636* pp. (US).

34. *H. guatemalensis* Loesener in Verh. Bot. Ver. Brandenb. 55: 182. 1913.

Perennial, 2.5–4 dm. high; stem subterete, internodes 7–12 cm. long; leaves prominently decurrent; basal leaves oblanceolate, attenuate into long narrow petioles, 3–6 cm. long, 1–1.5 cm. broad, acute or abruptly acuminate; lower cauline leaves petiolate, 3-nerved, obtuse or subrotund at apex, abruptly apiculate; upper cauline leaves sessile or subsessile, 2–3 pairs, elliptic-ovate to lanceolate; inflorescence terminal, subumbellate, 2–7 flowers, the lower hardly shorter than the cauline leaves, a single or two flowers inserted below the umbel in the axils of the higher leaves; pedicels striate, tetragonal, 3 cm. or less long; calyx about two-thirds the length of the corolla, segments obovate-spatulate, mucronulate, 3-nerved, reticulate; corolla yellow-green, about 2 cm. long; lobes ovate or oval, subacute at apex, many-nerved; spurs one-half the length of the entire corolla, narrow, slightly

spreading, descending and curved inward at the tip; stamens approximately .2 cm. long; anthers subovoid; capsule subrostriform, about 1.8 cm. long, .5-.6 cm. broad; seeds globose, depressed, granular.

Distribution: Guatemala.

Specimens examined:

GUATEMALA: Huehuetenango, Todos los Santos, road near Chiantla, alt. 3000 m., Sept. 11, 1896, *Seler & Seler 2728* (BG TYPE); Nebaj, Dept. Quiché, alt. 2300 m., April 1890, *Heyde & Lux 4729* (BM, G, K, US); mountains near Hacienda of Chaucol, alt. 2750, Jan. 2, 1896, *Nelson 3646a* (US).

34a. *H. guatemalensis* var. *latifolia* (Loesener) Allen, n. comb.

Halenia plantaginea var. *latifolia* Loesener in Verh. Bot. Ver. Brandenb. **55**: 182. 1913.

Habit similar to that of the species, but smaller and more rigid.

Distribution: Guatemala.

Specimens examined:

GUATEMALA: "Huehuetenango, Bergwald oberh. Todos los Santos," alt. 2800-3000 m., June 19, 1896, *Seler & Seler 3086* (BG TYPE).

KEY TO SOUTH AMERICAN SPECIES AND VARIETIES

1. Spurs usually pendulous and incurved.
 2. Spurs reduced to small protuberances, less than $\frac{1}{4}$ the length of corolla.
 3. Flowers .5-.6 cm. long.
 4. Flowers single, apical, or disposed in 1-3-flowered cymes.....35. *H. valerianoides*
 4. Flowers more numerous (usually 5), subumbellate.....36. *H. pusilla*
 3. Flowers about 1 cm. or more long.
 4. Calyx-segments spatulate.....37. *H. spatulata*
 4. Calyx-segments usually oblong-lanceolate.....38. *H. caespitosa*
 2. Spurs conspicuous, $\frac{1}{4}$ - $\frac{1}{2}$ the length of corolla.
 3. Stems sterile, densely leafy; leaves fleshy or coriaceous.
 4. Leaves lanceolate or oblong-lanceolate.....39. *H. hypericoides*
 4. Leaves obovate.....40. *H. pulchella*
 4. Leaves linear.....41. *H. pinifolia*
 3. Sterile stems none; leaves thin, herbaceous.
 4. Stem single; rosette absent.....42. *H. gracilis*
 4. Stems 1-many; rosette present in complete plant.
 5. Flowers 1-1.5 cm. long; plant yellow-green.....43. *H. Killipii*
 5. Flowers less than 1 cm. long (except in *H. Weberbaueri*); plant not yellow-green.
 6. Flowering stem scapiform, almost aphyllous; flowers 5 or less.44. *H. Mathewsii*
 6. Flowering stem leafy; flowers more than 5.
 7. Leaves linear, narrowly linear-lanceolate.
 8. Plant less than 20 cm. high.

- 9. Plant more than 10 cm. high; flowers .6–.7 cm. long... 45. *H. vincetoxicoides*
- 9. Plant less than 10 cm. high; flowers 1.2–1.5 cm. long... 46. *H. Weberbaueri*
- 8. Plant more than 25 cm. high... 47. *H. Stuebelii*
- 7. Leaves ovate-lanceolate to oblong-lanceolate; stem stout, rigid... 48. *H. robusta*
- 2. Spurs conspicuous, $\frac{1}{2}$ – $\frac{3}{4}$ the length of the corolla.
- 3. Stem decumbent, suffruticose; leaves subcoriaceous... 49. *H. taruga gasso*
- 3. Stem usually erect, not suffruticose.
- 4. Flower 2–3 cm. long... 50. *H. gigantea*
- 4. Flower less than 1.5 cm. long.
- 5. Leaves less than .8 cm. long... 51. *H. minima*
- 5. Leaves more than .8 cm. long.
- 6. Flowering stems curved at apex... 52. *H. penduliflora*
- 6. Flowering stems erect.
- 7. Pedicels scarcely 1 cm. long; flowers in dense heads.
- 8. Cauline leaves oblong, hardly narrowed at base... 53. *H. phytumoides*
- 8. Cauline leaves lanceolate or oblong-lanceolate, gradually elongated into petiole, dilated at base... 54. *H. Herzogii*
- 7. Pedicels more than 1 cm. long; flowers more loosely clustered.
- 8. Flowers less than 1 cm. long... 55. *H. silenoides*
- 8. Flowers more than 1 cm. long.
- 9. Spurs slender, more or less parallel; plant more than 15 cm. high... 56. *H. umbellata*
- 9. Spurs thick, distinctly incurved at tip; plant usually less than 15 cm. high... 57. *H. Meyeri Johannis*
- 1. Spurs pendulous, divaricate.
- 2. Spurs scarcely $\frac{3}{4}$ the length of the corolla, more or less divergent at tip.
- 3. Stems and branches densely and long-ciliate... 58. *H. barbicaulis*
- 3. Stems and branches not ciliate, smooth.
- 4. Pedicels of apical flowers more than 1.5 cm. long.
- 5. Leaves ovate to obovate-lanceolate... 59. *H. Rusbyi*
- 5. Leaves linear or linear-lanceolate.
- 6. Plant more than 10 cm. high, not caespitose... 60. *H. Purdieana*
- 6. Plant less than 10 cm. high, densely caespitose... 60a. *H. Purdieana* var. *congesta*
- 4. Pedicels of apical flowers less than 1.5 cm. long... 61. *H. Hieronymi*
- 2. Spurs $\frac{1}{2}$ – $\frac{3}{4}$ the length of the corolla, horizontally or subhorizontally divaricate, but incurved at apex.
- 3. Stem strict; sterile branches none; basal leaves rigid and erect, disposed in a dense rosette... 62. *H. bifida*
- 3. Stems more or less flexuous; sterile branches numerous; basal leaves not rigid, occasionally recurved, not disposed in a dense rosette... 63. *H. Weddelliana*
- 1. Spurs horizontal or reflexed.
- 2. Flowers 3–4 cm. long... 64. *H. elegans*
- 2. Flowers less than 2 cm. long.

- 3. Flowers less than 1 cm. long.....65. *H. Hoppii*
- 3. Flowers more than 1 cm. long.
 - 4. Sepals ovate-lanceolate.
 - 5. Leaves thin, herbaceous, no rosette; spurs thick.....66. *H. asclepiadea*
 - 5. Leaves subcoriaceous; dense, many-leaved rosette; spurs slender.
.....67. *H. Kalbreyeri*
 - 4. Sepals obovate or oblanceolate.
 - 5. Rosette and lower leaves lanceolate, slightly narrowed at base
into a short petiole.....68. *H. bella*
 - 5. Rosette and lower leaves obovate, long-petiolate.....69. *H. sphagnicola*

35. *H. valerianoides* Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 106. 1916.

Small caespitose perennial, less than .5 dm. high; root very thick and densely branching; stems short, erect, 2-3 cm. high, almost leafless, arising from a dense rosette of basal leaves; basal leaves thick, petiolate, oblanceolate, 2-3 cm. long, .4 cm. broad, acute, obsoletely 3-nerved; cauline leaves broadly sessile, 1 pair or none, ovate-oblong, .5-.6 cm. long, .2-.3 cm. broad; inflorescence a terminal 1-3-flowered cyme, pedicels .7-1.0 cm. long; calyx-lobes obovate-oblong, .3 cm. long, .2 cm. broad, acute, obsoletely 3-nerved; corolla approximately .5 cm. long, .4 cm. broad, tube slightly less than one-half the length of the entire corolla; lobes ovate, acute; spurs small laterally prominent protuberances at the base of the corolla.

Distribution: Peru and Bolivia.

Specimens examined:

PERU: (TYPE not seen, *Weberbauer 1676*, BG, M photo). According to Gilg, this number is incorrect, since the data given does not agree with the specimen.

BOLIVIA: Chacaltaya, 130 klm. from La Paz, alt. 4800 m., Feb. 1908, *Buchtien 1484* (US); Alaska Mine, alt. about 4500 m., March 1-4, 1926, *Tate 67* (NY).

36. *H. pusilla* Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 107. 1916.

H. Dombeyana var. *brevicornis* Wedd. Chlor. And. 2: 76. 1859, fide Gilg, *l. c.*

Perennial caespitose herb, under .5 dm. high; root short, thick, covered with remains of marcescent leaves, bearing at the apex a dense rosette of leaves; flowering stems numerous, densely crowded, erect, short; rosette leaves petiolate, very thick, oblanceolate, 1-1.5 cm. long, .2-.3 cm. broad, acute, obsoletely 3-nerved; cauline leaves 1-2 pairs, closely approximated, sessile,

ovate-oblong to oblong, .6–.7 cm. long, .3–.35 cm. broad; inflorescence a few-flowered (5 usually) cyme, pedicels up to 1 cm. long; calyx-lobes oblong-lanceolate, .5 cm. long, .2 cm. broad, acute, obsoletely 3-nerved; corolla .5–.6 cm. long, tube about one-half the length of the entire corolla; lobes ovate, acute; spurs small laterally prominent protuberances at the base of the corolla; stamens about .2 cm. long; filaments linear; anthers ovate, tip attenuate; capsule ovate.

Distribution: Bolivia and Peru.

Specimens examined:

BOLIVIA: Prov. Larecaja, on road to Lacatia, in meadows, in vicinity of Sorata, alt. 3200–3700 m., *Mandon 369* pp. (V).

PERU: Cerro de Pasco, alt. about 4600 m., March 28, 1923, *MacBride 3072* (F, M); Piñasniocj, Panticalla Pass, alt. 3600 m., June 18, 1915, *Cook & Gilbert 1793* (US).

37. *H. spatulata*⁵⁹ Allen, n. sp.

Perennial caespitose herb, up to .8 dm. high; root coarse, woody; 1–2 flowering stems, erect, simple or rarely branched from base, occasional short sterile leafy branches; numerous basal leaves attenuate into long petioles, elliptic to spatulate, up to 2.5 cm. long, .4–.5 cm. broad, prominently uninerviate; cauline leaves 1–2 pairs, sessile, elliptic, less than 1 cm. long; inflorescence usually terminal, 1–few-flowered cyme, pedicels erect or slightly recurved at tip; calyx-lobes spatulate, up to .6 cm. long, .2 cm. broad, 3-nerved; corolla 1 cm. long, "lime green," tube over one-half the length of the entire corolla; lobes broadly ovate, acute; spurs approximately one-fourth the length of the corolla, pendulous and incurved, broad at the base, attenuate at tip; stamens

⁵⁹ *H. spatulata* Allen, sp. nov.—Herba perennis, caespitosa, usque ad .8 dm. alta; radice crassa, lignea; 1–2 caulibus floriferis, erectis, simplicibus vel raro e baso ramosis, vel ramis brevibus sterilibus foliosis; foliis basalibus multis, longis petiolis attenuatis, ellipticis vel spatulatis, usque ad 2.5 cm. longis, .4–.5 cm. latis, prominente 1-nerviis; foliis caulinis 1–2 geminis, sessilibus, ellipticis, minusquam 1 cm. longis; inflorescentia plerumque terminali, cymosa, 1–pauciflora; pedicellis erectis vel ad apicem parum recurvatis; calycis lobis spatulatis, usque ad .6 cm. longis, .2 cm. latis, 3-nerviis; corolla 1 cm. longa, "viride"; tubo plusquam $\frac{1}{2}$ corollae longitudini adaequanti; lobis late ovatis, acutis; calcaribus $\frac{1}{4}$ corollae longitudini subaequanti, pendulis incurvatisque, ad basin latis, ad apicem attenuatis; staminibus ca. .2 cm. longis; filamentis linearibus; antheris ovatis; capsula late lanceolata; stigmatibus truncatis, planis superficiebus, ut videtur, stigmaticibus.—PERU: Dept. Cusco, open, grassy páramo, Cerro de Colquipata, alt. 3900–4000 m., May 1, 1925, *Pennell 13749* (ANSP TYPE, NY, US).

about .2 cm. long; filaments linear, anthers ovate; capsule broadly lanceolate; stigmas truncate, the flat surfaces apparently stigmatic.

Distribution: Peru.

Specimens examined:

PERU: Dept. Cusco, open grassy páramo, Cerro de Colquipata, alt. 3900–4000 m., May 1, 1925, *Pennell 13749* (ANSP TYPE, NY, US).

38. *H. caespitosa* Gilg in Fedde, Rep. Spec. Nov. 2: 53. 1906; Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 107. 1916.

Small caespitose herb, forming a broad dense mat .5–.8 dm. in diameter, usually .4–.5 dm. high, the flowering stems frequently reaching a height of 1–1.5 dm.; sterile branches usually intermingled with the fertile; leaves in dense aggregation, very fleshy, petiolate, obovate-lanceolate to oblanceolate, 1.5–2 cm. long, about .3–.4 cm. broad, acute, nerves scarcely conspicuous; cauline leaves, when present, sessile, oblong-lanceolate to linear-lanceolate, 1–2 cm. long; inflorescence usually consisting of a 1-, rarely 2–3-, flowered cyme at the apex of the fertile stem, pedicels 1.6–2 cm. long, erect or slightly nodding; calyx-lobes oblanceolate to oblong-lanceolate, .6–.8 cm. long, .2 cm. broad, acute to obtusish, 3-nerved; corolla about 1 cm. long, greenish, length of tube nearly equalling that of the entire corolla; lobes ovate, subrotund, crisped; spurs pendant, .1–.2 cm. long and almost as thick; stamens approximately .4 cm. long, attached just below the sinus; filaments linear, anthers ovate; capsule linear.

Distribution: moist places in Peru.

Specimens examined:

PERU: Oroya, near Lima, alt. 3300–3600 m., 1919, *Kalenborn 91*⁶⁰ (M, US); wet stream margin, Morococha, May 23, 1922, *Macbride & Featherstone 898* (F, M); "Hacienda Arapa bei Yauli, an der Lima-Oroya-Bahn," alt. 4400 m., 1906, *Weberbauer 279* (BG TYPE, DH, M photo).

39. *H. hypericoides* (HBK.) G. Don, Gen. Hist. 4: 177. 1838; Griseb. Gen. & Sp. Gent. 328. 1839.

Swertia hypericoides HBK. Nov. Gen. & Sp. Pl. 3: 176. 1818; Roem. & Schult. Syst. Veg. 6: 76. 1820.

Perennial herb; stem procumbent, branching, leafy, less than

⁶⁰ The specimen in the Herbarium of the Missouri Botanical Garden was collected by *Margaret Kalenborn*, No. 91. That from the United States National Herbarium bears the same number, but the collector is *A. S. Kalenborn*. In all probability these are the same collection.

.3 dm. high; lower leaves several pairs, approximate, petiolate, sheathing at base, oblong-lanceolate or lanceolate, 2 cm. long, acute, 3-nerved; upper leaves smaller, sessile, oblong; inflorescence terminal and axillary many-flowered panicles, pedicels up to 1.5 cm. long; calyx-lobes linear-lanceolate, about .5 cm. long; corolla .7–.8 cm. long, yellowish; lobes ovate, acute; spurs pendulous, incurved, subconical, about one-half the length of the corolla; filaments linear, anthers oblong; capsule oblong, obtuse, compressed; seeds subglobose, blackish brown, smooth.

Distribution: Colombia.

No specimen examined, but description compiled from original publication and photograph. (TYPE, *Humboldt & Bonpland*, HJP, M photo).

40. *H. pulchella* Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 107. 1916.

Perennial herb, .5–1.0 dm. high; root thick, elongate; axis elongate, more or less procumbent, densely covered with obsolete remains of leaves, the apex curved-erect, sending out a single loosely leafy flowering stem, and some few (3–5) sterile procumbent or curved-erect leafy branches 3–13 cm. long; rosette leaves lacking; lower cauline leaves broadly petiolate, upper sessile, rather fleshy, obovate, 1.2–1.6 cm. long, .5–.6 cm. broad, manifestly 3-nerved, veins sunken above, prominent below, acute; inflorescence composed of terminal and axillary pseudoracemose 3-flowered cymes, more or less approximate, pedicels .6–1.2 cm. long; leaves subtending inflorescence, minute, euphylloid; calyx-lobes oblong-lanceolate to oblanceolate, about .8 cm. long, .25–.3 cm. broad, 3-nerved, margin hirtellous; corolla about 1 cm. long, tube less than one-half the length of the entire corolla; lobes ovate, somewhat acute, auriculate; spurs pendulous, incurved, about one-half the length of the corolla; stamens about .2 cm. long; filaments linear, anthers ovate.

Distribution: Ecuador.

Specimens examined:

ECUADOR: in the Andes, *Jameson 53* (DH TYPE, M photo, V).

Very similar to *H. Weddelliana*, but rather stouter, more leafy, and spurs less divergent.

41. *H. pinifolia* (R. & P.) G. Don, Gen. Hist. 4: 177. 1838.
Swertia pinifolia (R. & P.) ex Don, *l. c.*

Perennial herb, growing in tufts, .7–1.5 cm. high; stems erect, simple; leaves linear, channeled, acute, edges scabrous; inflorescence umbellate; calyx-lobes ovate-lanceolate, acute; corolla golden-yellow; spurs straight, one-half as long as the corolla.

Distribution: cordilleras of the Andes of Peru.

No specimens examined, but description compiled from original publication. (TYPE, *Ruiz & Pavon*—Herbarium at Madrid).

42. *H. gracilis* (HBK.) G. Don, Gen. Hist. 4: 177. 1838; Griseb. Gen. & Sp. Gent. 327. 1839; DC. Prodr. 9: 130. 1845 (excl. var.).

Swertia gracilis HBK. Nov. Gen. & Sp. Pl. 3: 170. 1818.

Halenia pichinchensis Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 109. 1916.

H. Jamesoni Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 115. 1916.

Annual herb, up to 3 dm. high; stem simple, erect, minutely striate; few basal leaves suggesting a rosette, usually fugacious, with persistent bases, broadly elliptic to ovate, attenuate into narrow petioles longer than the blade, up to 3 cm. long, up to 1 cm. broad, acute, prominently 3-nerved; cauline leaves up to 5 pairs, at intervals of 4 cm., petiolate, elliptic, becoming broadly lanceolate toward the summit of the stem, acute, 3-nerved; floral leaves smaller than cauline; inflorescence few-flowered (2–6) axillary and terminal cymes, erect pedicels up to 1.2 cm. long; calyx-lobes more or less obovate, papillate, approximately .6 cm. long, .2 cm. broad, abruptly acuminate, 3-nerved, reticulate at tip; corolla 1–1.5 cm. long, greenish, tube one-half the length of the entire corolla; lobes ovate, acuminate; spurs slightly less than one-third the length of the corolla, very slender, slightly divergent, the tip frequently, but not always, slightly incurved; stamens approximately .3 cm. long, attached just below the summit of the tube; filaments linear, anthers oval, abruptly acuminate; stigmas broad, recurved; capsule lanceolate, sub-falcate, 1.8 cm. long; seeds reticulate.

Distribution: Colombia and Ecuador.

Specimens examined:

COLOMBIA: Zipaquira, alt. 2730 m., *Humboldt & Bonpland* (HJP TYPE, M photo).

ECUADOR: Pichincha, *Karsten* (BG, V); on Mt. Pichincha, opposite Quito, March 3, 1920, *Heilborn 437* (V); La Planta del Chillo, about Tanque, alt. 2700 m., April

2, 1920, *Firmin 697* (US); near Quito, coll. of 1864, *Jameson* (V); about Quito, *Jameson* (ANSP, BG); Guagrapata, *Spruce 5131* (V).

Halenia gracilis shows a marked relationship to *Halenia Schiedeana* of Mexico. The specimens which Gilg has described as *H. Jamesoni* and *H. pichinchensis* appear to be conspecific with *gracilis*. In the opinion of the author, the only possible difference is the texture of the leaves, which in the *Jamesoni* specimen is slightly rougher than that of the *gracilis* type.

43. *H. Killipii*⁶¹ Allen, n. sp.

Pale green perennial, .3–2.5 dm. high; root coarse, heavy, ligneous, covered with darkened remains of leaves; stem stout, conspicuously alate; basal leaves few, fleshy, in rosette, attenuate into long petioles, oblanceolate, 2–4 cm. long, .3–.35 cm. broad, 3-nerved, obtuse; cauline leaves 1–3 pairs, sessile, linear-lanceolate, 1.5–2.5 cm. long, .3 cm. broad, inconspicuously 3-nerved, obtuse; inflorescence 1 (rarely 7)-flowered, usually terminal, subumbellate cyme, pedicels erect or slightly nodding, up to 2.5 cm. long; calyx-lobes elliptic, .5–.9 cm. long, yellowish-green, acute, obsoletely 3-nerved; corolla 1–1.5 cm. long, tube about one-third the length of the entire corolla; lobes broadly ovate, erose; spurs thick, pendulous, incurved, about one-third the length of the corolla; stamens about .2 cm. long; filaments linear, anthers ovate; capsule ovate, attenuate at apex, yellowish-green.

Distribution: Peru.

Specimens examined:

PERU: Dept. Junín, Mount La Juntay, near Huancayo, alt. 4700 m., April 27, 1929, *Killip & Smith 22087* (US TYPE); same locality and date, *Killip & Smith 22083* (US).

⁶¹ *H. Killipii* Allen, sp. nov.—Herba perennis, pallida viride, .3–2.5 dm. alta; radice crassa, lignea, reliquiis foliorum tecta; caule robusto, conspicue alato; foliis basalibus paucis, carnosius, in rosula, petiolis longis attenuatis, oblanceolatis, 2–4 cm. longis, .3–.35 cm. latis, 3-nerviis, obtusis; foliis caulinis 1–3 geminis, sessilibus, lineari-lanceolatis, 1.5–2.5 cm. longis, .3 cm. latis, inconspicue 3-nerviis, obtusis; inflorescentia 1 (raro 7)-florifera, plerumque terminali, subumbellata-cymosa; pedicellis erectis vel parum nutantibus, usque ad 2.5 cm. longis; calycis lobis ellipticis, .5–.9 cm. longis, flavo-viridibus, acutis, obsolete 3-nerviis; corolla 1–1.5 cm. longa; tubo ca. $\frac{1}{3}$ corollae longitudini adaequanti; lobis late ovatis, erosis; calcaribus crassis, pendulis, incurvatis, ca. $\frac{1}{3}$ corollae longitudini adaequanti; staminibus .2 cm. longis; filamentis linearibus, antheris ovatis; capsula ovata, apice attenuati, flavo-viride.—PERU: Dept. Junín, Mt. La Juntay, near Huancayo, alt. 4700 m., April 27, 1929, *Killip & Smith 22087* (US TYPE); same locality and date, *Killip & Smith 22083* (US).

44. *H. Mathewsii* Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 111. 1916.

H. asclepiadea Griseb. Gen. & Sp. Gent. 326. 1839; in DC. Prodr. 9: 129. 1845, pp; non *Swertia asclepiadea* HBK. fide Gilg, *l. c.*

Perennial herb, up to 2.5 dm. high (usually less than 1.5 dm.); subterranean axis thick, short, erect; numerous flowering stems erect, slender, sparingly leafy; basal leaves in dense rosette, herbaceous, petiolate, obovate-oblong, up to 2.5 cm. long, .4-.5 cm. broad, the lowest equal and equidistant on the stem, the uppermost sessile and much reduced, oblong or ovate-oblong, more or less acute, obsoletely or inconspicuously 5-nerved; inflorescence a 5-flowered cyme, on a more or less scapiform stem; pedicels of terminal flowers 2 cm. long, of laterals 1.5 cm., decreasing toward the base; calyx-lobes oblanceolate, about .55 cm. long, acute, obsoletely 3-nerved; corolla about .7 cm. long, tube about one-third the length of the entire corolla; lobes ovate-oblong, subrotund; spurs pendulous, slightly incurved, one-third the length of the corolla.

Distribution: Peru.

Specimens examined:

PERU: near Huamatanga, *Mathews 523* (V TYPE); Dept. Lima, swale on páramo, near Antaicocha, Cerro Colorado, east of Canta, alt. 4000-4200 m., June 20, 1925, *Pennell 14678* (ANSP, NY, S, US); Dept. Lima, open hillside, Rio Blanco, alt. 3000-3500 m., April 15-17, 1929, *Killip & Smith 21737* (US).

45. *H. vincetoxicoides* Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 108. 1916.

Tetragonanthus Whitei Rusby in Mem. N. Y. Bot. Gard. 7: 321. 1927.

Perennial herb, 1.5-2 dm. high; stems 1-5, simple, arising from tuft of basal leaves which may or may not be persistent, internodes up to 8 cm. long; basal leaves numerous, attenuate into long petioles, narrowly elliptic, 1.5-2.5 cm. long, .2-.45 cm. broad, acute; cauline leaves 2-3 pairs, sessile, subconnate, lanceolate, 1.5-3.5 cm. long, up to .4 cm. broad, 3-nerved, midvein prominent; inflorescence axillary and terminal many-flowered (6-14) subumbellate cymes; pedicels usually recurved at tip, 2.5 cm. long; calyx-lobes oblanceolate-elliptic, papillate, up to .55 cm. long, .25 cm. broad, acute, 3-nerved, reticulate at tip; corolla

.6-.7 cm. long, yellowish, tube one-half the length of the entire corolla; lobes ovate-oblong, papillate, acute, margin inrolled and erose; spurs one-fourth length of corolla, slender, slightly spreading, incurved at tip; stamens approximately .3 cm. long, attached at summit of tube; filaments linear, anthers broadly ovate; stigma only slightly reflexed, capsule up to 1 cm. long, subfalcate; seeds subglobose, reticulate, greenish yellow, brown.

Distribution: moist grassy meadows of Bolivia.

Specimens examined:

BOLIVIA: Yungas, 1890, *Bang* 665 (BG TYPE, G, M, NY, US, V); Sorata, alt. 3300 m., Feb. 1886, *Rusby* 669 (G, M, NY, US, V); Pongo, alt. 3800 m., July 11, 1921, *White* 178 (NY TYPE of *Tetragonanthus Whitei* Rusby).

This last-cited specimen was described as *Tetragonanthus Whitei* Rusby, but accords exactly with *H. vincetoxicoides* Gilg, except for its small size.

46. *H. Weberbaueri*⁶² Allen, n. sp.

Perennial herb, caespitose, .5-1 dm. high; root fibrous, covered with darkened remains of leaves; stems usually several, rather stout; basal leaves numerous, attenuate into long slender petioles equalling the blade in length, oblanceolate to lanceolate, 2.5-3.5 cm. long, .2-.4 cm. broad, obtuse, 3-nerved; cauline leaves sessile, 1 pair at extreme base of stem, linear-lanceolate, 3-4 cm. long, .2-.3 cm. broad, obtuse, 3-nerved; inflorescence 3-5-flowered terminal subumbellate cymes with occasional depauperate 1-flowered cymes in axils of cauline leaves, pedicels .6-2 cm. long, erect or curving at the tips; calyx-lobes broadly oblanceolate to

⁶² *H. Weberbaueri* Allen, sp. nov.—Herba perennis, caespitosa, .5-1 dm. alta; radice fibrata, reliquiis foliorum tecta; caulibus plerumque pluribus, aliquid robustis; foliis basalibus multis, petiolis longis tenuibus laminae longitudini adaequantibus attenuatis, 2.5-3.5 cm. longis, .2-.4 cm. latis, obtusis, 3-nerviis; foliis caulinis, sessilibus, plerumque ad basin caulis, 1-geminis, lineari-lanceolatis, 3-4 cm. longis, .2-.3 cm. latis, obtusis, 3-nerviis; inflorescentia 3-5 florifera, terminali, subumbellata-cymosa, per occasionem depauperata 1-florifera foliorum caulinum axillibus; pedicellis .6-2 cm. longis, erectis, vel ad apicem curvatis; calycis lobis late oblanceolatis vel attenuate obovato-ellipticis, .4-.6 cm. longis, acutis vel obtusis, 3-nerviis; corolla 1.2-1.5 cm. longa, viridula; tubo circiter $\frac{1}{2}$ totae corollae longitudini adaequantibus; lobis ovatis, acutis, erosis; calcaribus $\frac{1}{3}$ corollae longitudini adaequantibus, tenuibus, pendulis, saepe parum divaricatis, sed semper ad apicem incurvatis; staminibus minusquam .2 cm. longis; filamentis linearibus, antheris ovatis; capsula lanceolata, ad apicem attenuata.—PERU: rocks, Mt. Razuhuilla, Prov. Huanta, Dept. Ayacucho, alt. 4300-4500 m., Feb. 4-6, 1926, *Weberbauer* 7498 (F TYPE).

narrowly obovate-elliptic, .4-.6 cm. long, acute to obtuse, 3-nerved; corolla 1.2-1.5 cm. long, greenish, tube about one-half the length of the entire corolla; lobes ovate, acute, erose; spurs one-third the length of the corolla, slender, pendulous, often slightly divaricate but always incurved at the tips; stamens less than .2 cm. long; filaments linear, anthers ovate; capsule lanceolate, attenuate at tip.

Distribution: Peru.

Specimens examined:

PERU: rocks, Mt. Razuhuilla, Prov. Huanta, Dept. Ayacucho, alt. 4300-4500 m., Feb. 4-6, 1926, *Weberbauer 7498* (F TYPE).

47. *H. Stuebelii* Gilg in Engl. Bot. Jahrb. **54**: Beibl. 118, p. 110. 1916.

Biennial, up to 3-4 dm. high; stem thick, erect, simple or branching at base; basal leaves in dense rosette, narrowed at base, lanceolate, 3-3.5 cm. long, .3-.4 cm. broad, acute; cauline leaves thickly herbaceous, sessile, oblong-lanceolate, 2-5 cm. long, .3 cm. broad, the uppermost smaller, obsolete, narrowly acuminate, 5-nerved, veins sunken above, prominent below; inflorescence a terminal dense many-flowered (5-7-9) subcapitate cyme, and axillary 1-few-flowered (3, rarely 5) cymes, pedicels 1-2.7 cm. long; calyx-lobes lanceolate, .7-.8 cm. long, .25 cm. broad, acute, obsoletely 3-5-nerved; corolla almost 1 cm. long, tube approximately one-third the length of the entire corolla; lobes ovate-oblong, acute; spurs pendulous, incurved, about one-third the length of the corolla.

Distribution: Peru.

Specimens examined:

PERU: Rio Blanco, about 5000 m., May 20-25, 1923, *Macbride 3040* (F, M). (TYPE not seen, *Stübel 49e*, BG, M photo).

48. *H. robusta* Gilg in Engl. Bot. Jahrb. **54**: Beibl. 118, p. 110. 1916.

Biennial herb, up to 3 dm. high; ligneous unbranched tap-root; stems 1-3, simple or branching below or above, erect, sturdy, up to .3 cm. thick, striate, internodes up to 6 cm. long; numerous basal leaves in rosette, attenuate into narrower petiole, broadly elliptic, 2-2.5 cm. long, .6 cm. broad, acute-acuminate, 3-nerved,

nerves appearing sunken from above, prominent below; cauline leaves 1–3 pairs, sessile, elliptic, up to 4 cm. long, .65 cm. broad, 3–5-nerved, acute; inflorescence axillary and terminal many-flowered (6–15) subumbelliform cymes; pedicel sturdy, slightly recurved at tip, up to 3 cm. long; calyx-lobes oblong to ovate, approximately .5 cm. long, .25 cm. broad, acute, papillate, uninerviate, tip reticulate; corolla up to .7 cm. long, yellow, tube slightly less than one-half the length of the entire corolla; lobes narrowly ovate, acute; spurs borne at the midpoint of the corolla-tube, tiny, slender, scarcely one-fourth the length of the corolla, tip incurved; stamens about .25 cm. long, inserted at the summit of the tube; filaments linear, anthers ovate-oval; capsule up to 1.3 cm. long, ovate; seeds oval, reticulate.

Distribution: near snow line in Bolivia.

Specimens examined:

BOLIVIA: near snow line, Mt. Tunari, near Cochabamba, 1891, *Bang 1019* (ANSP, BG TYPE, F, G, M, NY, US, V); Dept. Cochabamba, Prov. Chaparé, Ceja-region, La Aduana, alt. 3000 m., March 7, 1927, *Steinbach 9535* (M, NY, S).

49. *H. taruga gasso* Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 117. 1916.

Suffruticose perennial, ligneous, more or less decumbent, up to 1.5 dm. high; root frequently sending up one or more short sterile densely leafy stems; flowering stems simple, leafy, rather slender; basal leaves, if present, petiolate, subcoriaceous, in dense spirals about lower portion of stem, lanceolate or linear-lanceolate, up to 2 cm. long, .35 cm. broad, acute; cauline leaves more or less sessile, more linear, otherwise similar to basal leaves; inflorescence usually a terminal many-flowered (6) cyme, pedicels up to 1 cm. long; calyx-lobes oblong-elliptic, acute, 3-nerved, reticulate at tip; corolla up to 1.3 cm. long, greenish-yellow, tube approximately one-fourth the length of the entire corolla; lobes ovate, acute; spurs almost one-half the length of the corolla, slender, spreading, tip incurved or divergent; stamens about 2 cm. long; filaments linear, anthers ovate; capsule oblong-ovate, subfalcate, up to 1.3 cm. long; seeds subglobose, reticulate.

Distribution: Ecuador.

Specimens examined:

ECUADOR: Loja, alt. 3000–3500 m., *Lehmann 4878* (BG TYPE, M photo); Cañar, Sept. 15, 1918, *Rose & Rose 22674* (NY, US); Mt. Pittshum, *Jameson* (G).

50. *H. gigantea*⁶³ Allen, n. sp.

Stout coarse perennial, up to 4 dm. high; root thick, ligneous, up to .5 cm. in diameter; axis subhorizontal or horizontal, coarse, fleshy, .5-.6 cm. in diameter, covered with dense coarse black remains of leaves; stems 1-many, coarse, erect, simple, internodes up to 7 cm. long; numerous basal leaves, in dense rosette, herbaceous, narrowed into petioles equalling the blade in length, dilated and almost sheathing at the base, lanceolate, 5-10 cm. long, .6-1 cm. broad, attenuate-acuminate, 3-5-nerved; cauline leaves about 3 pairs, sessile, lanceolate, 2-3 cm. long, decreasing in length toward the summit, .5 cm. broad, acuminate, 3-nerved; inflorescence a loose terminal usually 3-flowered cyme, pedicels up to 5 cm. long, erect; calyx-lobes ovate to ovate-oblong to oblong, up to 1.5 cm. long, .5 cm. broad, acute, often with suggestion of apicule, 3-many-nerved; corolla 3-4 cm. long, light green, tube less than one-third the length of the entire corolla; lobes oblong-ovate, acute, more or less erose, frequently subapiculate; spurs coarse, about one-third the length of the corolla, pendulous, incurved, the tip heavily glandular; stamens nearly 1 cm. long; filaments linear, anthers ovate, acuminate; capsule lanceolate.

Distribution: Colombia.

Specimens examined:

COLOMBIA: Dept. Santander, Páramo de Santurbán, near Vetás, alt. 3950-4160

⁶³ *H. gigantea* Allen, sp. nov.—Herba perennis, robusta, crassa, usque ad 4 dm. alta; radice crassa, lignea, usque ad .5 cm. in diametro; axe subhorizontale horizontaleve, crasso, carnosio, usque ad .5-.6 cm. in diametro, reliquiis foliorum densis crassis tecto; caulibus 1-multis, crassis, erectis, simplicibus, internodiis usque ad 7 cm. longis; foliis basalibus multis, in rosula densa, herbescens, petiolis laminæ longitudini adaequantibus attenuatis, dilatatis et prope ad basin vaginantibus, lanceolatis, 5-10 cm. longis, .6-1 cm. latis, attenuate acuminatis, 3-5-nerviis; foliis caulinis ca. 3 geminis, sessilibus, lanceolatis, 2-3 cm. longis, decrescentibus sursum, .5 cm. latis, acuminatis, 3-nerviis; inflorescentia laxa, cymosa, terminali, plerumque 3-florifera, pedicellis usque ad 5 cm. longis, erectis; calycis lobis ovatis vel ovato-oblongis vel oblongis, usque ad 1.5 cm. longis, .5 cm. latis, acutis, saepe subapiculatis, 3-multi-nerviis; corolla 3-4 cm. longa, pallida viride; tubo minusquam $\frac{1}{3}$ corollae longitudini adaequantibus; lobis oblongo-ovatis, acutis, plus minusve erosis, saepe subapiculatis; calcaribus crassis, ca. $\frac{1}{3}$ corollae longitudini adaequantibus, pendulosis, incurvatis, ad apicem dense glandulosis; staminibus ca. 1 cm. longis; filamentis linearibus; antheris ovatis, acuminatis; capsula lanceolata.—COLOMBIA: Dept. Santander, Páramo de Santurbán, near Vetás, alt. 3950-4160 m., Jan. 17 1927, Killip & Smith 17566 (M TYPE, NY, US).

m., Jan. 17, 1927, *Killip & Smith 17566* (M TYPE, NY, US); same locality, *Killip & Smith 17521* (US); same locality, *Killip & Smith 17516* (M, NY, US).

51. *H. minima*⁶⁴ Allen, n. sp.

Small perennial, caespitose, .6 dm. or less high; root ligneous; frequently numerous short sterile leafy stems up to 2.5 cm. high; flowering stems 1–2 cm. high, erect, slender, almost scapiform, simple; basal leaves in dense rosette, thick, coarse, attenuate into petioles shorter than blades, broadly oblanceolate, less than 1 cm. long, .2–.3 cm. broad, acute, obsoletely 3-nerved; leaves of sterile branches abruptly narrowed into petioles, exceeding blades in length, elliptic, up to .8 cm. long, .2 cm. broad, acute, obsoletely 3-nerved, midvein prominent; cauline leaves 1 pair at base, a second pair subtending the inflorescence, sessile, oblanceolate, .3–.7 cm. long, .2 cm. broad, acute to acuminate, obsoletely 3-nerved; inflorescence a 2–4-flowered terminal loose cyme, pedicels 1.5 cm. long, slightly curved at apex; calyx-lobes oblong-oblanceolate, .4–.5 cm. long, .1–.15 cm. broad, acute, obsoletely 3-nerved; corolla .6–.8 cm. long, tube one-half the length of the entire corolla; lobes ovate, acute; spurs slender, pendulous, slightly incurved, between one-third and one-half the length of the corolla; stamens about .2 cm. long; filaments linear, anthers ovate; capsule ovate, attenuate at apex.

Distribution: Ecuador.

Specimens examined:

ECUADOR: Andes, coll. of 1855, *Couthouy* (G TYPE, NY).

⁶⁴ *H. minima* Allen, sp. nov.—Herba perennis, parva, caespitosa, .6 dm. minusve alta; radice lignea; saepe caulibus multis, brevibus, sterilibus, foliosis, usque ad 2.5 cm. altis; caulibus floriferis 1–2 cm. altis, erectis, tenuibus, prope scapiformibus, simplicibus; foliis basalibus in rosula densa, crassis, petiolis brevioribus laminis attenuatis, late oblanceolatis, minusquam 1 cm. longis, .2–.3 cm. latis, acutis, obsolete 3-nerviis; foliis ramorum steriliū petiolis longioribus laminis subito attenuatis, ellipticis, usque ad .8 cm. longis, .2 cm. latis, acutis, obsolete 3-nerviis, medio-nervo prominenti; foliis caulinis ad basin 1-geminis, alio gemine inflorescentiam subtendenti, sessilibus, oblanceolatis, .3–.7 cm. longis, .2 cm. latis, acutis vel acuminatis, obsolete 3-nerviis; inflorescentia 2–4-florifera, terminali, laxa, cymosa, pedicellis 1.5 cm. longis, ad apicem parum curvatis; calycis lobis oblongo-oblanceolatis, .4–.5 cm. longis, .1–.15 cm. latis, acutis, obsolete 3-nerviis; corolla .6–.8 cm. longa; tubo $\frac{1}{2}$ corollae longitudini adaequant; lobis ovatis, acutis; calcaribus tenuibus, pendulis, parum incurvatis, $\frac{1}{3}$ – $\frac{1}{2}$ corollae longitudini adaequantibus; staminibus ca. .2 cm. longis; filamentis linearibus, antheris ovatis; capsula ovata, ad apicem attenuata.—ECUADOR: Andes, coll. of 1855, *Couthouy* (G TYPE).

52. *H. penduliflora* Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 116. 1916.

H. Dombeyana var. α Wedd. Chlor. And. 2: 76. 1859 pp.

Biennial, up to 3 dm. high; root fibrous, axis thick, short, covered with remains of marcescent leaves; stem single, simple, erect, curved at apex; basal leaves in loose rosette, herbaceous, petiolate, oblong-lanceolate to elliptic, 4 cm. long, .5-.6 cm. broad, acute; cauline leaves 3 pairs or so, slightly narrowed at base, but sessile, oblong, 2-3 cm. long, .5-.7 cm. broad, acute, 3-nerved; inflorescence a 7-11-flowered subumbellate terminal cyme, always pendulous, rarely an axillary small 3-flowered cyme, pedicels 1.5 cm. long; calyx-lobes oblanceolate to oblong-oblanceolate, about .8 cm. long, .2-.5 cm. broad, obsoletely 3-nerved; corolla 1-1.2 cm. long, tube scarcely one-third the length of the entire corolla; lobes ovate, acute; spurs pendulous, slightly divergent, but incurved at tips about one-third to three-fourths the length of the corolla; stamens about .4 cm. long; filaments linear, anthers ovate; capsule ovate, attenuate at apex.

Distribution: Bolivia.

Specimens examined:

BOLIVIA: near Lacatia, in stony meadow, alt. 3200-3700 m., *Mandon* 369 pp. (G, M photo, NY, S, V).

The specimen of *Halenia penduliflora* Gilg, based on *Mandon* 369 pp., has the same floral characteristics as *silenoides* and bears the label "in graminosis," which signifies a possible ecological variation. The habit is that of typical specimens of *silenoides*, which, having grown in grassy situation, has become attenuate, with the internodes more elongate, the stem more or less decumbent. However, until more material is available the species *penduliflora* must be retained.

53. *H. phyteumoides* Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 112. 1916.

Perennial caespitose herb, up to 1.2 dm. high; root short, thick, densely fibrous, with very short axis; stem lateral, erect, simple, thick, angled; basal leaves in dense rosette, attenuate into long petioles equalling the blades in length, spatulate or broadly oblanceolate, up to 2.5 cm. long, .35 cm. broad, acute, obsoletely 3-nerved; cauline leaves 1-2 pairs, slightly narrowed at base, but

sessile, thick, 1–1.5 cm. long, decreasing toward the summit, .3–.4 cm. broad, acute, obsoletely 3-nerved; inflorescence a terminal 5-flowered subcapitate cyme and axillary 3-flowered cymes; pedicels strongly winged, the apical up to 1 cm. long, the laterals .5–.6 cm. long; calyx-lobes obovate-oblong, up to .4 cm. long, .2 cm. broad, acute, obsoletely 3-nerved; corolla .8 cm. long, tube slightly less than one-half the length of the entire corolla; lobes ovate-oblong, subrotund; spurs slender, pendulous, incurved, one-half the length of the corolla.

Distribution: Peru.

No specimens examined, but description compiled from original publication and photographs. (TYPE, *Philippi*, BG, M photo).

54. *H. Herzogii* Gilg in Engl. Bot. Jahrb. **54**: Beibl. 118, p. 113. 1916.

Perennial caespitose herb, up to .5 dm. high; subterranean axis thick, black, branching, elongate, covered with blackened remains of leaf bases; stem curved-erect, scapiform, strongly winged, simple; basal leaves in dense rosette, thick, fleshy, attenuate into long petioles equalling the blades, spatulate or obovate-oblong to oblanceolate, up to 2.6 cm. long, .3 cm. broad, acute or more or less rounded at apex, obsoletely 3-nerved; cauline leaves 1–2 pairs, attenuate, but dilated at base and sessile, lanceolate to oblong-lanceolate, 1–2 cm. long, decreasing toward the summit, .25–.3 cm. broad, acute, obsoletely 3-nerved; inflorescence a small terminal 5-flowered subcapitate cyme; terminal pedicels 1 cm. long, lateral .5–.6 cm. long, strongly winged; calyx-lobes obovate-oblong to broadly oblanceolate, about .4 cm. long, less than .2 cm. broad, acute, obsoletely 3-nerved; corolla .6–.7 cm. long, tube about one-half the length of the entire corolla; lobes narrowly ovate, subrotund; spurs one-third to three-fourths the length of the corolla, pendulous, incurved; stamens about .15 cm. long, inserted at the orifice of the tube; filaments linear, anthers ovate; stigma truncate; capsule lanceolate.

Distribution: Bolivia.

Specimens examined:

BOLIVIA: Lagodos, alt. 4400 m., *Herzog 2377* (BG TYPE, M photo, V).

55. *H. silenoides* Gilg in Engl. Bot. Jahrb. **54**: Beibl. 118, p. 113. 1916.

Halenia Dombeyana var. α Wedd., Chlor. And. 2:76. 1859, pp. non *Halenia gracilis* var. *Dombeyana* Griseb.

Perennial herb, for the most part less than 1.5 dm. high, seldom over 2 dm.; root thick, many branches; stems 1-6, simple, erect or very slightly decumbent, rather thick, covered with marcescent leaves at the bases; sterile stems short, densely leafy; basal leaves numerous, attenuate into long narrow petioles frequently equalling the blades, less than 2 cm. long, .35 cm. broad, acute, 3-nerved; cauline leaves 1-2 pairs, sessile, lanceolate, usually about 2 cm. long, acute, 3-nerved; inflorescence a terminal or axillary 3-10-flowered cyme, pedicels more or less erect, up to 2.5 cm. long; calyx-lobes oblong-ob lanceolate, approximately .3-.5 cm. long, acute, uninerviate, densely reticulate; corolla approximately .9 cm. long, yellowish-green, tube about one-half the length of the entire corolla; spurs more than one-third the length of the corolla, slender, divergent, incurved at tips; stamens about .25 cm. long; filaments linear, anthers broadly ovate, acute; capsule up to 1.1 cm. long, narrowly ovate, attenuate at tip, subfalcate; seeds subglobose, reticulate.

Distribution: alpine meadows in Bolivia and Peru.

Specimens examined:

BOLIVIA: alpine meadows, Choquetanga Grande, alt. 3600 m., *Herzog 2402* (S); Unduavi, Nordyungas, 3300 m., *Buchtien 54* (F, G, NY); Unduavi, alt. 3300 m., *Buchtien 600* (US); Unduavi Valley, *Bro. Julio 338* (US); same locality, alt. 2000-2600 m., 1925, *Bro. Julio 455* (US); Pongo, alt. 4000 m., Feb. 17-March 1, 1926, *Tate 223* (NY); *Mandon 369* pp (BG TYPE?).

BOLIVIA WITHOUT LOCALITY: *Cumming 128* (V).

PERU: Dept. of Cusco, Paso de Tres Cruces, Cerro de Cusilluyoc, alt. 3800-3900 m., May 3, 1925, *Pennell 13842* pp. (ANSP, US).

The specimen collected by *Tate* is rather doubtfully included. It has the habit of *silenoides*, but the flowers on the whole appear smaller, the spurs shorter and thicker, more like those of *Herzogii*. The specimens, *Pennell 13842*, found in the United States National Herbarium and the Philadelphia Academy of Natural Sciences, are certainly *H. silenoides*, but the same number located in the New York Botanical Garden Herbarium is *H. asclepiadea*.

56. *H. umbellata* (R. & P.) Gilg in Fedde, Rep. Spec. Nov. 2: 53. 1906.

Swertia umbellata R. & P. Fl. Peruv. 3: 21. pl. 242, fig. b. 1802.

Halenia Pavoniana G. Don, Gen. Hist. 4: 177. 1838.

Halenia gracilis var. β *Dombeyana* Griseb. in DC. Prodr. 9: 130. 1845.

Halenia Dombeyana Wedd. Chlor. And. 2: 76. 1859.

Perennial herb up to 3 dm. high; root ligneous, frequently sending out short sterile densely leafy branches; stems 1–3, usually simple, erect, minutely striate, frequently branched above, the branches bearing inflorescences nearly as long as the terminal branch, marcescent leaves at base; basal leaves numerous, elliptic, attenuate into slender petioles nearly equalling blades, 2–3.5 cm. long, .6–.8 cm. broad, acute, 3-nerved; cauline leaves 2–3 pairs, attenuate into short petioles, or the extreme upper more or less sessile, lanceolate to elliptic, acute, 3-nerved; inflorescence terminal or axillary 5–14-flowered umbellate cymes, with an approach to a corymb; pedicels up to 3.5 cm. long, the center usually erect, the marginal more or less recurved and shorter; calyx-lobes obovate-elliptic, up to .6 cm. long, sub-acuminate, 3-nerved, reticulate at tip; corolla 1.0–1.3 cm. long, tube slightly less than half the length of the entire corolla; lobes ovate-oblong, acutish; spurs less than one-half the length of the corolla, very slender, tapering, slightly divergent; stamens .2–.25 cm. long; filaments linear, anthers broad-oblong, somewhat acute; stigma deeply cleft, slender, attenuate; capsule up to 1.5 cm. long, narrowly ovate-attenuate, subfalcate; seeds globose, reticulate.

Distribution: Andes of Peru.

Specimens examined:

PERU: Baños, *Dombey* (G, US); Agapata in Virgallis, coll. of 1854, *Lechler* 2001 (DH, V); Lucumayo Valley, alt. 1800–3600 m., June 18, 1915, *Cook & Gilbert* 1308 (US); Piñasniocj, Panticalla Pass, alt. 3600 m., July 14, 1915, *Cook & Gilbert* 1811 (US); Mito, alt. 3000 m., July 8–22, 1922, *Macbride & Featherstone* 1657 (F, M); La Quinoa, alt. about 4000 m., May 14, 1922, *Macbride & Featherstone* 2001 (F, M); Dept. of Cusco, Cerro de Colquipata, alt. 4100–4200 m., May 1, 1925, *Pennell* 13738 (ANSP, NY, US); Dept. Puno, Prov. Sandia, alt. 2700 m., *Weberbauer* 680 (DH).

PERU WITHOUT LOCALITY: *Pavon* 567 (DH).

The illustration of *S. umbellata* in Ruiz & Pavon's 'Flora Peruviana' has spurs longer than the specimens cited above but the plant is similar otherwise.

57. *H. Meyeri* Johannis Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 114. 1916.

Perennial herb up to 2 dm. high, though usually less than 1.5 dm.; root ligneous; stem simple, erect, rather stout base frequently covered with marcescent leaves; basal leaves, when present, in dense rosette, attenuate into petiole longer than blade, narrowly elliptic, up to 2.2 cm. long, up to .6 cm. broad, acute, 3-nerved; 1-2 pairs of cauline leaves, sessile, elliptic, up to 1.8 cm. long, about .5 cm. broad, inconspicuously 3-nerved, acute; inflorescence an axillary or terminal, 3-12-flowered cyme, loose or dense; pedicels up to 3 cm. long, usually recurved; calyx-lobes obovate-elliptic, papillate, approximately .6 cm. long, .2 cm. broad, 3-nerved, acute, reticulate; corolla up to 1.5 cm. long, yellowish, tube less than one-half the length of the entire corolla; lobes ovate-acute; spurs one-third to almost one-half the length of the corolla, rather thick, tapering, incurved; stamens about .5 cm. long; filaments linear, anthers ovate; capsule ovate, attenuate, about 1.5 cm. long.

Distribution: páramos of Ecuador.

Specimens examined:

ECUADOR: Sangai, *Karsten* (V); Azuay, *Spruce 5131* (V); Quitensian Andes, coll. of 1855, *Couthouy* (F); Farm of Antesian, Nov. 2, 1858, *Jameson* (ANSP); same locality, alt. 5000 m., Oct. 1923, *Anthony & Tate 299* (US); Rucu-Pichincha, Aug. 1923, *Anthony & Tate 182* (US); Prov. Carchi, páramos 12 miles west of Tulcán, alt. 3300 m., Aug. 10, 1923, *Hitchcock 20909* (G, NY, US); Chimborazo, *Hans Meyer 113* (BG TYPE).

58. *H. barbicaulis* Gilg in Engl. Bot. Jahrb. **54**: Beibl. 118, p. 112. 1916.

Annual herb, up to 2 dm. high; flowering stem seemingly erect, simple below, frequently branched above, branches erect, about .2 cm. thick, densely leafy, 4-alate, densely, long-ciliate below each node; internodes 2-4 cm. long; cauline leaves herbaceous, narrowed into broad ciliolate petioles, oblong, up to 2 cm. long, .5-.6 cm. broad, acute or very acute, subapiculate, 5-nerved, veins inconspicuous above, prominent beneath, loosely reticulate; inflorescence a terminal dense many-flowered (7-9) subumbellate cyme, or 3-flowered axillary cymes; pedicels of apical flowers 3-4 cm. long, lateral 2 cm. or less, all winged; calyx-lobes obovate-oblong, .6-.7 cm. long, .35-.4 cm. broad, apiculate, obsoletely 3-nerved; corolla about 1 cm. long, tube over one-third the length of the entire corolla; lobes ovate, subrotund, erose; spurs almost

one-half the length of the corolla, pendulous, divaricate; stamens .2–.3 cm. long; anthers ovate-oblong.

Distribution: Peru.

Specimens examined:

PERU: Chacapoyas, Dec. 1846, *Mathews* (DH TYPE).

59. *H. Rusbyi* Gilg in Engl. Bot. Jahrb. **54**: Beibl. 118, p. 117. 1916.

Perennial herb up to 3 dm. high; root strong, thick, ligneous, frequently horizontal, curved at the apex, sending up one or more simple erect flowering stems, bearing marcescent leaves at the base, or short densely leafy sterile branches; basal leaves slightly narrowed into broad petioles as long as the leaf blades, elliptic, frequently up to 3 cm. long, acute, 3-nerved; cauline leaves 1–4 pairs, becoming sessile toward the summit of the stem, up to 3 cm. long, oblong-lanceolate, attenuate, acuminate; inflorescence terminal and axillary many-flowered umbelliform cymes; pedicels erect, up to 2 cm. long; calyx-lobes narrowly ovate, up to .7 cm. long, acute, 3-nerved; corolla up to 1.4 cm. long, tube .25–.3 cm. long; lobes ovate, acute; spurs approximately one-half or slightly more than one-half the length of the corolla, almost horizontally divergent, often with the tips incurved; stamens about .35 cm. long; filaments linear, anthers broadly ovate; capsule up to 1.5 cm. long, ovate-lanceolate, subfalcate; seeds ovoid.

Distribution: Bolivia.

Specimens examined:

BOLIVIA: Unduavi, alt. 3300 m., Oct. 1885, *Rusby* 670 (ANSP, G, M, NY, US, V TYPE).

Similar to *H. Purdieana*, but a sturdier plant with broader flowers, spurs more divergent and more strongly recurved at tip, stem thicker, and leaves larger.

60. *H. Purdieana* Wedd. Chlor. And. **2**: 76. *pl. 53 A*. 1859.

Perennial herb, up to 2.5 dm. high; root ligneous; sterile stems 1–3, short, leafy; fertile stems probably more than one, simple, erect, slender; basal leaves in dense rosette, attenuate into slender petioles nearly equalling the blades in length, lanceolate to linear, up to 1.5 cm. long, .3 cm. broad, acute, obscurely 3-nerved, mid-vein prominent; cauline leaves 3–5 pairs, at intervals of about 4 cm., more or less closely appressed, practically sessile, linear,

attenuate, 2 cm. or less long, acuminate; inflorescence a terminal, rarely axillary as well, 1-5-flowered cyme; pedicels up to 2.5 cm. long, recurving conspicuously at tip; calyx-lobes lanceolate, up to .7 cm. long, attenuately acuminate, 3-nerved; corolla up to 1.8 cm. long, greenish-white (fide *Killip & Smith 18665*, corolla-tube and lobes greenish-white, spurs white; *Linden 729*, fl: blanches), tube less than one-third the length of the entire corolla; lobes ovate, acute, erose; spurs nearly one-half the length of the corolla, slender, tapering, divergent, but slightly depressed at tip; capsule approximately 1.4 cm. long, ovate, attenuate at tip.

Distribution: Colombia.

Specimens examined:

COLOMBIA: Prov. de Pamplona, Páramo de las Cruces, alt. 3000 m., Nov. 1842, *Linden 729* pp. (BG TYPE, DH, M photo, V); "Dept. Norte de Santander: between Mutiscua and Pamplona," alt. 3400 m., Feb. 23, 1927, *Killip & Smith 19723* (US); "Dept. Norte de Santander: Páramo de Romeral," alt. 3800-4200 m., Jan. 30, 1927, *Killip & Smith 18665* (US); "Dept. Santander: Páramo de las Puentes," above La Baja, alt. 3500-3700 m., Jan. 25, 1927, *Killip & Smith 18229* (US); "Dept. Santander: Páramo de Romeral," alt. 3800-4000 m., Jan. 29-30, 1927, *Killip & Smith 18546* (NY, US); same locality, 3800-4200 m., Jan. 30, 1927, *Killip & Smith 18644* (US); same locality and date, *Killip & Smith 18688* (US); Páramo de las Coloradas, above La Baja, alt. 3900-4100 m., Jan. 27, 1927, *Killip & Smith 18426* (M, NY, US); same locality and date, *Killip & Smith 18466* (NY, US); western slope of Páramo Rico, alt. 3600 m., Jan. 15-19, 1927, *Killip & Smith 17722* (US).

The majority of the specimens collected by *Killip & Smith* vary from the typical members of the species only in that the spurs are slightly more pendulous. The habit is similar. This difference is not considered of varietal importance, hence the specimens are placed in the species proper. The species *H. Purdieana* has a marked resemblance in habit and in the color of the flower to *H. Pringlei* of Mexico, but the spurs are not reflexed to the extent they are in the former.

60a. *H. Purdieana* var. *congesta*⁶⁵ Allen, n. var.

Plant shorter than the species, not more than 1 dm., usually less than .5 dm., high; root heavy, extremely ligneous; stems 1-

⁶⁵ *H. Purdieana* var. *congesta* Allen, var. nov.—Planta speciei breviora, non plusquam 1 dm. alta, plerumque minusquam .5 dm. alta; radice crassa, lignissima; caulibus 1-multis, erectis, simplicibus; foliis basalibus speciei pluribus, in rosula densissima, subcoriaceis, linearibus vel lineari-lanceolatis, minusquam 1.5 cm. longis; foliis caulinis 1-2 geminis, lineari-lanceolatis, adpressis; inflorescentia speciei simili.—COLOMBIA: Dept. Santander, Páramo de Santurbán, near Vetás, alt. 3950-4160 m., Jan. 17, 1927, *Killip & Smith 17568* (M TYPE, NY, US).

many, erect, simple; basal leaves more numerous than in the species, and in very dense rosettes, subcoriaceous, linear to linear-lanceolate, less than 1.5 cm. long; cauline leaves 1–2 pairs, linear-lanceolate, very closely appressed; inflorescence similar to that of species.

Distribution: known only from the Dept. of Santander, Colombia.

Specimens examined:

COLOMBIA: "Dept. Santander: Páramo de Santurbán," near Vetás, alt. 3950–4160 m., Jan. 17, 1927, *Killip & Smith 17568* (M TYPE, NY, US); same locality and date, *Killip & Smith 17485* (NY, US); Páramo Frailejonale, near Vetás, alt. 3750–3850 m., Jan. 21, 1927, *Killip & Smith 17982* (NY, US); Páramo de Mogotocoro, near Vetás, alt. 3700–3800 m., Jan. 18, 1927, *Killip & Smith 17604* (NY, US); Páramo Rico, near Vetás, alt. 3750–3850 m., Jan. 18, 1927, *Killip & Smith 17662* (M, NY, US); Páramo de las Vegas, alt. 3700–3800 m., Dec. 20–21, 1926, *Killip & Smith 15680* (US); Páramo de Santurbán, en route from Tona to Mutiscua, alt. 3800–4300 m., Feb. 18, 1927, *Killip & Smith 19551* (US).

61. *H. Hieronymi* Gilg in Fedde, Rep. Spec. Nov. 2: 52. 1906.

Annual, up to 3.5 dm. high; stem single, simple, erect; basal leaves few, in a rather loose rosette, petiolate, oblanceolate, up to 2.5 cm. long, .25 cm. broad; cauline leaves 4–5 pairs, membranaceous, sessile, lanceolate, 1.5–5 cm. long, .3–.9 cm. broad, acute, obsoletely 3-nerved; inflorescence a terminal 5–6-flowered subumbelliform cyme, or often solitary axillary flowers, pedicels up to .7 cm. long; calyx-lobes oblanceolate, .6–.7 cm. long, .2 cm. broad, acute; corolla about 1 cm. long, yellow-green; lobes ovate, acute; spurs nearly one-half the length of the corolla, pendulous, slightly spreading.

Distribution: Argentina.

No specimens examined, but description compiled from original publication and photograph. (TYPE, *Fiebrig 2645*, BG).

62. *H. bifida*⁶⁶ Rusby & Allen, n. sp.

Perennial, up to 3 dm. high; root thick, ligneous; stem single, simple, erect, rather stiff, stout, winged; basal leaves in a dense

⁶⁶ *H. bifida* Rusby & Allen, sp. nov.—Herba perennis, usque ad 3 dm. alta; radice crassa, lignea; caule solitario, simplice, erecto, paulo rigido, robusto, alato; foliis basalibus, in rosula densa, rigidis, petiolatis, oblanceolatis, usque ad 4.5 cm. longis, .4 cm. latis, acutis vel subito acuminatis, 3-nerviis; foliis caulinis 3–4 geminis, sessilibus, lanceolatis, 2–3 cm. longis, decrescentibus sursum, .3 cm. latis, acuminatis, 3-nerviis, medio-nervo infra prominenti, supra immerso; inflorescentia multo-flor-

rosette, stiff, petiolate, oblanceolate, up to 4.5 cm. long, .4 cm. broad, acute to abruptly acuminate, 3-nerved; cauline leaves 3-4 pairs, sessile, lanceolate, 2-3 cm. long, decreasing toward the summit, .3 cm. broad, acuminate, 3-nerved, midvein prominent below, sunken above; inflorescence a many-flowered terminal subumbellate cyme, frequently fewer-flowered cymes in axils of upper leaves; pedicels up to 3 cm. long; calyx-lobes broadly oblanceolate, .5 cm. long, .15 cm. broad, acute, obsoletely 3-nerved; corolla up to 1.3 cm. long, tube one-third the length of the entire corolla; lobes ovate, more or less acute, apiculate, erose; spurs more than $\frac{1}{2}$ the length of the entire corolla, slender, tapering, pendulous, spreading, incurved at tip; stamens .25 cm. long; filaments linear; seeds ovoid, dark brown.

Distribution: Bolivia.

Specimens examined:

BOLIVIA: Cocopunco, alt. about 3000 m., March 24-30, 1926, *Tate 379* (NY TYPE).

63. *H. Weddelliana* Gilg in Engl. Bot. Jahrb. 25: 724. 1898; 54: Beibl. 118, p. 118. 1916.

H. antigonorrhoea Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 119. 1916.

Perennial herb from 1.5-3 dm. high; root fibrous; subterranean stem more or less elongate, densely covered with remains of marcescent leaves, horizontal, more or less erect, many-stemmed; sterile stems leafy, numerous; flowering stems numerous, curved or erect, the lower part densely leafy, the upper loosely leafy, internodes 2-8 cm. long; basal leaves numerous, in rosette, narrowly petiolate, subconnate, spatulate to oblong-lanceolate, 1-3 (rarely 5) cm. long, .2-.6 cm. broad, acute, 3-nerved; cauline leaves subconnate, lanceolate to oblong-lanceolate, 1-2 (rarely 6) cm. long, .2-.6 cm. broad, acute, 3-nerved; inflorescence usually terminal, occasionally lateral, subumbellate or subcapitate many-

ifera, terminali, subumbellato-cymosa; saepe cymis pauciore-floriferis in superiorum foliorum axibus; pedicellis usque ad 3 cm. longis; calycis lobis late oblanceolatis, acutis, obsolete 3-nerviis, ca. .5 cm. longis, .15 cm. latis; corolla usque ad 1.3 cm. longa; tubo $\frac{1}{3}$ totae corollae longitudini adaequanti; lobis ovatis, plusminusve acutis, apiculatis, erosis; calcaribus tenuibus, plusquam $\frac{1}{2}$ totae corollae longitudini adaequanti, attenuatis, pendulis, divaricatis, ad apicem incurvatis; staminibus .25 cm. longis; filamentis linearibus; seminibus ovoideis, brunneis.—BOLIVIA: Cocopunco, alt. about 3000 m., March 24-30, 1926, *Tate 379* (NY TYPE).

flowered cymes; pedicels .3–.8 cm. long, the central one longer; calyx-lobes obovate-oblong to oblong, .5–.8 cm. long, acuminate or acute, obsoletely 3-nerved; corolla 1.2–1.5 cm. long, yellow-green, tube less than one-half the length of the entire corolla; lobes ovate, acute to subrotund, entire or crenulate, erose; spurs one-half (rarely three-fourths) the length of the corolla, subhorizontally divaricate but incurved at the apex; stamens .25–.35 cm. long; filaments linear usually, anthers ovate; capsule lanceolate-ovate.

Distribution: mountains of Colombia, Ecuador, and Peru.

Specimens examined:

COLOMBIA: near Pasto, alt. 3600 m., June 13, 1878, *Lehmann* (V); páramos of Guanacas, Prov. Popayan, *Lehmann* 809 (NY); same locality, *Lehmann* 6128 (BG TYPE, F, US); same locality, *Hartweg* 1255 (NY, V TYPE of *H. antigonorrhoeica* Gilg); grassy páramo, Paletara, Dept. of Cauca, June 15–17, 1922, *Pennell* 6929 (ANSP, G, NY, US); same locality, alt. 2950 m., 1884, *Lehmann* 3498 (US).

ECUADOR: Andes, Quito, alt. 4000 m., April 1864, *Jameson* (V); pasture of the Andes, alt. 4000 m., March 1859, *Jameson* (NY, US, V); 1859, *Jameson* (BG G, M photo, UC); without locality or date, *Jameson* (NY, US); Quitian Andes, *Jameson* (V); Andes, Quito, 1855, *Couthouy* (ANSP, G, NY); same locality, 1857–9, *Spruce* 5131 (G, UC, V); San Ignacio, Pichincha Region, alt. approximately 4000 m., Aug. 14–19, 1923, *Anthony & Tate* 133 (US); Pichincha, alt. 3500 m., Feb. 3, 1927, *Firmin* 5 (US); Pichincha-Quito, *Karsten* (V); same locality, Dec. 30, 1929, *Heilborn* 137 (S); Tunguragua, above Baños, alt. 2000 m., Feb. 27, 1920, *Holmgren* 378 (S); Cotopaxi, alt. 3000–4000 m., Dec. 27, 1879, *Lehmann* (V); without locality, *Gesner* (UC); Mt. Chimborazo, alt. 4200 m., *Rimbach* 154 (US, M); “in pascuis andinis, alt. 2800–4000 m.,” *Sodiño* 109 (BG, TYPE of *H. Weddelliana* Gilg).

PERU: grassy places in shrub-wood, Putis, Choimacota Valley, Prov. Huanta, Dept. Ayacucho, alt. 3400–3500 m., Feb. 27–March 12, 1926, *Weberbauer* 7524 (F); Tambo de Vaca, alt. about 4000 m., June 10–24, 1923, *Macbride* 4362 (F, M).

64. *H. elegans*⁶⁷ Allen, n. sp.

Stout perennial, up to 4 dm. high; root thick, fibrous; axis covered with blackened remains of leaf bases, erect, sometimes

⁶⁷ *H. elegans* Allen, sp. nov.—Herba perennis, usque ad 4 dm. alta; radice crassa, fibrata; axe foliorum reliquiis tecto, erecto, saepe plus minusve decumbenti; ramis brevibus sterilibus, dense foliosis, 10–12 cm. altis; caule solitario, florifero, crasso, .5–.6 cm. in diametro, infra simplice, supra parum ramoso, striato; foliis basalibus in rosula densa, petiolatis, late lanceolatis, 7–9 cm. longis, acuminatis, prominenti 3-nerviis, nervis supra immersis, infra prominenti; foliis caulinis 4–6 geminis, sessilibus, 2–4 cm. longis, sursum decrescentibus; inflorescentia cymosa, laxa, multo-florifera, terminali vel ramis brevibus clause adpressis terminatis, laxis spicis similibus; pedicellis usque ad 4 cm. longis, ad apicem parum curvatis; calycis lobis foliosis, late lanceolato-ellipticis vel ovatis, 1–1.2 cm. longis, .4 cm. latis, attenuate acuminatis, prominenti 3-nerviis; corolla 3–4 cm. longa, viride, tubo $\frac{1}{6}$ – $\frac{1}{4}$ corollae longitudini adaequanti; lobis obovato-ovatis, erosis, apiculatis; calcaribus prope $\frac{1}{2}$

more or less decumbent; short sterile branches, densely leafy, 10–12 cm. high; single flowering stem, coarse, .5–.6 cm. in diameter, simple below, slightly branched above, striate; basal leaves in dense rosettes, petiolate, broadly lanceolate, 7–9 cm. long, acuminate, prominently 3-nerved, nerves sunken above, prominent below; cauline leaves 4–6 pairs, sessile, 2–4 cm. long, decreasing toward the summit; inflorescence loose, many-flowered, terminal cymes, or cymes terminating the short, closely appressed branches, giving the inflorescence a loose, spike-like appearance; pedicels up to 4 cm. long, slightly curved at the tip; calyx-lobes foliaceous, broadly lanceolate-elliptic or ovate, 1–1.2 cm. long, .4 cm. broad, attenuate-acuminate, prominently 3-nerved; corolla 3–4 cm. long, green, tube one-sixth to one-fourth the length of the entire corolla; lobes obovate-ovate, erose, apiculate; spurs nearly one-half the length of the corolla, slender, with tips extremely glandular, pendulous, curved outward, somewhat spreading, approximate at base; stamens about 1 cm. long; filaments linear, anthers narrowly ovate; capsule attenuate-ovate.

Distribution: Colombia.

Specimens examined:

COLOMBIA: Dept. Santander, Páramo de Romeral, alt. 3800–4100 m., Jan. 29–30, 1927, *Killip & Smith 18568* (M TYPE, NY, US).

65. *H. Hoppii* Reimers in Engl. Bot. Jahrb. 62: 335. 1929.

Perennial about 1 dm. high; flowering stem simple, erect, rather stout; basal leaves in a dense rosette, herbaceous, petiolate, oblanceolate, 3 cm. long, .4 cm. broad, acute, nerved; cauline leaves 1–2 pairs, similar to a rosette, but petioles shorter; inflorescence a terminal, many-flowered cyme; pedicels 1–3 cm. or more long; calyx-lobes ligulate to elliptic, .6 cm. long, .2 cm. broad, acute at apex, subapiculate, obsoletely 3-nerved; corolla 1 cm. or less long, yellow-green, tube about one-third the length of the entire corolla; lobes acutish ovate, subrotund; spurs very slender, one-third to one-half the length of the corolla, pendulous, divergent at apex; stamens .35 cm. long.

corollae longitudini adaequanti, tenuibus, ad apicem glandulosis, pendulis, curvatis extrinsecis divergentioribus ad basin approximatis; staminibus ca. 1 cm. longis; filamentis linearibus; antheris attenuate ovatis; capsula attenuata-ovata.—COLOMBIA: Dept. Santander, páramo de Romeral, alt. 3800–4100 m., Jan. 29–30, 1927, *Killip & Smith 18568* (M TYPE, NY, US).

Distribution: Colombia and Peru.

Specimens examined:

COLOMBIA: (TYPE not seen, *Hopp 33a* BG, M photo).

PERU: Cuzco, alt. 3000–3600 m., July 1923, *Herrera* (US).

66. *H. asclepiadea* (HBK.) G. Don, Gen. Hist. 4: 177. 1838; Griseb. Gen. & Sp. Gent. 326. 1839; in DC. Prodr. 9: 129. 1845 pp; in Linnaea 22: 45. 1849; Benth. Pl. Hartw. 228. 1846; Wedd. Chlor. And. 2: 75. 1859, pp.

Swertia asclepiadea HBK. Nov. Gen. & Sp. Pl. 3: 175. 1818.

S. quadricornis Willd. ex Roem. & Schult. Syst. Veg. 6: 134. 1820; fide Gilg, l. c.

Perennial herb, up to 4 dm. high; fertile stems one or more, simple, erect; one to several short densely leafy sterile stems arising from the root or, rarely, from the base of a flowering stem; basal leaves attenuate into a more or less slender elongate petiole, narrowly lanceolate, 3–4 cm. long, up to .5 cm. broad, attenuate-acuminate, 3-nerved; cauline leaves sessile, more elongate than the basal leaves but otherwise similar to them; inflorescence a terminal or axillary, 3–8-flowered, occasionally umbelliform cyme, petioles up to 3.5 cm. long; calyx-lobes broadly lanceolate, up to .6 cm. long, acute, 3-nerved; corolla approximately 1.2–1.3 cm. long, greenish-yellow, tube one-fourth the length of the entire corolla; lobes broadly ovate, acute; spurs horizontal, measuring up to 1.7 cm. from tip to tip; stamens approximately .45 cm. long; filaments linear, anthers ovate; capsule up to 1.8 cm. long, ovate, attenuate at tip, subfalcate; seeds oval-elliptic, reticulate.

Distribution: Colombia, Ecuador, and Peru.

Specimens examined:

COLOMBIA: Dept. of Cundinamarca, above Bogota, bushy slope, alt. 2700–2800 m., Aug. 16, 1917, *Rusby & Pennell 1269* (NY); Páramo de Guasca, July 21, 1919, *Bro. Ariste-Joseph A390* (US); mountains near Bogota, Oct. 20, 1852, *Holton 468* (ANSP, DH, G, NY); páramos, Bogota, March 1916, *M. T. Daire 123* (US); Bogota, alt. 2900 m., *Karsten* (V); Bogota, alt. 3000 m., 1851–57, *Triana 1958* (V); near Bogota, *Goudot* (DH); Andes near Bogota, 1843, *Hartweg 1254* (DH, NY, V); same locality, *Bro. Ariste-Joseph* (US); Pamplona, Páramo de las Cruces, alt. 3600 m., Nov. 1842, *Linden 729* pp. (DH, V); Tequendama, 1917, *Bro. Ariste-Joseph A46* (G, US); páramos, Guasca, alt. 4000 m., Aug. 1931, *Arbelaez 1201* (US); (TYPE not seen, *Humboldt & Bonpland*, HJP, M, photo).

ECUADOR: Prov. Loja, between San Lucas and Oña, alt. 2200–3100 m., Sept. 7, 1923, *Hitchcock 21539* (G, NY, US).

PERU: Dept. of Cusco, Paso de Tres Cruces, Cerro de Cusilluyoc, alt. 3800–3900 m., May 3, 1925, *Pennell 13842* pp. (NY).

This species is closely related to *H. recurva* of southwestern United States and Mexico.

67. *H. Kalbreyeri* Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 120. 1916.

Perennial caespitose herb up to 2.5–4 dm. high; axis procumbent, slender, subligneous, the upper part erect; stems 1–several, erect, more or less slender, simple, internodes 3.5 cm. long; sterile stems up to 7–8 cm. high, densely leafy above; rosette leaves petiolate, herbaceous, stiffly erect, never drooping, oblanceolate, about 5 cm. long, .3 cm. broad, acute, 3-nerved, midvein heavy and hard; cauline leaves often as many as 8 pairs, sessile, linear-lanceolate to lanceolate, up to 2.5 cm. long, .2–.25 cm. broad, acute, 3-nerved; inflorescence terminal or axillary cymes, 1–5-flowered, frequently pseudo-spicate or pseudo-paniculate, pedicels up to 3 cm. long; calyx-lobes lanceolate, up to .5 cm. long, .15 cm. broad, 3-nerved; corolla 1.2–1.5 cm. long; tube one-third the length of the entire corolla; lobes ovate, somewhat acute, erose; spurs one-half to three-fourths the length of the corolla; stamens about .4 cm. long; filaments linear, anthers broadly ovate; capsule lanceolate.

Distribution: Colombia.

Specimens examined:

COLOMBIA: Páramo de Choavhi, near Bogota, alt. 3700 m., Aug. 8, 1922, Killip & Bro. Ariste-Joseph 11924 (ANSP, US); Dept. Cusco, La Raya, April 22, 1925, Pennell 13513 (ANSP); Dept. Norte de Santander, between Mutiscua and Pamplona, alt. 3400 m., Feb. 23, 1927, Killip & Smith 19723 (US). (TYPE not seen, Kalbreyer 717, BG, M photo).

68. *H. bella* Gilg in Fedde, Rep. Spec. Nov. 2: 52. 1906.

Perennial herb, 2–2.5 dm. high; stems decumbent, bearing at apex numerous short sterile leafy branches up to 10 cm. long, and elongate fertile branches, simple, erect, more or less slender, internodes up to 6 cm. long; basal leaves numerous, subcoriaceous, petiolate, oblanceolate to lanceolate, 3–3.5 cm. long, .4 cm. broad, acute, 3–5-nerved, veins sunken above, prominent below; leaves of sterile branches lanceolate, acute; cauline leaves 3–4 pairs, sessile, lanceolate, acute; inflorescence a terminal subumbelliform many-flowered cyme, rarely axillary 3-flowered cymes; calyx-lobes obovate-lanceolate, .6–.7 cm. long, .2 cm.

broad, acute, nerved; corolla approximately 1.6 cm. long, green; lobes obovate, acute; spurs horizontal or subhorizontal, about three-fourths the length of the corolla.

Distribution: Peru.

Specimens examined:

PERU: Dept. Junín, Prov. Tarma, Huacapistana, alt. 3000–3100 m., *Weberbauer* 2065 (BG TYPE, DH, M photo); *Pavon* 737 (DH).

69. *H. sphagnicola* Gilg in Engl. Bot. Jahrb. 54: Beibl. 118, p. 121. 1916.

Perennial, about 2.5 dm. high; root slender, multifibrous; axis short, slender, nearly erect; several curved-ascending sterile branches; fertile branches single, simple or branched at base, erect, the lower portion densely leafy, the upper loosely leafy; basal leaves in rosette, herbaceous, attenuate into petioles once or twice the length of the blades, obovate, 1.5–2.2 cm. long, .5 cm. broad; lower cauline leaves several pairs, petiolate, obovate, 1.5–2 cm. long, .3 cm. broad, acute; upper cauline leaves slightly narrowed at base but more or less sessile, oblong or oblong-lanceolate, .7–1.2 cm. long, .2–.25 cm. broad, acute to acuminate, obsoletely 3-nerved; inflorescence a terminal many-flowered subglobose cyme; pedicels about 1–1.3 cm. long; calyx-lobes obovate to ovobate-oblong, scarcely .3 cm. long, .1–.15 cm. broad, subrotund at apex, obsoletely 3-nerved; corolla .8–.9 cm. long, sulphur-yellow, tube less than one-half the length of the entire corolla; lobes ovate, rotund; spurs slender, tapering, one-half the length of the corolla, but subhorizontally divaricate, often curved upward at the apex.

Distribution: Peru.

No specimens examined, but description compiled from original publication and photograph. (TYPE, *Weberbauer* 4376, BG, M, photo).

LIST OF EXSICCATAE

The distribution numbers are printed in *italics*. Unnumbered collections are indicated by a dash. The numbers in parentheses are the species numbers used in this monograph.

Aiton, G. B. — (23).
 Alaman, L. — (2a).
 Allen, J. A. — (23).
 Altamirano, F. 908 (21).

Andrieux, G. 226 (31).
 Anthony, H. E. & Tate, G. H. H. 133
 (63); 182, 299 (57).
 Arbelaez, E. P. 1201 (66).

- Archer, W. A. 1348 (2).
 Ariste-Joseph, Bro. —, A46 (66); A423 (10); A390 (66).
 Arnold, I. S. — (23).
 Arsène, Bro. G. — (2a); — (2d); — (31a); 37 (23); 55 (2d); 1703, 1711 (2a); 2098 (2); 5610 (2a); 5864, 5957 (2d).
 Bailey, W. W. — (23).
 Bang, M. 665 (45); 1019 (48).
 Banks, J. — (23); — (23a).
 Bergman, H. F. 2948 (23).
 Berlandier, J. L. 1207 (2, 2a).
 Beyrich, H. K. — (2a).
 Blake, J. — (23).
 Blumer, J. C. 1359 (22).
 Boott, W. — (23).
 Bourgeau, E. — (23); 799, 3126 (2a).
 Bowdoin College, 290 (23a).
 Boyce, T. E. — (23).
 Brenton, M. E. — (23); 144a ? (23a).
 Brinkman, A. H. 3678 (23).
 Brown, S. 667 (23).
 Buchtien, O. 54, 600 (55); 1484 (35).
 Burtlehaus, F. — (23).
 Canby, W. M. — (23).
 Chapman, A. W. — (23).
 Churchill, J. R. — (23).
 Chute, A. P. — (23).
 Collins, J. F., Fernald, M. L. & Pease, A. S. —, 4261 (23).
 Conzatti, C. 2295, 4265 (26).
 Conzatti, C. & Gonzalez, V. 878 (2b).
 Cook, O. F. 45 (32a).
 Cook, O. F. & Gilbert, G. B. 1308 (56); 1793 (36); 1811 (56).
 Coulter, T. 939 (31).
 Couthouy, J. P. — (51); — (57); — (63).
 Cristan, F. — (24).
 Cumming, H. 128 (55).
 Daire, M. T. 123 (66).
 Dodge, C. K. 352 (23).
 Dombey, J. — (56).
 Don, D. — (31).
 Drexler, C. — (23).
 Drummond, J. — (23).
 Eames, E. A. — (23).
 Eames, E. H. & Godfrey, C. C. 8030 (23a).
 Eggleston, W. W. —, 3051 (23); 10774, 15781, 17137 (22).
 Eggleston, W. W. & Fernald, M. L. — (23).
 Ehrenberg, K. 608 (30).
 Ellis, C. C. 20 (22).
 Endlich, R. 53 (22).
 Farr, E. M. — (23).
 Farwell, O. A. 249, 770 (23).
 Faxon, C. E. — (23).
 Fellows, D. W. — (23).
 Fernald, M. L. —, 87, 1151 (23).
 Fernald, M. L. & Collins, J. F. 244 (23).
 Fernald, M. L., Dodge, C. W. & Smith, L. B. 25986 (23).
 Fernald, M. L. & Long, B. 14390, 14392 (23); 28950 (23a).
 Fernald, M. L., Long, B. & Dunbar, B. H. 26982, 26983, 26984, 26985, 26986 (23a).
 Fernald, M. L., Long, B. & Fogg, J. M. 381, 382 (23a).
 Fernald, M. L. & Pease, A. S. 16624 (23).
 Fernald, M. L. & Wiegand, K. M. 3908, 3909, 6081 (23a).
 Fernald, M. L., Wiegand, K. M. & Kittredge, J. 3910 (23a); 3911 (23); 3912 (23a).
 Fernald, M. L., Wiegand, K. M. & Long, B. 28951 (23a).
 Firmin, Fr. G. 5 (63); 697 (42).
 Forbes, F. F. — (23).
 Fowler, J. — (23).
 Franklin & Douglas — (23).
 Friedrichstahl, E. — (24).
 Funck, N. 415 (15).
 Funck, N. & Schlim, L. J. 901 (7); 1148 (8).
 Galeotti, H. 1488 (30); 1489 (26); 1490 (2b); 7166 (33); 7219 (2); 7220 (30); 7221 (1); 7222 (31).
 Garcia, P. Ibana — 410 (25).
 Gates, F. C. 14156 (23).
 Gates, F. C. & M. T. 9768, 10716 (23).
 Gehriger, W. 92a (8).
 Gesner, — (63).
 Ghiesbreght, A. 137, 618 (2).
 Goderiel, — (23).
 Goodale, G. L. — (23).

- Goudot, — (10); — (66).
 Greenman, J. M. & M. T. 5994 (24b).
 Grisebach, A. H. R. — (2); — (23).
 Gutzwiller, 32 (18).
 Haberer, J. V. —, 601 (23).
 Hadley, J. 1 (23).
 Hall, C. H. — (23).
 Hallowell, S. M. — (23).
 Harper, E. T. — (23).
 Harshberger, J. W. 137 (2a, 30).
 Hartweg, T. 210 (2b); 347 (31a); 494 (33); 1254 (66); 1255 (63).
 Hasse, H. E. — (23).
 Hay, G. U. — (23).
 Haydon, W. — (23).
 Heilborn, O. 137 (63); 437 (42).
 Heinburger, — (23).
 Heller, A. A. 391 (31a); 401 (2).
 Herrera, F. L. — (65).
 Herzog, T. 2377 (54); 2402 (55).
 Heyde, E. T. & Lux, E. 4729 (34).
 Hill, E. J. 179 (23).
 Hitchcock, A. S. 20909 (57); 21539 (66).
 Hoffmann, C. 119 (24b).
 Holmgren, I. 378 (63).
 Holton, I. F. 19 (464) (2); 467 (10); 468 (66).
 Holway, E. D. W. — (23).
 Hooker, J. D. — (23).
 Hosford, F. H. — (23).
 Houghton, D. 34 (23).
 House, H. D. 5643, 15688 (23).
 Howe, C. D. — (23a).
 Howe, C. D. & Lang, W. F. 1298, 1403 (23a).
 Humboldt, A. & Bonpland, A. — (2); — (31); — (42).
 Hyatt, A., Shaler, N. & Verrill, A. E. — (23).
 Jahn, A. 558, 839 (7).
 Jameson, W. — (2); 53 (40); — (42); — (49); — (57); — (63).
 Jones, M. E. — (2e); — (25); —, 28603 (22).
 Julio, Bro. 338, 455 (55).
 Jurgensen, 386 (33); 812 (26); 811 (30).
 Kalenborn, A. S. 91 (38).
 Kalenborn, M. 91 (38).
 Karsten, H. — (5); — (10); — (42); — (57); — (63); — (66).
 Karwinsky, W. F. von, 122 (31).
 Kennedy, G. G. — (23).
 Kennedy, Mrs. J. J. 38 (23).
 Killip, E. P. 6889 (2).
 Killip, E. P. & Ariste-Joseph, Bro. 11924 (67).
 Killip, E. P. & Smith, A. C. 15679 (3); 15680, 17485 (60a); 17516, 17521, 17566 (50); 17568, 17604, 17662 (60a); 17722 (60); 17982 (60a); 18229, 18426, 18466, 18546 (60); 18568 (64); 18644, 18665, 18688 (60); 19551 (60a); 19723 (60, 67); 21737 (44); 22083, 22087 (43).
 Kittredge, E. M. — (23).
 Kofoed, C. A. — (23).
 Kuntze, O. 2356 (24); 23783 (2).
 Lange, J. — (23).
 Lankester, C. H. 670 (24).
 Lechler, W. 2001 (56).
 Lehmann, F. C. — (66); 809, 3498 (63); 4878 (49); 6128 (63); 6190 (12); 7860 (17).
 Lemmon, J. G. — (2a); — (22).
 Lemmon, J. G. & wife — (2a); — (22).
 Leston, — (23).
 Liebmann, F. M. 10770 (33); 10771 (26); 10774 (30); 10775 (2); 10776 (30); 10777 (2c); 10778 (2); 10780 (31).
 Linden, J. 437 (6); 456 (2); 729 (60); 729 (66); 934 (1); 935 (31a).
 Loew, O. — (22).
 Loring, — (23a); — (23).
 Louis-Arsène, Fr. 365, 403 (23a).
 Lour, O. — (22).
 Macbride, J. F. 3040 (47); 3072 (36); 3431 (2); 4362 (63).
 Macbride, J. F. & Featherstone, 898 (38); 1657, 2001 (56).
 Macfarlane, — (23).
 Mackenzie, K. K. 3618 (23).
 Mackenzie, K. K. & Griscom, L. 10411, 11135 (23a).
 MacNab, W. — (23).
 Macoun, J. —, 77, 300, 1191, 54300?, 68734? (23).
 Mandon, G. 369 (36, 52); 369 (56).

- Marie-Victorin, Bro. 28, 8349 (23).
 Marie-Victorin, Bro., Brunel, J. B.,
 Rolland-Germaine & Rousseau, Z.
 17663 (23).
 Marie-Victorin, Bro., & Rolland-Ger-
 maine, 9647, 9881, 18482 (23a);
 27159 (23).
 Marie-Victorin, Bro., Rolland-Germaine
 & Louis-Marie, 21076 (23).
 Martin, — (23).
 Mathew, G. F. — (23).
 Mathews, A. — (58); 523 (44); 3133
 (2).
 Maxon, W. R. & Hay, R. 3675 (28).
 Mell, P. H. & Knopf, — (23).
 Metcalfe, O. B. 501 (22).
 Mexia, Y. 2693 (31).
 Millspaugh, C. F. 82 (23).
 Moore, A. H. 1211 (23).
 Morison, — (23a).
 Morton, J. A. — (23).
 Muller, F. — (2d).
 Murdock, J. 3072 (23).
 Mutis, J. C. — (22).
 Nelson, E. W. 636 (30, 33); 652 (30);
 698 (33); 1096 (30); 1115, 1164, 1340
 (26); 1748 (30); 2126 (2b); 3646a
 (34); 4798 (25); 4868 (22).
 Nichols, G. E. 1901 (23a).
 Northrup, J. I. 69 (23).
 Oakes, W. — (23).
 Oersted, A. S. 10772, 10773 (24); —,
 10779 (2).
 Olson, — (23).
 Over, W. H. 16145 (23).
 Palmer, E. — (2f); 160 (2b); 359 (25);
 403 (2e); 680, 683 (2b); 839 (22).
 Parry, C. C. — (23).
 Parry, C. C. & Palmer, E. 600 (2); 600b
 (2b).
 Pavon, J. A. — (2); 567 (56); 737 (68).
 Pease, A. S. 1081, 1082 (23); 2384 (24);
 2910, 18030, 18058 (23).
 Peck, C. H. — (23).
 Pennell, F. W. 2434 (2); 2438 (19); 3001
 (14); 4268 (13); 6889 (2); 6929 (63);
 7034 (19); 7052 (12); 7154 (2); 10575
 (19); 13513 (67); 13738 (56); 13749
 (37); 13842 (55); 14678 (44).
 Pennell, F. W. & Hazen, T. E. 9841,
 9894 (16); 9997 (14).
 Pennell, F. W. & Killip, E. P. 6480 (2).
 Percival, Mrs. — (23).
 Pickering, C. — (23).
 Pinkerton, M. E. & Allen, C. K. — (23).
 Pittier, H. 39 (32); 744 (24); 1111 (14);
 2975, 3499 (24); 13076 (24b).
 Pittier, H. & Tonduz, A. 10805 (24).
 Poggenburg, J. F. — (23).
 Porter, T. C. — (23).
 Priest, M. E. — (23a).
 Pringle, C. A. — (2e); — (31a); — (22);
 — (23); 1329 (22); 1330 (2e); 1663
 (22); 1664 (2e); 2735 (2b); 4209 (21);
 4224 (31a); 4229 (20); 4720 (31a);
 4908 (26); 5465 (22); 6964, 7918, 7943
 (2e); 8939 (27); 11033 (31); 11329
 (2e); 11636 (2b); 11842 (2e); 13120
 (2a); 13121 (21); 13588 (22); 13971
 (23).
 Pringle, C. A. & Hosford, F. H. — (23).
 Puckner, W. A. — (23).
 Pulling, H. E. — (23).
 Purpus, C. A. — (2a); 318 (20); 1760
 (30); 1761 (2e); 1762 (2a); 2697 (2);
 2766 (31); 3070 (30); 6011 (27).
 Reiche, C. 36 ? (21).
 Richards, G. H. — (23).
 Rimbach, A. 154 (63).
 Robbins, W. W. 102, 95 (23).
 Robinson, B. L. 384 (23); 410 (23a).
 Robinson, B. L. & Schrenk, H. 180 (23a).
 Root, D. J. — (23).
 Rose, J. N. 2732, 2962 (2b).
 Rose, J. N. & G. 22674 (49).
 Rose, J. N. & Hay, R. 5569, 5730 (31);
 5999 (20).
 Rose, J. N. & Painter, J. H. 6665 (31);
 7025 (31a); 7026 (2a); 7910, 7964
 (31a).
 Rothrock, J. T. — 733 (22); — (23).
 Rousseau, J. 26646, 30711 (23).
 Rowlee, W. W. & Stork, H. E. 899 (24).
 Rusby, H. H. —, 264 (22); 669 (45);
 670 (59).
 Rusby, H. H. & Pennell, F. W. 1269 (66).
 Rydberg, P. A. 878, 9619 (23).
 St. John, H. 90687 (23a); 90688 (23).

- St. John, H. & Nichols, G. E. 2449 (23).
 Salazar, F. — (2a); — (31a).
 Salvin, O. — (32).
 Salvin, O. & Godman, F. D. 311, 249 (32).
 Sandberg, J. H. —, 457, 719, 1151 (23).
 Schaffer, C. — (23).
 Schaffner, J. G. 38 (2b); 421 (2).
 Scherzer, C. von, — (28).
 Schiede, C. J. W. & Deppe, F. 246 (31);
 247 (2, 2a); 248 (27).
 Schrenk, J. — (23).
 Schuette, J. H. — (23).
 Seaton, H. E. 205 (31).
 Seler, C. & E. 2728 (34); 3086 (34a).
 Sewall, C. S. & Weed, A. C. — (23a).
 Shannon, W. C. 3613, 3630 (32).
 Shreve, F. 4312, 5373 (22).
 Smith, C. E. —, 5026 (23).
 Smith, C. L. 236 (26); 665a (2b).
 Smith, J. D. 2170 (29); 4888 (24).
 Sornborger, J. D. (23a).
 Spruce, R. — (63); 5131 (42, 57, 63).
 Standley, P. C. 35285 (24a); 35141 (24b).
 Stanton, J. 19 (23).
 Stearns, W. A. — (23a).
 Steinbach, J. 9535 (48).
 Sumichrast, I. — (2d).
 Svensen, H. K. & Fassett, N. C. 2096
 (23).
 Swezey, G. D. 17 (23).
 Tate, G. H. H. — (2); 67 (35); 223 (55);
 379 (62).
 Thaxter, R. — (23a).
 Thompson, S. L. 31 (23).
 Thurber, G. — (23).
 Tonduz, A. 4316, 10865 (24).
 Torrey, G. S. 35 (23a).
 Townsend, C. H. T. & Barber, C. N. 303
 (25); 309 (22).
 Townsend, C. W. — (23a).
 Triana, J. J. 1958 (66); 1964 (10).
 Tuerckheim, H. von, 2041 (2g).
 Umbach, L. M. — (23).
 Vasey, G. — (23).
 Verrill, A. E. — (23).
 Visher, S. S. 1557 (23).
 Waghorne, A. C. — (23); — (23a).
 Warscewicz, J. 216 (24).
 Wawra, H. von, 425 (2); 424, 952 (31).
 Weberbauer, A. 279 (38); 680 (56); 2065
 (68); 7498 (46); 7524 (63).
 Wheeler, C. F. — (23).
 Wheeler, O. F. & Jones, J. C. 1054 (23).
 White, O. E. 178 (45).
 Williams, E. F. — (23).
 Williams, E. F. & Fernald, M. L. — (23).
 Williams, E. F., Robinson, B. L. &
 Fernald, M. L. 58 (23).
 Williams, R. S. 903 (23).
 Williamson, C. S. — (23); 501, 547, 559,
 601 (23a); 1325, 1422, 2090, 2278 (23).
 Woelfflin, B. — (31).
 Woods, F. F. — (23).
 Woodworth, R. H. 357 (23a).
 Young, A. — (23).

INDEX TO SPECIES

New genera, species, varieties, and combinations are printed in **bold face type**; synonyms in *italics*; and previously published names in ordinary type.

	Page		Page
<i>Ceratia</i>	138	<i>Halenia</i>	137
<i>Exadenus</i>	138	adpressa	148
<i>alatus</i>	139	<i>alata</i>	139
<i>brevicornis</i>	140	<i>antigonorrhoeica</i>	202
<i>parviflorus</i>	140	<i>apiculata</i>	178
var. <i>β latifolius</i>	142	<i>asclepiadea</i>	205
<i>paucifolius</i>	140	<i>asclepiadea</i>	188
<i>Gentiana viridis</i>	151	<i>barbicaulis</i>	198

	Page		Page
<i>bella</i>	206	<i>macrantha</i>	148
<i>bifida</i>	201	<i>major</i>	158
<i>Brentoniana</i>	167	<i>Mathewsii</i>	188
<i>brevicornis</i>	140, 147	<i>Meyeri Johannis</i>	197
var. <i>chihuahuensis</i>	144	<i>Michauxiana</i>	162
var. <i>divergens</i>	144	<i>micranthella</i>	143
var. <i>latifolia</i>	141	<i>minima</i>	193
var. <i>micranthella</i>	143	<i>multiflora</i>	142
var. <i>multiflora</i>	142	<i>nudicaulis</i>	174
var. <i>ovata</i>	145	<i>nutans</i>	175
var. <i>Tuerckheimii</i>	145	<i>Palmeri</i>	171
<i>caespitosa</i>	184	<i>parallela</i>	157
<i>caleoides</i>	173	<i>parviflora</i>	140
<i>candida</i>	161	var. <i>latifolia</i>	142
<i>chlorantha</i>	172	<i>paucifolia</i>	140
<i>Conzattii</i>	171	<i>Pavoniana</i>	197
<i>crassiuscula</i>	159	<i>penduliflora</i>	194
<i>dasyantha</i>	154	<i>phyteumoides</i>	194
<i>decumbens</i>	178	<i>pichinchensis</i>	186
<i>deflexa</i>	162	<i>pinifolia</i>	185
var. <i>Brentoniana</i>	167	<i>plantaginea</i>	175
<i>Dombeyana</i>	197	f. <i>grandiflora</i>	176
var. α	194, 196	var. <i>latifolia</i>	180
var. <i>brevicornis</i>	182	<i>platyphylla</i>	173
<i>elata</i>	155	<i>Pringlei</i>	160
<i>elegans</i>	203	<i>pulchella</i>	185
<i>elongata</i>	175	<i>Purdieana</i>	199
<i>erythraeoides</i>	140	var. <i>congesta</i>	200
<i>foliosa</i>	153	<i>Purpusi</i>	174
<i>gentianoides</i>	152	<i>pusilla</i>	182
<i>gigantea</i>	192	<i>recurva</i>	161
<i>gracilis</i>	186	<i>reflexa</i>	162
var. <i>Dombeyana</i>	197	<i>rhyacophila</i>	168
<i>guatemalensis</i>	179	var. <i>macropoda</i>	170
var. <i>latifolia</i>	180	var. <i>procumbens</i>	170
<i>heterantha</i>	162	<i>robusta</i>	190
<i>Herzogii</i>	195	<i>Rothrockii</i>	161
<i>Hieronymi</i>	201	<i>Rusbyi</i>	199
<i>Hoppii</i>	204	<i>scapiformis</i>	174
<i>hygrophila</i>	156	<i>Schiedeana</i>	172
<i>hypericoides</i>	184	<i>Schultzei</i>	151
<i>inaequalis</i>	150	<i>Shannonii</i>	177
<i>inaequalis</i>	151	f. <i>compacta</i>	178
<i>Jamesoni</i>	186	<i>silenooides</i>	195
<i>Kalbreyeri</i>	206	<i>spatulata</i>	183
<i>Karstenii</i>	149	<i>sphagnicola</i>	207
<i>Killipii</i>	187	<i>stellarioides</i>	152
<i>longicornu</i>	178	<i>Stuebelii</i>	190

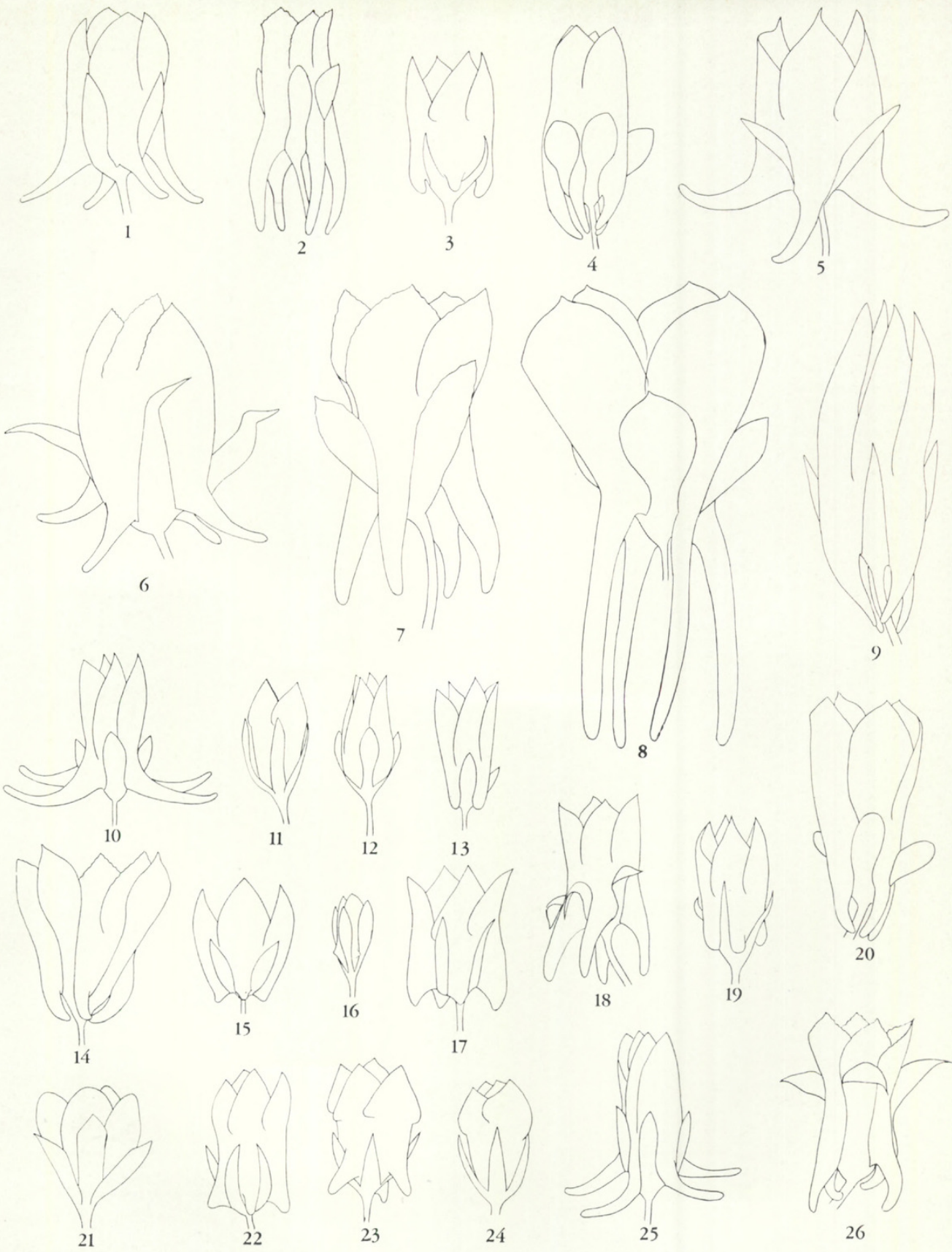
	Page		Page
subinvoluta.....	149	<i>pinifolia</i>	185
taruga gasso.....	191	<i>plantaginea</i>	175
Tolimae.....	155	<i>quadricornis</i>	205
<i>Tuerkheimii</i>	145	<i>recurva</i>	161
umbellata.....	196	<i>umbellata</i>	196
valerianoides.....	182	Swertiella.....	139
verticillata.....	153	<i>Tetragonanthus</i>	138
vincetoxicoides.....	188	<i>alatus</i>	139
viridis.....	151	<i>Brentonianus</i>	167
Weberbaueri	189	<i>brevicornis</i>	140
Weddelliana.....	202	<i>decumbens</i>	178
<i>Haleniastrum</i>	158	<i>deflexus</i>	163
<i>Swertia</i>	138	var. <i>Brentonianus</i>	167
<i>americana</i>	162	var. <i>heteranthus</i>	163
<i>asclepiadea</i>	205	<i>heterantherus</i>	163
<i>brevicornis</i>	140	<i>heteranthus</i>	163
<i>corniculata</i>	162	<i>longicornis</i>	178
<i>cucullata</i>	140	<i>Palmeri</i>	171
<i>deflexa</i>	162	<i>parviflorus</i>	140
<i>gracilis</i>	186	<i>paucifolius</i>	140
<i>hypericoides</i>	184	<i>plantagineus</i>	175
<i>Michauxiana</i>	162, 172	<i>Rothrockii</i>	161
<i>parviflora</i>	140	<i>Schiedeanus</i>	172
var. <i>angustifolia</i>	140	<i>Whitei</i>	188
var. <i>latifolia</i>	142		

EXPLANATION OF PLATE

PLATE 8

Camera-lucida drawings of the flower of the following species of *Halenia*. $\times 2$.

- Fig. 1. *H. deflexa* (Sm.) Griseb. (spurred form).
- Fig. 2. *H. decumbens* Benth.
- Fig. 3. *H. brevicornis* (HBK.) Don var. *multiflora* (Benth.) Allen.
- Fig. 4. *H. Conzattii* Greenm.
- Fig. 5. *H. recurva* (Sm.) Allen.
- Fig. 6. *H. rhyacophila* Allen.
- Fig. 7. *H. Shannonii* Briq.
- Fig. 8. *H. guatemalensis* Loesener.
- Fig. 9. *H. Palmeri* Gray.
- Fig. 10. *H. Pringlei* Rob. & Seat. (spurred form).
- Fig. 11. *H. brevicornis* (HBK.) Don.
- Fig. 12. *H. Pringlei* Rob. & Seat. (non-spurred form).
- Fig. 13. *H. nudicaulis* Mart. & Gal.
- Fig. 14. *H. platyphylla* Allen.
- Fig. 15. *H. brevicornis* (HBK.) Don var. *latifolia* (Schl. & Cham.) Allen.
- Fig. 16. *H. deflexa* (Sm.) Griseb. (non-spurred form).
- Fig. 17. *H. brevicornis* (HBK.) Don var. *divergens* Allen.
- Fig. 18. *H. Schiedeana* (Schl. & Cham.) Griseb.
- Fig. 19. *H. brevicornis* (HBK.) Don var. *chihuahuensis* Allen.
- Fig. 20. *H. plantaginea* (HBK.) Griseb.
- Fig. 21. *H. alata* (Mart. & Gal.) Hemsl.
- Fig. 22. *H. brevicornis* (HBK.) Don var. *Tuerckheimii* (Briq.) Allen.
- Fig. 23. *H. brevicornis* (HBK.) Don var. *ovata* Allen.
- Fig. 24. *H. brevicornis* (HBK.) Don var. *micranthella* (Briq.) Allen.
- Fig. 25. *H. crassiuscula* Rob. & Seat.
- Fig. 26. *H. caleoides* Allen.



ALLEN—THE GENUS *HALENIA*

EXPLANATION OF PLATE

PLATE 9

Camera-lucida drawings of the flower of the following species of *Halenia*. $\times 2$.

Fig. 1. *H. Purdieana* Wedd. var. *congesta* Allen.

Fig. 2. *H. Meyeri Johannis* Gilg.

Fig. 3. *H. Weddelliana* Gilg.

Fig. 4. *H. Killipii* Allen.

Fig. 5. *H. Stuebelii* Gilg.

Fig. 6. *H. gracilis* (HBK.) Don.

Fig. 7. *H. robusta* Gilg.

Fig. 8. *H. minima* Allen.

Fig. 9. *H. penduliflora* Gilg.

Fig. 10. *H. spatulata* Allen.

Fig. 11. *H. caespitosa* Gilg.

Fig. 12. *H. bifida* Rusby & Allen.

Fig. 13. *H. vincetoxicoides* Gilg.

Fig. 14. *H. pusilla* Gilg.

Fig. 15. *H. silenoides* Gilg.

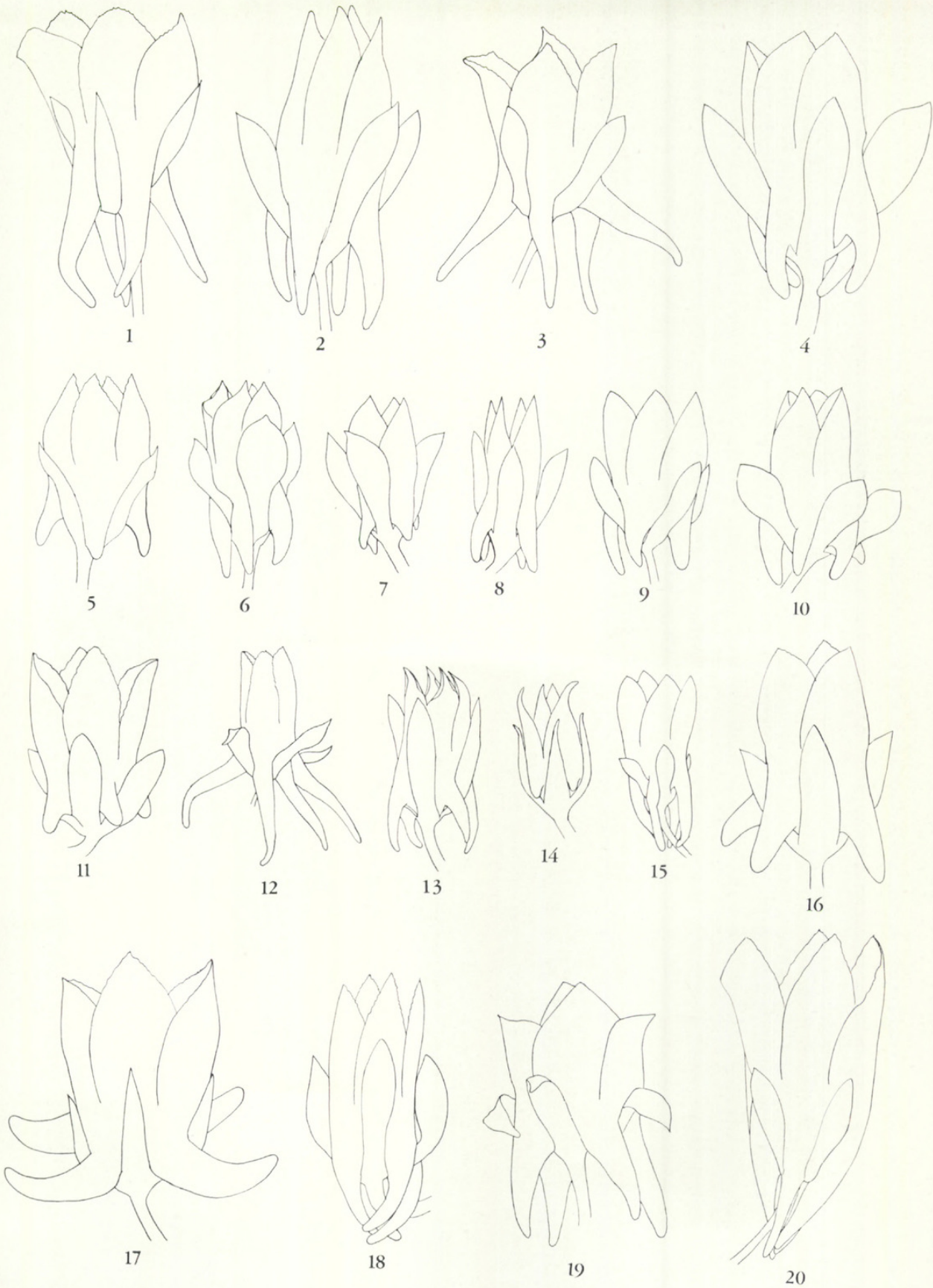
Fig. 16. *H. Hoppii* Reimers.

Fig. 17. *H. asclepiadea* (HBK.) Don.

Fig. 18. *H. Weberbaueri* Allen.

Fig. 19. *H. Rusbyi* Gilg.

Fig. 20. *H. umbellata* (R. & P.) Gilg.



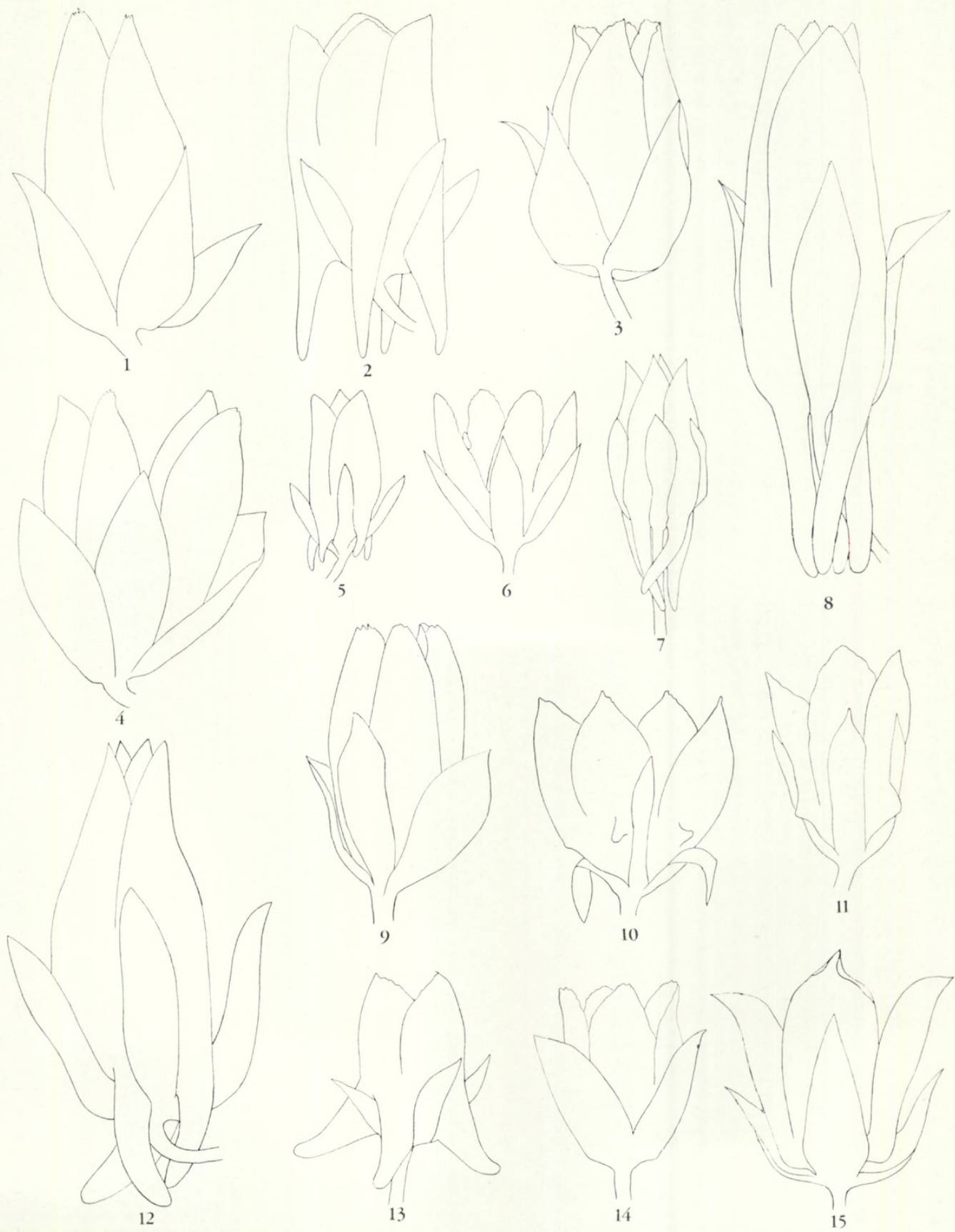
ALLEN—THE GENUS HALENIA

EXPLANATION OF PLATE

PLATE 10

Camera-lucida drawings of the flower of the following species of *Halenia*. $\times 2$.

- Fig. 1. *H. verticillata* Gilg.
- Fig. 2. *H. Purdieana* Wedd.
- Fig. 3. *H. hygrophila* Gilg.
- Fig. 4. *H. dasyantha* Gilg.
- Fig. 5. *H. adpressa* Allen.
- Fig. 6. *H. gentianoides* Wedd.
- Fig. 7. *H. taruga gasso* Gilg.
- Fig. 8. *H. elegans* Allen.
- Fig. 9. *H. Tolimae* Gilg.
- Fig. 10. *H. major* Wedd.
- Fig. 11. *H. Karstenii* Gilg.
- Fig. 12. *H. gigantea* Allen.
- Fig. 13. *H. Kalbreyeri* Gilg.
- Fig. 14. *H. inaequalis* Gilg.
- Fig. 15. *H. parallela* Allen.



ALLEN—THE GENUS *HALENIA*

EXPLANATION OF PLATE

PLATE 11

Camera-lucida drawings of the flower of the following species of *Halenia*. $\times 2$.

- Fig. 1. *H. subinvoluta* Gilg.
- Fig. 2. *H. viridis* (Griseb.) Gilg.
- Fig. 3. *H. pulchella* Gilg.
- Fig. 4. *H. bella* Gilg.
- Fig. 5. *H. barbicaulis* Gilg.
- Fig. 6. *H. elata* Wedd.
- Fig. 7. *H. foliosa* Gilg.



Allen, Caroline K. 1933. "A Monograph of the American Species of the Genus Halenia." *Annals of the Missouri Botanical Garden* 20, 119–222.

<https://doi.org/10.2307/2394423>.

View This Item Online: <https://www.biodiversitylibrary.org/item/54268>

DOI: <https://doi.org/10.2307/2394423>

Permalink: <https://www.biodiversitylibrary.org/partpdf/23688>

Holding Institution

Missouri Botanical Garden, Peter H. Raven Library

Sponsored by

Missouri Botanical Garden

Copyright & Reuse

Copyright Status: In copyright. Digitized with the permission of the rights holder.

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.