

**Revision of the North and Central American Hexandrous Species of
Aristolochia (Aristolochiaceae)**



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Annals of the Missouri Botanical Garden, Vol. 53, No. 2 (1966), 115-196.

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Annals of the Missouri Botanical Garden

Vol. 53

1966

No. 2

REVISION OF THE NORTH AND CENTRAL AMERICAN HEXANDROUS SPECIES OF ARISTOLOCHIA (ARISTOLOCHIACEAE)¹

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ABSTRACT

A taxonomic revision of the North American species of *Aristolochia*, exclusive of the Mexican pentandrous group, is presented. A total of 58 species is enumerated with descriptions, illustrations, distribution maps and complete taxonomic synonymy; seven species are novelties.

Aristolochia has an estimated 450 species distributed mainly throughout the world tropics and subtropics. Geographic areas richest in endemic species are Brazil and the island of Hispaniola; the numbers of species decline sharply as one moves northward and very few are capable of withstanding freezing temperatures.

The present revision includes all of the native or introduced species of North and Central America except those with five stamens. These pentandrous species are chiefly natives of Mexico; a taxonomic revision for them is in preparation.

Aristolochia in the New World has not been taxonomically revised for 100 years. Duchartre presented the most recent comprehensive treatment in an account of *Aristolochiaceae* for de Candolle's "Prodromus" (Duchartre, 1864); he recognized 171 species in the genus. There is an outline account of the genus in the second

¹Rewritten portion of a thesis submitted in partial fulfillment for the Doctor of Philosophy degree at Washington University in affiliation with the Missouri Botanical Garden in June, 1963.

²I wish to express appreciation for support to several agencies and institutions during the six years' preparation of this paper. They include the Research Foundation of Southern Illinois University, the Missouri Botanical Garden, the Research Foundation of the University of Connecticut and the National Science Foundation (Grant No. GB-2761).

I am also deeply grateful to the curators of the following herbaria who furnished specimens for study or who aided in other ways, namely A, BM, COL, DS, F, FI, G-DC, GH, K, LE, LINN, MEXU, MICH, MO, NCU, NY, P, S and US.

ANN. MISSOURI BOT. GARD. **53** (2): 115-196, 1966.

edition of "Die Natürlichen Pflanzenfamilien" (Schmidt, 1935), but it is incomplete because not all species are described and some subgeneric categories are named as "catch-alls" for species not fitting into the framework of Schmidt's classification. An account of the collections then in the Berlin herbarium was prepared by Klotzsch (1859). More recent contributions to the taxonomy of the genus are a revision of near-eastern species by Davis & Khan (1961), an account of Brazilian species by Hoehne (1927) and a short paper splitting the genus into several segregates after Rafinesque by Huber (1960).

MORPHOLOGY

Typically species of *Aristolochia* are lianas of temperate and tropical forested areas. Some species are perennial herbs which sprawl over shrubs or along the ground. A few are shrubs, small trees or small upright perennial herbs.

The leaves frequently are heart-shaped with a deeply cordate or subhastate base; many species have heteromorphic foliage. While leaf shape is a valuable character for many species in a general sense, a wide variety of shapes may occur on a single stem. Examples of species with variable or unusual leaf outlines are *A. bilobata*, *A. gigantea*, *A. lindeniana*, *A. passifloraefolia*, *A. peltata*, *A. pentandra*, *A. maxima*, *A. panamensis*, *A. tigrina* and *A. trilobata*. The leaves range from thin, light-green membranes to those of gray-green, subcoriaceous texture.

The first prophyll of an axillary branch in individuals of some species becomes enlarged concurrent with the subtending leaf on the main axis. These *pseudostipules* are similar in appearance to a pair of connate, clasping stipules. In a few species, they are reliable characters for identification purposes.

The indument of the leaves and other organs is similarly varied. In some Antillean species, the upper surface of the leaves may bear minute hamate hairs while the lower is glabrous. In others, the stems, petioles, leaves and flowers are hispid-strigose, but judging from field observations, pubescence varies with exposure, soil, water relationships, and possibly other factors.

Flowers are always solitary in leaf or bract axils; the leaves of the flowering branch may be sharply reduced and the flowers aggregated in a racemiform or monochasial fashion, as in *A. bilabiata* and *A. serpentaria*. Some of the woody tropical species have cauliflorous inflorescences appearing umbelliform due to the greatly shortened internodes of the flowering axis (e.g. *A. veraguensis*). The bracteolate peduncles of *A. grandiflora*, *A. macrophylla* and *A. serpentaria* possibly have developed through the loss of branches or additional flowers at those nodes.

The calyx tube is composed of three united sepals. Arising from the apex of the ovary the calyx expands into an ovoid, gibbous *utricle*. From the distal end of the utricle the *tube* narrows perceptibly, finally widening to form the more or less expanded *limb*. The calyx sometimes has two additional intussusceptive structures. At the juncture of the utricle and the tube, the *syrinx* projects asymmetrically into the utricle cavity; where the tube and the limb join, the projection is a circular flange, the *annulus* (Fig.1). The strongly zygomorphic calyx is unlike the other parts of the flower, which are actinomorphic. Calyx coloration may change drastically during the life of the flower; purple may fade to yellow, green areas

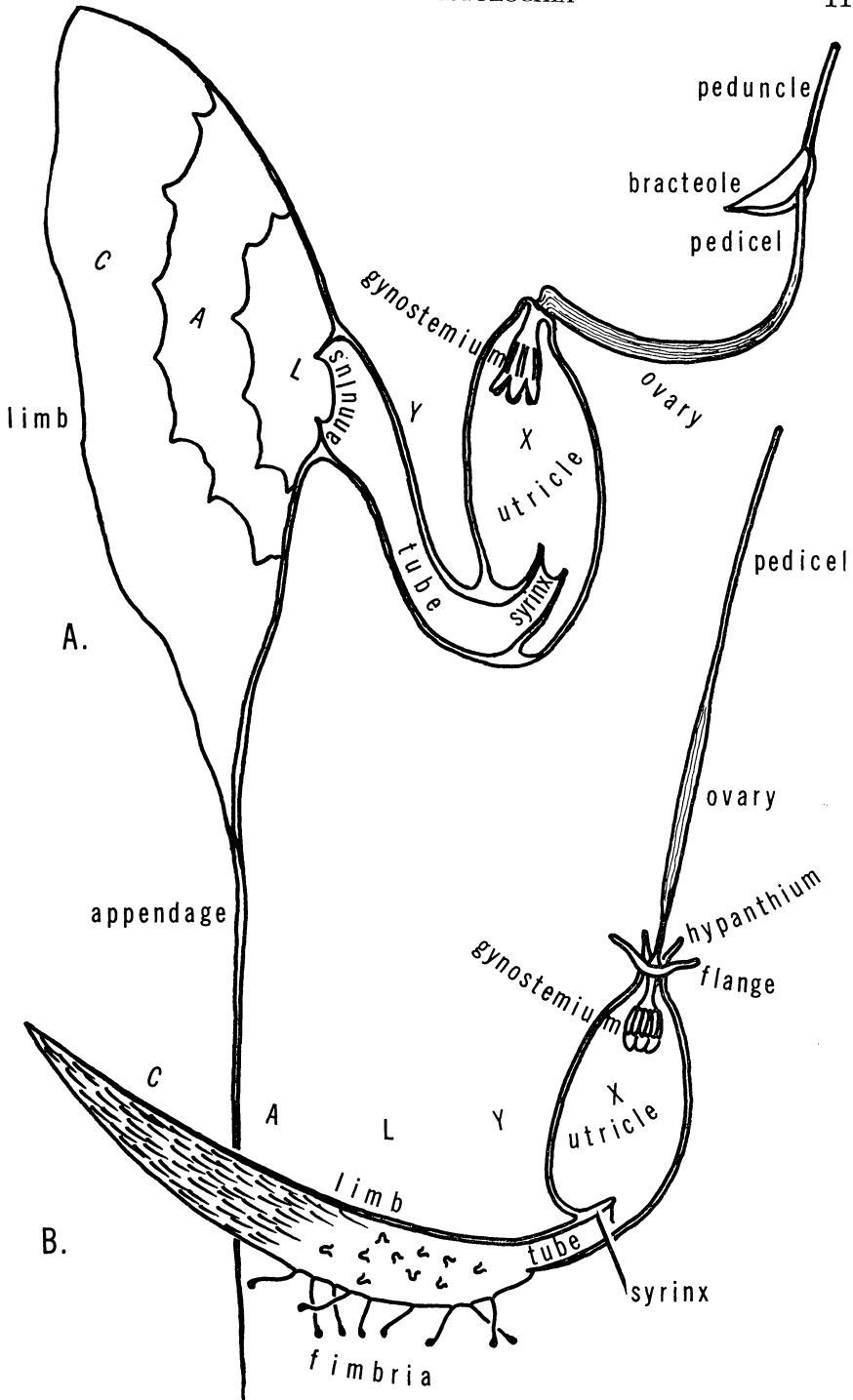


Fig. 1. Two hypothetical flowers illustrating the structures used in the keys and descriptions to define flower structure of *Aristolochia* in the present work; full discussion is in text.

may become translucent, and red spots or maculae may bleach and disappear. While it is generally true that the flowers may be described with regard to approximate color, no combination of colors in a description is an exclusive guarantee of accurate identification, especially in dried materials.

Illustrations of the various species which follow have not all been drawn to the same scale because of the broad range of floral size in the genus; however, the size of each is indicated by centimeter or, in the case of gynostemia, by millimeter scales. It has not been practical nor possible, in the several views presented of the flowers of some species, to make all of the drawings from the same flower; therefore, some allowance should be made for variation. Where gynostemia are illustrated, they cannot be assumed to be perfectly representative; they change during their ontogeny, particularly after the flower opens. Consequently, except for staminal number, they are comparatively less useful for identification than the details of the calyx and other features. Generally, the indument or pubescence of the flowers and leaves has been omitted in the drawings, but this is not critical, since variation is common and extreme. In any case, the descriptions are complete in this regard and should be referred to for details of the indument in any of the species.

Buds and mature flowers in many species of *Aristolochia* may be strikingly different and misleading in their proportions. This cannot be overemphasized. Furthermore, a merely "open" flower on an herbarium sheet may not necessarily be a mature one, since the flower buds are inflated during their ontogeny and always burst when the specimen is pressed; they split along the line of normal calyx valvate aestivation where the calyx is thinner and easily ruptured. The only true measure of maturity is the condition of the anthers and stigmas. These change sharply and significantly during the life of each flower and details of stigmatic structure and posture must be interpreted with the age of the flower borne in mind.

Another source of taxonomic error is the relative vigor of the flowers. Variation in size with true proportionality is common, but calyces with appendages also show great variation in the lengths of the latter. Flower size is influenced by the number of buds maturing on the branch; large numbers of buds produce uniformly small flowers while a single bud will develop into a large calyx. The dimensions of the gynostemium seem always to lie within comparatively narrow limits, whether the calyx tube is large or small.

An explanatory, schematic drawing (Fig. 1) elucidates some of the terms used in connection with the descriptions of the flowers; the upper flower, A, is geniculate and in the pistillate phase, the lower, B, is rectilinear and shedding pollen.

Lorch (1959) has presented interesting teratological evidence which suggests to him that the calyx of *Aristolochia* may be a greatly modified foliage leaf. This view is also held by Hagerup (1961) in studies on *A. elegans* (= *A. littoralis*).

Practically all of the West Indian species, as well as many others, have a rich covering of uniseriate hairs on the limb and in the tube. These wilt, become matted and generally are shed from the calyx following pollination; consequently

the limb and tube may be densely clothed in hairs or naked, depending upon the age of the flower. These hairs taper gradually along their whole length, ending in a fine, sharp point. Not to be confused with hairs are the curious *fimbriae*. These are enations found on the calyx limb of some species, which are fleshy, persistent, and often have a terminal, glandular swelling.

The styles, stigmas and anthers are closely united into a *gynostemium* which is usually a coroniform structure a few millimeters high. The sessile anthers are closely adnate to the lobes of the stylar column.

The gynostemium radically alters its outline and proportions during the ontogeny of the protogynous flower. The lobes, when young and approaching stigmatic maturity, generally are tall, thick and erect, greatly exceeding the tips of the immature anthers. Following pollination, the stigmatic lobes wither, bending inward upon themselves and exposing the turgid mature anthers. This sequence is illustrated in the drawing for *A. passifloraefolia* (Fig. 30).

I have noted in the field that following pollination the calyx and gynostemium of the large-flowered tropical species rapidly deliquesce. Old calyces are rarely found persistent at the tip of the fruit in any of the species. They are either autodigested similarly, or fall and decay quickly. This propensity for liquefaction can be frustrating when collecting these flowers in the humid tropics, where a specimen may be only a purple stain in newsprint after a few hours in an ordinary plant press; maggots, too, are fond of the damp flowers in a press.

Few tales of pollination wonders can surpass the sequence of events which lead to the production of seed in *Aristolochia*. The work of Petch (1924) is an exemplary account of extended investigation on this subject. I shall not attempt to review the innumerable accounts in the literature, but a summary of the events generally follows this succession:

1. *First day*: The stigmas are receptive—the tube hairs rigid, retrorse, allowing only entry of pollinators.
2. Pollination occurs through the agency of the insects imprisoned within the utricle.
3. *Second day*: the anthers dehisce, shedding pollen on the insects—the tube hairs wilt.
4. The insects leave, carrying pollen to another flower.

There are three reports known to me of presumptive cleistogamy in *Aristolochia serpentaria*. The oldest (1864) is a notation on a Leggett specimen, "with apert? flowers;" the second is the letter reproduced below. Both are taken from specimens deposited in the herbarium of the New York Botanical Garden.

"Dr. N. L. Britton:
Dear Sir:

June 22, 1896

I send to you some plants of *Aristolochia Serpentaria* with what I think cleistogamous flowers. I've watched plants on a hillside near here and only once in 3 seasons have I found the ordinary blossom as described in Gray. This single instance was a few days ago. I've watched the plants from the time

the bud appeared till the fruit was nearly matured. I find no description of such a habit in this plant, & would like to ask if I am right in supposing it to be cleistogamous bloom and if it has been described before reporting it.

Respectfully,
Emma J. Thompson, M. D.
East Haddam, Conn."

The third report is a short note by Ahles (1959); he has generously collected special material for my study.

Flowers of *A. serpentaria* suspected of being self-pollinating (Fig. 4) have very small and rudimentary perianths. The calyx tube is reduced to a conic cover over the gynostemium, barely adequate to accommodate the enclosed structures. A short, oblique, gibbous tube is produced at the distal end of the calyx cone, its aperture being less than one millimeter in diameter and effectively plugged by the dense pilose hairs which clothe the whole flower. The gynostemium is somewhat aberrant when compared with that in a normal flower; there is, however, a full complement of six fertile anthers. The stigmatic lobes are unequally reduced; this is chiefly responsible for the abnormal appearance of the gynostemium. Material has not been available to allow an investigation of pollen tube growth or fertilization. The ovaries enlarge, but none of the specimens examined show conclusively whether the fruits present were produced from normal or cleistogamous flowers. The meager evidence suggests that either type may form fruit.

Resupination in the flowers of some species has been unreported by earlier investigators; there are several degrees of resupination in the species discussed here. Modification of floral structure is involved intrinsically with the twisting of the axis; the larger, median lobe of the calyx may be abaxial at anthesis (the normal state), or it may become adaxial by a 180° turn of the supporting axis. It may twist through several revolutions, making a numerical measure of the degree of resupination in the axis of the flower difficult. Since resupination is a response to gravitational pull of the symmetry of the flower, and *Aristolochia* flowers are strongly zygomorphic, there seems to be little point in establishing how many numerical degrees of revolution are produced; the effective rotation relative to the final posture of the flower is the significant point. As may be seen in Fig. 2, the flower bud emerges from the leaf axil with the median, largest calyx lobe in an abaxial position. This is modified by resupination in some species to the adaxial position; a very few species have an apparent double bend in the *floral axis*, which recreates the abaxial position of the median lobe. It is not clear whether the latter truly originates as a result of simple bending of the calyx or as a result of "double resupination," which would have the obvious effect of cancelling the resupination. It conceivably could be due to a combination of the two.

Since the utricle is *always* pendent from the apex of the ovary, this dictates the final posture of the flower. Thus, there is little difficulty in determining the position of the median lobe, enabling the flower to be described as resupinate (or geniculate) or rectilinear.

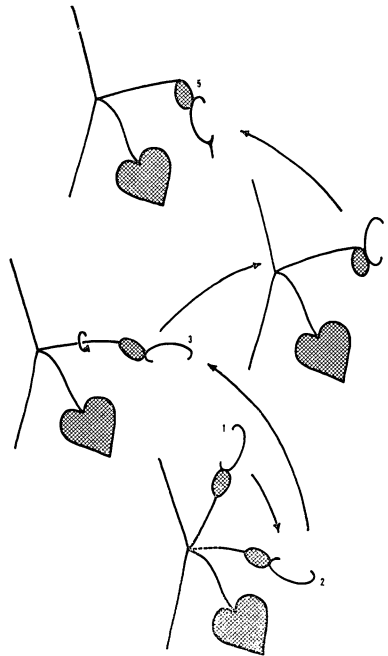


Fig. 2. Diagram representing floral resupination in *Aristolochia*. The stages shown, proceeding in the direction shown by the arrows, are: 1, the normal position of the flower in bud, with the largest medial calyx lobe abaxial; 2, a simple flexure in the peduncle of the flower allows the utricle to become pendent; then resupination rotates the flower, 3, into the commonest position for flowers in the species studied in this work; 4, the geniculate arching of the tube produces a further stage in which the limb is reflexed back upon the utricle, making the medial lobe of the calyx vertical and erect; 5, further resupination through a second flexure or a second rotation of the peduncle, produces a flower with the same configuration as in 2, but the flower is no longer rectilinear.

HUMAN USES

A few species of *Aristolochia* are widely used in horticulture. The large, strange flowers of *A. grandiflora*, *A. labiata* and *A. littoralis* are included in many greenhouse collections; *A. macrophylla* and *A. tomentosa* may be grown in temperate gardens, chiefly as arbor or trellis subjects.

The continuing search for plant derivatives which uniquely affect human disease and metabolism has led to the study of aristolochic acid. This substance, probably present in the tissues of many species, possesses the capacity to reduce growth of certain types of cancer in mice (Kupchan & Dorskotch, 1962).

It is interesting to note that Rho Chi, an honorary pharmaceutical society in the United States, was known as the Aristolochite Society in its early history (ca 1908).

Aristolochia has an interesting etymology. Based upon the ancient usages dictated by the Doctrine of Signatures, and the fancied resemblance of the flower bud to the foetus, the plants were used as a source of medicine to alleviate the pain of childbirth. Thus, the name "best" (aristos) "delivery" (lochia) was coined.

TAXONOMY

- ARISTOLOCHIA L., Sp. Pl. 960, 1753. (Type: *A. rotunda* L.)
- Isotrema* Raf., Amer. Monthly Mag. & Crit. Rev. **4**: 195, 1819. (Type: *I. siphon* (L'Herit.) Raf.)
- Hocquartia* Dum., Comm. Bot. 30, 1822. (Type: *H. macrophylla* (Lam.) Dumortier)
- Dasyphionion* Raf., First Cat. Bot. Gard. Transylv. Univ. 13, 1824. (Type: *D. tomentosum* (Sims) Raf.)
- Cardiolochia* Raf. ex Reichb., Consp. Regni Veg. 85, 1828, nom. nud.
- Einomeia* Raf., Medic. Fl. **1**: 62, 1828. (Type: *E. bracteata* Raf. = *A. pentandra* L.)
- Endodeca* Raf., loc. cit. (Type: *E. hastata* (Nutt.) Raf.)
- Siphisia* Raf., loc. cit. (Type: *S. glabra* Raf. = *A. siphon* L'Herit.)
- Isiphia* Raf., Medic. Fl. **2**: 232, 1830. (Type: *I. glabra* Raf. = *A. siphon* L'Herit.)
- Dictyanthes* Raf. in Loudon, Gard. Mag. **3**: 247, 1832. (Type: *D. labiosa* (Edwards) Raf.)
- Niphus* Raf., loc. cit., nom. nud. = *Siphidia* Raf.
- Siphidia* Raf., loc. cit., nom. nud. = *Niphus* Raf.
- Ambuya* Raf., Fl. Tellur. **4**: 98, 1836. (Type: *A. labiosa* (Edwards) Raf.)
- Diglosselis* Raf., loc. cit. (Type: *D. trinervis* Raf. = *A. bilabiata* L.)
- Hexaplectris* Raf., loc. cit. 97. (Type: *H. bicolor* (L.) Raf.)
- Plagistra* Raf., loc. cit. 98. (Type: *P. cretica* (Lam.) Raf.)
- Sophiza* Raf., loc. cit. 99. (Type: *P. undulata* Raf. = *A. serpentaria* L.)
- Pteriphis* Raf., loc. cit. (Type: *P. tripteris* (Raf.) Raf.)
- Tropexa* Raf., loc. cit. 98. (Type: *T. biloba* (L.) Raf.)
- Guaco* Liebm., Verhandl. Skandin. Naturf. **1844**: 203, 1847. (Type: *G. mexicana* Liebm.)
- Howardia* Klotzsch, Monatsb. Acad. Berlin **1859**: 607, 1859, non Wedd. (1854). (Type: *H. ringens* (Vahl) Klotzsch)

Lianas, rarely upright perennial *herbs*, *shrubs* or *trees*. *Leaves* alternate, petiolate, estipulate but an axillary bud often producing a clasping, broadly reniform leaf (pseudostipule); blade entire or 2- to 7-lobed, often cordate, palmately or pinnately veined, often variable. *Flowers* axillary, solitary, perfect, epigynous, zygomorphic. *Calyx* gamosepalous, variously inflated, thence more or less contracted, ultimately expanding into a 1- to 3-lobed limb. *Corolla* absent. *Stamens* 5 or 6 or multiples of these, the anthers sessile and adnate to the style, 4-celled, dehiscing longitudinally. *Ovary* inferior, 5- or 6-loculate; placentation axile, the ovules numerous, anatropous. *Styles* 3, 5 or 6, marginally connate, fleshy, with coroniform to subcapitate stigmatic lobes. *Fruit* a capsule, dehiscence valvate or septifragal, acropetal or basipetal. *Seeds* usually numerous, more or less vertically compressed in 5 or 6 vertical rows, the embryo rudimentary in abundant endosperm.

KEY³

- 1a. Calyx limb 3-lobed, without fimbriae.
- 2a. Herbs of SE United States; flowers less than 2 cm long, in basal, bracteolate, racemose clusters.
- 3a. Leaves isomorphic, elliptic-sagittate, subcoriaceous, strongly amplexicaul, the venation coarsely verrucose beneath1. *A. reticulata*
- 3b. Leaves heteromorphic, lanceolate to ovate, delicately membranaceous, the venation subimmersed beneath2. *A. serpentaria*
- 2b. Shrubs, trees or lianas, or if not woody, with tropical distributions.
- 4a. Calyx lobes with linear, pendent appendages; leaves elliptic to oblong. Shrubs of Mexico & Guatemala.

³Including species of the United States, Mexico, the Central American Republics to and including Panama, the Greater and Lesser Antilles, the Bahamas and Bermuda.

- 5a. Flowers about 16 cm long; leaves acuminate, obtuse at the base, beneath tomentulose along the veins3. *A. tricaudata*
- 5b. Flowers about 10 cm long; leaves obtuse at the apex, sagittate at the base, beneath woolly-tomentose4. *A. malacophylla*
- 4b. Calyx lobes without appendages, acute, divergent; flowers 8 cm long or less.
- 6a. Calyx limb with a large inflated bulla or boss below the tube orifice. Mexico & Guatemala.
- 7a. Bulla capitate, stipitate; leaves oblong to elliptic; shrubs or small trees5. *A. arborea*
- 7b. Bulla umbonate, sessile; (leaves unknown); lianas6. *A. bullata*
- 6b. Calyx limb without a bulla.
- 8a. Leaves elliptic-ovate or orbiculate. Mexico & Central America.
- 9a. Utricle gradually contracted to an eccentric, tubular base.
- 10a. Syrinx a U-shaped thickening with the arms of the U extending and broadening onto the limb; leaves elliptic to suborbiculate, the apices obtuse. Lianas of Guatemala7. *A. paracleta*
- 10b. Syrinx small, merely an inequilaterally annular flap; leaves elliptic to ovate, the apices acute to acuminate. Shrubs of Panama8. *A. panamensis*
- 9b. Utricle abruptly contracted at the base.
- 11a. Syrinx distinct, thick-walled, a constricted tubular passage into the utricular cavity.
- 12a. Leaves subsessile, auriculate, amplexicaul; syrinx urceolate. Shrubs of Mexico9. *A. asclepiadifolia*
- 12b. Leaves short petiolate, slightly cordate; syrinx obliquely tubular. Shrubs of NE Mexico10. *A. rhizantha*
- 11b. Syrinx absent, the throat of the flower wide open, not constricted or narrowed into a tube; leaves elliptic-ovate, sagittate, shortly petiolate. Lianas of Nicaragua & Honduras11. *A. thwaitesii*
- 8b. Leaves broadly cordate. United States.
- 13a. Peduncle bracteolate; calyx lobes concave, divergent; limb with a thin, inconspicuous faucal annulus.
- 14a. Plants glabrous to puberulent; flower with an obvious constricted tube between the utricle and limb. E United States12. *A. macrophylla*
- 14b. Plants woolly to tomentose; flower without a constriction, the utricle apparently united directly with the limb. N California13. *A. californica*
- 13b. Peduncle ebracteolate; calyx lobes convex, strongly revolute; limb with a prominent, rugose faucal annulus; plants tomentose. SE & south-central United States.14. *A. tomentosa*
- 1b. Calyx limb 1- or 2-lobed.
- 15a. Leaves palmately 2- or 3-lobed; calyx limb without fimbriae; lianas.
- 16a. Calyx median lobe with a long, filiform appendage; flowers sharply geniculate; leaves large, 3-lobed. Caribbean islands, Central & South America15. *A. trilobata*
- 16b. Calyx median lobe without an appendage; flowers arcuate; leaves very small, 2-lobed. Hispaniola & St. Thomas 16. *A. bilobata*

- 15b. Leaves not palmately lobed.
- 17a. Leaves very strongly oblate-reniform.
- 18a. Calyx limb smooth, ovate, without fimbriae or warts. E Cuba
.....17. *A. lindeniana*
- 18b. Calyx limb fimbriate or warty.
- 19a. Flowers 7 cm long or more, the limb 6 cm long; leaves emarginate. Cuba, NE Hispaniola & St. Thomas18. *A. peltata*
- 19b. Flowers 3 cm long or less, the limb 1.5 cm long.
- 20a. Leaves obtuse at the apex, apiculate, the base cordate. S Hispaniola19. *A. leptosticta*
- 20b. Leaves emarginate, subrectangular, the base truncate. Gonave I.20. *A. haitiensis*
- 17b. Leaves otherwise.
- 21a. Calyx limb fimbriate.
- 22a. Fimbriae few, long, chiefly marginal; limb broadly lanceolate, 2.5 cm wide; leaves cordate-orbiculate SW Mexico
.....21. *A. tentaculata*
- 22b. Fimbriae numerous, distributed over the surface of the limb; limb orbiculate, spatulate or sublinear, 2 cm wide or less.
- 23a. Plants hispid-pilose throughout; the limb lingulate-spatulate, sparsely to heavily fimbriate, fimbriae few, small; leaves ovate-triangular. S Mexico, Central & South America22. *A. pilosa*
- 23b. Plants glabrous to glabrescent, not stiffly hairy.
- 24a. Leaves broadly cordate, not medially constricted; fimbriae variable, small and few to large and numerous. SW Mexico23. *A. taliscana*
- 24b. Leaves broadly to narrowly pandurate, medially constricted.
- 25a. Fimbriae conspicuously capitate. Cuba.
- 26a. Fimbriae peltate-capitate; calyx limb ovate24. *A. glandulosa*
- 26b. Fimbriae compressed-capitate; calyx limb spatulate25. *A. clavidenia*
- 25b. Fimbriae subulate or only slightly swollen terminally.
- 27a. Calyx limb narrowly lingulate, emarginate, half the length of the calyx; fimbriae mostly marginal. Hispaniola26. *A. fuertesii*
- 27b. Calyx limb broadly spatulate, less than half the length of the calyx; fimbriae distributed over the surface of the limb.
- 28a. Calyx limb 1.5-2.0 cm long, half as long as the tube. Lesser Antilles
.....27. *A. rugosa*
- 28b. Calyx limb 2-3 cm long, as long as the tube or longer. Cuba & the Bahamas28. *A. passifloraeifolia*
- 21b. Calyx limb without fimbriae.
- 29a. Calyx limb with 2 lobes, sub-equal in length, superposed one above the other, the lower narrowly lanceolate, often longer than the upper.

- 30a. Upper calyx lobe deflected, obovate-orbicular, narrowly clawed, ruffled. South America; escaped from cultivation in our area29. *A. labiata*
- 30b. Upper calyx lobe not deflected, obovate-spatulate. Circumcaribbean30. *A. ringens*
- 29b. Calyx limb 1-lobed, or if 2-lobed, the upper clearly longer than the lower.
- 31a. Calyx limb abruptly spreading from the tube, more than 6 cm wide.
- 32a. Leaves densely white-tomentulose beneath.
- 33a. Flowers 6 cm wide; leaves cordate at the base. Lianas. Location unknown31. *A. esoterica*
- 33b. Flowers 12 or more cm wide; leaves truncate at the base. Lianas of Panama32. *A. gigantea*
- 32b. Leaves glabrous.
- 34a. Flowers 10 cm wide, without an annulus.
- 35a. Hypanthium and utricle rectilinear from the ovary, pseudostipules present. Circumcaribbean.33. *A. littoralis*
- 35b. Hypanthium and utricle sharply deflected from the ovary, pseudostipules absent. Mexico, Central America, the West Indies & Florida34. *A. odoratissima*
- 34b. Flowers 20 to 50 cm wide, with an annulus; pseudostipules absent. Mexico, Central America & the West Indies.35. *A. grandiflora*
- 31b. Calyx limb gradually expanding from the tube, less than 5 cm wide.
- 36a. Leaves oblong, 3 cm long or less; flower axis about 5 cm long.
- 37a. Leaves with 5 basal veins, shallowly cordate; flowers extremely arcuate. Hispaniola36. *A. ekmanii*
- 37b. Leaves with 3 basal veins, subtruncate; flowers slightly arcuate. Cuba37. *A. tigrina*
- 36b. Leaves otherwise, mostly much more than 3 cm long; flower axis more than 5 cm long (except *samanensis*, *ematitis* and *constricta*).
- 38a. Leaf bases cuneate, obtuse, truncate or shallowly cordate.
- 39a. Tube shorter than the utricle.
- 40a. Leaf undersurfaces prominently glaucous, smooth; flower axis about 2.5 cm long. Hispaniola38. *A. samanensis*
- 40b. Leaf undersurfaces green with prominent, raised, reticulate venation; flower axis about 10 cm long. Florida, Mexico, Central America & Martinique39. *A. maxima*
- 39b. Tube longer than the utricle.
- 41a. Pseudostipules absent.
- 42a. Leaves smooth, with immersed venation, narrowly triangular, the bases truncate; calyx limb 2-lobed. Hispaniola40. *A. chasmema*

- 42b. Leaves with raised reticulate venation, elliptic-ovate, the bases shallowly cordate; calyx limb 1-lobed. Mexico & British Honduras41. *A. ovalifolia*
- 41b. Pseudostipules present; leaves with raised, reticulate venation.
- 43a. Leaves linear to narrowly triangular, the bases acute to shallowly cordate; calyx limb 1.5-2.5 cm long. Cuba & Hispaniola42. *A. linearifolia*
- 43b. Leaves oblong to ovate, the bases cordate; calyx limb 1 cm long. Greater Antilles43. *A. bilabiata*
- 38b. Leaf bases deeply cordate, auriculate, hastate or sagittate.
- 44a. Calyx limb with a spatulate terminal appendage. Hispaniola.
- 45a. Calyx limb 2-3 cm long, including appendage; tube 4 times longer than the utricle44. *A. caudata*
- 45b. Calyx limb 6-7 cm long, including appendage; tube 2 times longer than the utricle45. *A. ehrenbergiana*
- 44b. Calyx limb not appendaged.
- 46a. Flowers in congested, axillary fascicles on young stems. Introduced European herbs naturalized in NE United States & adjacent Canada46. *A. clematitis*
- 46b. Flowers solitary in the axils of leaves or bracts, or fasciculate on old woody stems (cauliflorous); lianas (except *orbicularis*).
- 47a. Leaves variegated, white along the major veins, heart-shaped with deeply cordate-auriculate bases. Panama47. *A. veraguensis*
- 47b. Leaves not variegated.
- 48a. Plants stiffly hispid-pilose throughout. S Mexico, Central America & South America22. *A. pilosa*
- 48b. Plants glabrous to densely tomentulose.
- 49a. Leaves more than 15 cm long and 15 cm wide, deeply cordate; flowers 8 cm long, the limb about as long as the tube48. *A. schippii*
- 49b. Leaves mostly 13 cm long and 13 cm wide, or smaller.

- 50a. Leaves broadly triangular.
- 51a. Leaves membranous, the apex acute to acuminate.
- 52a. Calyx limb about 3 times longer than the tube; fruits cylindric-fusiform, 2.5-4.0 cm long, 1 cm wide. S Mexico to Panama49. *A. inflata*
- 52b. Calyx limb about as long as the tube; fruits short, thick-cylindric, 3 cm long, 2 cm wide. Central America, South America & the Lesser Antilles50. *A. anguicida*
- 51b. Leaves stiffly coriaceous, the apex obtuse to subemarginate.
- 53a. Calyx limb about as long as the tube.
- 54a. Calyx limb narrowed at its base, lanceolate-ovate, 1.5 cm wide, 2.5-3.0 cm long51. *A. carterae*
- 54b. Calyx limb not at all narrowed at its base, broadly triangular, 2 cm wide, 2 cm long52. *A. montana*
- 53b. Calyx limb longer than the tube.
- 55a. Calyx limb spatulate, 3-4 cm long, the board, terminal portion elliptic-lanceolate53. *A. glossa*
- 55b. Calyx limb steadily narrowing to the long-attenuate apex, 5 cm long54. *A. mycteria*
- 50b. Leaves oblong, elliptic or suborbiculate.
- 56a. Flowers about 8 cm long; plants puberulent to tomentulose.
- 57a. Leaves oblong; calyx glabrescent, the limb smooth. British Honduras (?) & Panama55. *A. chapmaniana*
- 57b. Leaves elliptic-oblong; calyx very densely tomentulose, the limb spotted with elevated maculae. Costa Rica56. *A. tonduzii*
- 56b. Flowers about 6 cm long or much less.

- 58a. Limb narrow, linear, 5 times longer than wide or more; leaves suborbiculate. Suffrutescent herbs of Mexico57. *A. orbicularis*
- 58b. Limb triangular, less than 4 times longer than wide; leaves elliptic to ovate. Woody lianas of Panama & the Lesser Antilles58. *A. constricta*

1. *ARISTOLOCHIA RETICULATA* Nutt., Trans. Amer. Phil. Soc., n.s., **5**: 162, 1835, non Seemann (1854), nec Holton ex Duchr. (1864). (ex char.)—Fig. 3.

Siphisia reticulata (Nutt.) Klotzsch, Monatsb. Acad. Berlin **1859**: 604, 1859.

Hispid-pilose *herbs*. *Leaves* isomorphic, elliptic-sagittate, subcoriaceous, obtuse at the apex, strongly amplexicaul, subsessile, 3-7 cm broad, 7-12 cm long, the venation strongly verrucose beneath. *Pseudostipules* absent. *Flowers* in basal racemose clusters, bracteolate, geniculate, purplish-brown, the utricle subglobose, 4 mm long, syrinx indistinct, inequilaterally annular, the tube bent, 7 mm long, annulus a thin, smooth ring, the limb 3-lobed, smooth, 5 mm wide, 5 mm long. *Gynostemium* 3-lobed, 2 mm high, 3 mm broad, the anthers 6, more or less united in 3 horizontal groups. *Fruits* spheric, sub-ligneous, 12 mm diameter, dehiscence basipetal. *Seeds* few, revolute, 3 mm wide, 3 mm long, 2 mm thick.

In sandy soils of eastern Texas, southwestern Arkansas and northwestern Louisiana.

UNITED STATES. ARKANSAS: Hempstead, Little River, Miller & Pulaski counties. LOUISIANA: Ouachita & Vernon parishes. TEXAS: Angelina, Austin, Bowie, Harris, Harrison, Houston, Jefferson, Leon, Marion, Montgomery, Nacogdoches, Polk, San Augustine, Smith, Trinity, Upshur, Van Zandt, Walker, Waller & Young counties.

2. *ARISTOLOCHIA SERPENTARIA* L., Sp. Pl. 961, 1753. (Type: *Linn. Herb. London*, no. 1071.7, photo)—Fig. 4.

- A. serpentaria* var. β Willd., Sp. Pl. **4**: 159, 1805. (ex char.)
A. serpentaria var. γ Willd., loc. cit. 160. (ex char.)
A. sagittata Muhl., Cat. Pl. Amer. Septent. 81, 1813, nom. nud.
A. hastata Nutt., Gen. N. Amer. Pl. **2**: 200, 1818, non H.B.K. (1817), nec Jack (1822), nec Jacquin, sphalm. ex Klotzsch (1859), nec Klotzsch (1859). (ex char.)
A. polyrrhizos Sprengel, Syst. Veg., ed. 16, **3**: 754, 1826. (Based on *A. hastata* Nutt.)
A. dodecandra Raf., Med. Fl. **1**: 62, 1828, nom. nud.
A. officinalis Nees, Pl. Offic. t. 144, 1828. (ex ic.)
Endodeca serpentaria (L.) Raf., Med. Fl. **1**: 62, 1828. (Based on *A. serpentaria* L. acc. to Bigel.)
E. hastata (Nutt.) Raf., Fl. Tellur. **4**: 99, 1836.
Pistolochia serpentaria (L.) Raf., loc. cit. 98 (ex ic. cit.)
Psophiza undulata Raf., loc. cit. 99. (Based on *A. serpentaria* L. acc. to Bigel.)
Endodeca bartonii Klotzsch, Monatsb. Acad. Berlin **1859**: 600, 1859. (Based on *A. serpentaria* L. acc. to Barton)

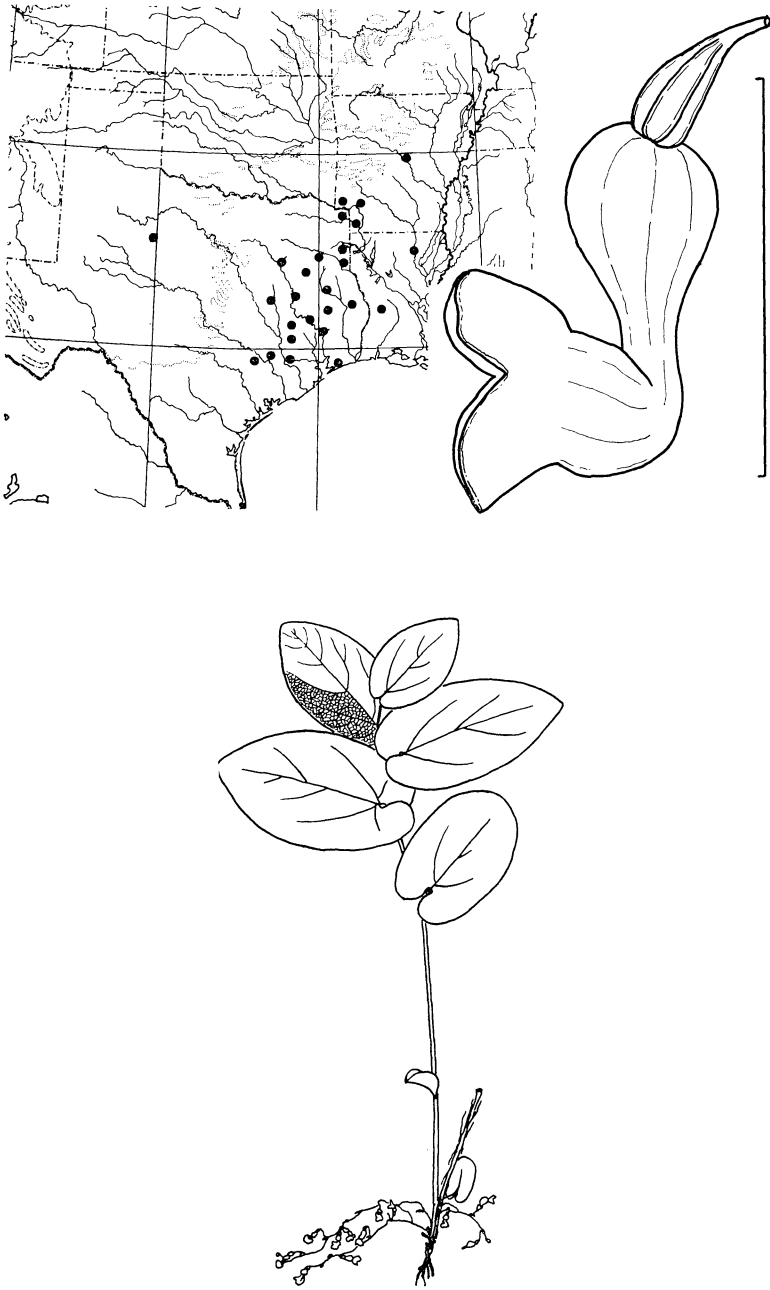


Fig. 3. Distribution, flower and habit of *A. reticulata*. (In all of the illustrations that follow, the flowers and leaves are scaled to a one centimeter line placed near the drawing; gynostemium are scaled to a one millimeter line placed near the drawing.)

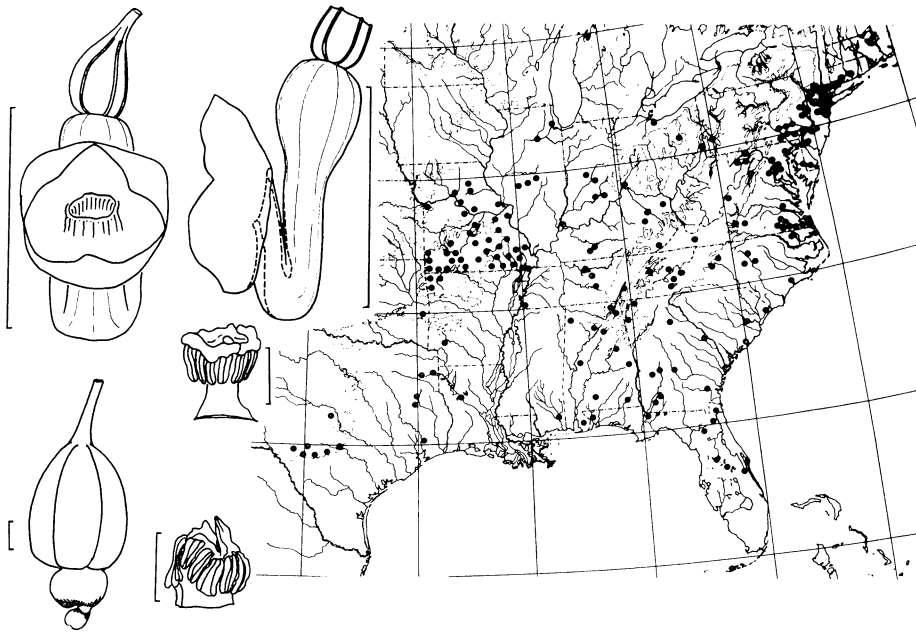


Fig. 4. Flowers, gynostemium and distribution of *A. serpentaria*; the lower left figure is a cleistogamous flower, and to its right the gynostemium of a cleistogamous flower. (The scale of the cleistogamous flower is shown by a one millimeter line.)

E. polyrrhizos (Sprengel) Klotzsch, loc. cit. 601.

Aristolochia serpentaria β *bartonii* (Klotzsch) Duchr. in DC., Prod. **15** (1): 433, 1864.

A. serpentaria γ *laxa* Duchr., loc. cit. 434. (Type: *without data*, LE; MO, photo)

A. serpentaria δ *hastata* (Nutt.) Duchr., loc. cit.

Endodeca dodecandra Raf. ex Jacks., Ind. Kew. **1**: 840, 1893. (= *A. dodecandra* Raf.)

Aristolochia nashii Kearney, Bull. Torrey Bot. Club **21**: 485, 1894. (Type: *Nash 1139*, GH, NY, UC, US)

A. convolvulacea Small, loc. cit. **24**: 335, 1897. (Type: *Boykin s.n.*, NY)

A. serpentaria var. *nashii* (Kearney) Ahles, Jour. Elisha Mitchell Sci. Soc. **75**: 130, 1959.

Glabrous to hispid-pilose perennial *herbs*. *Leaves* heteromorphic, narrowly lanceolate to broadly ovate, delicately membranaceous, acute to acuminate at the apex, diversely truncate, sagittate or hastate-cordate at the base, 1-5 cm broad, 5-15 cm long, smooth above, beneath, the venation subimmersed. *Pseudostipules* absent. *Flowers* borne at base of the stem in racemose clusters, bracteolate, geniculate, purplish, the utricle subglobose, 3 mm long, syrinx inequilaterally annular, the tube bent, 1 cm long, annulus a thin, smooth ring, the limb somewhat indistinctly 3-lobed, smooth, 5 mm wide, 5 mm long, subpatelliform. *Gynostemium* 3-lobed, 1.5 mm high, 1.2 mm broad, the anthers 6, more or less in 3 horizontal groups. *Fruits* spheric, subligneous, 2 cm diameter, dehiscence basipetal, valvate. *Seeds* few, revolute, 4 mm wide, 5 mm long, 2 mm thick.

Plants of rich woodland soils, throughout the south-eastern third of the United States.

UNITED STATES. ALABAMA: Baldwin, Blount, Conecuh, Cullman, Dale, DeKalb, Franklin, Hale, Jackson, Lee & Talladega counties. ARKANSAS: Benton, Carroll, Hempstead &

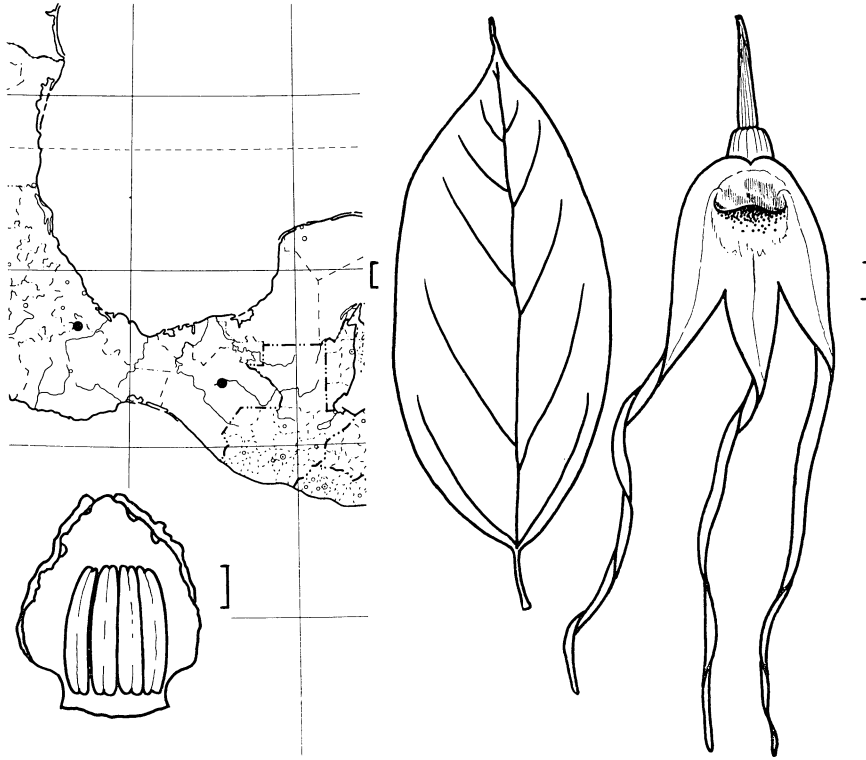


Fig. 5. Gynostemium, distribution, leaf and flower of *A. tricaudata*.

Washington counties. CONNECTICUT: Fairfield, Middlesex & New Haven counties. DELAWARE: New Castle & Sussex counties. DISTRICT OF COLUMBIA. FLORIDA: Alachua, Brevard, Clay, Columbia, Duval, Escambia, Gadsden, Lake, Monroe & Orange counties. GEORGIA: Baker, Chatham, Clarke, Dodge, Dooly, Dougherty, Floyd, Richmond, Sumter, Wayne & Whitfield counties. ILLINOIS: DePage, LaSalle, Macon, Morgan, Richland & Sangamon counties. INDIANA: Jackson, Jennings, Marion, Posey & Shelby counties. KENTUCKY: Bath, Carter, Edmonson, Estill, Harlan & Warren counties. LOUISIANA: Natchitoches parish. MARYLAND: Allegheny, Baltimore, Caroline, Montgomery & Prince Georges counties. MISSISSIPPI: George county. MISSOURI: Audrian, Barry, Benton, Bollinger, Butler, Callaway, Camden, Cape Girardeau, Carter, Cedar, Chariton, Christian, Crawford, Dallas, Dent, Douglas, Dunklin, Franklin, Gasconade, Greene, Hickory, Howard, Howell, Iron, Jackson, Jasper, Laclede, Lincoln, Linn, McDonald, Madison, Maries, Marion, Moniteau, Monroe, Montgomery, Morgan, New Madrid, Newton, Oregon, Osage, Ozark, Perry, Pettis, Pike, Pulaski, Ralls, Reynolds, Ripley, St. Francois, Ste. Genevieve, St. Louis, Scott, Shannon, Shelby, Stoddard, Stone, Taney, Texas, Vernon, Washington, Wayne & Webster counties. NEW JERSEY: Bergen, Burlington, Essex, Hunterdon, Middlesex, Monmouth, Morris, Salem & Sussex counties. NEW YORK: Bronx, Orange, Queens, Richmond, Rockland & Westchester counties. NORTH CAROLINA: Buncombe, Chatham, Forsyth, Haywood, Hertford, Iredell, Jackson, Onslow, Orange & Wake counties. OKLAHOMA: LeFlore county. OHIO: Erie, Hamilton & Holmes counties. PENNSYLVANIA: Allegheny, Berks, Bucks, Chester, Dauphin, Lancaster, Lebanon, Northampton, Philadelphia & York counties. SOUTH CAROLINA: Anderson, Charleston, Clarendon, Greenville, Horry & Williamsburg counties. TENNESSEE: Cocke, Davidson, Knox, Moore, Rutherford, Sequatchie & Shelby counties. TEXAS: Bandera, Cherokee, Edwards, Hays, Houston, Kendall, Kerr, Liberty, Marion, Real, San Saba & Upshur counties. VIRGINIA: Bath, Bedford, Brunswick, Campbell, Dinwiddie, Fairfax, Greensville, Henrico, Nansemond,

Norfolk, Princess Anne, Prince William, Shenandoah, Smyth, Southampton & Sussex counties. WEST VIRGINIA: Hampshire & Mineral counties.

The heteromorphic or polymorphic foliage of these plants is their most striking feature, and the one most likely to afford difficulty in identification.

This plant is the once-popular *serpentary* or *snake-root* of commerce. The literature catalogues its use for nearly all of the ills man falls heir to, but judging from its lack of use in modern pharmacognosy, these former uses seem to have no modern medical value.

3. *ARISTOLOCHIA TRICAUDATA* Lemaire, Illus. Hort. **14**: t. 522, 1867. (ex ic.)—Fig. 5.

Tomentulose *shrubs*. *Leaves* petiolate, elliptic to oblong, acuminate, basally obtuse, 6-12 cm broad, 18-22 cm long, deep green, glabrous above, beneath paler, tomentulose along the veins. *Pseudostipules* absent. *Flowers* solitary in the leaf axils (?), ebracteolate, geniculate, purple, the utricle pyriform, ca 4 cm long, syrinx absent, the tube bent, indistinguishable from the utricle except by the flexure at the apex of the utricle, ca 2 cm long, annulus absent, the limb of 3 subparallel lobes, smooth, each with a linear, pendent appendage, 4 cm wide, ca 16 cm long, overall. *Gynostemium* 3-lobed, 5 mm high, 4 mm broad, the anthers 6 in 3 horizontal groups. *Fruits* not seen.

On forested hillsides, southern Mexico.

MEXICO: Chiapas, Oaxaca.

Sterile specimens of *A. tricaudata* may be confused with the foliage of *A. arborea*, but these two plants are unmistakably distinct when flowers are present. *Aristolochia tricaudata* has been, unfortunately, very rarely collected. It would make a magnificent ornamental plant.

4. *ARISTOLOCHIA MALACOPHYLLA* Standl., Proc. Biol. Soc. Wash. **33**: 65, 1920. (Type: *Pringle 13424*, GH, MEXU, US)—Fig. 6.

A. sericea Benth., Pl. Hartweg. 81, 1841, non Blanco (1837) (Type: *Hartweg 565 P*; photos F, MO, NY, US)

A. mexiae Standl., Field Mus. Pub. Bot. **8**: 136, 1930. (Type: *Mexia 2772*, A, F, MO, NY, UC)

Sprawling tomentose *shrubs*. *Leaves* variable, petiolate, elliptic to oblong, obtuse at the apex, basally sagittate to cordate, 4-7 cm broad, 8-12 cm long, tomentulose along the veins above, beneath woolly tomentose. *Pseudostipules* absent. *Flowers* on short, axillary leafless, bracteolate branches, geniculate, purple and yellow, the utricle long-ovoid, 3 cm long, syrinx absent, the tube indistinguishable from the utricle except by the flexure at its origin at the apex of the utricle, 3 cm long, annulus absent, the limb smooth, 3-lobed, the lobes parallel, directed downward, each with a linear, pendent, tapelike appendage, 1 cm wide, ca 4 cm long overall. *Gynostemium* 3-lobed, 3 mm high, 3 mm broad, the anthers 6 in 3 horizontal groups. *Fruits* woody, 5 cm long, 2 cm wide, dehiscence basipetal, valvate (?). *Seeds* numerous, revolute.

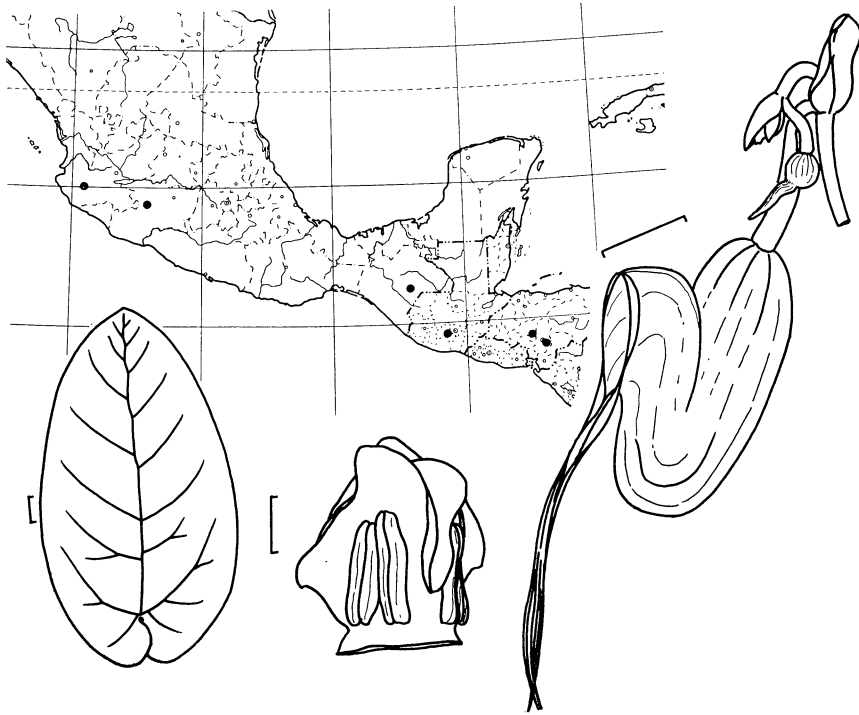


Fig. 6. Distribution, leaf, gynostemium and flower of *A. malacophylla*.

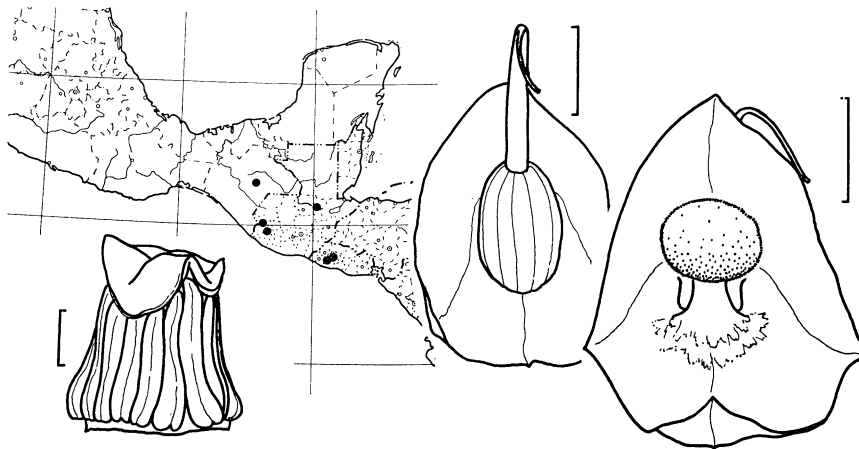


Fig. 7. Distribution, gynostemium and flowers of *A. arborea*.

In open pine-oak forests, in dry or wet situations, west Mexico eastward to Honduras.

MEXICO: Chiapas, Jalisco, Michoacán.

GUATEMALA: Sacatepequez.

HONDURAS: Comayagua, Morazán.

As in most other species, *A. malacophylla* requires flowering material for accurate identification. It has been the custom to call any tomentose, oblong-leaved species *A. sericea*; however, this familiar name must yield to the earliest synonym *A. malacophylla* Standl.

5. *ARISTOLOCHIA ARBOREA* J. Linden, Cat. Pl. **13**: 6, 1858. (ex char.)—Fig. 7.

A. salvadorensis Standl., Jour. Wash. Acad. Sci. **13**: 367, 1923. (Type: *Calderón 1484*, US)
A. steyermarkii Standl., Field Mus. Pub. Bot. **22**: 329, 1940. (Type: *Steyermark 33455*, F)

Finely tomentulose *shrubs* or small *trees*. *Leaves* petiolate, rather variable, narrowly elliptic, ovate, obovate or oblong, acuminate, basally subtruncate to acute, 4-10 cm broad, 9-25 cm long, green and smooth above, beneath rusty-tomentulose, particularly along the veins. *Pseudostipules* absent. *Flowers* in cauliflorous, many branched, bracteolate, racemose clusters, geniculate, purple, the utricle ellipsoid, 2 cm long, syrinx absent, the tube bent, 1 cm long, annulus absent, the limb smooth, 3-lobed, the lobes acute, divergent, 2.5-3.0 cm wide, 3-4 cm long, the limb with a large, inflated, capitate, stipitate, bulla or boss below the tube orifice. *Gynostemium* barely 3-lobed, the anthers 6, equidistant. *Fruits* woody, ca 3 cm long, ca 1.5 cm wide or larger, dehiscence basipetal, subvalvate (?). Mature *seeds* not seen.

On moist mountainsides, Mexico to El Salvador.

MEXICO: Chiapas.

GUATEMALA: Alta Verapaz, Quetzaltenango, San Marcos.

EL SALVADOR: La Libertad, San Salvador.

Calderón reports the vernacular name, *guaquito de la tierra*, in El Salvador; Steyermark, *guaco de montaña*, in Guatemala. Broadway, who collected it from cultivated plants in Trinidad, mentions that the flowers resemble bats clinging to the plant on the old wood.

6. *ARISTOLOCHIA BULLATA* Pfeifer, sp. nov.—Fig. 8.

Caules subprostrati flexuosi volubiles. *Folia* ignota. *Flores* multi paniculati parum bracteolati geniculati purpurei; utriculus ovoideus 1.5 cm longus; syrinx absens; tuba absens; foramen utriculi a latere; limbus 3-lobus patulus 4 cm latus 3.5 cm longus cum bulla una magna tumida sessili infra foramen tubam. *Columna* 3-loba 3 mm alta 2.5 mm lata; stamina 6 ad libram in catervis 3. *Fructus* ignotus.—HOLOTYPE: *Hinton 14569*, US ("forested hillside; procumbent vine in shade; local: Atoyac; alt. 25-100 m.; Distr. Galeana, Guerrero, Mexico."). Isotypi GH, NY.

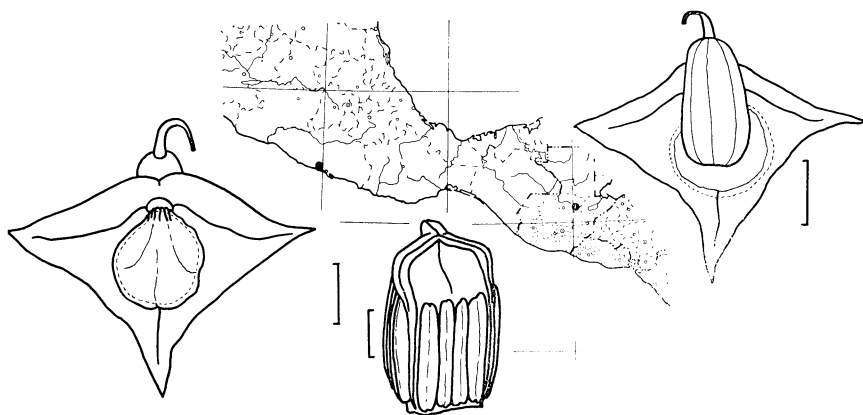


Fig. 8. Flowers, gynostemium and distribution of *A. bullata*.

Large procumbent *lianas*. Vegetative parts not seen. *Flowers* in several-flowered, long, several-branched, bracteolate, cauliflorous, racemose clusters, geniculate, purple, the utricle ovoid, 1.5 cm long, syrinx merely a stricture at the side of the utricle, opening onto the limb, the tube absent, the limb of 3 divergent lobes, with a large, inflated, umbonate, sessile bulla or boss below the tube orifice, 4 cm wide, 3.5 cm long. *Gynostemium* 3-lobed, 3 mm high, 2.5 mm broad, the anthers 6, in 3 groups. *Fruits* not seen.

I have seen one other specimen, *von Tuerckheim (JDS) 8452*, US. ("Cubilquitz, Depart. Alta Verapaz, Guatemala, alt. 350 m., M. Jul. 1903.")

Aristolochia bullata is especially distinctive; the inflated bulge or "blister" on the limb sets it apart from all other species. It should be sought by collectors in the areas between the two distant localities cited here.

7. *ARISTOLOCHIA PARACLETA* Pfeifer, nom. nov.—Fig. 9.

A. mollis Standl. & Steyerl., Field Mus. Pub. Bot. **23**: 155, 1944, non Dunn (1908). (Type: Steyermark 51269, F, NY, US)

Wooly *lianas*. *Leaves* petiolate, elliptic to suborbiculate, obtuse at the apex, basally cuneate-obtuse, 6-15 cm broad, 10-20 cm long, smooth above, beneath tomentulose. *Pseudostipules* absent. *Inflorescence* few-flowered, racemose. *Flowers* geniculate, the utricle gradually contracted to an eccentric tubular base, 3 cm long, the syrinx extending in a ridge downward onto the limb, the tube not delimited by a constriction from the utricle and limb, the limb unequally 3-lobed, 2.0-3.5 cm long, the median lobe lowest, unappendaged. *Gynostemium* 3-lobed, narrowly columnar, 1 cm tall, 0.4 cm broad, the anthers 6, in 3 horizontal groups. *Fruits* not seen.

Known only from the type locality.

GUATEMALA: Huehuetenango.

This species is reported by Dr. Julian Steyermark to be used in treating gas on the stomach; the leaves are boiled to make a tea. It is called *hoja aire* in Guatemala.

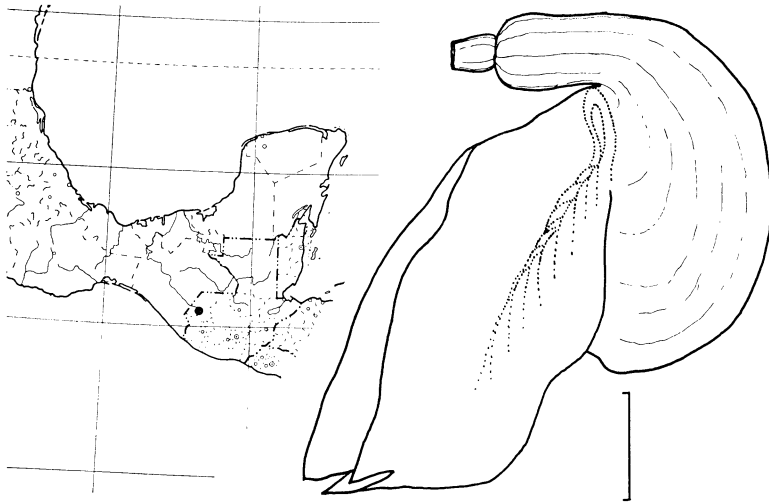


Fig. 9. Distribution and flower of *A. paracleta*.

Accurate identification of this plant requires dissection of flowers. It may be confused, on the basis of superficial vegetative and floral appearances, with *A. rhizantha*, *A. thwaitesii* and *A. arborea* as well as other Central American species with tomentose leaves.

8. *ARISTOLOCHIA PANAMENSIS* Standl., Jour. Wash. Acad. Sci. **15**: 5, 1925. (Type: *Standley 29906*, A, US)—Fig. 10.

Low, pubescent *shrubs*. *Leaves* petiolate, elliptic-ovate, acute to acuminate, basally acute to attenuate, 5-12 cm broad, 10-23 cm long, green and smooth above, beneath paler, silvery-pubescent. *Pseudostipules* absent. *Flowers* in several-branched, bracteolate, cauliflorous, racemose clusters near the soil level, geniculate, purple, the utricle subpyriform but gradually contracted to an eccentric, tubular base, syrinx inequilaterally annular, 3 cm long, the tube absent, the limb smooth, 3-lobed, sub-inflated, 1.5 cm wide, ca 2 cm long, unappendaged. *Gynostemium* 3-lobed, 5 mm high, 4 mm broad, the anthers 6 in 3 horizontal groups. *Fruits* ellipsoid-cylindric, woody, 2.5 cm long, 1.5 cm wide, dehiscence basipetal, valvate, the hypanthium absent. *Seeds* few, strongly revolute, pyramidal, 4 mm wide, 5 mm long, 4 mm thick.

In open savannahs; known only from Panama.

PANAMA: Chiriquí, Canal Zone.

In habit, *A. panamensis* is least like any preconception of an *Aristolochia* one might have; if it is once identified to genus, there is little else in *Aristolochia* it vegetatively resembles. The flowers show its close alliances to the other species of Central America with 3-lobed calyx limbs.

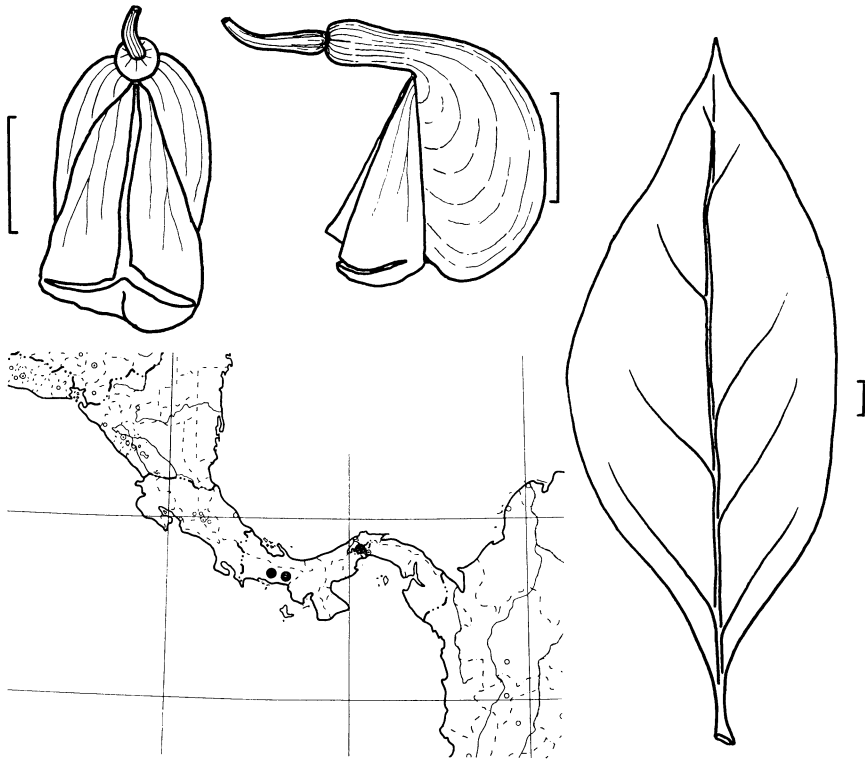


Fig. 10. Flowers, distribution and leaf of *A. panamensis*.

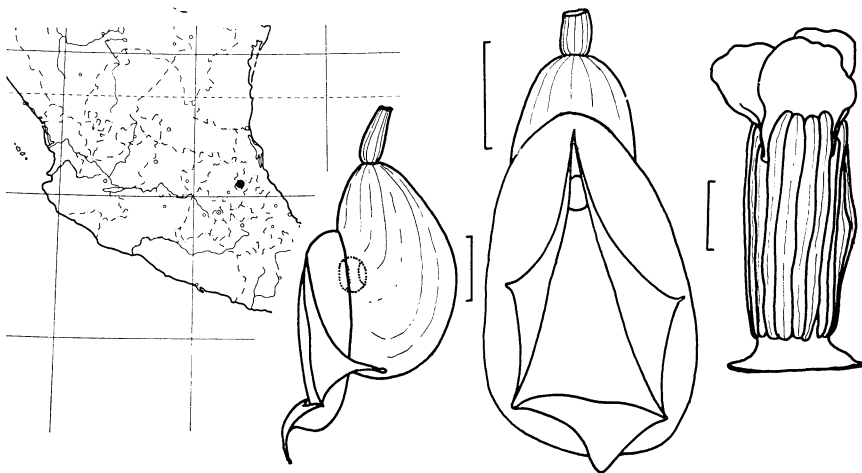


Fig. 11. Distribution, flowers and gynostemium of *A. asclepiadifolia*.

9. *ARISTOLOCHIA ASCLEPIADIFOLIA* Brandg., Univ. Calif. Pub. Bot. **6**: 178, 1915. (Type: *Purpus* 7394, F, GH, MO, NY, UC, US)—Fig. 11.

Tomentulose sprawling *shrubs* or *lianas*. *Leaves* sub-sessile, auriculate, amplexicaul, elliptic-obovate, obtuse at the apex, 5-10 cm broad, 8-17 cm long, rough-strigose above, beneath tomentulose. *Pseudostipules* absent. *Flowers* in few-flowered, short axillary racemes, bracteolate, geniculate, purple, the utricle abruptly contracted at the base, ovoid, 3 cm long, syrinx urceolate, the tube absent, the limb smooth, 3-lobed, 2 cm wide, the median lobe lowest. *Gynostemium* narrowly columnar, 3-lobed, 5 mm high, 2 mm broad, the anthers 6 in 3 horizontal groups. *Fruits* very woody, 3.5-6.0 cm long, 2-3 cm wide, dehiscence acropetal, septifragal, the hypanthium absent. *Seeds* numerous, revolute, 5 mm wide, 5 mm long, 3 mm thick.

Growing on rocks at low elevations along the eastern coast of Vera Cruz.

MEXICO: Vera Cruz.

This species is easily distinguished from its close relatives by the urceolate syrinx and clasping leaves. If one is acquainted with those species of *Asclepias* with heavy, large felty leaves, the name *asclepiadifolia* is a useful mnemonic device.

10. *ARISTOLOCHIA RHIZANTHA* Lundell, Field & Lab. **6**: 10, 1937. (Type: *Lundell & Lundell* 7257, MICH, NY, S, US)—Fig. 12.

Tomentulose clambering *shrubs*. *Leaves* petiolate, broadly elliptic, obtuse at the apex, truncate to shallowly cordate at the base, 12-15 cm broad, 20-25 long, strigose, deep green above, beneath tomentulose, paler. *Pseudostipules* absent. *Flowers* on many-branched compound-racemose basal inflorescences, bractcolate, geniculate, the utricle abruptly contracted at the base, 1 cm long, the syrinx tubular, sharply oblique, the tube absent, the limb rugose-warty, 3-lobed, the median lobe lowest, 2 cm long. *Gynostemium* narrowly columnar, 3-lobed, 7 mm high, 3 mm broad, the anthers 6 in 3 horizontal groups. *Fruits* ligneous, narrowly cylindrical, 4 cm long, 1.2 cm wide, dehiscence acropetal, valvate, the hypanthium absent. *Seeds* few, revolute, 3 mm wide, 4 mm long, 3 mm thick.

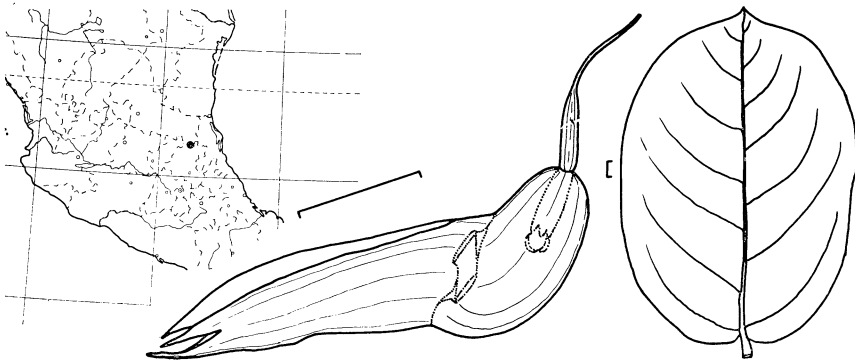


Fig. 12. Distribution, flower and leaf of *A. rhizantha*.

Found in low forests on mountain side, Sierra Madre Oriental, near Tamazunchale. Known only from the type collection.

MEXICO: San Luis Potosí.

A very distinctive species, *A. rhizantha* is unique in its sharp reduction of the syrx and tube into the oblique, tubular syrx which affords passage into the utricle. During the winter of 1961-2, much of the vegetation of northeastern Mexico was badly frozen, including the area around Tamazunchale, in an unprecedented (in recorded times) cold wave; it is not unreasonable to expect that the colony of *A. rhizantha* was killed, along with many of the tree ferns and other exotics which made the area so interesting from a botanical viewpoint. (A recent visit showed the flora nearly recovered, but it has not been possible to locate plants of *A. rhizantha*.)

11. ARISTOLOCHIA THWAITESII Hook., Bot. Mag. t. 4918, 1856. (ex ic.)—Fig. 13.

Small, woody *shrubs* or *lianas*. *Leaves* elliptic-ovate, obtuse at the apex, the base sagittate-auriculate to cuneate, 4-8 cm broad, 10-20 cm long, smooth above, beneath woolly. *Pseudostipules* absent. *Inflorescences* racemose, bracteolate, at base of stem. *Flowers* geniculate, the utricle more or less swollen, 1.5 cm long, the syrx absent, the tube not constricted, scarcely differentiated from the utricle and limb, the limb unequally 3-lobed, 1 cm wide, 2 cm long, the median lobe lowest, unappendaged. *Gynostemium* 3-lobed, narrowly columnar, 1 cm high, 0.4 cm broad, the anthers 6 in 3 horizontal groups. *Fruits* not seen.

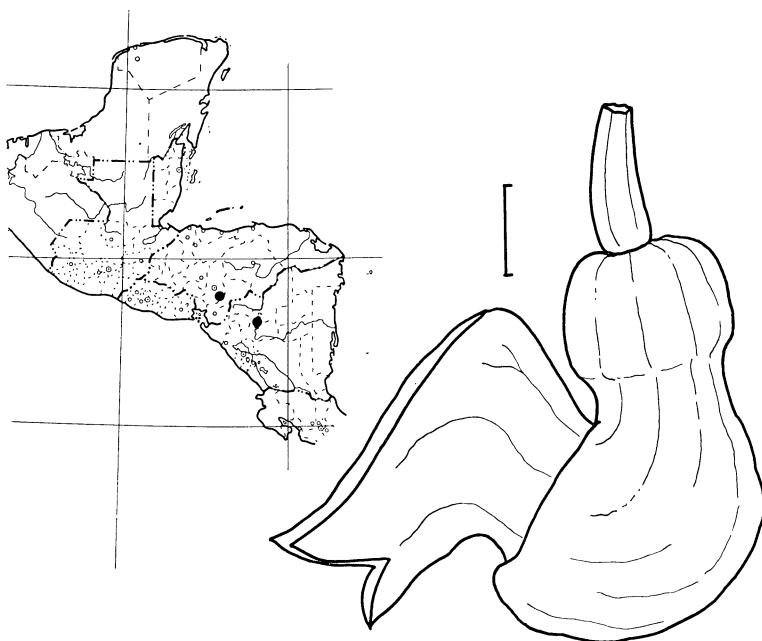


Fig. 13. Distribution and flower of *A. thwaitesii*.

Dense, wet, rocky forests in Honduras and Nicaragua.

HONDURAS: Morazán.

NICARAGUA: Jinotega.

Originally describing *A. thwaitesii* as being from Ceylon, Hooker later (Bot. Mag. t. 5295) mentioned the improbability of this information; the illustration supplied with his description is superlative, showing an obvious relationship to the curious Central American *A. arborea*. A search for material from Central America matching the illustration yielded specimens agreeing with his description, and prompted me to reassign the name. There is little doubt that these are the plants described by Hooker.

12. *ARISTOLOCHIA MACROPHYLLA* Lam., Encycl. Méth. Bot. **1**: 255, 1783, non Duchr. (1854). (ex char.)—Fig. 14.

A. siphon L'Herit., Stirp. Nov. 13. t. 7, 1784. (ex ic.)

A. frutescens Marsh, Arb. Am. 24, 1785. (ex char.)

A. grandifolia Salisb., Prod. 215, 1796. (ex char.)

Isotrema siphon (L'Herit.) Raf., Amer. Monthly Mag. & Crit. Rev. **4**: 195, 1819.

Hocquartia macrophylla (Lam.) Dum., Comm. Bot. 30, 1822.

Aristolochia arkansaw Lodd., Cat. Pl., ed. 14, 37, 1826, nom. nud. (*A. arkansana* auct.)

Siphisia glabra Raf., Medic. Fl. **1**: 65, 1828. (Based on *A. siphon* L'Herit.)

S. siphon (L'Herit.) Raf., loc. cit. 62.

Isiphia glabra (Raf.) Raf., loc. cit. **2**: 232, 1830.

Isotrema durius (Hill) H. Huber, Mitt. Bot. Staatssam. München **3**: 550, 1960. (Based on *A. macrophylla* Lam.)

Glabrescent *lianas*. *Leaves* broadly cordate, acute to obtuse at the apex, basally cordate, 7-45 cm broad, 7-50 cm long, glabrous above, beneath finely puberulent

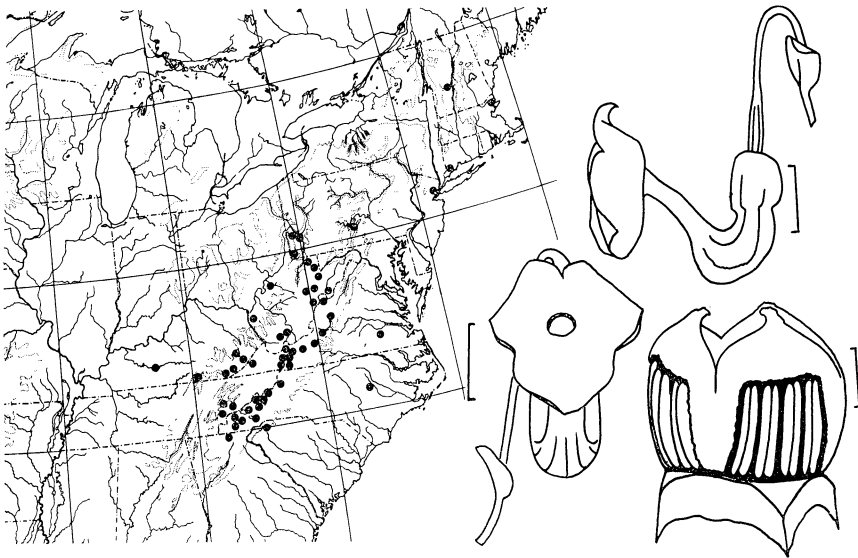


Fig. 14. Distribution, flowers and gynoecium of *A. macrophylla*.

to glabrous. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, bracteolate, geniculate, green spotted with purple, brown and yellow, the utricle cylindric, 0.5 cm long, syrinx absent, the tube curved upward at its center, narrowing to the limb, 2.5 cm long, the annulus diminutive, a slightly raised, smooth ring or absent, the limb smooth, 3-lobed, 2 cm wide, 2 cm long, the lobes concave, divergent, subequal, unappendaged. *Gynostemium* squat, 3-lobed, 4 mm high, 6 mm broad, the anthers 6 in 3 horizontal groups. *Fruits* woody, persistent, glabrous to puberulent, 6-8 cm long, 4-6 cm wide, dehiscence valvate, hypanthium absent. *Seeds* numerous, flat, 1 cm wide, 1 cm long, 1 mm thick.

In rich forest soils in the Appalachian mountains.

UNITED STATES. CONNECTICUT: Fairfield county. GEORGIA: Towns county. KENTUCKY: Bell, Edmonson, Harlan, Letcher, Perry & Wayne counties. MASSACHUSETTS: Essex county. NEW JERSEY: Hudson county. NORTH CAROLINA: Buncombe, Hayward, Jackson, Johnston, Macon, Madison, Mitchell, Swain, Transylvania, Watauga & Yancey counties. PENNSYLVANIA: Allegheny, Beaver, Greene & Huntingdon counties. SOUTH CAROLINA: Greenville county. TENNESSEE: Blount, Knox, Morgan & Sevier counties. VERMONT: Windsor county. VIRGINIA: Bedford, Botetourt, Dinwiddie, Giles, Grayson, Highland, Montgomery, Roanoke, Rockbridge, Smyth, Washington, Wise & Wythe counties. WEST VIRGINIA: Monogalia, Pendleton, Pocahontas, Preston, Raleigh, Randolph, Summers, Tucker, Upshur, Wayne, Webster & Wirt counties.

This species is known throughout the eastern United States as *A. durior* Hill, based on an illustration of Hill's which more closely resembles *Bignonia capreolata* L. than *Aristolochia*. (See Pfeifer, Status of the name *Aristolochia durior* Hill. *Baileya* **10**: 4-7, 1962).

13. ARISTOLOCHIA CALIFORNICA Torr., Pacif. Rail. Rep. **4**: 128, 1857. (Type: *Bigelow s.n.*, NY)—Fig. 15.

Isotrema californicum (Torr.) H. Huber, Mitt. Bot. Staatssam. München **3**: 550, 1960.

Woolly to tomentose *lianas*. *Leaves* broadly cordate, acute to obtuse at the apex, basally cordate, rarely pandurate, 3-10 cm broad, 4-12 cm long, strigose above, tomentose beneath. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, bracteolate, geniculate, purplish, the utricle bladderly, U-shaped, unevenly inflated, ca 3 cm long, not at all differentiated into utricle and tube, syrinx absent, abruptly narrowed at the limb, a distinct annulus absent, the limb 3-lobed, smooth, 2 cm wide, 2 cm long, the lobes concave, divergent. *Gynostemium* cylindric, deeply 3-lobed, 5 mm high, 5 mm broad, the anthers 6 in 3 horizontal groups. *Fruits* cylindric, ribbed, puberulent, 6 cm long, 2.5 cm wide, dehiscence valvate, hypanthium absent. *Seeds* numerous, flat, 1 cm wide, 1 cm long, 1 mm thick.

Generally along stream sides in California, north and east of San Francisco.

UNITED STATES. CALIFORNIA: Butte, Colusa, Contra Costa, Marin, Napa, Placer, Sacramento, San Francisco, Shasta, Siskiyou, Solano, Sonoma, Sutter, Tehama, Yolo & Yuba counties.

Very closely related to *A. macrophylla* and *A. tomentosa* of the eastern United States, *A. californica* is nevertheless very distinct. The lack of structural definition

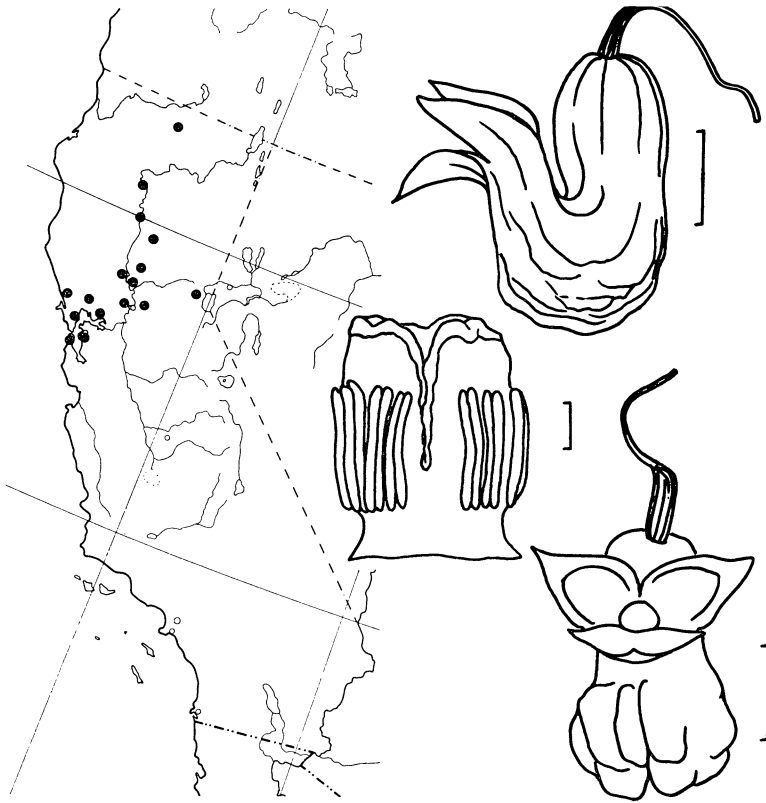


Fig. 15. Distribution, gynostemium and flowers of *A. californica*.

between utricle and tube in the flower, occurring through excessive inflation of the tube, sets it apart from the other two species.

Aristolochia californica is widely cultivated in California by persons interested in natural curiosities. This fact may be an explanation for unverified reports of *A. californica* far to the south of the range reported here.

14. *ARISTOLOCHIA TOMENTOSA* Sims, Bot. Mag. *t.* 1369, 1811. (ex ic.)—Fig. 16.

A. hirsuta Muhi., Cat. Pl. Amer. Septent. 81, 1813, non L. (1767), nom. nud.

A. tripteris Raf., Fl. Ludov. 24, 1817. (ex char.)

Hocquartia tomentosa (Sims) Dum., Comm. Bot. 30, 1822.

Dasyphorion tomentosum Raf., First Cat. Bot Gard. Transylv. Univ. 13, 1824. (Based on *A. tomentosa* Sims acc. to Merrill, 1949)

Siphisia tomentosa (Sims) Raf., Medic. Fl. **1**: 65, 1828.

Isiphia tomentosa (Sims) Raf., loc. cit. **2**: 232, 1830.

Aristolochia coriacea Raf., Atl. Jour. **1**: 146, 1832. (= *A. tomentosa* Sims acc. to Merrill, 1949)

A. hitchcockii Gandoger, Bull. Soc. Bot. France **66**: 232, 1919. (Type: Hitchcock 809, GH, MO, NY, US)

Isotrema tomentosum (Sims) H. Huber, Mitt. Bot. Staatssam. München **3**: 550, 1950.

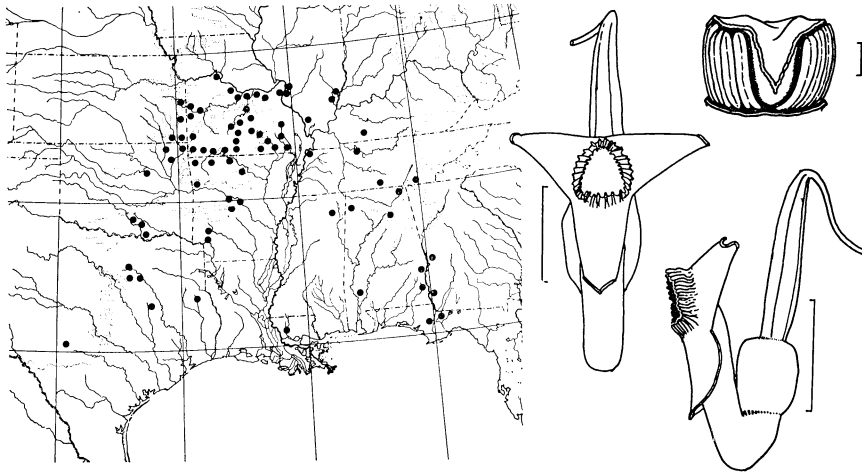


Fig. 16. Distribution, flowers and gynostemium of *A. tomentosa*.

Tomentose lianas. *Leaves* broadly cordate, acute to obtuse at the apex, shallowly cordate at the base, 8-15 cm broad, 9-20 cm long, finely pubescent above, beneath tomentose. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, ebracteolate, geniculate, purple, yellow and green, the utricle cylindric, 0.7 cm long, syrinx absent, the tube sharply bent, constricted, 1.5 cm long, the annulus prominent, rugose, the limb smooth, 3-lobed, 2 cm wide, 2 cm long, the lobes convex, strongly revolute, subequal, unappendaged. *Gynostemium* squat, 3-lobed, 3 mm high, 6 mm broad, the anthers 6 in 3 horizontal groups. *Fruits* woody, persistent, finely pubescent, 6-8 cm long, 4-6 cm wide, dehiscence valvate, hypanthium absent. *Seeds* numerous, flat, 1 cm wide, 1 cm long, 1 mm thick.

Mostly in alluvial soils along streams in the southeastern and south-central United States.

UNITED STATES. ALABAMA: Barbour, Blount, Clarke, Franklin, Jackson & Russell counties. ARKANSAS: Benton, Carrol, Crawford, Hempstead, Marion, Perry, Pike, Pulaski, Saline & Stone counties. FLORIDA: Calhoun & Gadsden counties. GEORGIA: Early & Muscogee counties. ILLINOIS: Jackson, Madison, St. Clair, Wabash & White counties. KANSAS: Bourbon, Cherokee, Labette & Miami counties. KENTUCKY: Warren county. LOUISIANA: East Baton Rouge parish. MISSISSIPPI: Lee county. MISSOURI: Barry, Bates, Butler, Carter, Cedar, Cole, Crawford, Douglas, Franklin, Gasconade, Jasper, Laclede, Lincoln, McDonald, Madison, Maries, Miller, Moniteau, Newton, Oregon, Osage, Ozark, Phelps, Pulaski, Ripley, St. Claire, St. Louis, Saline, Shannon, Stone, Taney, Texas, Vernon, Wayne & Wright counties. OKLAHOMA: Bryan, Creek, Johnston, Mayes, Murray, Nowata & Ottawa counties. TENNESSEE: Davidson, Hamilton, Lake & Lincoln counties. TEXAS: Dallas, Denton, Kerr, McLennan, Nacogdoches & Tarrant counties.

Visiting the Smoky Mountain region, one of the areas where the ranges of *A. tomentosa* and *A. macrophylla* abut, I saw neither sympatry nor hybridization; the region of one species ends abruptly where that of the other begins. I know of no satisfactory explanation for this sharp range delineation.

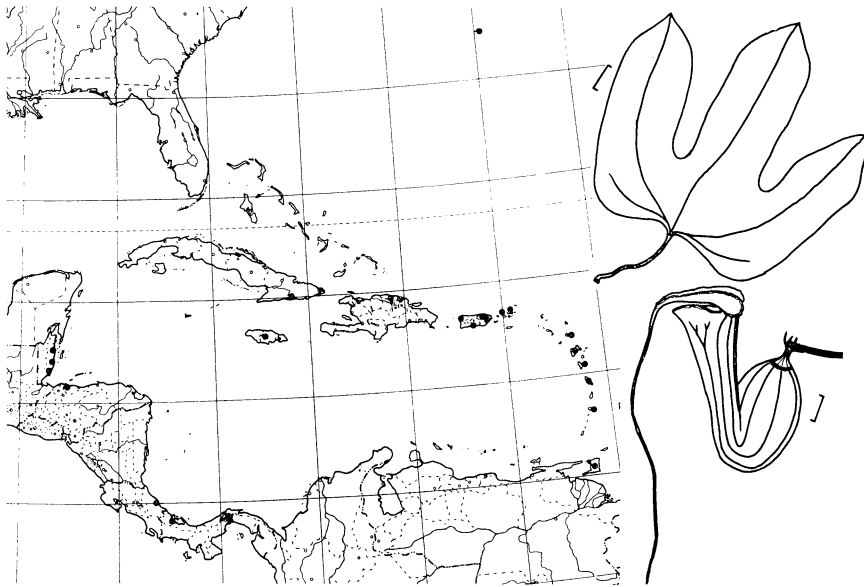


Fig. 17. Distribution, leaf and flower of *A. trilobata*.

15. *ARISTOLOCHIA TRILOBATA* L., Sp. Pl. 960, 1753. (Type *Linn. Herb. London*, no. 1071.1, photo)—Fig. 17.

- A. 3 scandens* P. Browne, Civ. & nat. hist. Jamaica 329, 1756. (ex char.)
A. trifida Lam., Encycl. Méth. Bot. **1**: 251, 1783. (ex char.)
A. triloba Salisb., Prod. 214, 1796. (Based on *A. trilobata* L.)
A. surinamensis Willd., Sp. Pl. **4**: 151, 1805. (ex ic. cit.)
A. macroura Gomez, Mem. Acad. Lisboa **3**: Mem. dos Corresp. 77, 1812. (Type: *Martius inter Brasil 1817*, photo M)
A. appendiculata Vell., Fl. Flum. **9**: t. 98, 1827. (ex ic.)
A. caudata Booth ex Lindl., Bot. Reg. t. 1453, 1831, non Jacq. (1762), nec Parodi (1878). (ex ic.)
A. macrota Duchr. in DC., Prod. **15** (1): 447, 1864. (Type: *Schomburgk 679*, photo G-DC.)
A. tapetotricha Lem., Illustr. Hort. **3**: Misc. 22, 1856. (ex char.)
Howardia macroura (Gomez) Klotzsch, Monatsb. Acad. Berlin **1859**: 617, 1859.
H. surinamensis (Willd.) Klotzsch, loc. cit. 613.
H. trilobata (L.) Klotzsch, loc. cit. 617.

Glabrous, strong *lianas*. *Leaves* deeply to barely palmately 3-lobed, truncate at the base, 3-15 cm broad, 10-15 cm long. *Pseudostipules* suborbiculate, amplexicaul. *Flowers* solitary in the leaf axils, ebracteolate, geniculate, the utricle ellipsoid, 4-5 cm long, syrinx absent, the tube bent, 5-7 cm long, annulus absent, the limb smooth, 1-lobed, (the tube and limb resembling the pitcher and lid of a *Sarracenia*), narrowly triangular, 2-3 cm wide, 15-20 cm long, including the length of the tape-like appendix. *Gynostemium* 6-lobed, 7 mm high, 6 mm broad, the anthers 6, equidistant. *Fruits* cylindric, 9 cm long, 2.5 cm wide, dehiscence acropetal, septifragal, the hypanthium absent. *Seeds* numerous, flat, triangular, 8 mm wide, 8 mm long, 1 mm thick.

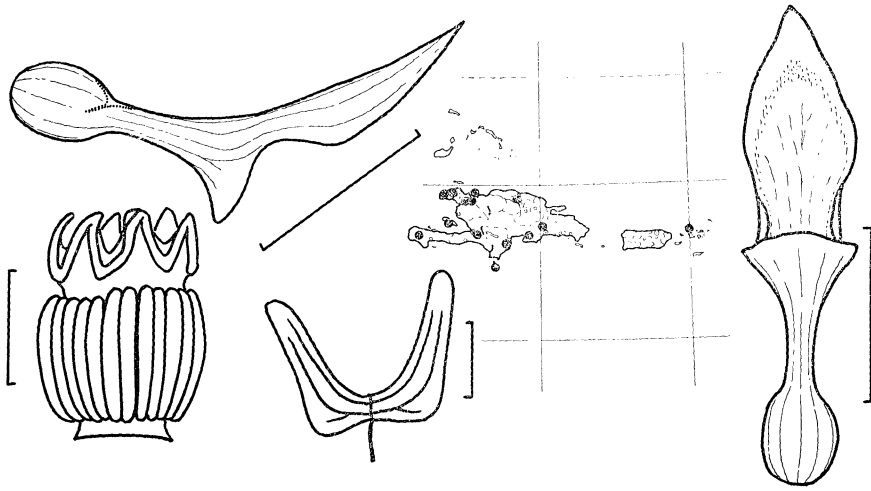


Fig. 18. Gynostemium, leaf, flowers and distribution of *A. bilobata*.

At clearing margins, in thickets and woodlands, along the Caribbean side of Central America from British Honduras to Panama, and throughout the West Indies.

BRITISH HONDURAS: Belize, Monkey River, Stann Creek.

HONDURAS: Atlántida.

COSTA RICA: Limón.

PANAMA: Canal Zone, Chiriquí.

BERMUDA. CUBA: Oriente. JAMAICA. HAITI. DOMINICAN REPUBLIC. PUERTO RICO. ST. THOMAS. TORTOLA. ANTIGUA. GUADELOUPE. DOMINICA. MARTINIQUE. ST. VINCENT. TRINIDAD.

16. *ARISTOLOCHIA BILOBATA* L., Sp. Pl. 960, 1753. (ex ic. cit.)—Fig. 18.

Tropexa biloba Raf., Fl. Tellur. 4: 98, 1838. (Based on *A. bilobata* L.)

Howardia bilobata (L.) Klotzsch, Monatsb. Acad. Berlin 1859: 619, 1859.

Glabrous small *lianas*. *Leaves* palmately 2-lobed, truncate at the base, 1-3 cm broad 1-2.5 cm long. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, ebracteolate, rectilinear, purple, the utricle ellipsoid, 5-8 mm long, syrinx an inequilateral cylinder, the tube straight, 5-10 mm long, the limb smooth, 1-lobed, lanceolate, exappendiculate, 6-10 cm wide, 15-22 mm long. *Gynostemium* 6-lobed, 2 mm high, 2 mm broad, the anthers 6, equidistant. *Fruits* short-cylindric, 2.5 cm long, 1.5 cm wide, dehiscence acropetal, septifragal, the hypanthium 2-3 mm long. *Seeds* numerous, flat, 5 mm wide, 6 mm long, 0.2 mm thick.

On low bushes and in thickets in dry soils on the islands of Hispaniola and St. Thomas, and other smaller islands nearby.

HAITI (incl. Gonave I.). DOMINICAN REPUBLIC (incl. Beata I.). ST. THOMAS.

While this species is frequently collected without flowers or fruits, it can be readily identified by the curious bilobate leaves.

17. *ARISTOLOCHIA LINDENIANA* Duchr. in DC., Prod. **15-1**: 453, 1864. (Type: *Linden 18*, not seen)—Fig. 19.

A. lindeniana Duchr. var. *plagiophylla* Griseb., Cat. Pl. Cub. 115, 1866. (Type: *Wright 2616*, MO)

A. clementis Alain, Rev. Soc. Cubana Bot. **5**: 80, 1948. (Type: *Clemente 6096*, NY)

Small, twiggly *lianas*. *Leaves* varying widely in size, strongly oblate-reniform, shallowly emarginate, rarely truncate at the apex, basally subtruncate, peltate, 17-25 mm broad, 5-9 mm long, smooth above and beneath, green. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, ebracteolate, geniculate, terra cotta and purple, the utricle ovoid, 1 cm long, syrxinx absent, the tube bent, 5 mm long, the limb 1-lobed, smooth, ovate, the margins crisped, revolute, 8 mm wide, 13 mm long, unappendaged. *Gynostemium* 6-lobed, 2 mm high, 2 mm broad, the anthers 6, equidistant. *Fruits* small, spheric, 8 mm diameter, the hypanthium straight, 2 mm long. *Seeds* numerous, flat, 3 mm wide, 3 mm long, 0.5 mm thick.

In dry limestone and pine forests, eastern Cuba.

CUBA: Oriente.

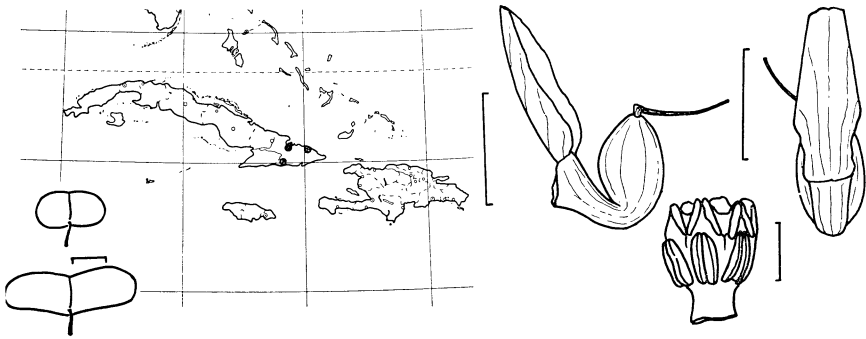


Fig. 19. Leaves, distribution, flowers and gynostemium of *A. lindeniana*.

18. *ARISTOLOCHIA PELTATA* L., Sp. Pl. 960, 1753. (ex char.)—Fig. 20.

A. reniformis Willd., Sp. Pl. **4**: 153, 1805, non Vell. (1827). (ex char.)

Howardia peltata (L.) Klotzsch, Monatsb. Acad. Berlin **1859**: 618, 1859.

H. reniformis (Willd.) Klotzsch, loc. cit.

Subglabrous *lianas*. *Leaves* strongly oblate-reniform, emarginate, cordate, barely peltate, 3-4 cm broad, 1.5-2.2 cm long, minutely hamate-hairy above, beneath glabrous. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, ebracteolate, rectilinear, purple and green, the utricle ovoid, 8-10 mm long, syrxinx small, inequilateral, the tube straight or slightly arcuate, 1.5-2.0 cm long, the limb 1-lobed, long-spatulate, densely fimbriate on the expanded terminal portion, ca 6 cm long, the apex obtuse to emarginate. *Gynostemium* 6-lobed, 2 mm high, 2 mm broad, the anthers 6, equidistant. *Fruits* short-cylindric, 2 cm long, 1.3 cm wide, dehiscence

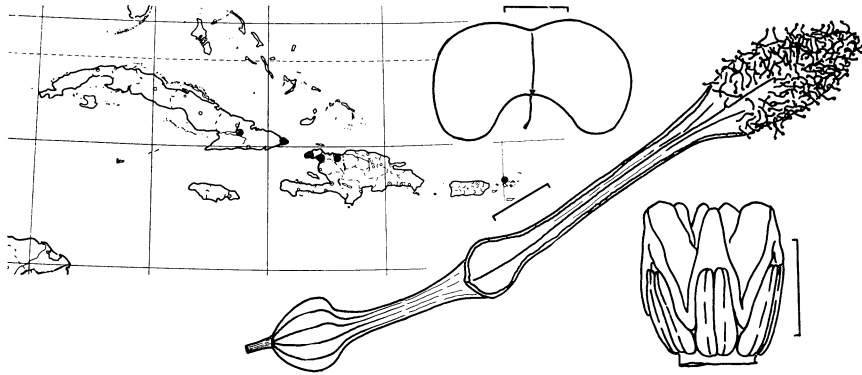


Fig. 20. Distribution, leaf, flower and gynostemium of *A. peltata*.

acropetal, septifragal, the hypanthium 2 mm long. Seeds numerous, flat, 4 mm wide, 3.5 mm long, 0.2 mm thick.

On shrubs, in dry thickets, eastern Cuba, Haiti and St. Thomas.

CUBA: Oriente. HAITI. ST. THOMAS.

The curious, long limb is densely fimbriate on the expanded terminal lobe and has no prominent warts or tubercles; this will differentiate *A. peltata* from *A. fuertesii*.

19. *ARISTOLOCHIA LEPTOSTICTA* Urban, Symb. Antill. 7: 206, 1912. (Type: von Tuerckheim 2661, not seen)—Fig. 21.

A. peltata L. var. *poitaei* Urban, loc. cit. 207. (Type: Bredemeyer 17054, not seen)

Glabrous lianas. Leaves strongly oblate-reniform, obtuse at the apex, apiculate, basally cordate-hastate, 2.5-4.0 cm broad, 2.5-4.0 cm long, glabrous, smooth.



Fig. 21. Distribution, flower, gynostemium and leaf of *A. leptosticta*.

Pseudostipules absent. *Flowers* solitary in the leaf axils, ebracteolate, rectilinear, yellow and spotted purple, the utricle ovoid, 7 mm long, syrinx a low cylindric rim, the tube straight, 7 mm long, the limb 1-lobed, fimbriate-warty, ovate-spatulate, 8 mm wide, 1.5 cm long, unappendaged. *Gynostemium* 6-lobed, squat, 2 mm high, 3 mm broad, the anthers 6, equidistant. *Fruits* not seen.

In thickets and dry limestone rocks, along the southern shores of Hispaniola.

HAITI. DOMINICAN REPUBLIC.

While I have not seen Urban's type, he listed two other collections in addition to the holotype. My identification is based upon both of these, *Fuertes 26* (US) and *Fuertes 973b* (A).

20. *ARISTOLOCHIA HAITIENSIS* Ekman & Schmidt in Fedde, Repert. Sp. Nov. **27**: 101, 1929. (Type: *Ekman H8671*, S, US)—Fig. 22.

Glabrous, twiggy *lianas*. *Leaves* strongly oblate reniform, subrectangular, emarginate, basally truncate, barely subpeltate, 2-2.5 cm broad, 7-9 mm long, green, smooth. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, ebracteolate, rectilinear, spotted purple, the utricle ovoid, 6-8 mm long, syrinx a small, inequilateral flap, the tube straight, 8-12 mm long, the limb 1-lobed, fimbriate-warty, spatulate, 7-9 mm wide, 15 mm long, unappendaged. *Gynostemium* 6-lobed, 2 mm high, 2 mm broad, the anthers 6, equidistant. *Fruits* small, cylindric, 1.75 cm long, 0.75 cm wide, dehiscence acropetal, septifragal, the hypanthium slightly curved, 3 mm long. *Seeds* numerous, flat, 2.5 mm wide, 3 mm long, 0.2 mm thick.

On limestone rocks; known only from islands in Golfe de la Gonave.

HAITI.

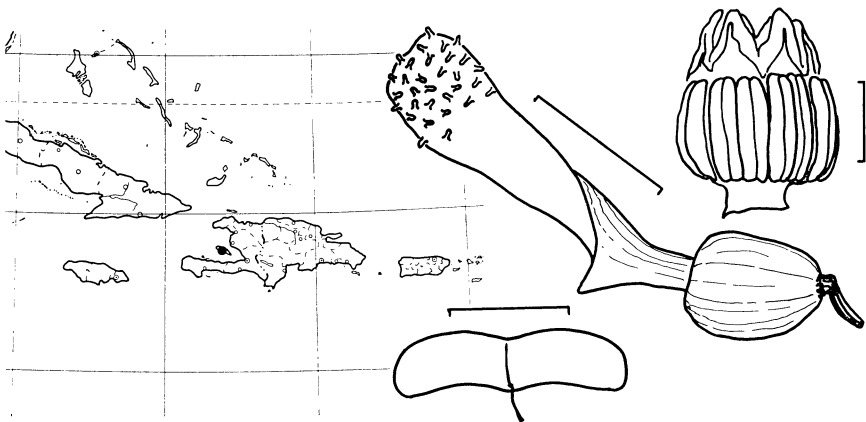


Fig. 22. Distribution, leaf, flower and gynostemium of *A. haitiensis*.

21. *ARISTOLOCHIA TENTACULATA* Schmidt in Fedde, Repert. Sp. Nov. **23**: 283, 1927. (Type: *Palmer 351*, A, F, GH, MO, NY, UC, US)—Fig. 23.

Glabrous small *lianas*... *Leaves* cordate-orbulate, slightly emarginate, cordateauriculate, 2-6 cm broad, 3-8 cm long, smooth above, beneath paler with emersed veins. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, often on small-leaved, short, lateral shoots, ebracteolate, subgeniculate, purple, green and yellow, the utricle gibbous-obconic, 1 cm long, syrinx inequilateral, annular, the tube straight, narrow at first, thence flaring into the limb, 2-3 cm long, the limb broadly lanceolate, sparsely long-fimbriate along the lateral margins, 2.5 cm wide, 6-8 cm long, unappendaged. *Gynostemium* 6-lobed, 4 mm high, 4-5 mm broad, the anthers 6, equidistant. *Fruits* cylindric, 5 cm long, 2.5 cm wide, dehiscence acropetal, septifragal, the hypanthium straight, 2 mm long. *Seeds* numerous, 6.5 mm wide, 8 mm long, thin, papery.

On shrubs and in open woodlands, west-central Mexico.

MEXICO: Guerrero, Mexico, Michoacán.

This species, called *guaco* (along with most other Mexican species of *Aristolochia*) by the native population, is used by Mexicans for treating nearly every chronic constitutional disorder of man.



Fig. 23. Gynostemium, distribution, flowers and leaf of *A. tentaculata*.

22. *ARISTOLOCHIA PILOSA* H.B.K., Nov. Gen. Sp. Pl. **2**: 146, t. 113, 1817. (ex ic.)—Fig. 24.

Howardia pilosa (H.B.K.) Klotzsch, Monatsb. Acad. Berlin **1859**: 612, 1859.

H. costaricensis Klotzsch, loc. cit. 614. (Type: *Hoffman s.n.*, photo G-DC)

Aristolochia costaricensis (Klotzsch) Duchr. in DC., Prod. **15**(1): 450, 1864.

A. pilosa H.B.K. var. *ligulifera* Mast., Bot. Gaz. **33**: 256, 1902. (Type: *von Tuerckheim* (JDS) 7768, A, GH, NY, US)

A. ferruginea Brandg., Univ. Calif. Pub. Bot. **6**: 51, 1914. (Type: *Purpus 6931*, F, GH, MO, NY, UC, US)

A. haughtiana Hoehne, Arquiv. Bot. Estad. S. Paulo, n. s., **2**: 99, t. 37, 1947. (Type: *Haught 4648*, US)

Hispid-pilose *lianas*. *Leaves* oval to ovate, acute at the apex, basally deeply

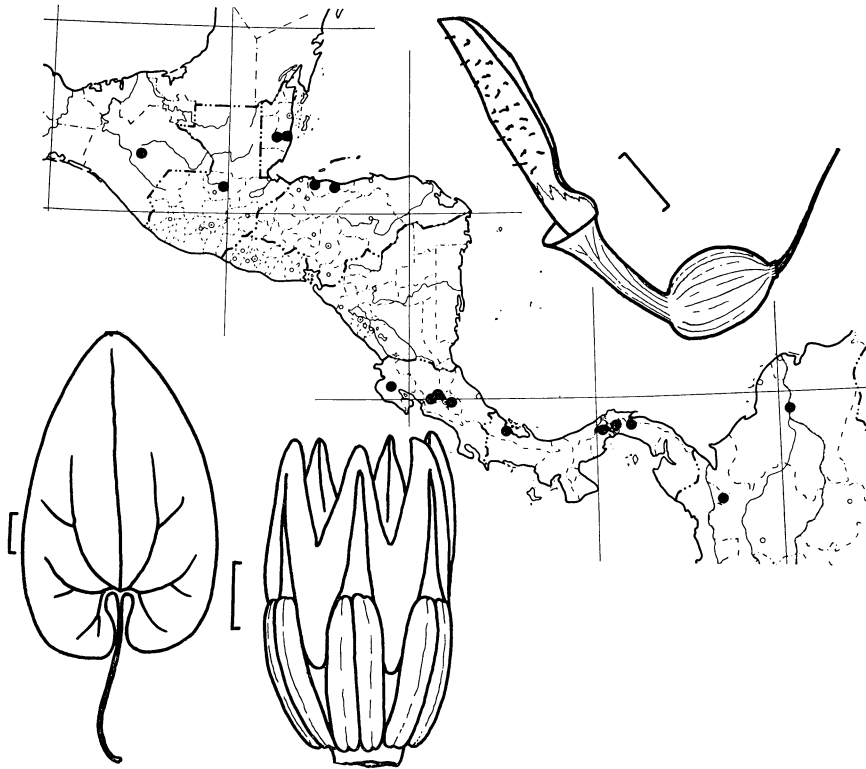


Fig. 24. Leaf, gynostemium, distribution and flower of *A. pilosa*.

cordate, 5-10 cm broad, 6-15 cm long, deep green, glabrescent above, beneath paler, pilose along the veins. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, ebracteolate, arcuate, purple, green and yellow, the utricle ovoid, 1.5 cm long, syrinx inequilateral, small, annular, the tube straight, 1.5-2.5 cm long, the limb 1-lobed, sparsely to heavily fimbriate, lingulate-spatulate, 2 cm wide, 3.5-4.5 cm long, unappendaged. *Gynostemium* 6-lobed, 5 mm high, 3 mm broad, the anthers 6, equidistant. *Fruits* large, woody, short-cylindric, 6-7 cm long, 4-5 cm wide, dehiscence acropetal, septifragal, the hypanthium absent. *Seeds* numerous, flat, 15 mm wide, 11 mm long, 1 mm thick.

Rain forests, southern Mexico to Colombia in our area; probably extensively distributed in South America.

MEXICO: Chiapas.

GUATEMALA: Alta Verapaz.

BRITISH HONDURAS: Belice.

HONDURAS: Atlántida.

COSTA RICA: Alajuela, Cartago, Guanacaste.

PANAMA: Canal Zone, Chiriquí, Panama.

This is the only conspicuously stiff-haired hexandrous species in our area. Authors have treated fimbriate plants as *A. costaricensis*, and efimbriate ones as *A.*

pilosa, but many intermediates occur which are indistinguishable from one another in other details; the intermediates, furthermore, do not occur in any geographic sequence.

23. *ARISTOLOCHIA TALISCANA* Hook. & Arn., Bot. Beech. Voy. 309, 1840. (Type: *Lay & Collie s.n.*, BM)—Fig. 25.

A. galeottii Duchr., Ann. Sci. Nat., sér. 4, 2: 44, 1854. (Type: *Galeotti 212*, P; photos F, MO)

A. pardina Duchr., loc. cit. 47. (Type: *Ghiesbreght 214*, F, P)

Glabrescent *lianas*. *Leaves* broadly cordate, rounded to emarginate, basally deeply cordate-auriculate, 2.5-6.0 cm broad, 2.5-7.0 cm long, smooth. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, slightly arcuate to sharply geniculate, brown and yellow, the utricle obconic, 8 mm long, syrinx inequilateral, annular, the tube straight, 2-3 cm long, the limb subspatulate, erect, densely to sparsely fimbriate-warty, fimbriae variable, small and few to large and numerous, 1 cm wide, 2.5-3.0 cm long, unappendaged. *Gynostemium* 6-lobed, 2.5-3.5 mm high, 2-4 mm broad, the anthers 6, equidistant. *Fruits* cylindric, 3.5 cm long, 2.0-2.5 cm wide, dehiscence acropetal, septifragal, the hypanthium slightly curved, 4 mm long. *Seeds* numerous, flat, 6 mm wide, 9 mm long, 0.5 mm thick.

In thickets, open places and scrub forests, west-central Mexico.

MEXICO: Colima, María Madre I., Michoacán, Nayarit, Sinaloa.

This species is one of the most variable, and thus confusing, of all the species treated in this paper. There are several extremes of flower structure, and all intermingle and merge in various combinations. Placing all of these variants in a single species perhaps is not adequate treatment, but any other action is precluded without extensive field studies.

A word might be added regarding the spelling of the species epithet. It was named for Jalisco, but regrettably was published as *taliscana*. While a correction would satisfy a few overmeticulous persons, there is little need to litter *Aristolochia* with yet another name. I choose to allow it to remain as *taliscana*.

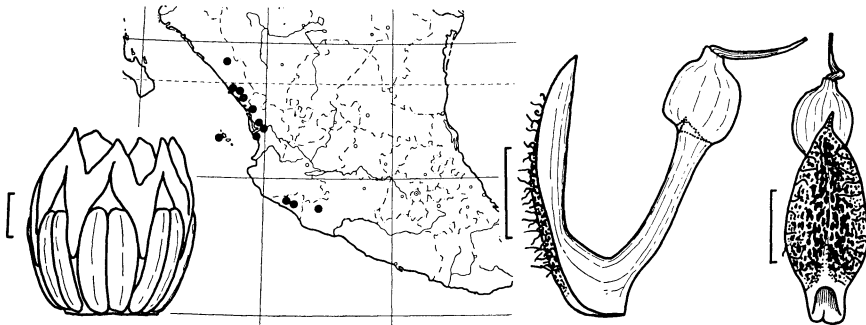


Fig. 25. Gynostemium, distribution and flowers of *A. taliscana*.

24. *ARISTOLOCHIA GLANDULOSA* Kickx, Bull. Acad. Roy. Brux., **1839**: 453, t. 455, 1839. (ex ic. cit.)—Fig. 26.

A. macradenia Hook., Bot. Mag. t. 4467, 1849. (ex ic. cit.)

Howardia macradenia (Hook). Klotzsch, Monatsb. Acad. Berlin **1859**: 618, 1859.

Aristolochia glandulosa Kickx β *glabra* Duchr. in DC., Prod. **15**(1): 452, 1864. (Based on *A. macradenia* Hook.)

Finely tomentulose *lianas*. *Leaves* broadly to narrowly pandurate, medially constricted, slightly emarginate to obtuse, deeply cordate-hastate, 2.5-6.0 cm broad, 7.5-12.0 cm long, deep green, finely hamate-hairy above, often therefore scabrous, beneath delicately tomentulose. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, ebracteolate, rectilinear to subarcuate, green and dark purple, the utricle ovoid, 1.5 cm long, syrinx a small rim, the tube straight, ca 2 cm long, the limb 1-lobed, ovate, with peltate-capitate fimbriae, 2-2.5 cm wide, 3-4 cm long, unappendaged. *Gynostemium* 6-lobed, obconic, 5 mm high, 3 mm broad, the anthers 6, equidistant. *Fruits* cylindrical, pubescent, 4 cm long, 2.5 cm wide, dehiscence acropetal, septifragal, the hypanthium absent. *Seeds* numerous, flat, 7 mm wide, 7 mm long, 0.5 mm thick.

Climbing on shrubs and rocks in limestone soils, western Cuba.

CUBA: Habana, Isla de Pinos, Pinár del Río, Santa Clara.

The curious fimbriae distinguish *A. glandulosa* sufficiently well. It is also noteworthy for the strange, scabrous leaves, a condition also seen in a few other species, but most striking here and due to the presence of great numbers of minute, hamate hairs on the upper surfaces of the leaves.

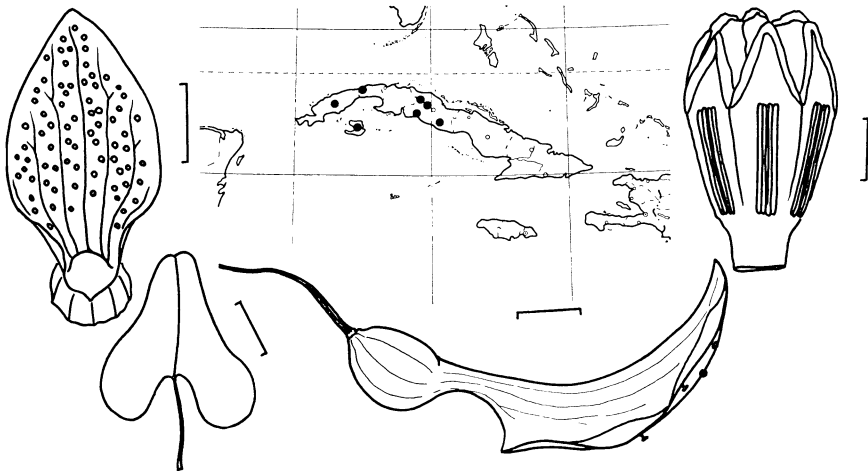


Fig. 26. Flowers, leaf, distribution and gynostemium of *A. glandulosa*.

25. *ARISTOLOCHIA CLAVIDENIA* Griseb., Cat. Pl. Cub. 115, 1866. (Type: *Wright* 2612, MO, NY)—Fig. 27.

Glabrescent *lianas*. *Leaves* broadly to narrowly pandurate, medially constricted, obtuse at the apex, basally cordate-hastate, 6-12 cm broad, 7-14 cm long, dark

green and smooth above, beneath paler, sparsely very fine-puberulent. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, ebracteolate, subgeniculate, purplish, the utricle obconic, 1.5 cm long, syrinx inequilateral, annular, the tube arched, 2 cm long, the limb 1-lobed, spatulate, the terminal portion with laterally compressed capitate fimbriae, 2 cm wide, 4-6 cm long. *Gynostemium* 6-lobed, 5 mm high, 4 mm broad, the anthers 6, equidistant. *Fruits* not seen.

Habitat not known, eastern Cuba.

CUBA: Oriente.

Aristolochia clavidenia is distinguishable from all other species by the laterally compressed, capitate fimbriae and the large flowers.

26. ARISTOLOCHIA FUERTESII Urban, Symb. Antill. 7: 207, 1912. (Type: *Fuertes* 902, A)—Fig. 28.

Puberulent, glabrescent *lianas*. *Leaves* broadly to narrowly pandurate, medially constricted, obtuse to emarginate, broadly and deeply cordate-hastate, 17-22 mm broad, 17-24 mm long, smooth above, beneath slightly paler, puberulent. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, ebracteolate, 6 mm long, syrinx an inequilateral flap, the tube straight, 17-22 mm long, the limb 1-lobed, long-spatulate, with fimbriae subulate, chiefly marginal, large, warty, the limb apex emarginate, 7 mm wide, 27-30 mm long overall. *Gynostemium* 6-lobed, 1.4 mm high, 1.2 mm broad, the anthers 6, equidistant. *Fruits* not seen.

In dry thickets, extreme southern Hispaniola.

HAITI. DOMINICAN REPUBLIC.

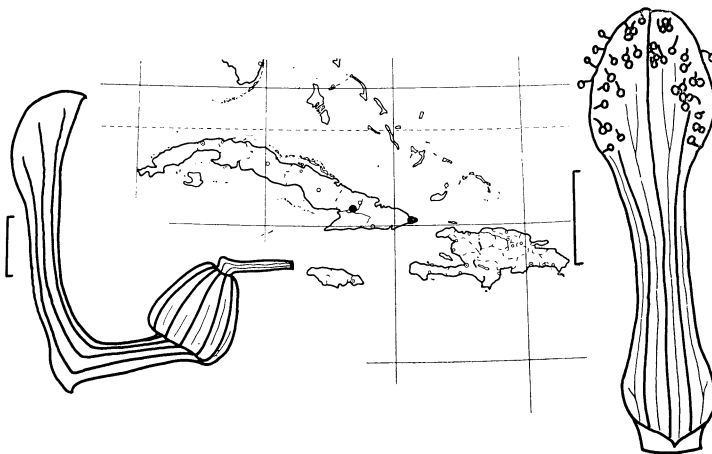


Fig. 27. Flowers and distribution of *A. clavidenia*.

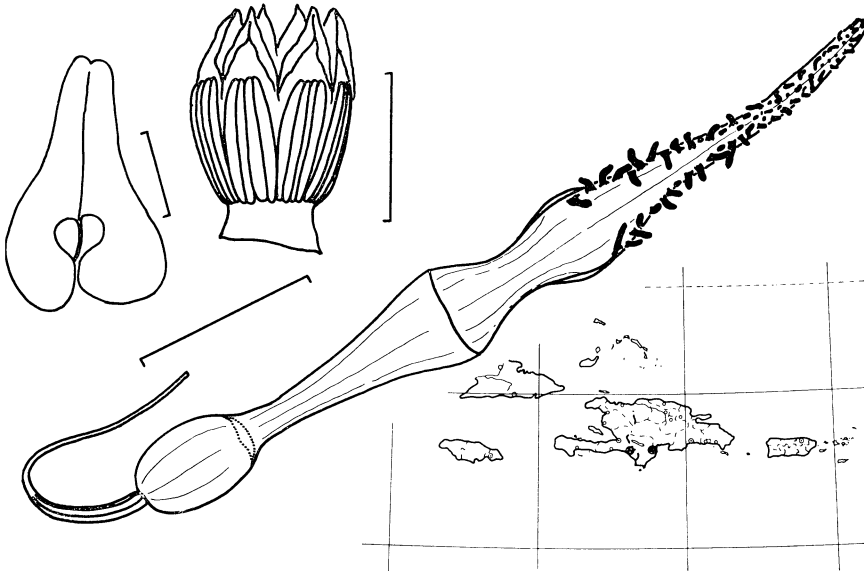


Fig. 28. Leaf, gynostemium, flower and distribution of *A. fuertesii*.

27. *ARISTOLOCHIA RUGOSA* Lam., Encycl. Méth. Bot. **1**: 252, 1783. (ex ic. cit.)—
Fig. 29.

A. obtusata Sw., Prod. Veg. Ind. Occ. 126, 1788. (ex ic. cit.)

A. barbata Jacq., Ic. Pl. Rar. **3**: t. 608, 1789. (ex ic.)

A. dictyantha Duchr., Ann. Sci. Nat., sér. 4, **2**: 40, 1854. (Type: *Vargas s.n.*, photo G-DC)

A. eurystoma Duchr., loc. cit. 41. (Type: *Beaupertuis s.n.*, P)

Howardia obtusata (Sw.) Klotzsch, Monatsb. Acad. Berlin **1859**: 612, 1859.

H. barbata (Jacq.) Klotzsch, loc. cit. 613.

H. schomburgkii Klotzsch, loc. cit. (ex char.)

Aristolochia dictyantha Duchr. *β schomburgkii* (Klotzsch) Duchr. in DC., Prod. **15**(1): 447, 1864.

A. rumicifolia Schomb. ex Duchr., loc. cit., non Mart. (1824), pro syn.

Glabrescent *lianas*. *Leaves* broadly to narrowly pandurate, medially constricted, with rounded apices, the bases deeply cordate-sagittate, 3-7 cm broad, 8-12 cm long, paler beneath. *Pseudostipules* absent. *Flowers* solitary, axillary, ebracteolate, rectilinear, the utricle subovoid, 1 cm long, syrinx an inequilateral flap, the tube trumpet-shaped, straight, 3 cm long, the limb 1-lobed, broadly spatulate, with subulate, surficial fimbriae, 1 cm wide, 1.5-2.0 cm long. *Gynostemium* coroniform, 6-lobed, the anthers 6, equidistant. *Fruits* cylindric, 5 cm long, 1.5 cm wide, dehiscence neither acropetal nor basipetal, but appearing median, septifragal. *Seeds* numerous, subrevolute, 4 mm wide, 5 mm long, 1 mm thick.

Apparently limited in our range to the Leeward Islands.

ANTIGUA. GUADELOUPE. MARTINIQUE.

The dehiscence type of the fruits of *A. rugosa* is intermediate between two well-defined extremes, acropetal and basipetal. The papery consistency of the

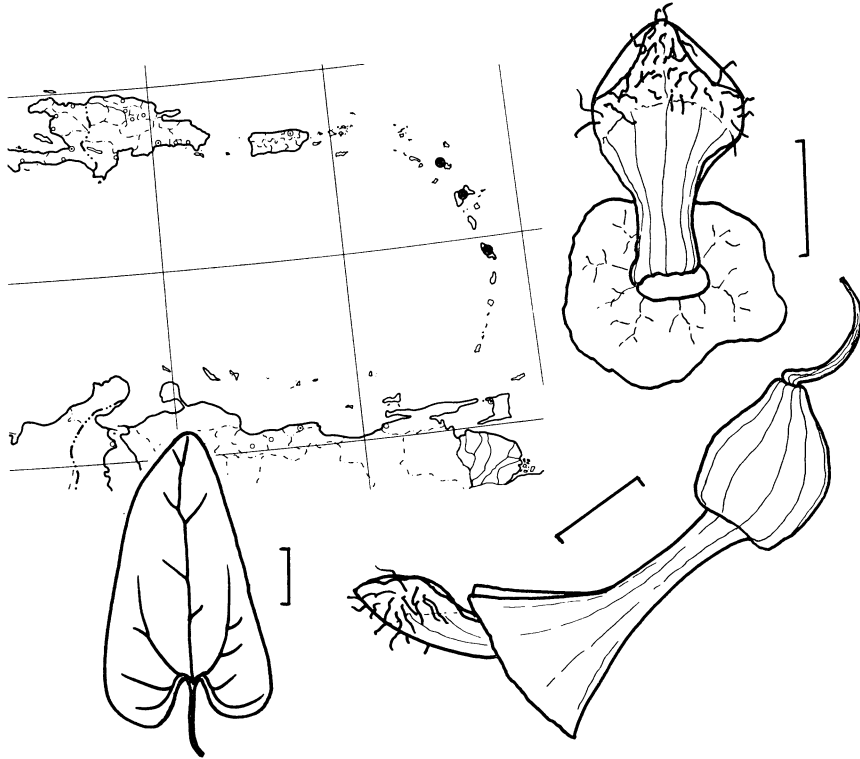


Fig. 29. Distribution, leaf and flowers of *A. rugosa*.

capsules seems to reflect closer affinities with those of acropetal dehiscence, but the subrevolute seeds are typical of the basipetally opening fruits.

28. *ARISTOLOCHIA PASSIFLORAEFOLIA* A. Rich., Fl. Cub. Fanerog. **2**: 195, 1850. (Type: *Sagra s.n.*, P)—Fig. 30.

A. cyclochilia Duchr., Ann. Sci. Nat., sér. 4, **2**: 45, 1854. (Type: *Sagra s.n.*, not seen)
A. trichostoma Griseb., Mem. Amer. Acad., n. s., **8**: 190, 1861. (Type: *Wright 463*, MO, P)
A. spatulata Duchr. in DC., Prod. **15**(1): 448, 1864. (Type: *Wright 463*, MO, P)

Glabrescent *lianas*. *Leaves* heteromorphic, subtriangular, or broadly to narrowly pandurate, medially constricted, acuminate to obtuse at the apex, basally sagittate-auriculate to cordate to auriculate-hastate, 2-6 cm broad, 4-10 cm long, smooth. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, ebracteolate, subgeniculate, purple marked with green, the utricle ovoid, ca 1 cm long, syrinx inequilateral, small, the tube straight to arcuate, 1-1.5 cm long, the limb 1-lobed, broadly spatulate, densely subulate-fimbriate, 1 cm wide, 2-3 cm long, unappendaged. *Gynostemium* 6-lobed, 2-3 mm high, 2 mm broad, the anthers 6, equidistant. *Fruits* cylindric 3.5-4.0 cm long, 2.0-2.5 cm wide, dehiscing acropetally,

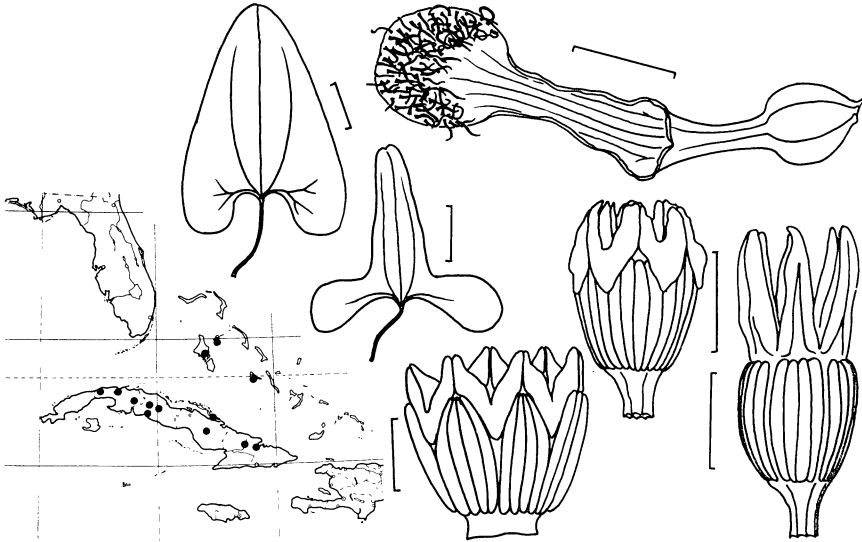


Fig. 30. Distribution, leaves, gynostemium and flower of *A. passifloraefolia*.

septifragally, the hypanthium absent. Seeds numerous, flat, 7 mm wide, 8 mm long, 0.5 mm thick.

In dry thickets, Cuba and the Bahamas.

CUBA: Camagüey, Habana, Matanzas, Oriente, Santa Clara.
BAHAMAS: Andros, Great Exuma, New Providence Islands.

The flowers and leaves of *A. passifloraefolia* are quite variable. The length of the limb varies inversely with the length of the tube; i.e. the tube may split farther, becoming shorter, the limb correspondingly longer. Leaf shapes, even on a single branch, have a range making adequate description impossible.

29. *ARISTOLOCHIA LABIATA* Willd., Mem. Soc. Nat. Mosc. **2**: 101, t. 6, 1809. (ex ic.)—Fig. 31.

A. ringens Link & Otto, Abbild. auserl. Gewächse **3**: 33, t. 13, 1821, excl. syn. (ex ic.)

A. labiosa Ker-Gawl. in Edwards, Bot. Reg. t. 689, 1822. (ex ic.)

A. brasiliensis Mart. & Zucc., Nov. Gen. Sp. Pl. **1**: 77, 1824. (ex ic. cit.)

A. galeata Mart. & Zucc., loc. cit. 76, t. 50. (ex ic.)

Ambuya labiosa (Ker-Gawl.) Raf., Fl. Tellur. **4**: 98, 1838.

Aristolochia ornithocephala Hook., Bot. Mag. t. 4120, 1844. (ex ic.)

Howardia galeata (Mart. & Zucc.) Klotzsch, Monatsb. Acad. Berlin **1859**: 608, 1859, excl. syn.

Aristolochia brasiliensis Mart. & Zucc. β *macrophylla* Duchr., Man. Gén. Pl. **4**: 30, 1852. (Based on *A. ornithocephala* Hook.)

A. brasiliensis Mart. & Zucc. γ *parviflora* Duchr. in DC., Prod. **15**(1): 471, 1864. (Based on *A. labiata* Willd.)

Stout, glaucous *lianas*. Leaves glabrous, broadly cordate, obtuse at the apex, 7-15 cm broad, 7-12 cm long, green above, beneath gray. *Pseudostipules* large, sessile, amplexicaul, ruffled. *Flowers* solitary in the leaf axils, ebracteolate, geniculate, mottled red, yellow, green and purple, the utricle subglobose, 7 cm long,

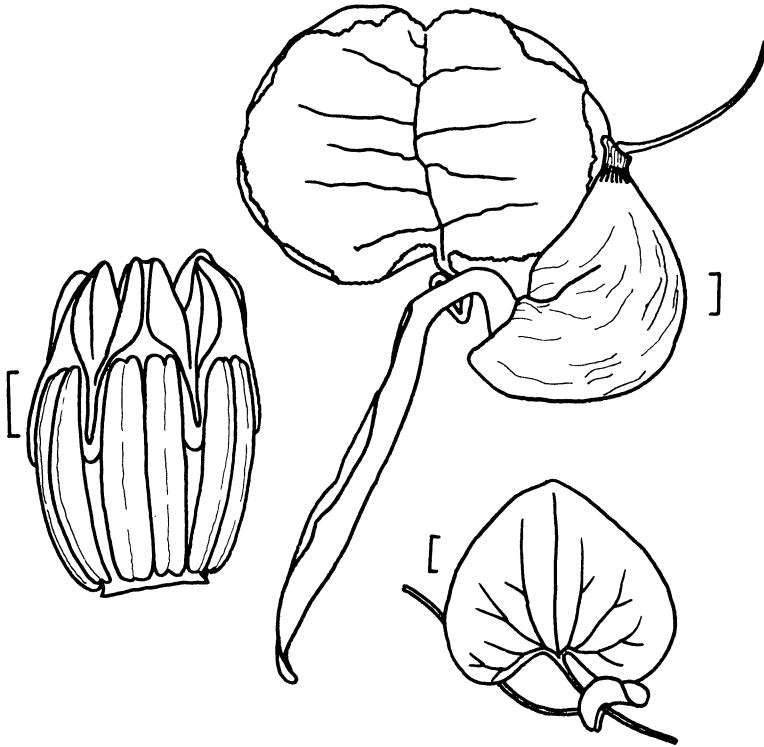


Fig. 31. Gynostemium, flower and leaf showing pseudostipule of *A. labiata*. The flower is drawn with the upper ruffled, orbiculate lobe folded into an erect position; it normally hangs pendent.

syrinx absent, the tube straight, emerging from the side of the utricle at a sharp angle, 4 cm long, annulus absent, the limb with 2 superposed lobes, the upper lobe oblate-orbicular, narrowly clawed, ruffled, deflected and pendent, 14-18 cm wide, 13-15 cm long (including claw), the lower lobe stiffly erect, narrowly lanceolate, 10-15 cm long. *Gynostemium* 6-lobed, the lobes connivent-erect, 1 cm high, 6 mm broad, the anthers 6, equidistant. *Fruits* cylindric, 8 cm long, 3 cm wide. *Seeds* numerous, as in *A. ringens* Vahl.

Aristolochia labiata, a South American plant, in our area is known only from cultivated plants; it may be becoming naturalized in some areas.

A proven hybrid exists between *A. labiata* Willd. and *A. trilobata* L. and was described in the Gardeners' Chronicle (Anon., **50**: 300, 1911.) as *A. × kewensis* W. W. It was later again described by Ekman & Schmidt as *A. domingensis* (Notizbl. Bot. Gart. Berlin **12**: 393, 1935).

30. *ARISTOLOCHIA RINGENS* Vahl, Symb. Bot. **3**: 99, 1794. (ex ic. cit.)—Fig. 32.

A. grandiflora Vahl, loc. cit. **2**: 94, t. 47, 1791, non Swartz (1788), nec Gomez (1803), nec Arruda (1816). (ex ic.)

Howardia ringens (Vahl) Klotzsch, Monatsb. Acad. Berlin **1859**: 607, 1859.

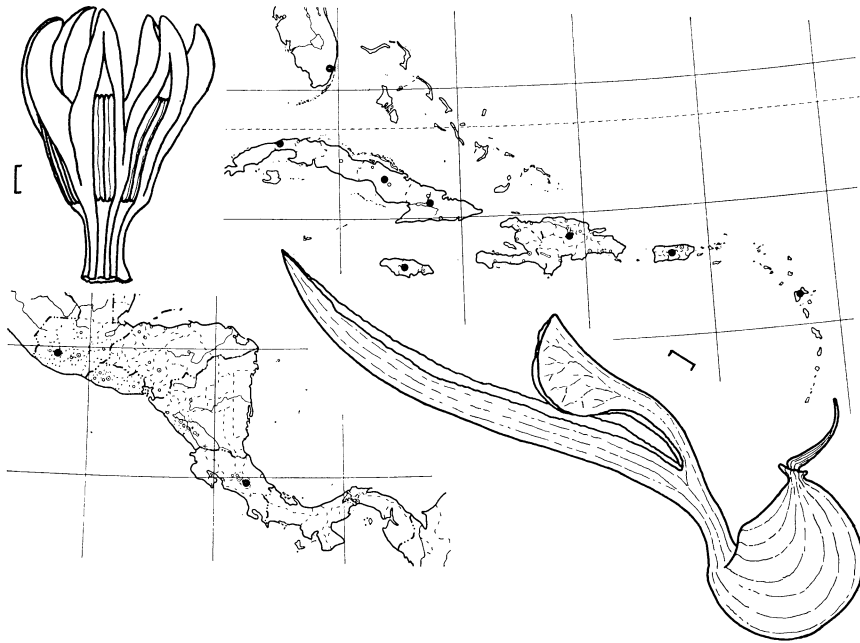


Fig. 32. Gynostemium, distribution and flower of *A. ringens*.

Stout, glaucous *lianas*. *Leaves* glabrous, broadly cordate, obtuse at the apex, 7-15 cm broad, 7-12 cm long, green above, beneath gray. *Pseudostipules* large, sessile, amplexicaul, ruffled. *Flowers* solitary in the leaf axils, ebracteolate, geniculate, mottled red, yellow, green and purple, the utricle subglobose, 7 cm long, syrx absent, the tube straight, emerging from the side of the utricle at a sharp angle, 4 cm long, annulus absent, the limb with 2 superposed lobes, the upper lobe obovate-spatulate, not deflected, 4-5 cm wide, 8 cm long, the lower lobe stiffly erect, narrowly lanceolate, 16-20 cm long. *Gynostemium* 6-lobed, the lobes spreading-coroniform, 1 cm high, 8 mm broad, the anthers 2.5-3.0 cm wide, dehiscence acropetal, septifragal, the hypanthium present, bent. *Seeds* numerous, narrowly cordate, flat, 7 mm wide, 12 mm long, 0.2 mm thick.

Aristolochia ringens is naturalized in Florida. I suspect it is a native of South America and only secondarily introduced in our area.

UNITED STATES. FLORIDA: Dade county.

GUATEMALA: Guatemala.

COSTA RICA: Cartago.

CUBA: Habana, Camagüey, Oriente. JAMAICA. DOMINICAN REPUBLIC. PUERTO RICO. GUADELOUPE.

Aristolochia ringens and *A. labiata* probably hybridize to form *A. cymbifera* Mart. & Zucc.

31. *ARISTOLOCHIA ESOTERICA* Pfeifer, sp. nov.—Fig. 33.

Caules volubiles scandentes. *Folia* firmiter membranacea late cordata apice obtusa 12-16 cm lata 9-12 cm longa supra viridia laevia subtus argenteo-viridia subtiliter tomentulosa, venis fulvo-purpureis. *Pseudostipulae* nullae. *Flores* magni geniculati purpurei; utriculus lacrimiformis 2.5 cm longus, sine syringe; tuba curvata sensim ampliata 3.0 cm longa; limbus 1-lobatus subtriangulatus circa 5 cm latus 6 cm longus, sine appendice. *Columna* 6-loba; stamina 6. *Fractus* ignotus.—HOLOTYPE: *Richard s.n.*, P (Sine loco verisimiliter ex Antillis sinon America Australe.)

Scandent *lianas*. *Leaves* firmly membranous, broadly cordate, apically obtuse, 12-16 cm broad, 9-12 cm long, smooth, dark-green above, beneath minutely silvery-green, tomentulose, the veins brown-purple. *Pseudostipules* absent. *Flowers* large, geniculate, purplish, the utricle lacrimiform, 2.5 cm long, syrinx absent, the tube bent, gradually opening, 3.0 cm long, the limb 1-lobed, subtriangular, ca 5 cm wide, 6 cm long, unappendaged. *Gynostemium* 6-lobed, the anthers 6. *Fruits* not seen.

The sole specimen yields little information. The leaves are particularly distinct. A similar specimen from Departamento Izabal, Guatemala (*Steyermark 41790*, F), is sterile, making positive identification uncertain.

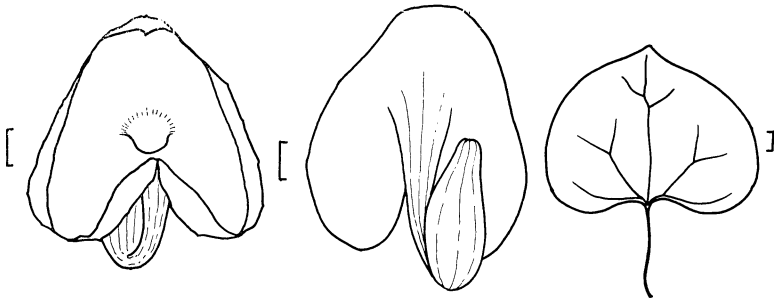


Fig. 33. Flowers and leaf of *A. esoterica*.

32. *ARISTOLOCHIA GIGANTEA* Mart. & Zucc., Nov. Gen. Sp. Pl. **1**: 75, t. 48, 1824, non Hook. (1846). (ex ic.)—Fig. 34.

Howardia gigantea (Mart. & Zucc.) Klotzsch, Monatsb. Acad. Berlin **1859**: 610, 1859. (quoad syn. Mart.)

Aristolochia clypeata J. Linden & André, Illus. Hort. **17**: t. 40, 1870. (ex ic.)

A. sylvicola Standl., Jour. Wash. Acad. Sci. **15**: 5, 1925. (Type: *Standley 27469*, US)

Large, strong-growing *lianas*. *Leaves* broadly ovate-triangular, acuminate, basally subtruncate, 10-15 cm broad, 12-16 cm long, deep green, glabrous above, beneath white-tomentose. *Pseudostipules* absent. *Flowers* cauliflorous, ebracteolate, geniculate, purple and yellow-orange, the utricle sublacrimiform, gibbous, 10 cm long, syrinx absent, the tube not sharply differentiated from the utricle and limb, U-shaped, ca 4 cm long, annulus absent, the limb 1-lobed, abruptly spreading

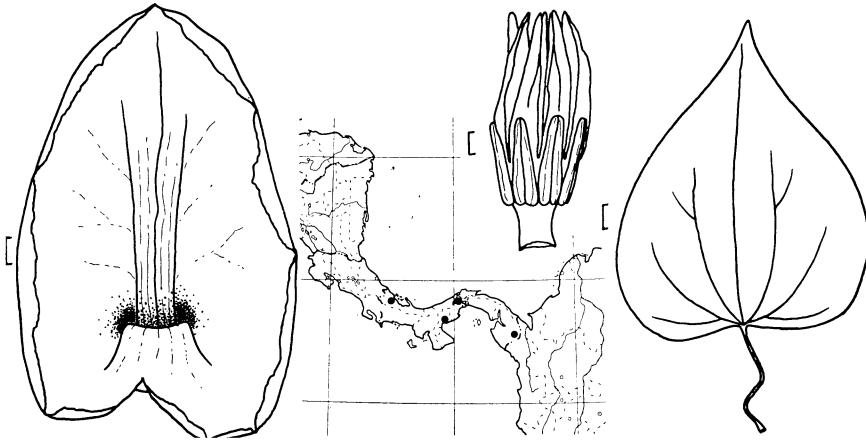


Fig. 34. Face view of flower, distribution, gynostemium and leaf of *A. gigantea*.

from the tube, broadly cordate, ca 14 cm wide, 16 cm long, unappendaged. *Gynostemium* 6-lobed, 1 cm high, 4 cm broad, the anthers 6, equidistant. *Fruits* large, glaucous, 8 cm long, 2.5-3.0 cm wide, dehiscence acropetal, septifragal, the hypanthium curved, 5 mm long. *Seeds* numerous, flat, 5 mm wide, 7 mm long, very thin, papery.

Wet rain forests, Panama.

PANAMA: Bocas del Toro, Canal Zone, Coclé, Darién.

Of South American affinities, *A. gigantea* is distinct in its flower and leaf shape from all other species in our area.

33. *ARISTOLOCHIA LITTORALIS* Parodi, Anal. Soc. Cient. Argent. **5**: 155 (Contrib. 47), 1878. (Type: *Parodi* s.n., not seen)—Fig. 35.

A. elegans Mast., Gard. Chron., n.s., **34**: 301, t. 61, 1885. (Type: *Glaziou* 13163, not seen)

A. hassleriana Chod., Bull. Herb. Boiss. **7**: App. 1, 61, 1899. (Type: *Hassler* 3365, not seen)

A. elegans Mast. var. *hassleriana* (Chod.) Hassl. in Fedde, Repert. Sp. Nov. **11**: 177, 1912.

Vigorous, glaucous *lianas*. *Leaves* cordate-reniform, obtuse at the apex, basally cordate, 6-10 cm broad, 7-9 cm long, smooth, green above, beneath gray-green, heavily glaucous. *Pseudostipules* auriculate, amplexicaul, pale green. *Flowers* solitary in the leaf axils, ebracteolate, geniculate, greenish-yellow and deep black-purple, the utricle subcylindric, 3.5 cm long, syrinx absent, the tube bent, 3 cm long, annulus absent, the limb 1-lobed orbiculate, abruptly spreading from the tube, 10 cm wide, 10 cm long. *Gynostemium* 6-lobed, 8 mm high, 5 mm broad, the anthers 6, equidistant. *Fruits* cylindric, 4.5 cm long, 2.5 cm wide, dehiscence acropetal, septifragal, the hypanthium retilinear from the ovary. *Seeds* numerous, flat, 4 mm wide, 6 mm long, 0.5 mm thick.

Commonly growing in second growth forests as an escape from wide cultiva-

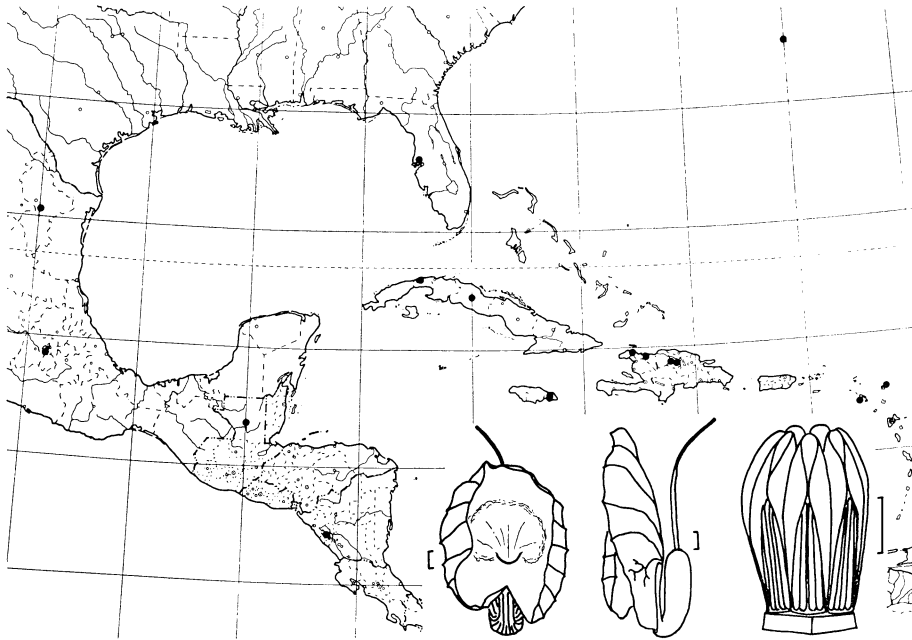


Fig. 35. Distribution, flowers and gynostemium of *A. littoralis*.

tion, its native area obscure, but probably South American; in our region ubiquitous in cultivation in the tropic areas.

UNITED STATES. FLORIDA: Hillsborough county.

MEXICO: Mexico, Nuevo León.

GUATEMALA: La Libertad.

NICARAGUA: Managua.

BERMUDA. CUBA: Habana, Sta. Clara. JAMAICA. HAITI. DOMINICAN REPUBLIC. ST. KITTS. BARBUDA. GUADELOUPE.

34. *ARISTOLOCHIA ODORATISSIMA* L., Sp. Pl. 1362, 1763, non Vell. (1827), nec Benth. (1841). (ex char.)—Fig. 36.

A. l scandens P. Browne, Civ. & nat. hist. Jamaica 329, 1756. (ex char.)

A. pandurata Jacq., Hort. Schoenbr. 4: 49, t. 497, 1804, non Wall. ex Duchr. (1864). (ex ic. cit.)

A. panduriformis Willd., Sp. Pl. 4: 152, 1805. (Based on *A. pandurata* Jacq.)

A. picta Karst., Auswahl neuer und schönblühender Gewächse Venezuelas 24, t. 8, 1848, pro. syn.

Howardia pandurata (Jacq.) Klotzsch, Monatsb. Acad. Berlin 1859: 619, 1859.

Aristolochia aurantiaca Duchr. in DC., Prod. 15(1): 475, 1864. (Type: *Linden 310*, photo G-DC)

A. moschata Wedd. ex Duchr., loc. cit., pro syn.

A. odoratissima L. β *grandiflora* Duchr., loc. cit. (Type *Linden 49*, photo G-DC)

A. ottonis Klotzsch ex Duchr., loc. cit. 476, pro syn.

Howardia warszewiczii Klotzsch ex Duchr., loc. cit. pro syn. (Type: *Warszewicz s.n.*, not seen)

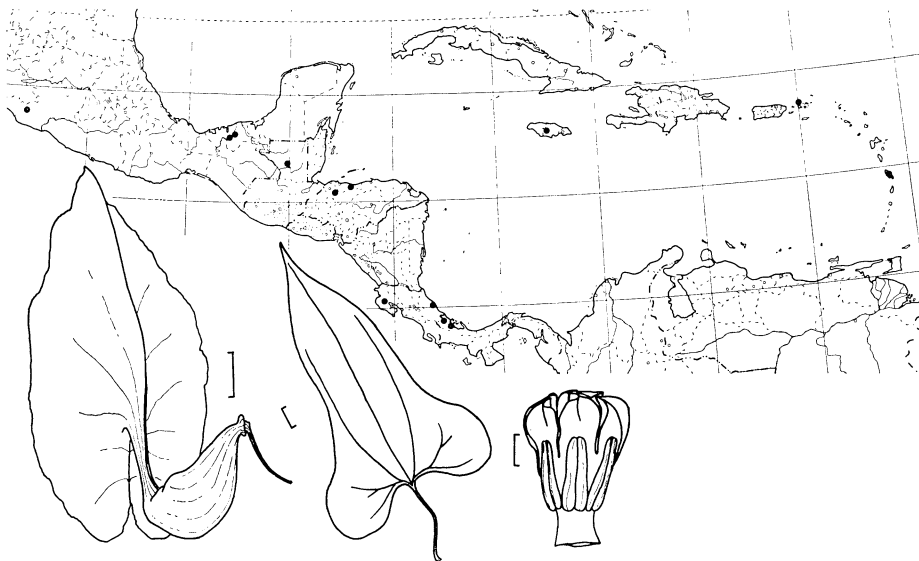


Fig. 36. Flower, leaf, gynostemium and distribution of *A. odoratissima*.

- Aristolochia pandurata* Jacq. β *warsewiczii* (Klotzch ex Duchr.) Duchr., loc. cit (ex char.)
A. rimbachii Schmidt in Fedde, Repert. Sp. Nov. **23**: 287, 1927. (Type: Rimbach 37, photo MO)
A. martiniana Standl., Field Mus. Pub. Bot. **17**: 238, 1937. (Type: Klug 4168, F, MO, NY, US)
A. odoratissima L. var. *pandurata* (Jacq.) Hoehne, Fl. Brasílica **15** (2): 47, 1942.

Glabrous *lianas*. *Leaves* membranous, cordate-subpandurate to triangular, medially constricted, acuminate, basally cordate-hastate, 5-9 cm broad, 8-12 cm long, glabrous. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, ebracteolate, geniculate, purple and yellow, the utricle lacrimiform, gibbous, 3 cm long, syrinx absent, the tube bent at its origin on side of utricle, 2-3 cm long, annulus absent, the limb 1-lobed, abruptly spreading from the tube, 4-6 cm wide, 10-13 cm long, tapering to an acuminate apex at the upper medial border. *Gynostemium* 6-lobed, 4-5 mm high, 2-3 mm broad, the anthers 6, equidistant. *Fruits* cylindric, ribbed, arcuate, 7-10 cm long, 1 cm wide, dehiscence acropetal, septifragal, the hypanthium sharply deflected and bent, 7 mm long. *Seeds* numerous, subrevolute, 2 mm wide, 3 mm long, 1 mm thick.

In hot, wet secondary growth and forested areas, Mexico to Panama, and sparsely in the West Indies.

MEXICO: Michoacán, Tabasco.
 GUATEMALA: Petén.
 HONDURAS: Atlántida, Cortés.
 COSTA RICA: Limón, Nicoya.
 PANAMA: Bocas del Toro.
 JAMAICA. ST. THOMAS. MARTINIQUE.

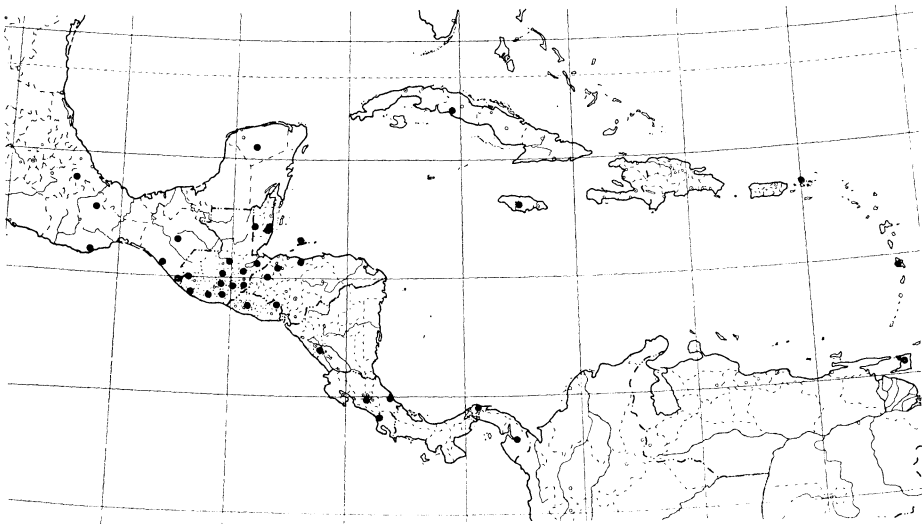
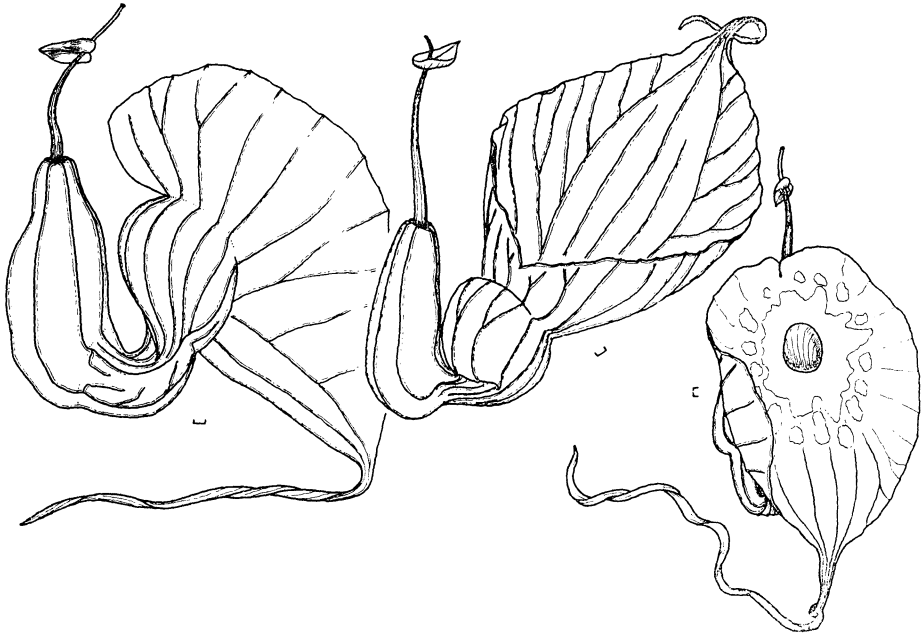


Fig. 37. Flower and distribution of *A. grandiflora*.

35. *ARISTOLOCHIA GRANDIFLORA* Sw., Prod. Veg. Ind. Occ. 126, 1788, non Vahl (1791), nec Gomez (1803), nec Arruda (1816). (Type: *Swartz s.n.*, S)—Fig. 37.

A. 2 scandens P. Browne, Civ. & nat. hist. Jamaica 329, 1756, non Mill. (1768). (ex char.)

A. cordiflora Mutis ex H.B.K., Nov. Gen. Sp. Pl. **2**: 149, 1817. (Type: *Mutis s.n.*, not seen)

A. foetens Lindley, Bot. Reg. t. 1824, 1836. (ex ic.)

A. gigas Lindley, loc. cit. t. 60, 1842. (Type: *Hartweg s.n.*, not seen)

A. gigantea Hook., Bot. Mag. t. 4221, 1846. (ex ic.)

Howardia gigantea (Hook.) Klotzsch, Monatsb. Acad. Berlin **1859**: 610, 1859. (quoad syn. Hook.)

H. grandiflora (Sw.) Klotzsch, loc. cit.

Aristolochia grandiflora (Sw.) β *hookeri* Duchr. in DC., Prod. **15**(1): 473, 1864. (Based on *A. gigantea* Hook.)

Strong-growing, glabrescent *lianas*. *Leaves* triangular-cordate, apex acute to acuminate, basally deeply cordate, 8-15 cm broad, 10-20 cm long, deep green, smooth above, beneath strigose in juvenile leaves, becoming smooth with age, paler. *Pseudostipules* absent. *Flowers* solitary in leaf axils, bracteolate, more or less twice-geniculate (once at the tube flexure and again at the annulus), variously blotched with purple, white, yellow, red and green, very variable in size over a vast range, but commonly very large, the utricle lacrimiform, gibbous, 6-18 cm long, syrxis cylindric, as long as 4 cm, directed obliquely into the utricle, the tube bent at its middle, 7-15 cm long, annulus thin, sharp-edged, the limb abruptly spreading from the annulus and tube, 1-lobed, 20-50 cm or more wide, 0.5-3.0 m long, including the length of the pendent, tape-like appendage on the lower border of the limb. *Gynostemium* 6-lobed, coroniform, 1.5 cm high, 1.0 cm broad, the anthers 6, equidistant. *Fruits* cylindric, 10 cm long, 4 cm wide, dehiscence acropetal, septifragal, hypanthium absent. *Seeds* numerous, triangular, flat, 1 cm wide, 1.2 cm long, 2 mm thick.

Common along streams and in secondary-growth thickets from tropical Mexico to Panama and the West Indies.

MEXICO: Chiapas, Oaxaca, Vera Cruz, Yucatán.

GUATEMALA: Alta Verapaz, Chiquimula, El Progreso, Escuintla, Guatemala, Izabal, Jalapa, Retalhuleu, San Marcos, Santa Rosa, Zacapa.

BRITISH HONDURAS: Caya, Kendall, Stann Creek.

EL SALVADOR: San Salvador, Morazán.

HONDURAS: Atlántida, Cortés, Santa Barbara.

NICARAGUA: Granada.

COSTA RICA: Limón, San José, Talamanca.

PANAMA: Darien, Nombre de Dios.

CUBA: Las Villas. JAMAICA. ST. THOMAS. MARTINIQUE. TRINIDAD.

It is possible that more than one species is represented in this taxon, but without further collections and field work to yield an understanding of the variability of the group, this is probably the best disposition.

36. *ARISTOLOCHIA EKMANII* Schmidt, Arkiv Bot. Stockh. **21A**(5): 1, 1927. (Type: *Ekman H4964*, S, US)—Fig. 38.

Glabrous, subglaucous, twiggy *lianas*. *Leaves* small, oblong, with 5 basal veins, shallowly cordate, 5-10 mm broad, 1-2 cm long, deep green, with hamate

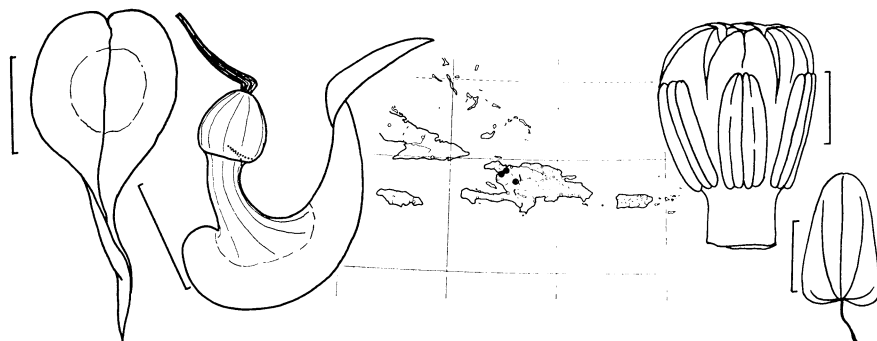


Fig. 38. Flowers, distribution, gynostemium and leaf of a *A. ekmanii*.

hairs above, beneath smooth, glaucous. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, ebracteolate, extremely arcuate, green, brown, yellow and purple, the utricle ovoid, 5 mm long, syrx an inequilateral flap, the tube slightly arched, 5 mm long, the limb 1-lobed, cordate-acuminate, leathery, gradually expanding from the tube, 2 cm wide, 3-4 cm long. *Gynostemium* 6-lobed, 2.5 mm high, 2 mm broad, the anthers 6, equidistant. *Fruits* subspheric-cylindric, 1.5-2.0 cm long, 1.5 cm wide, dehiscence acropetal, septifragal, the hypanthium straight, 5 mm long. *Seeds* numerous, flat, 3 mm wide, 3 mm long, very thin, papery.

In limestone soils, on rocks and shrubs, northern Haiti.

HAITI.

Aristolochia ekmanii is often mistaken for the Cuban *A. tigrina*, but it differs in details of leaf venation, as well as in floral morphology.

37. *ARISTOLOCHIA TIGRINA* A. Rich., Fl. Cub. Fanerog. **2**: 194, 1850. (Type: *Sagra s.n.*, P)—Fig. 39.

A. elliptica Duchr., Ann. Sci. Nat., sér. 4, **2**: 51, 1854. (Type: *Galeotti 209*, P)

Glabrous, twiggy *lianas*. *Leaves* small, oblong to obovate with 3 basal veins, obtuse at the apex, basally obtuse to truncate, 5-8 mm broad, 1-3 cm long, smooth. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, ebracteolate, slightly arcuate, green, yellow, spotted purple, the utricle ovoid, gibbous, 7 mm long, syrx inequilateral, cylindric, the tube straight, 1 cm long, the limb 1-lobed, triangular, gradually expanding from the tube, ca 1 cm wide, 1.5-2.0 cm long, un-appendaged. *Gynostemium* 6-lobed, obconic, 3 mm high, 2.5 mm broad, the anthers 6, equidistant. *Fruits* subspheric, 1.5 cm diameter, dehiscence acropetal, septifragal, the hypanthium straight, 2 mm long. *Seeds* numerous, flat, triangular, 5 mm wide, 5 mm long, 0.2 mm thick.

In rocks, dry soils, Cuba.

CUBA: Habana, Oriente, Pinar del Río, Santa Clara.

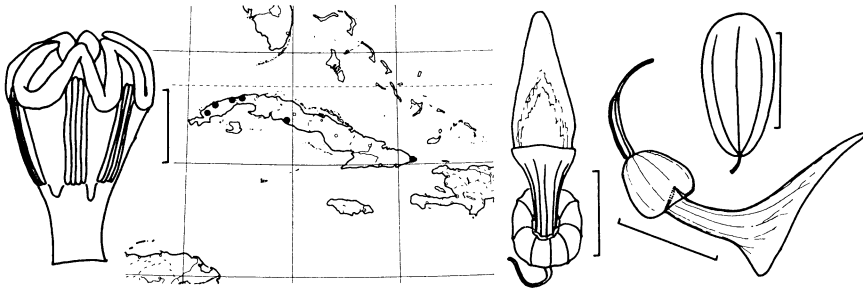


Fig. 39. *Gynostemium*, distribution, flowers and leaf of *A. tigrina*.

38. *ARISTOLOCHIA SAMANENSIS* Schmidt, Notizbl. Bot. Gart. Berlin **12**: 393, 1935. (Type: *Ekman H15468, S*)—Fig. 40.

Small, glabrous, glaucous *lianas*. *Leaves* ovate, rounded to obtuse at the apex, basally subtruncate, 2.5 cm broad, 4.5 cm long, deep green and smooth above, beneath prominently glaucous, smooth. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, ebracteolate, leathery, subgeniculate, green, brown and white, the utricle obconic, 8 mm long, syrinx inequilateral, tubular, the tube short, 7 mm long, the limb 1-lobed, arching sharply upward, smooth, ovate, 1.5 cm wide, 2 cm long, unappendaged. *Gynostemium* broadly 6-lobed, 3 mm high, 4 mm broad, the anthers 6, equidistant. *Fruits* cylindric, glaucous, 3 cm long, 1.75 cm wide, dehiscence acropetal, septifragal, the hypanthium straight, 2 mm long. *Seeds* numerous, flat, triangular, 6 mm wide, 7 mm long, 0.2 mm thick.

Precise locality unknown. Known only from the type specimen.

DOMINICAN REPUBLIC.

39. *ARISTOLOCHIA MAXIMA* Jacq., Enum. Syst. Pl. 30, 1762; Stirp. Amer. Hist. 233, t. 146, 1763, non Cham. (1832). (ex ic.)—Fig. 41.

A. geminiflora H.B.K., Nov. Gen. Sp. Pl. **2**: 148, t. 117, 1817. (ex ic.)

A. mexicana Dietr., Syn. Pl. **5**: 196, 1852 (fide Duchr., 1864), non Willd. (1805), nec Kostel. (1831).

Howardia geminiflora (H.B.K.) Klotzsch, Monatsb. Acad. Berlin **1859**: 619, 1859.

H. gollmerii Klotzsch, loc. cit. 621. (Type: *Gollmer s.n.*, not seen)

H. hoffmannii Klotzsch, loc. cit. (Type: *Hoffmann 49*, not seen)

H. maxima (Jacq.) Klotzsch, loc. cit. 615.

Aristolochia biflora Willd. ex Duchr. in DC., Prod. **15**(1): 457, 1864. (Based on *A. geminiflora* H.B.K.)

A. maxima L. (1763) α *maxima* Duchr., loc. cit. 456.

A. maxima L. β *geminiflora* (H.B.K.) Duchr., loc. cit. 457.

A. maxima L. γ *augustifolia* Duchr., loc. cit., (Type: *Hoffman 49*, not seen.)

A. reticulata Holton ex Duchr., loc. cit., non Nutt. (1835). (ex char.)

A. oblongifolia Brandg., Univ. Calif. Pub. Bot. **10**: 404, 1924. (Type: *Purpus 9076, UC*)

Sprawling subglabrous *lianas*. *Leaves* oblong to spatulate, obtuse to apiculate at the apex, basally truncate to shallowly subcordate, 3-7 cm broad, 6-12 cm long, glabrous or glabrescent, beneath with prominent, raised reticulate venation.

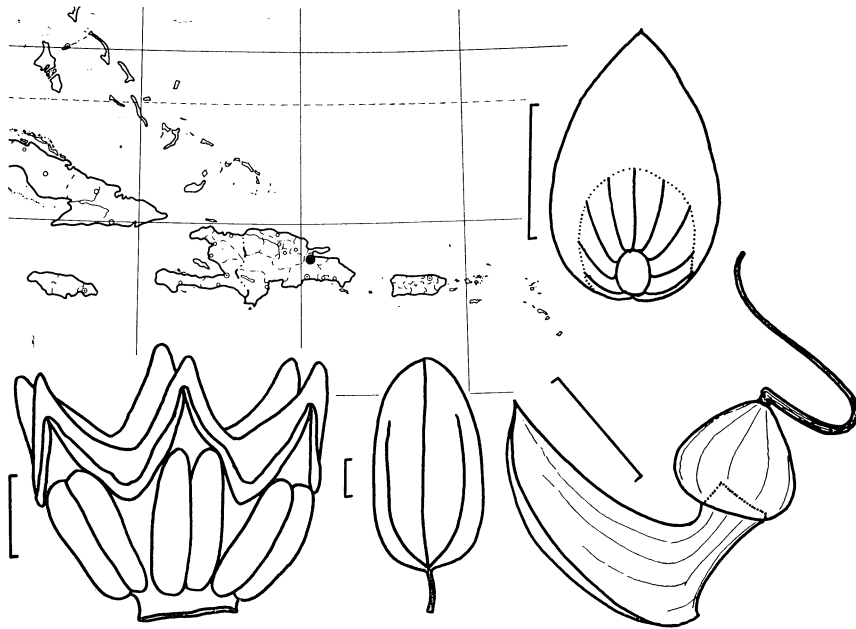


Fig. 40. *Gynostemium*, leaf, distribution and flowers of *A. samanensis*.

Pseudostipules absent. *Flowers* in several-branched axillary, racemose clusters, bracteolate, geniculate, purple, the utricle ovoid, 2.5 cm long, syrinx absent, the tube bent, 2 cm long, the limb 1-lobed, ovate, gradually expanding from the tube, 3-4 cm wide, 5-6 cm long. *Gynostemium* 6-lobed, 5 mm high, 4 mm broad, the anthers 6, equidistant. *Fruits* very large, pendent, 10-15 cm long, 7-10 cm wide, dehiscence acropetal, septifragal, exposing latticed septa, the hypanthium absent. *Seeds* very numerous, flat, triangular, 15 mm wide, 10 mm long, 1 mm thick.

Along streams and in moist thickets, in southern Florida, southern Mexico southward throughout Central America; common.

UNITED STATES. FLORIDA: Dade county.

MEXICO: Chiapas, Campeche, Yucatán.

GUATEMALA: Alta Verapaz, Chiquimula, Escuintla, Guatemala, Jutiapa, Retalhuleu, Santa Rosa, Zacapa.

BRITISH HONDURAS: Belice.

EL SALVADOR: Ahuachapán, La Unión, San Salvador.

HONDURAS: Atlántida, Comayagua, Morazán.

COSTA RICA: San José.

PANAMA: Panama.

MARTINIQUE.

This is the commonest *Aristolochia* species in Central America. It is confused with all of the Central American species with oblong leaves, but needlessly so, since the others all have leaves which are tomentose beneath while *A. maxima* is essentially smooth and devoid of hairs when mature. The subspatulate outline of its leaves is a further aid to identification.



Fig. 41. Gynostemium, distribution, flower and leaf of *A. maxima*.

40. *ARISTOLOCHIA CHASMEMA* Pfeifer, sp. nov.—Fig. 42.

Caules glabri volubiles laeves. *Folia* angustio triangulata vel oblongata apice rotundata basi truncata 11-16 mm lata 4-5 cm longa supra viridia laevia subtus glauca laevia. *Pseudostipulae* nullae. *Flores* axillares solitarii ebracteolati arcuati virides flavi fulvi; utriculus ovoideus 8 mm longus; syrinx tenuis inaequalateralis tubiformis brevis; tuba tenuis arcuata 20 mm longa; limbus 2-lobus labro supero longissimo lanceolato subacuto erecto 3.8 cm longo labro infero brevi rotundato nonnihil erecto 0.8 cm longo. *Columna* 6-loba obconica brevis stipitata 2.5-3.0 mm alta 2 mm lata; stamina 6 ad libram aequilateralia. *Capsula* subcylindriciformis 2 cm longa 12 mm lata basi dehiscens; hypanthium absens; semina ignota.—*HOLOTYPE*: Ekman H6740, US ("Hispaniola. Civ. Haiti: Massif de la Pelle, gr. Morne des Commissaires, Anses-à-Pitre, road to Banane, at Riv. Pedernales, c. 150 m., not rare. 25. VIII. 1926."). *Isotypi*: MO, S.

Glabrous smooth *lianas*. *Leaves* narrow triangulate to oblong, apex rounded, base truncate, 11-16 mm wide, 4-5 cm long, green and smooth above, beneath glaucous and smooth. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, ebracteate, arcuate, green, yellow and brown, the utricle ovoid, 8 mm long, syrinx a thin unequally short tube, the tube narrow, arcuate, 20 mm long, the limb 2-lobed, the upper lobe very long, lanceolate, subacute, erect, 3.8 cm long, the lower lobe short, rounded, somewhat erect, 0.8 cm long. *Gynostemium* 6-lobed obconic, short-stipitate, 2.5-3.0 mm high, 2 mm broad, the anthers 6, equidistant. *Capsule*

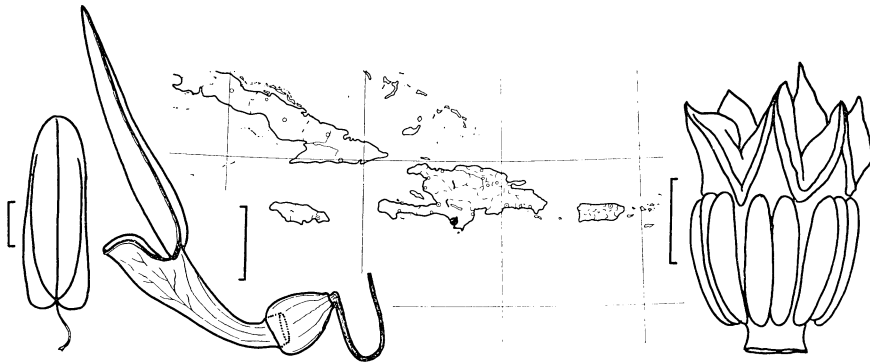


Fig. 42. Leaf, flower, distribution and gynostemium of *A. chasmema*.

subcylindric, 2 cm long, 12 mm wide, dehiscence acropetal, the hypanthium absent. *Seeds* not seen.

Known only from the type collection.

HATTI.

The glaucous, smooth leaves of *A. chasmema* may be mistaken for *A. samanensis*, but their flowers are extremely distinctive.

41. *ARISTOLOCHIA OVALIFOLIA* Duchr., Ann. Sci. Nat., sér. 4, **2**: 50, 1854. (Type: *Galeotti 213*, P)—Fig. 43.

Guaco mexicana Liebm., Forhandl. Skandin. Naturf. **1844**: 203, 1847, non *Aristolochia mexicana* Willd. (1805), nec Kostel. (1831), nec Dietr. (1839). Type: *Liebmann 409*, US; photos, F, GH, MO)

Puberulent *lianas*. *Leaves* elliptic-ovate, apiculate, shallowly cordate, 3-6 cm broad, 5-12 cm long, smooth above, beneath finely puberulent, particularly on the raised reticulum of veins. *Pseudostipules* absent. *Inflorescence* short, 2- to 8-flowered, racemose, axillary. *Flowers* bractelate, arcuate, brown with yellow throat, the utricle subpyriform, 1.5 cm long, syrinx cylindrical, 3 mm high, the tube arcuate, 2.5 cm long, the limb 1-lobed, gradually expanding from the tube, in mature flowers sharply revolute along the lateral margins, 1.75 cm wide, 5 cm long, unappendaged. *Gynostemium* fusiform, 5-6 mm high, 3 mm broad, the anthers 6, equidistant. *Fruits* ovoid, large, 8-10 cm long, 4-5 cm wide, dehiscence acropetal, septifragal, the hypanthium absent. *Seeds* numerous, flat, cordate, 8 mm wide, 7 mm long, 0.5 mm thick.

Found in wet, secondary forest growth, in extreme southern Mexico and British Honduras, chiefly in the eastern drainage area.

MEXICO: Oaxaca, Tabasco.

BRITISH HONDURAS: Middlesex.



Fig. 43. Leaf, distribution, gynostemium, flower and immature flower bud of *A. ovalifolia*. Note that the configuration of young buds bear little resemblance to the mature flower.

This species is easily confused with *A. maxima*, but differs in leaf shape, floral conformation and seeds. *Aristolochia ovalifolia* is mentioned on the labels of 3 sheets of Schipp 384, from the Gray Herbarium, University of California Herbarium and the Missouri Botanical Garden Herbarium as being "common," "occasional" and "rare," respectively.

42. *ARISTOLOCHIA LINEARIFOLIA* Griseb., Cat. Pl. Cub. 115, 1866. (Type: Wright 2617, MO, NY, S)—Fig. 44.

A. stenophylla Urban, Symb. Antill. 3: 281, 1902. (Type: Jicarda 1281, NY)

Glabrous *lianas*. *Leaves* linear to narrowly triangular, acute at the apex, basally acute to truncate or very shallowly cordate, 4-16 mm broad, 5.5 to 11 cm long, smooth above, beneath with emersed, reticulate venation. *Pseudostipules* amplexicaul, auriculate or absent. *Flowers* solitary in the leaf axils, ebracteolate, geniculate, pale, greenish-yellow with purple stripes, the utricle ellipsoid, 1 cm long, syrinx absent, the tube bent, 2-3 cm long, the limb 1-lobed, narrowly triangular, gradually expanding thence narrowing from the tube, ca 5 mm wide, 1.5-2.5 cm long, unappendaged. *Gynostemium* 6-lobed, 2 mm high, 3 mm broad, the anthers 6, equidistant, convergent at their apices, divergent below. *Fruits* subspheric, 1.5 cm diameter, dehiscence acropetal, septifragal, the hypanthium absent. *Seeds* numerous, flat, 3 mm wide, 3 mm long, 0.2 mm thick.

In thickets, dry soils; Cuba and southern Haiti.

CUBA: Oriente.
HAITI (incl. Gonave I.).

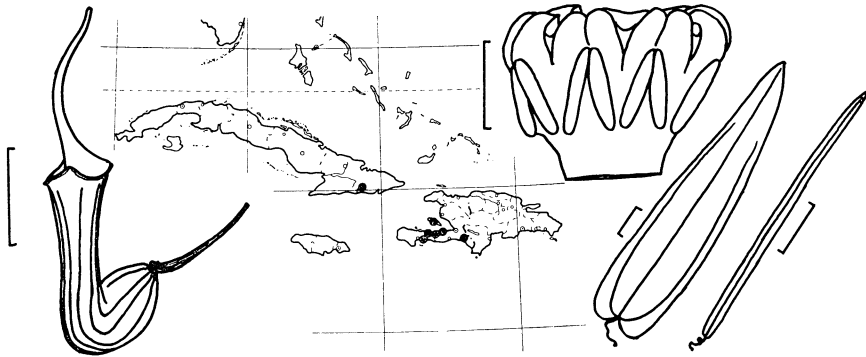


Fig. 44. Flower, distribution, gynostemium and leaves of *A. linearifolia*. The narrow-leaved form is Cuban, the broader-leaved form, Haitian.

The linear-leaved representatives are from Cuba, the triangular-leaved ones from Hispaniola. It may seem reasonable to some to give them subspecific status, but there are too few collections to satisfy me in this regard.

43. *ARISTOLOCHIA BILABIATA* L., Sp. Pl. 1361, 1763. (ex char., ex ic. cit.)—Fig. 45.

A. oblongata Jacq., Hort. Schoenb. **2**: 29, 1797. (ex char.)

Diglosselis trinervis Raf., Fl. Tellur. **4**: 98, 1838. (Based on *A. bilabiata* L.)

Howardia bilabiata (L.) Klotzsch, Monatsb. Acad. Berlin **1859**: 611, 1859.

Aristolochia conduplicata Poit. ex Duchr. in DC., Prod. **15**(1): 460, 1864. (Type: *Poiteau s.n.*, P)

A. calceiformis Urban, Symb. Antill. **1**: 300, 1899. (Type: *Sintenis 2490*, F, P, S, US)

Puberulent to glabrescent *lianas*. *Leaves* oblong to subtriangular, obtuse to apiculate at the apex, basally shallowly cordate to subtruncate, 2.0-3.5 cm broad, 4.5-6.5 cm long, beneath venation raised-reticulate. *Pseudostipules* large, amplexicaul, orbiculate. *Flowers* on short axillary shoots in axils of reduced leaves, ebracteolate, rectilinear, purple and yellow, the utricle elliptic, 7 mm long, syrinx an inequilateral flange, the tube straight, trumpet-shaped, 2-3 cm long, the limb 1-lobed, gradually expanding from the tube, lanceolate, plicate after anthesis, 7 mm wide, 1 cm long, unappendaged. *Gynostemium* 6-lobed, 2.5 mm high, 2 mm broad, the anthers 6, equidistant. *Fruits* ovoid-cylindric, 2-2.5 cm long, 1.5-1.75 cm wide, dehiscence acropetal, septifragal, the hypanthium absent. *Seeds* numerous, flat, triangular, 4 mm wide, 5 mm long, 0.2 mm thick.

Dry thickets and brush in limestone soils, throughout the Greater Antilles.

CUBA: Camagüey, Habana, Isla de Pinos, Matanzas, Oriente, Pinar del Río. HAITI (incl. Tortue I.). DOMINICAN REPUBLIC. PUERTO RICO. ST. THOMAS.

This species seems related to *A. anguicida*, though differs by its narrower leaves and the more shallow lobing of its gynostemium.

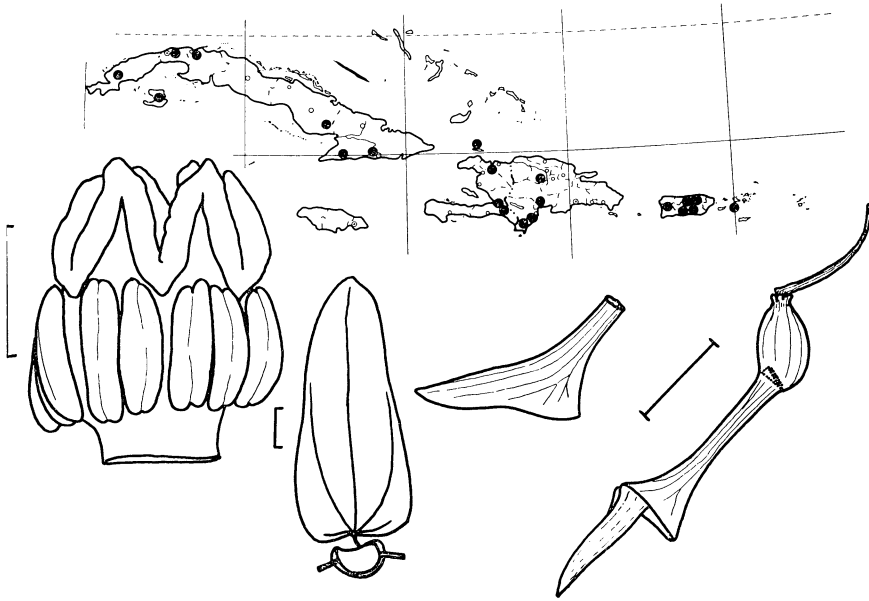


Fig. 45. Gynostemium, distribution, leaf with pseudostipule, portion of flower bud and flower of *A. bilabiata*.

44. *ARISTOLOCHIA CAUDATA* Jacq., Enum. Pl. Carib. 30, 1762; Sel. Stirp. Amer. Hist. t. 145, 1763, non Booth ex Lindl. (1831), nec Parodi (1878). (ex ic.)—Fig. 46.

Howardia caudata (Jacq.) Klotzsch, Monatsb. Acad. Berlin **1859**: 622, 1859.

Aristolochia brachyura Duchr. in DC., Prod. **15**(1): 446, 1864. (ex char.)

A. punctata Balbis ex Duchr., loc. cit., pro syn.

Subglabrous *lianas*. *Leaves* triangular-hastate, medially slightly constricted, emarginate to obtuse at the apex, basally deeply cordate-hastate, 2-4 cm broad, 4-6 cm long, minutely hamate-hairy above, beneath glabrous. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, ebracteolate, rectilinear, purple and green, the utricle ellipsoid, 1 cm long, syrinx small, inequilateral flap, the tube straight,

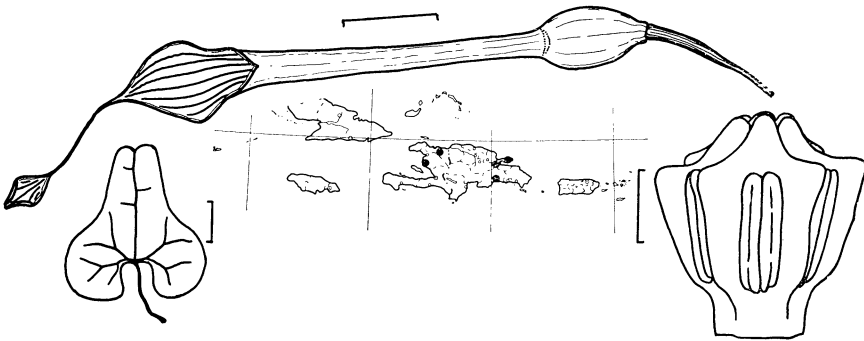


Fig. 46. Flower, leaf, distribution and gynostemium of *A. caudata*.

to 4 cm long, the limb 1-lobed, gradually expanding from the tube, with 2 lateral wings at the base, thence narrowing sharply to a filiform extension which ends in an enlarged, spatulate appendage, 1 cm wide, 3 cm long, inclusively. *Gynostemium* 6-lobed, with 6 radiate wings, 3 mm high, 3 mm broad, the anthers 6, equidistant between the wings. *Fruits* short-cylindric, 2 cm long, 1.5 cm wide, dehiscence acropetal, septifragal, the hypanthium straight, 3 mm long. *Seeds* not seen.

On shrubs in dry, open places, Hispaniola.

HAITI. DOMINICAN REPUBLIC.

The curious caudal appendage distinguishes this species from all others; it is often broken off dried material since it is very fragile.

45. *ARISTOLOCHIA EHRENBERGIANA* Cham., *Linnaea* 7: 209, t. 5, 1832. (Type: *Ehrenberg s.n.*, NY)—Fig. 47.

Howardia ehrenbergiana (Cham.) Klotzsch, *Montsb. Acad. Berlin* 1859: 622, 1859.

Small, glabrous *lianas*. *Leaves* triangular, slightly emarginate, deeply cordate-sagittate, 1.5-4.5 cm broad, 3-4 cm long, pale green, glabrous. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, ebracteolate, rectilinear, yellowish green and purple, the utricle ellipsoid, 1 cm long, syrinx inequilaterally annular, the tube 2 cm long, the limb 1-lobed, smooth, gradually expanding from the tube, very long-triangular, the appendage becoming filiform thence enlarging slightly into an emarginate, narrowly elliptic terminal lobe, 6 cm long overall. *Gynostemium* 6-lobed, 2 mm high, 2 mm broad, the anthers 6, equidistant. *Fruits* short-cylindric,

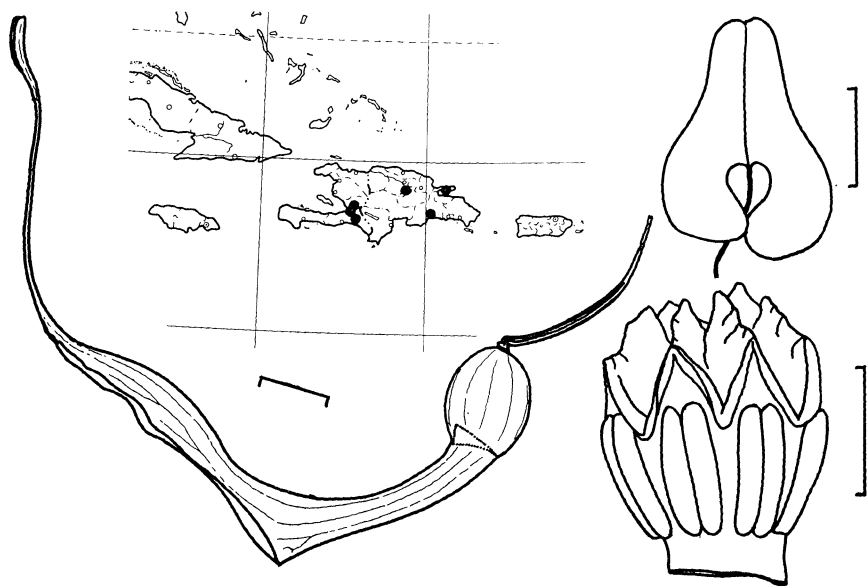


Fig. 47. Flower, distribution, leaf and gynostemium of *A. ehrenbergiana*.

2.5 cm long, 1.5 cm wide, dehiscence acropetal, septifragal, the hypanthium straight, 3 mm long. *Seeds* numerous, flat, 2.5 mm wide, 3.5 mm long, 0.5 mm thick.

On shrubs in dry foothills, Hispaniola.

HAITI. DOMINICAN REPUBLIC.

This long-appendaged flower with its curious, small, terminal lobe distinguishes this species from others with similar leaves.

46. *ARISTOLOCHIA CLEMATITIS* L., Sp. Pl. 962, 1753. (Type: *Linn. Herb. London*, no. 1071.11, photo)

Glabrous perennial *herbs*. *Leaves* broadly cordate, membranous, obtuse at the apex, basally deeply cordate, 6 cm wide, 6 cm long, smooth. *Pseudostipules* absent. *Flowers* in congested axillary fascicles on young stems, ebracteolate, rectilinear, yellow, green and purple, the utricle spheric, 5 mm long, syrinx absent, the tube slightly arcuate, 1 cm long, the limb 1-lobed, triangular, gradually expanding from the tube, 6 mm wide, 7-8 mm long, unappendaged. *Gynostemium* 6-lobed, 2 mm high, 2 mm broad, the anthers 6, equidistant. *Fruits* spheric, 3 cm diameter, dehiscence basipetal, subvalvate. *Seeds* large, flattened, 12 mm wide, 10 mm long, 5 mm thick.

European; said to be naturalized from gardens and on ballast in a few localities, evidently not spreading actively into new areas (Baltimore, Maryland; Philadelphia, Pennsylvania; Boston, Massachusetts; Ithaca, New York and Montreal, Quebec).

Aristolochia clematitis is illustrated in many local floras, taxonomic texts and other works; it is extremely distinct from our own native species.

47. *ARISTOLOCHIA VERAGUENSIS* Duchr. in DC., Prod. 15(1): 458, 1864. (Type: *Warcewicz* 252; photos, F, MO, NY, US)—Fig. 48.

Howardia veraguensis Klotzsch ex Duchr., loc. cit., pro syn.

Aristolochia argyoneura Hoehne ex Uribe, *Caldasia* 7: 160, 1955. (Type: *Uribe-Uribe* 2642, COL)

Strong, glabrous *lianas*. *Leaves* large, variegated, white along the major veins, heart-shaped, acuminate, deeply cordate-auriculate, 7-12 cm broad, 10-17 cm long, the veins emersed beneath. *Pseudostipules* absent. *Flowers* in basal, cauliflorous, several-branched, racemose clusters, ebracteolate, strongly arcuate, maroon and red, the utricle ovoid, 12 mm long, syrinx, inequilateral, annular-cylindric, the tube arcuate, 22 mm long, the limb 1-lobed, gradually expanding from the tube, lanceolate, smooth, 1 cm wide, 3 cm long, not appendaged. *Gynostemium* 6-lobed, 4 mm high, 3 mm broad, the anthers 6, equidistant. *Fruits* not seen.

In rain forests, Panama and southward.

PANAMA: Darien, Veraguas.

I know of variegated leaves only in this species. It resembles *A. schippii*, but the latter has larger flowers, not pronouncedly arcuate, and larger, green leaves.

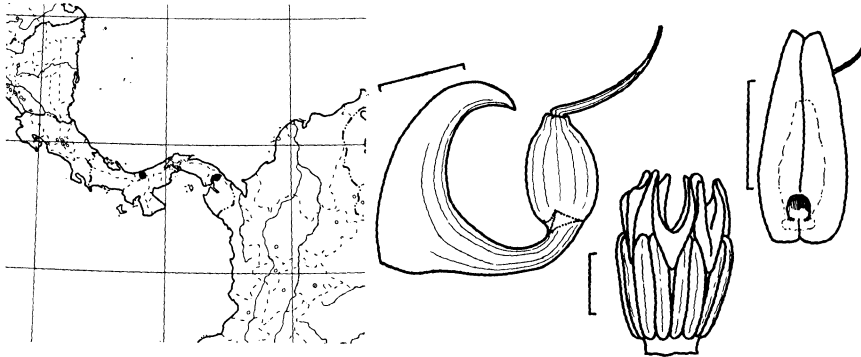


Fig. 48. Distribution, flower, gynostemium and lip detail of *A. veraguensis*.

48. *ARISTOLOCHIA SCHIPPII* Standl., Field Mus. Pub. Bot. **8**: 8, 1930. (Type: Schipp 75, A, F, GH, NY, UC, US)—Fig. 49.

Stout, glabrous *lianas*. *Leaves* large, deep green, heart-shaped, acuminate, deeply cordate, 15-25 cm broad, 18-30 cm long, the veins emersed beneath. *Pseudostipules* absent. *Flowers* in cauliflorous, several-branched, racemose clusters, ebracteolate, rectilinear, mauve, the utricle ovoid, gibbous, 1.5 cm long, syrinx inequilateral, annular-cylindric, the tube rather straight, 2.5 cm long, the limb 1-lobed, gradually expanding from the tube, narrowly triangular, smooth, 3 cm wide, 3.5-4.0 cm long, not appendaged. *Gynostemium* deeply 6-lobed, 5 mm high, 2.5 cm broad, the anthers 6, equidistant. *Fruits* long-cylindric, 13-18 cm long, 2 cm wide, dehiscence acropetal (?), septifragal (?). *Seeds* numerous, flat, 5 mm wide, 5 mm long, 0.3 mm thick.

Along ridges in forests, British Honduras.

BRITISH HONDURAS: Big Creek, Stann Creek.

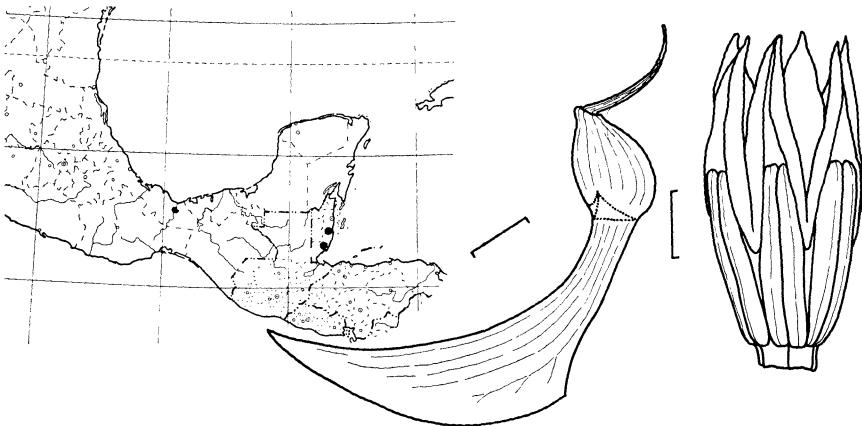


Fig. 49. Distribution, flower and gynostemium of *A. schippii*.

49. *ARISTOLOCHIA INFLATA* H.B.K., Nov. Gen. Sp. Pl. **2**: 145, t. 111, 1817. (ex ic.)—
Fig 50.

A. odoratissima Benth., Pl. Hartweg. 82, 1841, non L. (1763). (Type: Hartweg 566, P;
photos, F, MO, NY, US)

A. gibbosa Duchr., Ann. Sci. Nat., sér. 4, **2**: 53, 1854. (Type: Hartweg 566, P; photos F,
MO, NY, US)

Howardia benthamii Klotzsch, Monatsb. Acad. Berlin **1859**: 620, 1859. (Type: Hartweg
566, P; photos, F, MO, NY, US)

H. inflata (H.B.K.) Klotzsch, loc. cit. 619.

Aristolochia torta Willd. ex Klotzsch, loc. cit., pro syn.

Glabrous *lianas*. *Leaves* membranous, broadly triangular, not medially constricted, acute to acuminate, cordate, 3-6 cm broad, 5-8 cm long, green above, paler beneath. *Pseudostipules* present, amplexicaul, orbiculate. *Flowers* axillary, solitary, ebracteolate, rectilinear, faint purple without, inside pale yellow, the utricle extremely gibbous, ovoid, 1 cm long, syrx an inequilateral, short tube, the tube straight, 1 cm long, the limb 1-lobed, lanceolate, gradually expanding from the tube and about 3 times longer than the tube, 3 cm wide, 3-4 cm long, unappendaged. *Gynostemium* 6-lobed, 2.5-3.5 mm high, 2-4 mm broad, the anthers 6, equidistant. *Fruits* cylindrical-fusiform, 2.5-4.0 cm long, 1 cm wide, dehiscence acropetal, septifragal, the hypanthium 3-5 mm long, sharply bent at 90° angle. *Seeds* numerous, cordate, small, flat, 2 mm wide, 2.5 mm long, 0.5 mm thick.

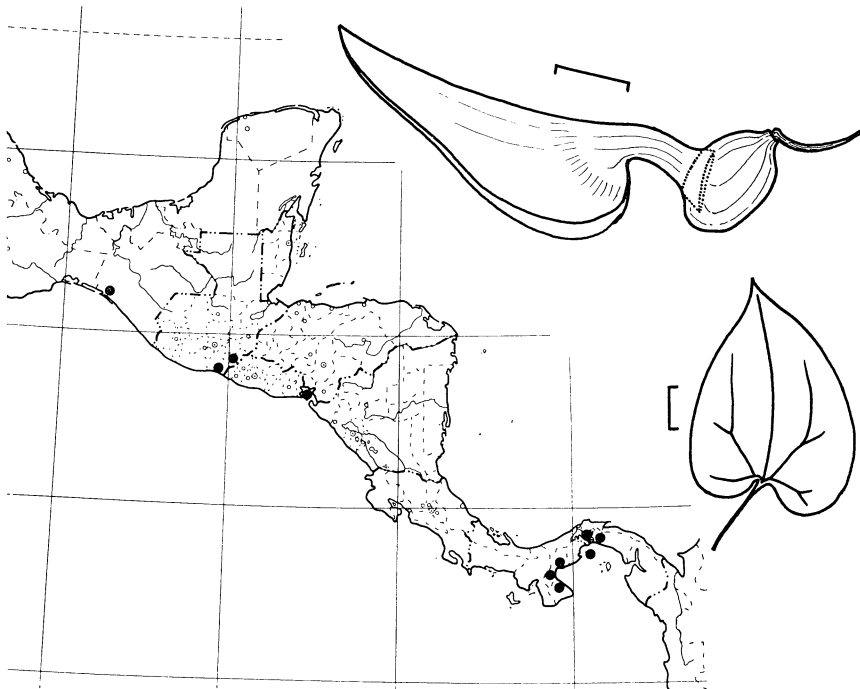


Fig. 50. Distribution, flower and leaf of *A. inflata*.

In thickets and among shrubs; one of the more common species in Central America.

MEXICO: Chiapas.

GUATEMALA: Jutiapa, Santa Rosa.

HONDURAS: Valle.

PANAMA: Aguadulce, Herrera, Panama, Penonomé, Taboga.

Vegetatively this species resembles *A. odoratissima* and *A. littoralis*. It may be distinguished from the former by its smaller flowers and fruits and from the latter by its sharply-curved hypanthium on the fruit tip.

50. *ARISTOLOCHIA ANGUICIDA* Jacq., Enum. Pl. Carib. 30, 1762, non Pavon ex Duchr. (1864), nec Sieber ex Duchr. (1864). (ex char.)—Fig. 51.

A. mexicana Willd., Sp. Pl. 4: 157, 1805, non Kostel. (1831), nec A. Dietr. (1839). (ex ic. cit.)

A. pavoniana Duchr., Ann. Sci. Nat., sér. 4, 2: 55, 1854. (Type: *Pavon s.n.*, FI)

Howardia anguicida (Jacq.) Klotzsch, Monatsb. Acad. Berlin 1859: 611, 1859.

Aristolochia loriflora Mast. in Engler, Bot. Jahrb. 8: 220, 1887. (Type: *Lehmann 1702*, F, US)

Glabrous *lianas*. *Leaves* membranous, broadly triangular, acute to obtuse at the apex, basally deeply cordate, 5-7 cm broad, 7-9 cm long, smooth above, beneath with emersed veins. *Pseudostipules* usually present on strong stems, amplexicaul. Flowers solitary in the leaf axils, ebracteolate, rectilinear, purple, green and yellow, the utricle ovoid, gibbous, 1 cm long, syrinx strongly inequilateral, the tube straight, 1.5 cm long, the limb 1-lobed, narrowly triangular, smooth, tightly revolute after anthesis, 1 cm wide, 1.5-2.0 cm long, unappendaged. *Gynostemium* deeply 6-lobed, 3 mm high, 2 mm broad, the anthers 6, equidistant. *Fruits* short, thick-cylindric, 3 cm long, 2 cm wide, dehiscence acropetal, septifragal, the hypanthium 1.5 mm long. *Seeds* numerous, flat, 3 mm wide, 4 mm long, 1 mm thick.

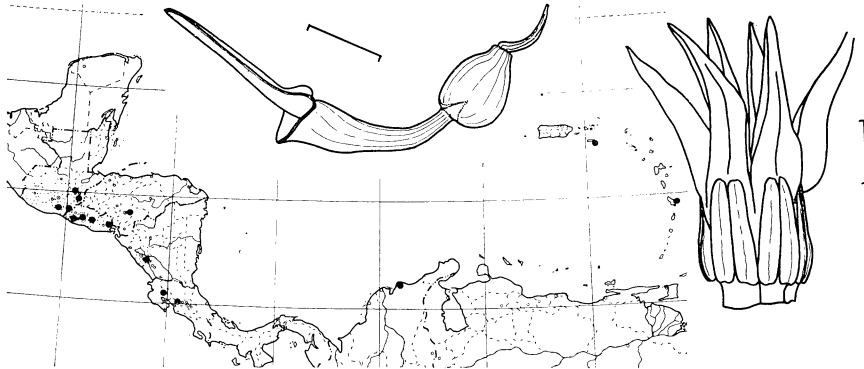


Fig. 51. Distribution, flower and gynostemium of *A. anguicida*.

In damp thickets, Guatemala southward to Costa Rica, and the Lesser Antilles.

GUATEMALA: Chiquimula, Jutiapa, Santa Rosa, Zacapa.
 EL SALVADOR: San Salvador, San Vicente, Sonsonate, Unión.
 HONDURAS: Morazán.
 NICARAGUA: Grenada.
 COSTA RICA: Alajuela, Guanacaste.
 ST. CROIX. MARTINIQUE.

Vernacular names reported for this plant are *chompipito*, *guaco* and *canastilla*; it is reported to be useful for stomach ache.

51. *ARISTOLOCHIA CARTERAE* Pfeifer, sp. nov.—Fig. 52.

Caules glabri volubiles. *Folia* deltoideo-cordata obtusa basi sagittato-cordata 2-5 cm lata 2-6 cm longa supra glabra subtus nervoso-reticulata. *Pseudostipulae* nullae. *Flores* axillares solitariae ebracteolati subrectilineares purpurei flavi virides; utriculus ovoideus subgibbosus 1 cm longus; syrinx annularis aequilateralis; tuba rectilinearis vel subarcuata circa tam longa quam limbus 2.5 cm longa; limbus 1-lobus lanceolato-ovatus 1.5 cm latus 2.5-3.0 cm longus sine appendice. *Columna* 6-loba obesa urceolata 5 mm alta 5 mm lata; stamina 6 ad libram aequilateralia. *Capsula* subcylindriciformis 5 cm longa 2 cm lata basi dehiscens; hypanthium arcuatum 1 cm longum; semina multa plana triangula 4 mm lata 4 mm longa 0.5 mm crassa.—HOLOTYPE: Carter & Chisaki 1187, MO ("vicinity of 'Las Canoas', Rio Cuale, Puerto Vallarta, Jalisco, México, March 26, 1959.") Isotypus: UC.

Glabrous *lianas*. *Leaves* triangular-cordate, obtuse at the apex, basally sagittate-cordate, 2-5 cm broad, 2-6 cm long, smooth above, beneath with emersed venation. *Pseudostipules* absent. *Flowers* solitary in leaf axils, ebracteolate, subrectilinear, purplish streaked with yellow and green, the utricle ovoid, subgibbous,

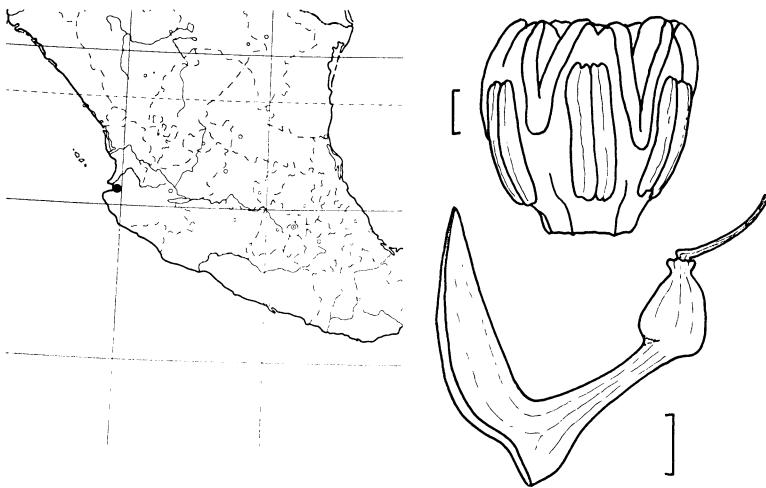


Fig. 52. Distribution, gynostemium and flower of *A. carterae*.

1 cm long, the syrinx inequilaterally annular, the tube straight or slightly arcuate, about as long as the limb, 2.5 cm long, the limb 1-lobed lanceolate-ovate, 1.5 cm wide, 2.5-3.0 cm long, unappendaged. *Gynostemium* 6-lobed, squat, urceolate, 5 mm high, 5 mm broad, the anthers 6, equidistant. *Fruits* cylindrical, 5 cm long, 2 cm wide, dehiscing acropetally, the hypanthium arcuate, 1 cm long. *Seeds* numerous, flat, triangular, 4 mm wide, 4 mm long, 0.5 mm thick.

Known only from the type locality.

MEXICO: Jalisco.

Aristolochia carterae is distinguishable from related species by the proportional lengths of the limb and the tube, as well as the distinctive purple and yellow coloration of the limb.

52. *ARISTOLOCHIA MONTANA* Ekman & Schmidt in Fedde, Repert. Sp. Nov. **29**: 11, 1931. (Type: *Ekman H11840*, S, US)—Fig. 53.

Glabrous *lianas*. *Leaves* coriaceous, broadly triangular, obtuse to subemarginate, deeply cordate, 4-5 cm broad, 3-7 cm long, beneath with a strong reticulum of raised veins. *Pseudostipules* coriaceous, amplexicaul, orbiculate. *Flowers* axillary, solitary, ebracteolate, arcuate, brown and yellow, the utricle ovoid, 1 cm long, syrinx an inequilateral flap, the tube arched and blending into the limb, 2 cm long, the limb 1-lobed, gradually expanding from the tube, 2 cm wide, 2 cm long, unappendaged. *Gynostemium* subobconic, 6-lobed, 3 mm high, 2 mm broad, the anthers 6, equidistant. *Fruits* not seen.

Known only from type locality.

DOMINICAN REPUBLIC.

This species is sharply distinguished from its near relatives by its coarse leaves, which become leathery and brown after drying.

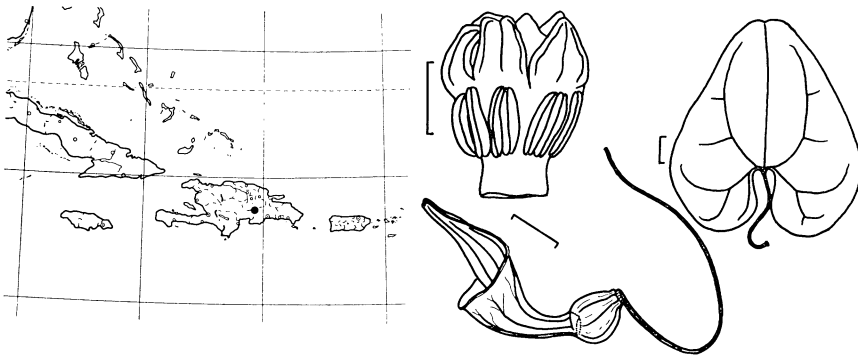


Fig. 53. Distribution, gynostemium, flower and leaf of *A. montana*.

53. *ARISTOLOCHIA GLOSSA* Pfeifer, sp. nov.—Fig. 54.

Caules glabri volubiles. *Folia* suborbiculari-cordata emarginata vel obtusa, basi sagittato-cordata 4-14 cm lata 5-15 cm longa supra viridia subtus pallida nervoso-recticulata. *Pseudostipulae* nullae. *Flores* axillares solitarii ebracteolati rectilineares virides fulvi; utriculus ovoideus 1 cm longus; syrinx annularis inaequalateralis parvula; tuba rectilinearis circa semilongitudo limbi 2 cm longa; limbus 1-lobus spathulatus 1 cm latus 3-4 cm longus sine appendice. *Columna* 6-loba obconica 5 mm alta 3 mm lata; stamina 6 ad libram aequilateralia. *Capsula* cylindriformis 4 cm longa 2 cm lata basi dehiscens; hypanthium rectilineare 4-6 mm longum; semina multa plana triangula 4 mm lata 4 mm longa 0.5 mm crassa.—HOLOTYPUS: *Hinton 15151*, MO (“Aguililla, Apatzingán, Michoacán, México, 1000 m., Sept. 11, 1939.”). Isotypi: GH, NY, US.

Glabrous *lianas*. *Leaves* suborbiculate-cordate, emarginate to obtuse at the apex, basally sagittate-cordate, 4-14 cm broad, 5-15 cm long, deep green above, beneath paler with emersed venation. *Pseudostipules* absent. *Flowers* solitary in leaf axils, ebracteolate, rectilinear, green spotted with brown, the utricle ovoid, 1 cm long, the syrinx unevenly annular, small, the tube straight, about half as long as the limb, 2 cm long, the limb 1-lobed, spatulate, 1 cm wide, 3-4 cm long, unappendaged. *Gynostemium* 6-lobed, obconic, 5 mm high, 3 mm broad, the anthers 6, equidistant. *Fruits* cylindric, 4 cm long, 2 cm wide, dehiscing acropetally,

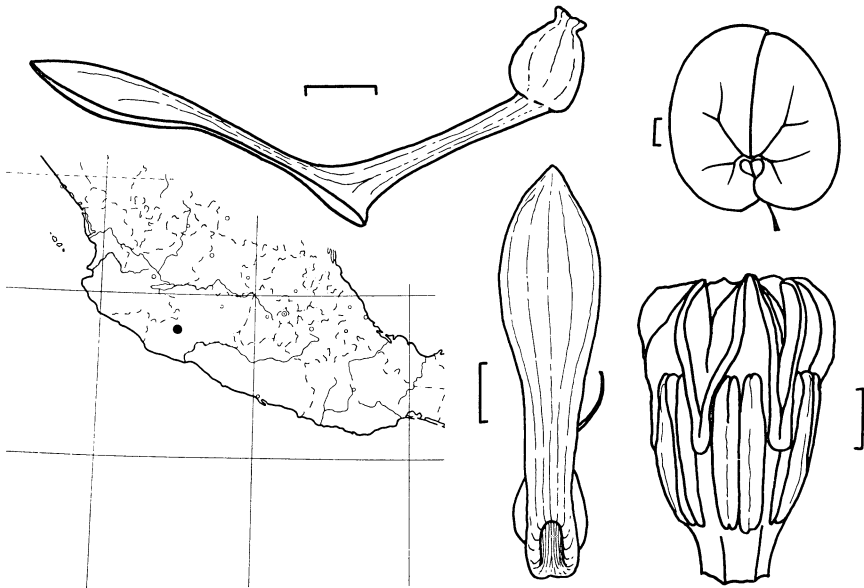


Fig. 54. Distribution, flowers, leaf and gynostemium of *A. glossa*.

the hypanthium straight, 4-6 mm long. *Seeds* numerous, flat, triangular, 4 mm wide, 4 mm long, 0.5 mm thick.

MEXICO: Michoacán.

Sessé & Mociño's collection (no. 4412, F) labelled *A. longa*, is *A. glossa*. Mrs. Olivia Converse, residing in Valle de Bravo, recently collected this plant from the probable type locality. The generous material which she sent me, together with an original drawing, has greatly aided me in delimiting this species.

Aristolochia glossa is distinguished from *A. taliscana* by its spatulate, efimbriate limb; flowering material of *A. glossa* would not be confused with any other species.

54. *ARISTOLOCHIA MYCTERIA* Pfeifer, sp. nov.—Fig. 55.

Caules subprostrati vel suberecti volubiles. *Folia* deltoideo-cordata obtusa basi cordata 4-10 cm lata 6-12 cm longa supra viridia subtus pallida nervoso-reticulata. *Pseudostipulae* nullae. *Flores* axillares solitariae ebracteolatae rectilineares purpurei; utriculus ovoideus gibbosus 1 cm longus; syrx annularis inaequilateralis; tuba rectilinearis circa tam longa quam limbus 4 cm longa; limbus 1-lobus angustus lanceolati-attenuatus 1 cm latus 5 cm longus, sine appendice. *Columna* 6-loba obesa in anthesi primum urceolata demum obconica circa 5 mm alta 5 mm lata; stamina 6 ad libram aequilateralia. *Fructus* ignotus.—*HOLOTYPE*: Mexia 8790, MO ("Temisco; Barranca del Consuelo, Guerrero, Mexico; sandy flat above stream, alt. 305 m., frequent; Nov. 11, 1937."). *Isotypi*: F, GH, NY, S, UC, US.

Glabrous sprawling or prostrate lianas. *Leaves* triangular-cordate, obtuse at

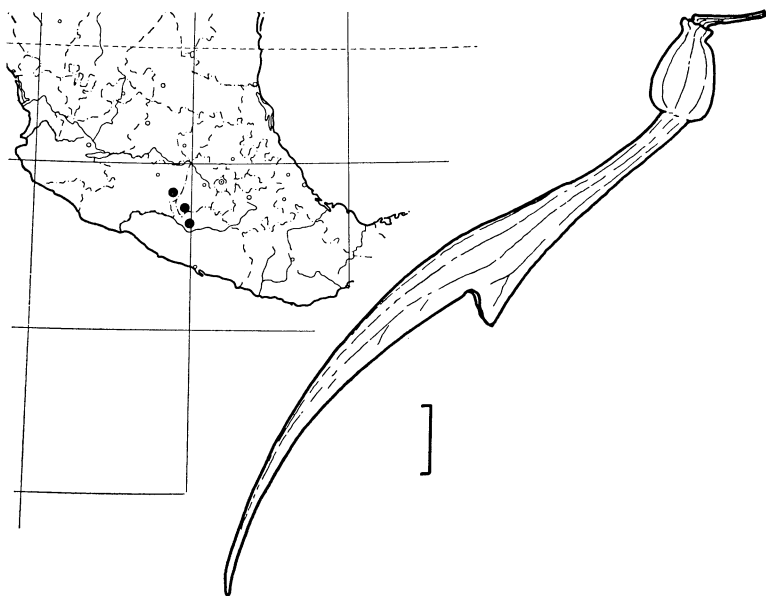


Fig. 55. Distribution and flower of *A. mycteria*.

the apex, basally cordate, 4-10 cm broad, 6-12 cm long, smooth, dark green above, beneath somewhat paler with emersed venation. *Pseudostipules* absent. *Flowers* solitary in leaf axils, ebracteolate, rectilinear, deep purple, the utricle ovoid, gibbous, 1 cm long; the syrinx inequilaterally annular, the tube straight, about as long as the limb, 4 cm long, the limb of the open flower 1-lobed, narrowly lanceolate-attenuate, 1 cm wide, 5 cm long, unappendaged. *Gynostemium* 6-lobed, squat, urceolate when immature, becoming narrowly obconic, ca 5 mm high, 5 mm broad, the anthers 6, equidistant. *Fruits* not seen.

In sandy prairies, often prostrate or growing along stone fencerows.

MEXICO: Guerrero, Mexico, Michoacán.

Hinton reports that the sap of the fruit is milky; Miss Mexía notes the vernacular name *hierba del huaco*, and mentions that the decoction made by boiling the roots and stalk is drunk for scorpion sting.

55. *ARISTOLOCHIA CHAPMANIANA* Standl., *Contrib. Arn. Arb.* **5**: 60, 1933. (Type: *Shattuck 413*, F, US)—Fig. 56.

Glabrescent *lianas*. *Leaves* oblong, acute at the apex, basally cordate, 4-5 cm broad, 10-12 cm long, smooth. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, bracteolate, subarcuate, purple, the utricle narrowly ellipsoid, 5 cm long, syrinx tubular, equilateral, the tube slightly arched, 3 cm long, the limb 1-lobed, narrowly triangular, gradually expanding from the tube, 2 cm wide, 6.5 cm long. *Gynostemium* 6-lobed, 4 mm high, 3 mm broad, the anthers 6, equidistant. *Fruits* large, woody, short-cylindric, 5.5 cm long, 4.5 cm wide, dehiscence acropetal,

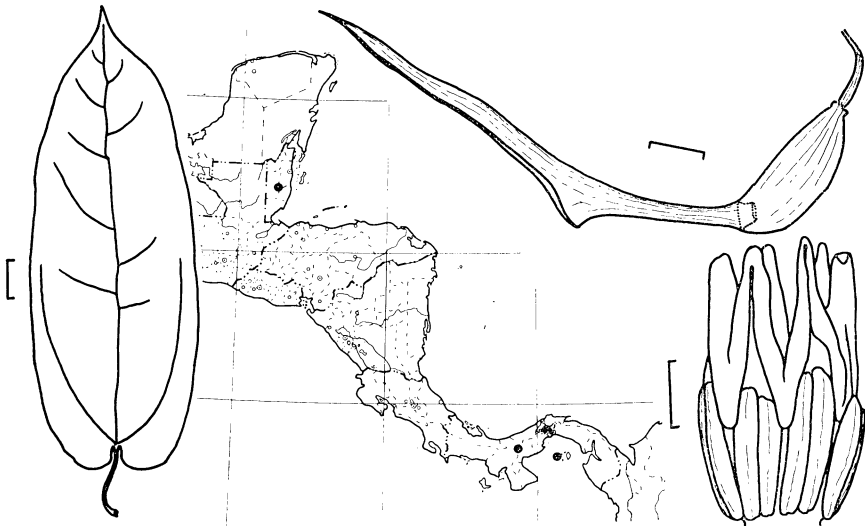


Fig. 56. Leaf, distribution, flower and gynostemium of *A. chapmaniana*.

septifragal, the hypanthium absent. *Seeds* numerous, flat, 1.5 cm wide, 9 mm long, 0.75 mm thick.

In rain forests, Panama.

PANAMA: Canal Zone, Coclé, San José.

Vegetatively, *A. chapmaniana* might be mistaken for the common *A. maxima*, but the flowers are very dissimilar. There are plants collected in British Honduras which, vegetatively, closely resemble *A. chapmaniana*; unfortunately they are sterile specimens, precluding positive identification.

56. *ARISTOLOCHIA TONDUZII* Schmidt in Fedde, Repert. Sp. Nov. **23**: 284, 1927. (Type: *Tonduz 13175*, US)—Fig. 57.

Large, densely tomentulose *lianas*. *Leaves* elliptic-oblong, apiculate, basally deeply cordate, 5-8 cm broad, 8-15 cm long, green, glabrescent above, beneath darker, densely tomentulose. *Pseudostipules* absent. *Flowers* on short, axillary, bracteolate lateral branches, rectilinear, velutinous, the utricle ellipsoid, 3.5 cm long, syrinx cylindric, equilateral, the tube straight, 3.5 cm long, the limb 1-lobed, gradually expanding from the tube, 2.5 cm wide, 5-6 cm long, on its distal half spotted with elevated maculae. *Gynostemium* 6-lobed, 6 mm high, 3 mm broad, the anthers 6, equidistant. *Fruits* large, woody, 8 cm long, 5 cm wide, dehiscence acropetal, septifragal. *Seeds* numerous, flat, 18 mm wide, 9 mm long, 1 mm thick.

In forests, Costa Rica.

COSTA RICA: Alajuela, Limón, Puntarenas, San José.

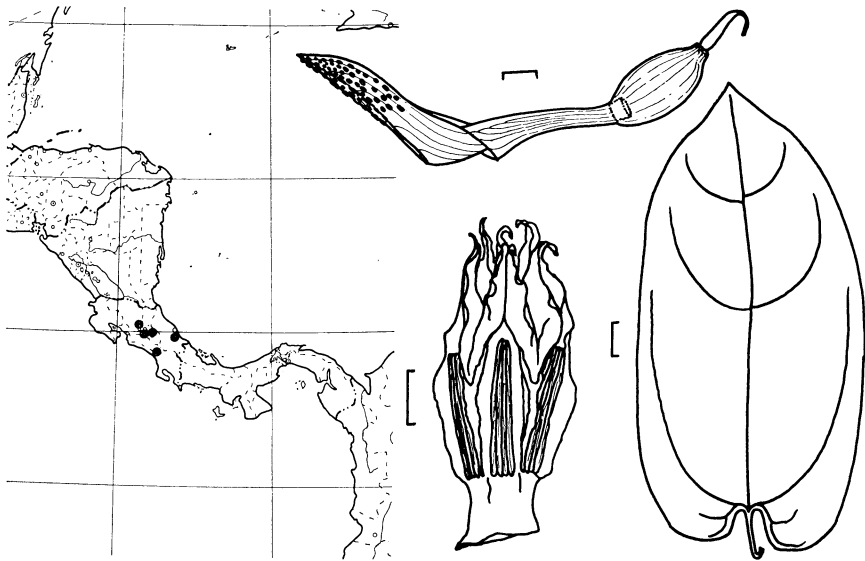


Fig. 57. Distribution, flower, gynostemium and leaf of *A. tonduzii*.

If flowers are present, *A. tonduzii* cannot be confused with any other species. In the past, it has been confused with *A. maxima*; the fruits are similar, but the hairy leaves with cordate bases of *A. tonduzii* should suffice to make the distinction.

Aristolochia reticulata Seem. (Bot. Voy. Herald. 193, 1854) was collected in Tarapota, Peru. The type specimen (BM) is meagre, but suggests close affinities with *A. tonduzii*. Since the name *reticulata* was preempted by Nuttall in 1835, Duchartre renamed the Seemann plant *A. mathewsii* in 1864 in the Prodrum (15-1: 497). Unfortunately, he erred in copying the name *reticulata* from Seemann, spelling it *utriculata*. The name *A. tonduzii* is retained here for the North American plant, but with the reservation that *A. mathewsii* Duchr. may be the earlier and correct name. Only further collections will permit the correct assignment of the names, and it will be necessary to review all of the related South American taxa.

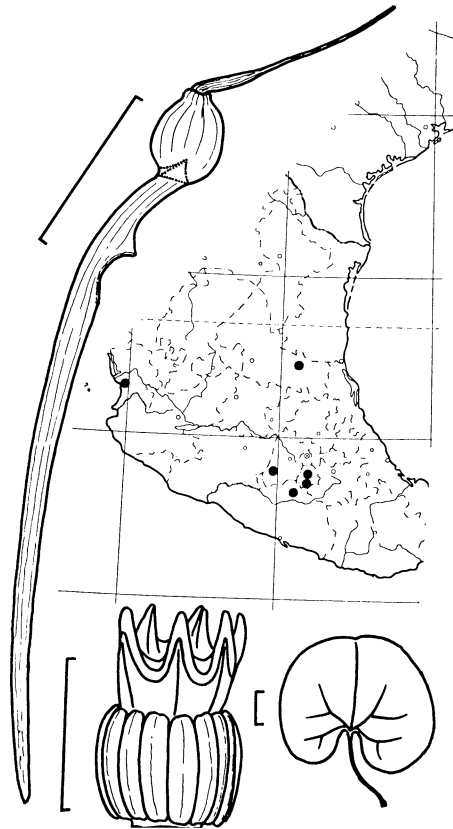


Fig. 58. Flower, distribution, gynostemium and leaf of *A. orbicularis*.

57. *ARISTOLOCHIA ORBICULARIS* Duchr., Ann. Sci. Nat., sér. 4, **2**: 59, 1854. (Type: Sessé & Mociño *s.n.*; photos, F, MO)—Fig. 58.

Aristolochia obtusifolia Sessé & Mociño ex Duchr. in DC., Prod. **15** (1): 467, 1864, pro syn.

Suffrutescent, finely puberulent to glabrous perennial *herbs*. *Leaves* suborbiculate, emarginate to rounded at the apex, basally deeply cordate, 2-7 cm broad, 3-9 cm long, smooth, beneath finely puberulent or glabrous. *Pseudostipules* absent. *Flowers* solitary in the leaf axils, ebracteolate, rectilinear, yellowish-green and dark purple, the utricle subspheric, 5 mm long, syrxinx inequilateral, annular, the tube straight, 4 mm long, the limb 1-lobed, linear, 4 mm wide, 3 cm long, subemarginate at the apex. *Gynostemium* 6-lobed, 1.2 mm high, 1 mm broad, the anthers 6, equidistant. *Fruits* ellipsoid, 14 mm long, 11 mm wide, dehiscence basipetal, septifragal. *Seeds* numerous subrevolute, 3mm wide, 4 mm long, 0.2 mm thick.

Rocky slopes, woodlands, Mexico.

MEXICO: Guerrero, Mexico, Morelos, Nayarit, San Luis Potosí, Tamaulipas.

This plant is easily identified by the small flowers, and their long, linear limbs, as well as the habit; Hinton reports the Mexican vernacular name *cuajo*.

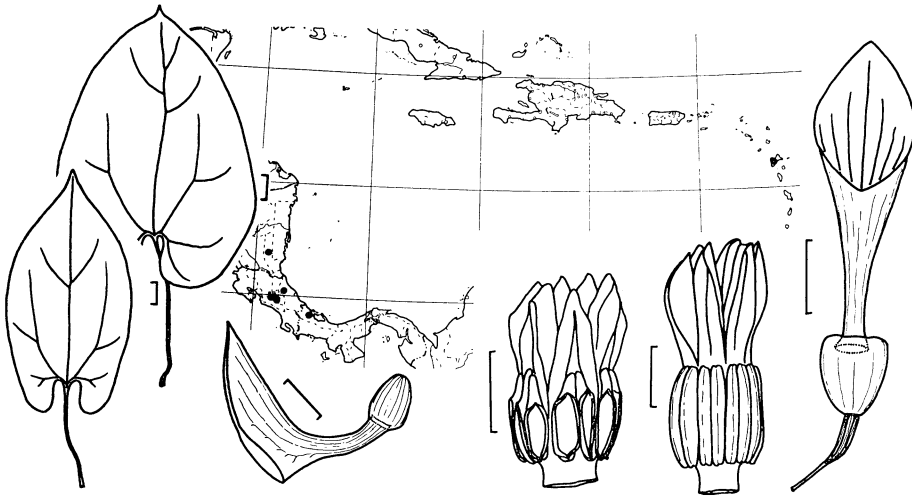


Fig. 59. Leaves, flowers, gynostemia and distribution of *A. constricta*.

58. *ARISTOLOCHIA CONSTRICTA* Griseb., Gesell. Wiss. Goettingen Abh. **7**: 225, 1857. (Type: Duss 4121, NY)—Fig. 59.

A. securidata Mast., Bot. Gaz. **33**: 256, 1902. (Type: Pittier 13422 (JDS 7604), US)

Tomentulose *lianas*. *Leaves* elliptic to ovate, acuminate, deeply cordate-sagittate, 7-9 cm broad, 10-13 cm long, smooth, dark green above, beneath paler, tomentulose. *Pseudostipules* absent. *Flowers* in short, axillary, several-branched, bracteolate, racemose clusters, rectilinear, purple, the utricle ovoid, 1 cm long,

syrinx cylindric, equilateral, the tube straight, 2 cm long, gradually expanding into the limb, the limb 1-lobed, triangular, ca 1 cm wide, 2.5-3.0 cm long, unappendaged. *Gynostemium* deeply 6-lobed, 3.5 mm high, 2 mm broad, the anthers 6, equidistant. *Fruits* large, ovoid, 6 cm long, 5 cm wide, dehiscence acropetal, septifragal, exposing the latticed septa, the hypanthium absent. *Seeds* numerous, flat, 14 mm wide, 10 mm long, 1 mm thick.

In forests, Costa Rica to Panama, the Lesser Antilles. To be expected in northern South America.

COSTA RICA: Cartago, Limón, San José.

PANAMA: Bocas del Toro.

GUADELOUPE.

EXCLUDED SPECIES

Aristolochia arborescens L., Sp. Pl. 960, 1753.

No authentic specimen exists for this species in the Linnaean herbarium. Authors have used *A. arborescens* as a synonym of *A. serpentaria* as well as of *A. grandiflora*. The description as published is inadequate.

A. cubensis J. Linden, Cat. Pl. n. 11, Suppl. **1856**: 12, 1856, nom. nud.

A. dammeriana Mast., Gard. Chron., ser. 3, **17**: 452, 1895.

I have been unable to obtain any material fitting the description of *A. dammeriana*. The Kew herbarium has a species folder bearing this name, but it contains only a cutting of the Gardener's Chronicle article.

A. durior Hill, Veg. Syst. **16**: App. 57, t. 60, 1824. = ?*Bignonia capreolata* L.

The peculiar circumstances pertaining to Alfred Rehder's acceptance of Hill's epithet, *A. durior* over that of Lamarck (*A. macrophylla*) has been reviewed by me in another paper (Bailey **10**: 4-7, 1962.)

A. leuconeura J. Linden, Belg. Hort. **8**: 164, 1858.

Based upon sterile material, this is possibly equivalent to *A. veraguensis*, but it is not possible to assign it to that species with certainty. Unfortunately, *A. leuconeura* antedates *A. veraguensis*.

A. longifolia Sessé & Mociño, Fl. Mex., ed. 2, 210, 1894, non Roxb. (1832), nec Hauman (1923).

Impossible to assign from the description, this species is not maintained by any modern authors. A search of the Sessé & Mociño collections from Madrid at Chicago Natural History Museum has failed to turn up any further information. Britton & Wilson, in the Flora of Porto Rico and the Virgin Islands (1924) cite *A. longifolia* as a synonym of *A. oblongata* Jacq. (= *A. bilabiata* L.).

A. podocarpa A. Bert., Acad. Scient. Institut. Bononiensis, Nov. comment. **4**: 437, 1840.

This Bertoloni species was described from leaves and fruits; a search for the type has been unsuccessful. It is possible this species is a synonym of *A. inflata* H.B.K. (1817). The herbarium at Bologna does not have a specimen. The type is from a plant grown from seed collected at Esquintla (=Escuintla), Guatemala by Joachim Velásquez (a member of the Mexican legation at Rome.)

A. pubescens Page ex Steudel, Nom. Bot., ed. 2, **1**: 133, 1840, nom. nud.

A. punctata Lam., Encycl. Méth. Bot. **1**: 253, 1783, non Balbis ex Duchr. (1864).

This species was described by Lamarck who based it upon a plate in Plumier (Spec. 5. Burm. Amer. t. 34). Although the species is maintained by Urban (e.g. in Flora Dominicensis, Symb. Antill. **8**: 193, 1920), he cited no collections. The type locality is "Anses à Pittes," now Anse à Pitre, Haiti. There are at least three species known from this locality; to judge from the plate, *A. punctata* could be ascribed to any of them, but to no single one with certainty. Furthermore, Hispaniola is rich in species of *Aristolochia*, especially the

southern regions. If one assumes other species may also grow at Anse à Pitre (although not yet collected there), the assignment of the name is even less sure.

A. uhdeana Duchr. in DC., Prod. **15** (1): 465, 1864. (Type: *Uhde s.n.* B†).

The type, the only specimen cited by Duchartre, no longer exists. It is impossible to assign the name with certainty from the description; no other specimens have been seen by me bearing the name *A. uhdeana*.

ENUMERATION OF HEXANDROUS SPECIES OF ARISTOLOCHIA

- | | |
|--|---------------------------------------|
| 1. <i>A. reticulata</i> Nutt. | 30. <i>A. ringens</i> Vahl |
| 2. <i>A. serpentaria</i> L. | 31. <i>A. esoterica</i> Pfeifer |
| 3. <i>A. tricaudata</i> Lem. | 32. <i>A. gigantea</i> Mart. & Zucc. |
| 4. <i>A. malacophylla</i> Standl. | 33. <i>A. littoralis</i> Parodi |
| 5. <i>A. arborea</i> Linden | 34. <i>A. odoratissima</i> L. |
| 6. <i>A. bullata</i> Pfeifer | 35. <i>A. grandiflora</i> Swartz |
| 7. <i>A. paracleta</i> Pfeifer | 36. <i>A. ekmanii</i> Schmidt |
| 8. <i>A. panamensis</i> Standl. | 37. <i>A. tigrina</i> A. Rich. |
| 9. <i>A. asclepiadifolia</i> Brandg. | 38. <i>A. samanensis</i> Schmidt |
| 10. <i>A. rhizantha</i> Lundell | 39. <i>A. maxima</i> Jacq. |
| 11. <i>A. thwaitesii</i> Hook. | 40. <i>A. chasmema</i> Pfeifer |
| 12. <i>A. macrophylla</i> Lam. | 41. <i>A. ovalifolia</i> Duchr. |
| 13. <i>A. californica</i> Torr. | 42. <i>A. linearifolia</i> Griseb. |
| 14. <i>A. tomentosa</i> Sims | 43. <i>A. bilabiata</i> L. |
| 15. <i>A. trilobata</i> L. | 44. <i>A. caudata</i> Jacq. |
| 16. <i>A. bilobata</i> L. | 45. <i>A. ehrenbergiana</i> Cham. |
| 17. <i>A. lindeniana</i> Duchr. | 46. <i>A. clematitis</i> L. |
| 18. <i>A. peltata</i> L. | 47. <i>A. veraguensis</i> Duchr. |
| 19. <i>A. leptosticta</i> Urban | 48. <i>A. schippii</i> Standl. |
| 20. <i>A. haitiensis</i> Ekman & Schmidt | 49. <i>A. inflata</i> H.B.K. |
| 21. <i>A. tentaculata</i> Schmidt | 50. <i>A. anguicida</i> Jacq. |
| 22. <i>A. pilosa</i> H.B.K. | 51. <i>A. carterae</i> Pfeifer |
| 23. <i>A. taliscana</i> Hook. & Arn. | 52. <i>A. montana</i> Ekman & Schmidt |
| 24. <i>A. glandulosa</i> Kickx | 53. <i>A. glossa</i> Pfeifer |
| 25. <i>A. clavidenia</i> Griseb. | 54. <i>A. mycteria</i> Pfeifer |
| 26. <i>A. fuertesii</i> Urban | 55. <i>A. chapmaniana</i> Standl. |
| 27. <i>A. rugosa</i> Lam. | 56. <i>A. tonduzii</i> Schmidt |
| 28. <i>A. passifloraefolia</i> A. Rich. | 57. <i>A. orbicularis</i> Duchr. |
| 29. <i>A. labiata</i> Willd. | 58. <i>A. constricta</i> Griseb. |

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M. E. H., s.n. May 1883 (2). Hale s.n. (2). E. Hall 528 (1), 529 (1), s.n. (1), s.n. 20 May 1872 (2), s.n. June 1873 (2), s.n. 4 July 1872 (14). H. M. Hall, 1682 (13), s.n. 23 Apr 1899 (13), s.n. 23 Apr 1900 (13), s.n. 24 Apr 1900 (13). Hannibal s.n. 7 Apr 1907 (13). Harbison s.n. ann. 1897 (12). Hardgrave s.n. Dec 1921 (15). Hardin & Duncan 15361 (14). Harger 7191 (2), s.n. 24 June 1887 (2). Harger & W. A. S. s.n. 24 June 1887 (2). Harper 246 (2), 309 (2), 499 (2), 581 (2), 1223 (14). Harris 6655 (34), 10655 (33), 11631 (33). Hartweg 565 (4), 566 (49). Harvey s.n. ann. 1844 (2), s.n. ann. 1844 (12), s.n. (12). Hasse 6798 (1), s.n. May 1886 (1), s.n. 1 May to 2-3 July 1886 (1). Hatch & Wilson 25 July 1936 (6). Haught 4648 (22). Hayes 146 (49), 294 (49), 620 (22), 781 (49), s.n. July-Nov 1860 (39). Heim, Cailleux & Stresser-Péan s.n. 11 July 1959 (3). Heller 7882 (13), 10687 (13), 11195 (13), 14480 (13), Heller & Brown 5042 (13). Heller & Heller 861 (30). Hennecart s.n. 28 July 1827 (2), s.n. Apr 1827 (16). Bro. Heriberto 247 (49). Hermann 2648 (24). Herre s.n. June 1893 (2). Hess 807 (43). Heyde 342 (39), 396 (35). Heyde & Lux JDS 3824 (39), JDS 3825 (35), JDS 6373 (50). Hinton 3141 (54), 4310 (54), 5258 (57), 8467 (57), 11605 (23), 12623 (21), 13530 (54), 14569 (6), 15151 (53), 15816 (23), 16147 (34), 16167 (23), s.n. 7 Mar 1933 (21). Hitchcock 809 (14), s.n. June-July 1894 (2), s.n. June-July 1898 (2), s.n. Aug 1892 (14), s.n. 17 Dec 1890 (35), s.n. 24 Dec 1890 (35), s.n. (35). Bro. Hivram s.n. Oct 1912 (15), s.n. Oct 1913 (15), s.n. Mar 1914 (15). Hjalmarson s.n. ann. 1850 (15), s.n. ann. 1853 (50). Hodge 3198 (15). Hodge & Howard 4317 (28). Hoffman s.n. (22). Hogg s.n. Mar 1888 (35). Holdridge 891 (16), 1104 (45). Holman s.n. 12 Apr 1933 (13). Holton

s.n. July 1845 (2), s.n. 16 May 1854 (15). Hood s.n. 14 Apr 1911 (2). Hoover 2769 (13). Hornbeck s.n. (15). Horr & McGregor E481 (14). House 1008 (2), 4253 (12), 4425 (12). Howard 5959 (17), 12366 (16). Howard, Briggs, Kamb, Lane & Ritland 74 (28), 430 (28). Howard & Howard 8387 (16), 9185 (43). Howell 8502 (21), 20864 (13). Huger s.n. Aug 1902 (2). Hunnewell 9751 (2), 9953 (12), 10739 (2), 11682 (2), 12023 (2), 17475 (12), 17737 (2), 18825 (35), 18950 (12), 19333 (2). Hunt s.n. 27 Feb 1899 (13). Hyams s.n. July 1898 (2).

A. G. J. 79 (14). Jack 4044 (33), 4709 (24), 5059 (24), 5509 (24), 8425 (35), 8633 (28). Jamain s.n. (15). L. James 26 (14). R. L. James 24 (2). Jaramillo-Mejia & Fernández 715 (47). O. E. Jennings 827 (12). S. K. Jennings s.n. ann. 1870 (2). Jennison & Anderson s.n. 14 May 1928 (12). Jepson s.n. 28 Apr 1893 (13). Jicarda 41 (45), 1131 (16), 1281 (42). Jimenez 1985 (15), 2006 (30), 2671 (33), 2716 (28), 2736 (15), 3743 (19). Johnston 2328 (2). I. M. Johnston 726 (55), 1253 (55), 1316 (55). J. R. Johnston 923 (43), s.n. 6 June 1903 (35). Jones 214 (13).

Kappler 1604 (15). Kearney 41 (2), 84 (2), 105 (12), 286 (12), 516 (12), 591 (12), 878 (2), 1075 (2), 1242 (2), s.n. 28 May 1894 (2), s.n. 23 May 1897 (2), s.n. 10 Apr 1893 (12), s.n. ann. 1893, (12). Kellerman 5870 (50), 6590 (35), 6592 (35), 7074 (50), 7826 (50), 8094 (35). A. Kellogg 851 (13), s.n. (13). A. Kellogg & Harford 851 (13), 857 (13). J. H. Kellogg 860 (2), s.n. 20 May 1899 (2). Kelley s.n. 27 May 1905 (13). Kenoyer 342 (22). Key s.n. May 1893 (15). King s.n. ann. 1894 (13), s.n. ann. 1897 (13). Kittredge s.n. 5 June 1940 (12). Klug 4168 (34). Koenig s.n. 1 June 1899 (12). Kolemán 1055 (12). Kotschy s.n. (12).

Lamb 385 (23), 462 (23). Lane s.n. Aug 1921 (14). Langlássé 199 (21). Lankester 1305 (50), 1313 (39). Leavenworth s.n. ann. 1839 (2), s.n. (2), s.n. (14). Leewis s.n. (13). Leggett s.n. 6 July 1864 (2), s.n. 7 July 1865 (2), s.n. July 1865 (2), s.n. ann. 1867 (2), s.n. ann. 1868 (2), s.n. 12 Aug 1868 (2), s.n. 6 July 1869 (2), s.n. June 1868 (12), s.n. ann. 1868 (12), s.n. ann. 1868 (14). Lehmann 1702 (50). Lemaire s.n. (2). Lemmon s.n. May 1883 (13). Leningrad Herbarium s.n. (2). Bro. León 462 (28), 692 (24), 1464 (24), 3641 (43), 3652 (43), 4832 (24), 6495 (24), 6853 (37), 7164 (37), 11409 (33), 12041 (18), 14930 (33), 15808 (28), 16265 (28), 17268 (18), 22377 (43). Bro. León & Cazañas 5969 (24). Bro. León & Roca 8176 (28). Bro. León & Ruiz 11405 (43). Bro. León & Sauchez 8462 (24). Bro. León & Victorin 20270 (17), 21010 (43), 22300 (43). J. León 367 (33), 687 (56). E. C. Leonard 3061 (16), 4847 (45), 4847a (45), 4869 (16), 4987 (44), 5244 (20), 7106 (16), 7209 (18), 7230 (18), 7281 (44), 7393 (16), 7413 (18), 7686 (16), 7757 (18), 8046 (18), 9037 (18), 9780 (18), 9781 (16), 9837 (16), 9956 (16), 10029 (18), s.n. 24-25 May 1920 (45). Leonard & Leonard 11225 (16), 11390 (16), 12440 (16), 12558 (18), 12589 (16), 12671 (16), 13059 (16), 13115 (16), 13310 (16), 13767 (18), 13831 (16), 14658 (16), 14977 (18), 15008 (18), 15019 (18), 15095 (16), 15275 (16), 15558 (16), 15746 (45). Le Roy s.n. ann. 1867 (2), s.n. 17 Feb 1869 (13). Letterman s.n. June 1894 (2), s.n. May 1898 (2), s.n. 15 May 1912 (2), s.n. 27 Aug 1878 (14), s.n. 30 June 1879 (14), s.n. ann. 188- (14), s.n. 20 June 1880 (14), s.n. ann. 1882 (14), s.n. June 1894 (14), s.n. Apr 1900 (14), s.n. (14). Levy 448 (35), 1129 (39). L'Herminier s.n. May 1843 (15). Leibmann 99 (41), 409 (41). Lighthipe s.n. 20 June & 13 July 1891 (2), s.n. 25 July 1893 (2). Linden 49 (34), 310 (34), s.n. ann. 1840 (34). Lindheimer 299 (1). Lindsay 488 (8). Lix 633 (2), 660 (12). B. Long 17560 (2), 23619 (2), 41859 (2). L. E. Long 149 (15). Lopez 1588 (30). Loring s.n. 20 Oct 1899 (12), s.n. 12 June 1906 (12), s.n. Sept 1906 (12). Lowrie s.n. June 1874 (12). Luna 474 (24), 500 (24). Lundell 878 (39), 964 (39), 2318 (33). Lundell & Lundell 7257 (10), 8437 (14).

Macbride 2763 (39). Mac Elwee 744 (2). Mackenzie 730 (2), 1119 (2), 1437 (2), 1690 (2), 7064 (2), 7443 (2). Maltby 6 (23), 143 (23). Manning s.n. June 1885 (14). Marie-Victorin & Marie-Victorin 21501 (17). Markens s.n. (14). Martínez-Calderón 74 (35). Martius s.n. ann. 1817 (15). Mason 910 (13), 1697 (23), 1778 (23), 2683 (13), 2797 (13), 3717 (13), 4331 (13), 7995 (13). Matuda 494 (35), 1755 (5), 2138 (39), 2234 (35), 16488 (22), 17132 (49), 17245 (49), 17628 (35). Matz 2328 (2). Maxon, Harvey & Valentine 7348 (33). Maxon & Hay 3291 (35). A. J. MC (?) s.n. 31 May 1887 (12). I. F. MC (?) s.n. 26 Aug 1895 (33). McCarthy s.n. (2). McClure s.n. 2 Feb 1905 (15). Mc Farland 60 (12), 4527 (12). Mc Farland & Rogers 4665 (12). H. E. Mc Minn 363 (13). I. M. Mc Minn 1841 (2), s.n. (2). Mc Murphy s.n. 1 Apr 1914 (13). Mc Vaugh 8470 (1). Meislahn 122 (2). Meredith s.n. 11 June 1920 (2). Merrill 243 (14), 1053 (14). Merrill & Hagan 1053 (14). Mertz 2328 (2), 2329 (12). Mexia 1057 (23), 1069 (23), 1666a (4),

2772 (4), 8790 (54). *Meyer* s.n. Apr 1929 (13). *Michaux* s.n. (1), s.n. (2), s.n. (12). *Michener & Bioletti* 115 (13), s.n. ann. 1892 (13). *E. R. Miller* s.n. 18 Sept 1897 (2). *G. S. Miller Jr.* 219 (45). *Milligan* s.n. May 1896 (1), s.n. June 1886 (2), s.n. Apr. (14). *Mills-paugh* 182 (12), 1958 (35). *Charles Mohr Herbarium* s.n. (2), s.n. 14 June 1883 (14), s.n. (14). *Moldenke* 709 (39), 2431 (12), 4766 (46), 5449 (33), 5551 (39). *Molina* 68 (39), 794 (39), 1341 (4), 1419 (50), 3076 (39), 10691 (11). *Monnet* 691 (13). *Montes & Salazar* 132 (23), 254 (23). *Mooney* s.n. ann. 1888 (2), s.n. ann. 1888 (12). *Moore* 2332 (12). *Morris* 1014 (12), *Morton & Acuña* 2930 (17). *Moseley* s.n. 1 Aug 1897 (2). *Mosier* s.n. Jan 1930 (39). *Munroe* s.n. ann. 1857 (2).

Nash 950 (16), 952 (18), 1139 (2). *Nash & Taylor* 1394 (16), 1451 (16). *Nee* s.n. (21). *Nelson* 3746 (35), 4304 (23), 6981 (21). *Nelthrop* 6 (35). *Nico'son* s.n. (15). *Nieuwland* 63 (2). *Northrup & Northrup* 568 (28). *Norton* 327 (2), s.n. 4 July 1900 (2).

Oberhalsler s.n. Aug 1895 (12). *Oberly* s.n. 10 Aug 1878 (2). *Oersted* 102 (50), s.n. (50). *Ohlendorf* 9330 (12), *Orcutt* 4560 (23). *Ortega* 64 (23), 132 (23), 222 (23), 391 (23), 4011 (23), 5664 (23), 10773 (23). *Osborn* 1377R (14). *Otero* 491 (30). *Oyster* 2329 (14), s.n. June 1885 (14).

T. C. P. (?) s.n. ann. 1864 (14). *Padilla* 27 (39), 113 (39). *Painter* 1320 (2). *E. Palmer* 67 (23), 351 (21), 1247 (23). *E. J. Palmer* 1503 (2), 1986 (2), 2136 (14) 2136a (14), 2422 (2), 4057 (14), 5733 (2), 5868 (14), 7389 (2), 7459 (2), 8058 (1), 8384 (1), 9970 (2), 9971 (2), 11828 (2), 12051 (1), 12102 (2), 13349 (2), 15610 (2), 16208 (14), 17466 (2), 19406 (14), 20658 (14), 21011 (14), 21077 (14), 22054 (14), 22281 (14), 22467 (14), 22777 (14), 22930 (14), 24972 (14), 26748 (14), 27002 (2), 32938 (14), 34704 (2), 35448 (14), 35504 (14), 39472 (2), 41685 (14), 44023 (14), 54523 (14), s.n. 8 Aug 1908 (2), s.n. 6 May 1906 (14). *W. Palmer* s.n. 8 July 1906 (2). *Parish* 19078 (13). *Parker* s.n. 26 June 1862 (2). *Parks* 2912 (14), 29482 (2), 40973 (2). *Patterson* s.n. Sept. 1877 (14). *Bro. Paul* 374 (22), 517 (39), 587 (49). *Pavon* s.n. (50). *Payson* s.n. 30 May 1952 (2). *Peabody Herbarium "Gray 444"* (29). *Pennell* s.n. 28 July 1904 (46), s.n. ann. 1905 (46). *Percival* s.n. 5 Sept. 1887 (12). *Perdue & Blum* s.n. 28 Aug 1961 (30). *Pfeifer* 1592 (39), 1658 (50), 1660 (50) 1684 (50), 1977 (33), 2451 (12), 2460 (12) 2462 (12), s.n. (14). *Phillips* s.n. 25 Mar 1928 (13). *Pittier* 90 (22), 1737 (50), 2304 (55), 2326 (22), 4145 (35), 4431 (22), 4732 (22), 5008 (49) 5236 (22), 5463 (8), 5750 (8), 6872 (49), 7094 (22), *JDS* 7604 (58), 8533 (35), 16020 (15), 16027 (22), 16039 (34), 16102 (56), 16129 (35), 16164 (22). 16430 (39). *Pittier, Tonduz & Tonduz* 9286 (56). *Plank* s.n. 17 May 1892 (1), s.n. (2). *Plée* s.n. ann. 1821 (15), s.n. (15). *Plitt* 835 (2), 1758 (46). *Poiret* s.n. (2), s.n. (15), s.n. (44). *Poiteau* s.n. (16), s.n. (18), s.n. (43). *Pollard* 472 (2). *Pollard, Maxon & Maxon* 242 (2), 337 (2). *Pollock* 71 (12), s.n. 23 May 1895 (12), s.n. 25 May 1895 (12), s.n. 20 May 1897 (12), s.n. 22 May 1897 (12). *Porter* s.n. 21 Aug 1863 (12), s.n. June 1864 (14). *Price* s.n. June 1891 (2), s.n. 1 June 1897 (14), s.n. summer 1898 (14), s.n. 23 May 1900 (14). *Pring* s.n. 10 Mar 1908 (22), s.n. ann. 1903 (35). *Pringle* 9273 (57), 13424 (4). *Prisc* 178 (2). *Proctor* 9572 (35). *Purpus* 205 (39), 1916 (9), 4416 (9), 5508 (57), 6931 (22), 7290 (22), 7291 (22), 7394 (9), 7570 (9), 8170 (9), 9076 (39).

Quentin 13 (15), 67 (15). *Questel* 582 (15), 859 (15), s.n. May 1940 (27), s.n. Sept. 29 (27). *Quiros* 496 (22), 617 (33), 1427 (22).

Radford 5743 (2), 6109 (12). *Ratelle* s.n. 21 Oct 1891 (35). *Rattan* 1877 (13). *Rau* s.n. ann. 1879 (14). *Raven* 6419 (13). *Rehder* s.n. 24 Aug 1907 (12). *Renson* 209 (35). *Rettig* 460 (14). *Reuter* s.n. (12). *Reverchon* 785 (14), 2131 (2), 2936 (1), s.n. 21 Oct 1900 (1), s.n. 8 Apr 1902 (1), s.n. 25 Apr 1903 (1), s.n. 7 May 1903 (1), s.n. Oct 4 (1), s.n. ann. 1879 (14). *Richard* s.n. (15), s.n. (16), s.n. (18), s.n. (27), s.n. (30), s.n. (31), s.n. (35), s.n. (44), s.n. (50). *Ricksecker* 85 (50), *Ridgway* 2904 (2), s.n. ann. 1873 (14). *Rimbach* 37 (34). *Robbins* 15 (13), 2766 (14). *Rock* 899 (14). *J. V. Rodriguez* 64 (50), 449 (50), 622 (39), 1138 (39), 1173 (39), 3410 (49). *L. Rodriguez* 2467 (27), 3616 (35), 3868 (27), 3985 (27). *J. N. Rose* 1459 (23), 1560 (23). *J. N. Rose, Fitch & Russell* 3848 (44), 3964 (16). *J. N. Rose, Painter & J. S. Rose* 8591 (57). *J. N. Rose, Standley & Russell* 13908 (23), 14183 (23), 14509 (23). *L. S. Rose* 42004 (13). *Ro:hrock* 489 (35), s.n. (2), s.n. (14). *Rovirosso* 245 (34), 520 (41), 584 (34), 588 (34). *Rowlee* s.n. 16 Aug 1895 (46). *Rowntree* s.n. 23 Apr 1933 (13). *Roy* 520 (46). *Rugel* 184 (43), 345 (43), 346 (37), s.n. May 1843 (14), s.n. ann. 1842 (15). *Ruth* 75 (2), 79 (12), 173 (12), 178 (12), 1112 (14), 1436 (12), s.n. May 1896 (2), s.n. May 1893 (12), s.n. June 1893 (12), s.n. May-July 1895 (12), s.n. July 1896 (12), s.n. July-Aug 1909 (12). *Rydberg & Imler* 353 (14).

F. L. S. 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