

## A MONOGRAPH OF THE GENUS *PEIXOTOA* (MALPIGHIACEAE)

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### INTRODUCTION

*Peixotoa* is a genus of 28 species of yellow-flowered, wing-fruited vines and small shrubs whose center of diversity is the Planalto of Brazil. It is a very homogeneous assemblage that is characterized by large, cordate stipules, compound inflorescences composed of 4-flowered umbels, and a uniseriate androecium of alternating stamens and staminodes. Within the family this is a relatively recently evolved group in which the species have not greatly diverged. Attempts at studying *Peixotoa* were limited in the past by a paucity of good material and complicated by the occurrence of apomixis, which has not been suspected until now. The most recent monograph (Nieden zu, 1928) contained little information beyond that presented in Jussieu's study of 1843 and an unsatisfactory key. It is hoped that this treatment will provide a beginning toward a better understanding of this difficult genus.

### TAXONOMIC HISTORY

St. Hilaire's collections from central Brazil included three species of Malpighiaceae which Adrien de Jussieu grouped into a new genus, *Peixotoa*, in his treatment of that family for St. Hilaire's *Flora Brasiliae Meridionalis* in 1832. The name commemorates Domingos Ribeiro dos Guimarães Peixoto, a physician who had published "Dissertation sur les médicaments brésiliens" in Paris in 1830. Grisebach published three more species in 1839 based on Sellow collections. In 1840 Jussieu, who by then had seen collections of Claussen, Gaudichaud, Martius, and Salzmann, added seven more names when he published his "Malpighiacearum synopsis," which preceded the comprehensive monograph of the family of 1843. Turczaninow recognized a Blanchet collection as another new species in 1858. Kuntze described *P. cordobensis* from Argentina in 1898. However, his type is now included in *Cordobia argentea* (Griseb.) Niedenzu. Few collections and almost none from additional geographical areas had been made by the time Niedenzu published his monograph of *Peixotoa* in 1912. The limited material available to him was often scanty and in poor condition. In his treatment of the genus for *Das Pflanzenreich* (1928) he recognized 11 species and one variety in addition to numerous forms. With the exception of a new name published by Ferreira in 1969, little work has been done since Niedenzu. However, extensive field work within the last 30 years in the Planalto and adjacent regions has yielded a large number of collections of *Peixotoa*, including an astonishing number of novelties. In this treatment I recognize twenty-eight species, of which eighteen are new.

## RELATIONSHIPS WITHIN THE FAMILY

Nieden zu (1928) divided the Malpighiaceae into two subfamilies, the *Planitorae*, characterized by a flat torus and wingless fruits, and the *Pyramidotorae*, characterized by a pyramidal torus and winged fruits. Morton (1968) substituted names based on included genera, since Niedenzu's names were not formed in accordance with the Code of Nomenclature. The *Pyramidotorae* thus became the *Gaudichaudioideae*. Niedenzu divided his *Pyramidotorae* into two tribes, the *Hiraeae*, for genera in which the lateral wings are larger than the dorsal wing, and the *Banisterieae* in which the dorsal wing exceeds the lateral two. He placed *Peixotoa* into the latter next to *Banisteriopsis* (his "*Banisteria*"). Since Niedenzu based his scheme strictly on the torus and wing characters, it contains a number of unnatural assemblages. W. R. Anderson's current investigation of the infra-familial structure of the *Malpighiaceae* will lead to changes in the present groupings (see Anderson, 1978). However, no matter how the family may eventually be subdivided, *Peixotoa* will be retained next to *Banisteriopsis*. This large and diverse genus is the most likely ancestor for the homogeneous, advanced *Peixotoa*.

With the exception of the "stipules," i.e. the two structures resulting from the fusion of the interpetiolar stipules, and the presence of the characteristic staminodes, all generic characters of *Peixotoa* occur in *Banisteriopsis* as circumscribed by Gates in her recent monograph (1982). While no single species shares all these characters, the following are found in the subgenus *Hemiramma* (*sensu* Gates): a vining habit; leaf glands borne on the lamina or petiole; 4-flowered umbels arranged in compound dichasia; sessile pedicels; calyx glands borne on the free part of the sepal and attached by their entire length; a corolla of yellow, glabrous petals with the posterior petal borne erect; glabrous anthers with the glandular connectives composed of large, inflated polygonal cells; a samara with a pair of lateral wings parallel to the areole; straight styles with capitate stigmas. In some species of *Banisteriopsis* the glandular connective becomes greatly enlarged while the size of the pollen sacs decreases, but completely sterile staminodes are not found. Yet, the pattern of reduction in the androecium is the same as in *Peixotoa* in that the change takes place in the stamens opposite the sepals. The composition of the androecium, i.e. fertile stamens opposite the petals alternating with sterile staminodes opposite the sepals, is constant throughout *Peixotoa* and was probably already established in the ancestor.

Three monotypic genera, *Cordobia*, *Mionandra*, and *Gallardoa*, from the southern edge of the family's range might be considered closely related to *Peixotoa*. In these three taxa the "stipules" also consist of the interpetiolar stipules which have fused into two cordate or triangular structures. In *Cordobia* and *Gallardoa* these may be bifid or entire with an acute or notched apex. Those of *Mionandra* are always bifid. In all three genera the inflorescence is reduced to a single flower with yellow, glabrous petals. Each androecium is similar to that of *Peixotoa* in that the stamens opposite the sepals are reduced to sterile structures. In *Cordobia* only tiny filaments are retained, while in *Gallardoa* and *Mionandra* the filaments, which are half as long or less than the stamen filaments, bear small apical glands. These glands are fusiform in *Gallardoa* and rhomboid in *Mionandra*. The pollen of *Cordobia* is like that of other Banisterioid genera, while that of *Mionandra* and *Gallardoa* is highly atypical (S. R. Lowrie, pers. comm.). One reason for grouping *Cordobia* with *Peixotoa* is its Banisterioid samara with its large dorsal wing and the usually present pair of lateral winglets. In the samara of *Gallardoa* the dorsal wing is reduced to a crest while the lateral wings are greatly enlarged. In *Mionandra* the change from a wind-dispersed samara to a detritus-fruit is reflected by the narrow, highly irregular crests that cover the mericarps. The vestiture in all three genera is sericeous; the T-shaped hairs typical of *Peixotoa* are lacking. The erect, capitate styles of *Mionandra* are similar to those of some

species of *Peixotoa*. Those of *Cordobia* and *Gallardoa* are somewhat curved and bear most unusual, internal stigmas. In *Cordobia* the stigma is borne laterally along the broad edge of the apically flattened style. In *Gallardoa* the stigma is associated with an appendage, similar to the condition in *Stigmaphyllon*.

Though *Cordobia*, *Gallardoa*, and *Mionandra* have several characters in common with *Peixotoa*, I do not believe that these similarities form evidence that any or all of the three genera should be included in *Peixotoa* or are derived from it. The atypical inflorescences and the peculiar style of *Cordobia* and *Gallardoa* point toward a different origin. It seems more probable that they also arose from ancestors in *Banisteriopsis*.

## ANATOMY AND MORPHOLOGY

*Hair Types.* The two basic hair types found in *Peixotoa* are Y-shaped and T-shaped. Pubescence composed of Y-shaped hairs is termed velutinous (Fig. 1a) and may occur on any part of the plant other than on the lower surface of the stem leaves. In the ovary and on the samara the stalks of these hairs are very short or the hairs may be sessile. The T-shaped hairs have an unusually long stalk, which in most species is 0.2–0.5 mm long. In *P. gardneri* and *P. hirta* the stalks are 0.5–1 mm or more long. While standard in *Peixotoa* these hairs are only infrequently encountered in the rest of the family. When the stalk is sinuous or twisted and the trabecula is wavy or curled the resulting vesture is called tomentose (Fig. 1b). If the hairs are very densely intertwined and so numerous that the epidermis is obscured, the term woolly is used. However, no term exists that describes vesture composed of T-shaped hairs in which the trabecula and stalk are straight (Fig. 1c). Little purpose is served by coining yet another term. For the sake of clarity, surfaces covered with such hairs are here described as “pubescent with T-shaped hairs.” *P. adenopoda* and *P. sericea* are the only species in the genus whose stem leaves have the true sericeous vesture that is a common condition in the rest of the family. These hairs consist of a long, straight, stiff, medifixed trabecula which is sessile or subsessile (Fig. 1d). In *Peixotoa* such hairs are also found on stipules and less frequently on inflorescence leaves.

*Habit.* While a small number of species are true vines with stems up to 8 m long, the majority are small shrubs ca 1–2.5 m tall. Yet, many of these shrubs form ascending or scandent branches that twine at the tips or may even switch to a vining habit if a suitable support is available. This flexibility suggests that the *Banisteriopsis* ancestor was probably a vine. *P. andersonii* is unusual in that it forms procumbent stems up to 4 m long that send up erect flowering axes. The stems of both vines and shrubs are terete and generally velutinous or sometimes tomentulose or both when young. The pubescence is generally abraded from the older parts. In *P. glabra*, *P. hatschbachii*, and *P. psilophylla* even the relatively young vegetative branches that bear inflorescences are glabrous at the time of flowering.

*Stipules.* The strikingly large stipules are a generic character in *Peixotoa*. Their presence or the characteristic stipule-scar permits even sterile material to be readily assigned to this genus. Each “stipule” is actually the product of fusion of the two opposing interpetiolar stipules. The two large, cordate structures that result from this fusion are decussate to the pair of leaves at that node. The stipules act as valvate bud scales. They may be glabrous or variously pubescent but are always finely and densely tomentulose along the margins. These marginal hairs interlock and act as a kind of seal when the stipules enclose the young shoot. The sides may be flat or recurved. Each stipule is commonly entire with an acute or, especially in the larger ones, notched apex or it may be bifid. While the stipules are necessarily concave when they act as bud scales, they usually become flat as the shoot matures. Yet in some species, especially in the inflorescence, the

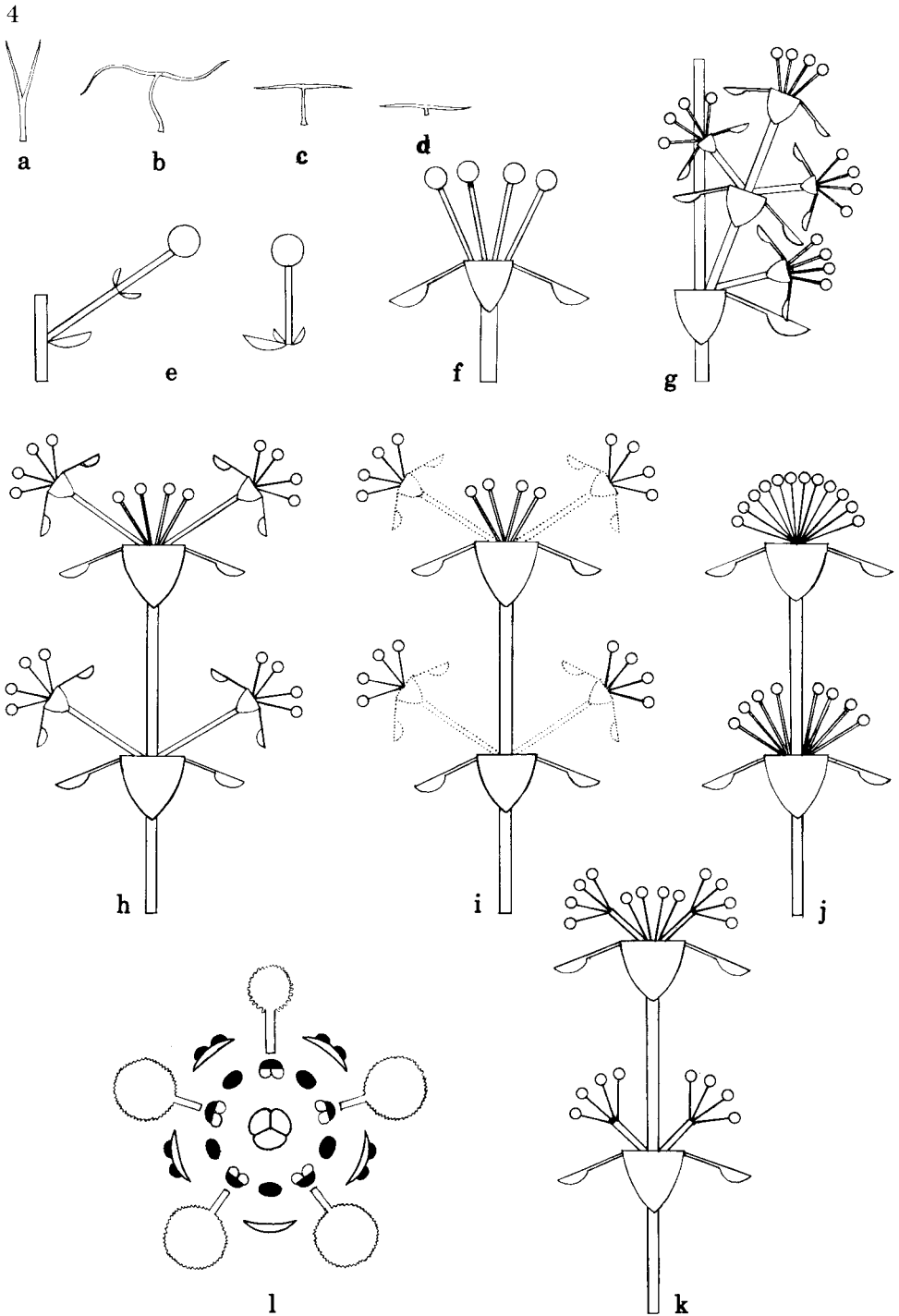


FIG. 1. Hair Types and Diagrams of Inflorescence Structure and Flower (see section Anatomy and Morphology). Hairs representative of these vestiture types: a) velutinous, b) tomentose, c) "pubescent with T-shaped hairs," d) sericeous. Inflorescence structure: e) hypothetical transition from pedunculate to sessile flower; f) typical umbel subtended by a pair of leaves and a pair of large stipules; g) "subsidiary axis" located between the secondary axis and the leaf; h-k) transition from 4-flowered (1-umbellate) terminal node to 12-flowered (3-umbellate) terminal node: h) all umbels 4-flowered, each umbel subtended by a pair of leaves and a pair of stipules, i-j) suppression of secondary axes accompanied by loss of leaves and stipules, terminal node 12-flowered, lateral nodes with a sessile umbel in each leaf axil, k) variation of condition in j: lateral umbels borne on secondary peduncles but not subtended by leaves and stipules. Floral Diagram: l.

concave shape is retained. The stipules are usually largest on the stem and become decreasingly smaller toward the distal portion of the inflorescence. In a few cases the inflorescence stipules equal those of the stem or may exceed them. They are deciduous in most species but are persistent in some. In *P. cordistipula* they are retained in the inflorescence even after the leaves and pedicels are shed. In very large inflorescences the stipules of the most distal nodes may be lacerated or split into narrow strips of tissue, or sometimes the stipules are fused. In these cases it is common for the inflorescence leaves to be suppressed entirely.

*Leaves.* *Peixotoa*, like most Malpighiaceae, has opposite, decussate, simple, entire leaves. The petioles are terete and usually short, often less than 1 cm long. In some species, especially in vines, the petioles may be longer but never more than 3.5 cm long. The laminas are most commonly elliptical or ovate, but may also be obovate, rhombic, suborbicular, lanceolate or oblanceolate. While the apex is apiculate or sometimes acuminate, the tip is often broken off in the larger leaves, which then appear to be rounded or obtuse. The base is usually cordate or sometimes subtruncate. In *P. catarinensis* the larger leaves are cordate but the sinuses may be truncate. In the stem leaves of *P. sericea* the bases are cuneate. The margins are at least slightly recurved. Thick, almost coriaceous laminas are rugose. The veins are prominent below in all species. The vestiture is variable. The laminas are sparsely to densely velutinous or glabrous above. Exceptions are *P. cipoana*, in which the laminas are sometimes tomentulose above, and *P. hirta*, in which they may bear T-shaped hairs and/or be velutinous above. Below, the laminas vary from glabrous to sparsely to densely pubescent with T-shaped hairs to sparsely to densely tomentose to woolly. *P. adenopoda* and *P. sericea* are the only species in which the stem leaves are sparsely sericeous above and more densely so below. The sericeous condition is common in the family but exceptional in *Peixotoa*.

As a rule the inflorescence leaves become gradually smaller toward the distal nodes, but sometimes the change is abrupt. The most proximal are usually similar to the most distal stem leaves. They usually change in shape toward the more distal nodes from lanceolate or triangular to linear and subulate. The presence or absence of a petiole in the more distal leaves is a good character for most species.

The leaf glands are always borne on the lower surface. Typically, each lamina bears two discoid or slightly oblong, prominent glands at the base, one on each side of the costa. Sometimes the glands are borne halfway on the petiole or rarely entirely on the petiole or rarely on the laminar tissue but very near the base and the costa. In the more distal inflorescence leaves the glands are usually disproportionately large and commonly cause the smallest leaves to become almost conduplicate. One to four additional smaller glands may be present. Most commonly they occur as a second pair adjacent to the larger glands. These additional glands are found especially in the inflorescence leaves. At times they become variously fused, especially so in the inflorescence leaves, where, in the most extreme cases, a band of glandular tissue extends across the base of the lamina. In *P. leptoclada* and *P. paludosa* the more distal inflorescence leaves may have a glandular tip. In *P. adenopoda*, *P. catarinensis*, *P. paludosa*, and *P. spinensis* the leaf glands are borne on the proximal  $\frac{1}{3}$  of the surface of the lamina, usually approximately equidistant from the base and costa. In *P. sericea* the glands are borne above the base and at or very close to the costa but at different levels, rather than equidistant, from the base. In *P. jussieuana* the glands may be at the base or on the laminar surface. The larger leaves of *P. leptoclada* may have one pair at the base and a second pair on the lamina, or on the same plant some of the largest leaves may bear a pair of glands on the lamina only and lack the basal pair. In the more distal inflorescence leaves the glands are always basal regardless of the position of the glands on the stem leaves. Though prominent, the

glands of most species are sessile. In the stem leaves of *P. adenopoda* and *P. hatschbachii* they are stalked. This stalk is ca 0.8–1.2 mm long. Glands of the more distal inflorescence leaves of these species are sessile. In some species one or both glands are sometimes lacking.

*Inflorescence.* The basic unit of the inflorescence is a 4-flowered umbel. This is so thoroughly established in the genus that it was probably already present in the *Banisteriopsis* ancestor. Each umbel is an extremely reduced 4-flowered raceme [the pseudoraceme of Cuatrecasas (1958) and Anderson (1981)] in which the axis is foreshortened and in which the primary peduncle is lost (Fig. 1e). This legacy is reflected in the maturation pattern of the four flowers: two are always at least slightly older than the other two. Typically each umbel is sessile or subsessile at the node and subtended by a pair of leaves and by the pair of stipules which functioned as bud scales (Fig. 1f). The sessile pedicel of each flower is subtended by a much reduced, non-vascularized bract and a pair of equally reduced bracteoles. These scale-like structures vary from triangular to oblong to semicircular to subrectangular and are glabrous or variously pubescent. They are persistent though in some species occasionally absent. The pedicel is extremely variable in size in all species. It may increase up to ½ of its length in fruit and always becomes a little stouter. It is always pubescent even in species which are otherwise glabrous.

The umbels are arranged into compound dichasia and thyrses, which are terminal and/or axillary. Solitary umbels are common only in *P. axillaris* and *P. hispidula*. In large inflorescences, especially in vines, additional axes are sometimes produced between the inflorescence branch and the leaf (Fig. 1g). Such subsidiary axes are always much smaller than the axes with which they are associated.

In *P. adenopoda*, *P. catarinensis*, *P. parviflora*, *P. tomentosa* and a few individuals of *P. reticulata*, the secondary inflorescence axes with their stipules and leaves are suppressed at the more distal nodes. As a result of this change the umbel borne on such a secondary axis now becomes sessile in the axil at the branch point. At the terminal node the central umbel is flanked by two sessile umbels, which results in a three-umbellate condition (Fig. 1h–j). The terminal nodes of these species are thus always 12-flowered. Commonly, when such a reduction of the inflorescence branches has taken place, the umbel instead of being sessile is supported by a secondary peduncle (Fig. 1k). This secondary peduncle differs from a typical inflorescence axis in that it lacks the stipules and leaves. Its length is variable within an individual inflorescence. Sometimes the bracts occur down on the secondary peduncle.

*Peixotoa octoflora* is unique in the genus in that each umbel is composed of four pairs of flowers. In each pair one pedicel is sessile while the second pedicel is borne on a short (1–2.5 mm long) primary peduncle (Fig. 21b). The umbels are grouped into a compound inflorescence typical for *Peixotoa*. A primary peduncle is otherwise only very rarely encountered in some individuals of *P. reticulata*.

*Flower.* The terminology used here to describe the various floral parts follows that of Niedenzu (1928), Cuatrecasas (1958), and Anderson (1981), and is illustrated in Fig. 11. The flowers of *Peixotoa* are bilaterally symmetrical with the odd, fifth petal in the posterior position. The remaining petals are grouped into an anterior-lateral pair and a posterior-lateral pair. These petals are reflexed between the sepals, while the posterior petal is erect. The eglandular sepal is designated the anterior sepal, while the other four, like the lateral petals, are grouped into an anterior-lateral pair and a posterior-lateral pair. The plane of symmetry passes through the posterior petal and the anterior sepal. The position of the stamens and staminodes is indicated by the perianth part they oppose. Thus, the stamen opposite the posterior petal is called the posterior stamen. The

3-carpellate ovary is placed so that the plane of symmetry passes through the anterior carpel and between the two posterior carpels. The designation of the style follows that of its carpel, i.e. the anterior style belongs to the anterior carpel. The posterior carpels and styles are alike. No distinction is made between them.

Within the genus the size and to a lesser extent the shape of the floral parts vary, but the arrangement is constant and permits visits by oil-collecting bees in the manner described by Vogel (1974) and Anderson (1979). In brief, the bee lands on the center of the flower, orients itself by the posterior petal, the "flag," whose claw it grasps with its mandibles, and with its front and middle legs reaches between the lateral petals to scrape oil from the calyx glands. Some bees also collect pollen. The oil and pollen are transferred to the hairy hind legs and carried to the nest to serve as food for the larvae. During the bee's visit pollen is rubbed on the underside of the bee and presumably transferred to the stigmas of the next flower visited. The claw of the flag petal of a visited flower commonly shows two lateral indentations which are caused by the pinching grasp of the bee's mandibles.

Sepals. The five valvate sepals are ovate or broadly oblong with an acute apex which becomes recurved or revolute when the flower opens. They are glabrous or variously pubescent adaxially and densely velutinous abaxially. All are densely tomentulose along the margins. These hairs interlock when the sepals are closed in bud. All except the anterior sepal bear a pair of oblong glands on the proximal  $1/3-1/2$  of the free part of the sepal. These glands are green in nature and turn dark brown upon drying. The anterior sepal is usually a little narrower than the lateral four.

Petals. The five petals are yellow, glabrous, and clawed. The four lateral petals are of equal shape and usually of equal size, though the anterior-lateral two are sometimes a little larger than the posterior-lateral two. The flat limb varies from elliptical to obovate to orbicular. *P. andersonii* is unique in that the limbs of its lateral petals are oblanceolate. The margin is usually fimbriate, sometimes denticulate, or sometimes both. The fimbriae and teeth commonly bear tiny glands. The posterior petal, the "flag," differs markedly from the other four. The claw is much longer than and about twice as thick as that of the lateral petals and is continuous with the limb. The posterior limb is also flat, but usually notably smaller than and often of a different shape than the lateral limbs. The margin is either entirely capitate-glandular or only so in the proximal  $1/3-4/5$  with the distal part fimbriate- or denticulate-glandular.

Androecium. The uniseriate androecium is composed of five fertile stamens, opposite the petals, alternating with five sterile staminodes, opposite the sepals. The filaments are connate at the base. The four lateral stamen filaments are usually equally long, but sometimes the anterior-lateral two exceed the posterior-lateral two a little. They are straight or, if very long, curved in the distal  $1/4$  toward the ovary. The posterior stamen filament is usually much shorter than the lateral four and is commonly arced toward the posterior petal. The anthers are basifixed and glabrous. They are all of equal size and have longitudinal, introrse pollen sacs. A prominent glandular connective projects ca 0.3-0.5 mm above the locules; it is lacking only in *P. anadenanthera*. The pollen is apparently released at or just prior to the opening of the flower. In apomictic plants the pollen sacs usually remain closed.

Stuart R. Lowrie, who is completing a comprehensive study of pollen in the Malpighiaceae, has kindly provided me with his findings in *Peixotoa*. The pollen grains of *Peixotoa* are of the cuboidal type that Lowrie believes is unique to the family and typical of most of the genera in Niedenzu's tribe *Banisteriae*. In *Peixotoa* each grain has 12 rugae and 6 pores (Fig. 2). The pores are not placed at the corners of the cube but slightly removed from them. Lowrie determined that they are located at the points of coincidence of an octahedron inscribed in the

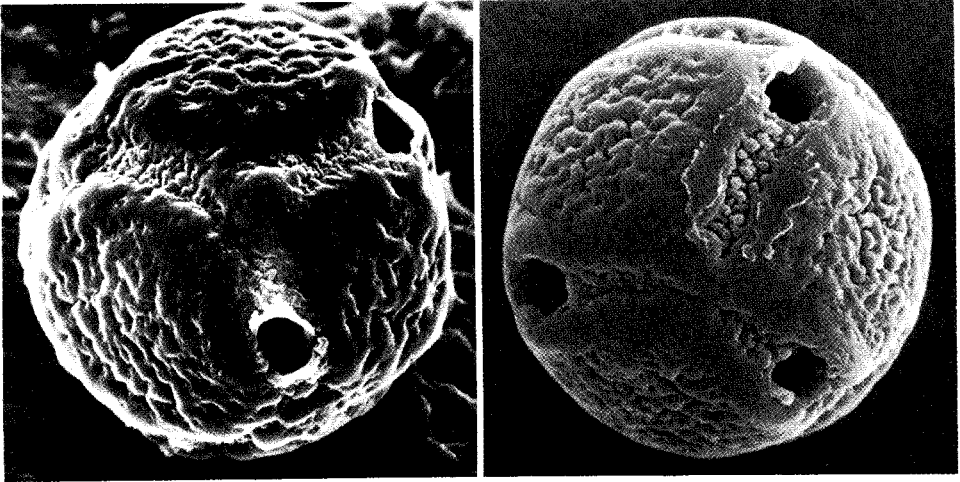


FIG. 2. Pollen of *Peixotoa*. Left, *P. goiana*,  $\times 1300$  (Irwin et al. 17562); right, *P. parviflora*,  $\times 1300$  (Dusén 9225). SEM photographs by S. R. Lowrie.

cube. Though there is considerable variation in the sculpturing of the pollen grains among the species of other genera, the pollen of the various species of *Peixotoa* is relatively uniform. The sizes given in the species descriptions, based on measurements of pollen grains placed in water, range from 42 to 74  $\mu\text{m}$ .

The slender staminode filaments are about half as thick as the stamen filaments and taper toward the apex. Each filament bears a basifixed, obovoid or sometimes spherical gland at the apex. The adaxial face of the gland has a groove in the proximal 1/3–3/4 (–7/8). The apex and abaxial surface are either smooth or the apex has a shallow to deep indentation which is decurrent on the abaxial face. If the indentation is very deep, the glands appear cordate. In *P. irwinii* the apex is smooth, but the abaxial face has a shallow and broad depression. Individual glands bearing one or even two small locules occur in *P. magnifica*, but are rare. Such locules are 0.7–1 mm long, contain largely aborted pollen, and remain closed. The anterior staminode is usually the largest but may equal the anterior-lateral two. The posterior-lateral two are usually the smallest. While the anterior and anterior-lateral filaments are erect, the posterior-lateral two are commonly inflexed between the posterior styles.

**Gynoecium.** The 3-carpellate, 3-loculate ovary is densely velutinous. Each locule is fertile and contains one anatropous, pendent ovule. The styles are free to the base and persistent in fruit. The anterior style is longer or shorter than or equal to the posterior two but always a little stouter. It may be erect but more commonly is arced or inclined toward the posterior petal, rarely toward the anterior sepal. The posterior styles are usually divergent and variously inclined toward the posterior-lateral petals. In *P. parviflora* they are curved toward the anterior-lateral petals. All styles are glabrous or may be very sparsely velutinous, especially near the base. The stigmas are terminal and in nearly all species capitate. The exceptions are *P. jussieuana* and *P. magnifica*, in which the anterior stigma is oblong and borne on the abaxial surface at the apex of a long, strongly curved style.

**Fruits.** The fruits of *Peixotoa* are schizocarps in which each mericarp develops into a velutinous samara. The samaras are grouped around a pyramidal torus and at maturity are suspended by a carpophore. Each samara bears a large dorsal wing which is thickened along the curved, sigmoid, or arced, entire upper (adaxial) margin. The lower margin may be straight, sigmoid or semicircular



and, though at times entire, is commonly somewhat erose. The dorsal wing is usually broadest at the middle or beyond. Each nut also bears two lateral winglets, which are much smaller than the dorsal wing. These are usually rectangular, and entire, erose or coarsely dentate. In some species the lateral wings are semicircular and recurved and give the samara an inflated appearance. In *P. hatschbachii* the lateral wings are absent or reduced to a narrow strip of tissue less than 1.5 mm wide or to a crest. The dorsal and lateral wings are confluent at the base of the nut and sometimes extend into a tooth. The ovoid nut has a triangular or cordate, concave areole. At maturity the seed fills the locule. The embryo has obspatulate, unequal cotyledons. The outer cotyledon is always larger and folded over the inner one. The inner cotyledon may also be folded or may be straight. Sometimes the apices are twisted.

### CHROMOSOME NUMBERS

Counts of  $n=10$  have been obtained for *P. glabra* (Anderson 11549) (W. R. Anderson, pers. comm.) and *P. hispidula* (Ormond *et al.*, 1981). Since  $n=10$  is the base number for *Banisteriopsis* (Gates, 1982), the most probable ancestor of *Peixotoa*, it is most likely that this is also the base number for *Peixotoa*. Counts have also been made of pollen mother cells of the apomictic *P. reticulata* (Anderson 11790). Here  $2n=30$ , but the separation at anaphase I/telophase I is highly irregular. Figures of 17 and 13, 16 and 14 as well as of 15 and 15 pairs occur (W. R. Anderson, pers. comm.). The pollen grains of the voucher, as in the great majority of the specimens of *P. reticulata*, are largely aborted. *P. reticulata* may be a triploid that resulted from a cross between a diploid and a tetraploid.  $N=15$  is otherwise unknown in the Malpighiaceae.

### DISTRIBUTION

*Peixotoa* is composed largely of small shrubs from the cerrados of the Brazilian Planalto and adjacent areas. Vines are commonly found also in woodlands, gallery forests and at forest margins. Three species from Bahia, *P. adenopoda*, *P. paludosa*, and *P. sericea*, and also *P. jussieuana* are reported from caatingas. *P. catarinensis* and *P. hispidula* are coastal species that grow in the coastal forests, restingas, on dunes, and on beaches.

Like many other Planalto groups, *Peixotoa* is characterized by a high degree of endemism. Twenty of the twenty-eight species are found in Minas Gerais and Goiás, of which only two are common to both states. Of the twelve occurring in Minas Gerais, eight are known only from that state. Of these, seven have been reported only from the Serra do Espinhaço. Five of the eight species occurring in Goiás are endemics. Four species are known only from Bahia. Only one species, a coastal endemic, is found in Santa Catarina. Only five species have relatively wide ranges. *P. hispidula*, the other coastal species, ranges from Bahia to Rio de Janeiro. It has also been collected twice from São Paulo. *P. parviflora* occurs in central and southern Minas Gerais, Rio de Janeiro, São Paulo and Paraná. *P. magnifica* is a vine of central and southern Goiás, central Mato Grosso and eastern Bolivia. The range of *P. jussieuana*, a close relative, extends from Ceará to Piauí and Maranhão. It has been collected once in Paraná (an atypical plant). The most widespread species is the apomictic *P. reticulata*. It is common from southern Minas Gerais, southern Goiás and southern Mato Grosso to São Paulo, Paraná, eastern Paraguay, and eastern Bolivia.

### APOMIXIS

Apomixis has not been previously reported in *Peixotoa*. The findings noted here are only a preliminary report. In this treatment "suspected apomicts" will

simply be called "apomicts" for the sake of brevity but also with the understanding that only a thorough study to be undertaken in the future will reveal the mechanisms involved.

Apomixis apparently occurs in five species. In *P. leptoclada* the apomicts are more robust than the sexual individuals but otherwise resemble them closely. There is no such gross morphological difference between the sexual specimens and the one known apomictic collection (Roth 1587) of *P. paludosa*. *P. axillaris* and *P. octoflora*, while clearly distinct taxa, are known only from apomictic material. Since both are from little-collected areas, sexual populations may well be discovered during future field work. The commonest *Peixotoa* is *P. reticulata*, which doubtlessly owes its wide distribution to apomixis.

In the flowers of apomicts the anthers never open and contain largely aborted pollen grains that are 88–99% non-staining in cotton blue in lactophenol. The few grains that do stain are often large and are perhaps unreduced pollen mother cells. Exceptions have been noted only in some individuals of *P. reticulata*. In Krapovickas & Cristóbal 34372 almost 100% of the pollen, contained in closed anthers, does stain; yet, the grains are abnormal in that they are small and very thick-walled. In a few specimens some flowers do have open anthers which often contain a lower percentage of non-staining grains than do closed anthers. For example, in Fiebrig 4590 pollen from the open anthers is 45% non-staining, while pollen from closed anthers is 94% non-staining. However, in Hatschbach 21770 the pollen from closed as well as from the few open anthers is only ca 3% non-staining. Only two collections are known in which all flowers have all anthers open. In Mexia 5798, the staining of the pollen is highly variable. The percentage of grains that do not stain ranges from 45–89% per anther. In the second collection, Occhioni 5775, nearly all the grains do stain. Perhaps this is a rare sexual individual. Examination of pollen mother cells of *P. reticulata* (Anderson 11890) revealed that while  $2n=30$ , the separation at anaphase I / telophase I is highly irregular with 17 and 13, 16 and 14, or 15 and 15 pairs segregating to the opposite poles (W. R. Anderson, pers. comm.). Such irregular meiosis would account for the high percentage of aborted pollen. Yet, if occasionally the separation is regular, some functional pollen could be produced. Since the anthers do open sometimes in some individuals, it may be possible for an apomict to function as a male parent. Of course, it is also possible that an apomict may function as a female parent.

In areas where the range of *P. reticulata* overlaps with that of sexual species, some hybridization apparently does take place. Anderson 8564 from the Gouvêia-Diamantina area in Minas Gerais has the glabrous foliage and the indented staminode glands of *P. glabra* but otherwise is like specimens of *P. reticulata* in that area. A number of collections from southern Goiás and the Distrito Federal are intermediate in various flower characters between *P. reticulata* and *P. goiana*. Hatschbach 2465 from Terenos, Mato Grosso, has fruits similar to those of *P. magnifica* in that the dorsal and the lateral wings are relatively large and extend into a long (ca 0.5 cm) tooth below the nut. Other collections from southern Mato Grosso and also from Paraguay have some attributes of *P. cordistipula*, a species of central Mato Grosso and eastern Bolivia. The readily recognizable regional types have perhaps originated as sterile hybrids that were apomictically propagated.

The apomicts are morphologically highly variable, especially in the shape and size of the flower. On the other hand, the differences in curvature and size, especially in length, of the stamens, staminodes and the styles are minimal. In sexual species these differences are generally constant. In apomictic individuals, especially of *P. reticulata*, it is not unusual to encounter flowers in which the stamens, staminodes and styles are subequal and erect. Teratologies, such as flowers with extra floral parts, have been noted in apomicts but are exceedingly

rare in sexual species. All of these morphological changes in the apomictic plants may reflect the relative unimportance of presenting the flower to the pollinator to assure seed set.

The fruit set in apomictic plants tends to be unusually high, often 100% or nearly so. Apparently maturation of the fruit begins soon after the flowers open. In *Irwin 17830* it seems to begin even earlier. Here the petals do not expand but are lifted like a cap and then shed by the developing fruit. Study of the seeds shows that polyembryony is sometimes involved. Often the seed contains both a normal embryo and an additional, smaller one. This extra embryo is commonly misshapen or may be an unformed mass of tissue.

## TAXONOMY

**Peixotoa** Adr. Jussieu in St. Hilaire, Fl. Bras. Mer. 3: 60. 1832 [1833].

Vines or shrubs or subshrubs with erect, ascending, scandent, pendent, or procumbent branches. Vegetative branches glabrous or velutinous or tomentose when young, the pubescence commonly abraded from older parts. Stipules large, interpetiolarly connate, the pair cordate or triangular, entire with the apex acute or notched or bifid, variously pubescent or glabrous adaxially and abaxially, persistent or deciduous, margins tomentulose, flat or recurved; inflorescence stipules often concave, enclosing immature umbels. Leaves opposite and decussate, petiolate, the lamina simple, often rugose, ovate, elliptical, obovate, rhombic, suborbicular, lanceolate, or oblanceolate, the apex apiculate or sometimes acuminate, the base cordate or subtruncate, velutinous or glabrous above (sericeous in *P. adenopoda* and *P. sericea*, sometimes tomentulose in *P. cipoana*), pubescent with T-shaped hairs, tomentose, woolly or glabrous below (sericeous in *P. adenopoda* and *P. sericea*), the veins prominent below, margins entire, recurved, with a pair of glands at the base at the costa or borne in the proximal  $\frac{1}{3}$  of the lamina away from the base and costa, sometimes with 1 to 4 smaller, additional glands, these sometimes variously fused, or the glands absent; glands discoid or slightly oblong, prominent, sessile (stalked in *P. adenopoda* and *P. hatschbachii*). Inflorescence leaves smaller than the cauline, petiolate or sessile, lanceolate, oblanceolate, triangular, linear, or subulate. Inflorescence terminal and/or axillary, of 4-flowered umbels (8-flowered in *P. octoflora*), borne in compound dichasia or thyrses with axes to the 6th order (or the umbel solitary in *P. axillaris* and *P. hispidula*), with 1 sessile umbel per node, or the distal lateral branches suppressed and then the terminal nodes with 3 umbels and the subterminal nodes with 1 or 2 umbels per leaf axil, these umbels sessile or borne on secondary peduncles, primary peduncles absent (present in *P. octoflora*). Bracts and bracteoles present and persistent, or absent, triangular, oblong, semicircular, or subrectangular, variously pubescent or glabrous. Pedicels pubescent, always stouter and commonly longer in fruit. Sepals 5, valvate, ovate or broadly oblong, apex acute, recurved or revolute, variously pubescent or glabrous adaxially, densely velutinous abaxially, margins tomentulose, the anterior sepal eglandular, the 4 lateral sepals each with a pair of oblong glands entirely borne on the free part of the sepal in the proximal  $\frac{1}{3}$  or  $\frac{1}{2}$ . Petals yellow, glabrous, clawed, the limb orbicular, obovate, or elliptical (oblanceolate in *P. andersonii*), the 4 lateral petals equal or subequal, the margins fimbriate or denticulate or both, glandular or eglandular, the posterior petal with a thicker, longer claw and a usually smaller limb than the lateral petals, its margin capitate-glandular or only so in the proximal part, the distal section fimbriate- or denticulate-glandular. Androecium uniseriate, the filaments connate at the base; fertile stamens 5, opposite the petals, the 4 lateral filaments equal or subequal, erect, the posterior filament usually shorter, arced or inclined toward the posterior

petal or erect, anthers basifixed, glabrous, with a prominent glandular connective (absent in *P. anadenanthera*), pollen sacs longitudinal, introrse, pollen cuboidal, with 12 rugae and 6 pores. Staminodes 5, sterile, opposite the sepals, the filaments ca  $\frac{1}{2}$  as wide as the stamen filaments, tapered, the anterior and anterior-lateral filaments erect, the posterior-lateral filaments usually inflexed between the posterior styles, bearing apical glands (modified sterile connectives), the glands basifixed, obovoid or spherical, glabrous, with a groove in the proximal  $\frac{1}{3}$ – $\frac{3}{4}$  ( $-\frac{7}{8}$ ) in the adaxial face, the apex smooth or with a shallow or deep indentation decurrent on the abaxial face (in *P. irwinii* the apex smooth, the abaxial face with a broad, shallow depression), the anterior and anterior-lateral staminodes usually larger than the posterior-lateral 2. Ovary densely velutinous, three-carpellate, three-loculate, with one anatropous, pendent ovule. Styles 3, free to the base, glabrous or sparsely velutinous, especially near the base, the anterior style arced or inclined toward the posterior petal or erect, longer or shorter than or equal to the posterior two, the posterior styles usually divergent, curved or inclined toward the posterior-lateral petals (toward the anterior-lateral petals in *P. parviflora*), stigmas terminal, capitate (in *P. magnifica* and *P. jussieuana* the anterior stigma oblong and borne at the apex but laterally on the abaxial surface). Torus pyramidal. Fruit schizocarpic, each mericarp a samara, velutinous, suspended by a carpophore, with a large dorsal wing and 2 much smaller lateral winglets (these much reduced or absent in *P. hatschbachii*), the 3 wings sometimes forming a basal tooth, areole cordate or triangular, nut ovoid, the mature seed filling the locule, the embryo with unequal, obspatulate cotyledons, the large outer cotyledon folded over the smaller, folded or straight, inner cotyledon. Chromosome number  $n=10$ .

Lectotype. *Peixotoa glabra* Adr. Jussieu.

#### NOTES ABOUT THE KEY TO THE SPECIES

*Peixotoa* is a homogeneous genus whose species are often separated on the basis of microscopic characters. To use this key it is essential to have an understanding of the structure of the flower and of the inflorescence. The reader who is not familiar with the genus is urged to read the section Anatomy and Morphology and to consult Fig. 1. The terminology used follows that of Niedenzu (1928), Cuatrecasas (1958), and Anderson (1981). It is necessary to revive dried flowers to ascertain the shapes and sizes of the petals, stamens, staminodes, and styles. For this purpose Pohl's solution (Pohl, 1965) was found to be a superior wetting agent. Measurements for floral parts, except for the sepals, are taken from revived material. The measurements for the wings of the samara are indicated as follows. In the dorsal wing the distance from the attachment at the nut to the farthest margin is the "length"; the maximum measurement at right angles to this length is the "width." For each lateral winglet, the maximum measurement from the attachment at the nut to the farthest margin is the "width"; the maximum measurement at right angles to this width is the "height." Since a large number of species are endemics, geographical ranges are listed in the key. The discussion following each species description cites the most distinguishing characters which help to separate that species from morphologically similar species and from those within its range. The reader may also find it useful to refer to the illustrations which are provided for each species.

*P. reticulata* is an apparently apomictic and polyphyletic assemblage. The anthers of all or of nearly all flowers remain closed. This condition is used here to key *P. reticulata*. Of all the collections examined only two have all anthers open. This condition has been omitted from the key. Since *P. reticulata* is highly variable and apparently hybridizes with some sexual species, structuring the key

to include all the possible morphological variation for this exceedingly rare condition would make the key extremely complicated and difficult to use. Therefore, the reader is cautioned that if his specimen, bearing open anthers, does not key and is from the range of *P. reticulata*, he may have another such rare individual. In such a case, it is suggested that for correct determination the description and illustrations of *P. reticulata* and of the sexual species of the same range be compared.

### KEY TO THE SPECIES OF *PEIXOTOA*

1. Lower surface of the stem leaves glabrous or very sparsely pubescent with the few hairs restricted to the major veins and margins.
  2. Anthers closed. (Minas Gerais) 25. *P. reticulata*.
  2. Anthers open.
    3. Glands of the stem leaves stalked. (Goiás) 13. *P. hatschbachii*.
    3. Glands of the stem leaves sessile or absent.
      4. Inflorescence commonly of 1 or 3 or 5 umbels, occasionally more, 3° axes absent; all inflorescence leaves petiolate; limb of the lateral petals 13–20 mm long; anterior and anterior-lateral staminode glands wider than long. (Coastal regions from Bahia to São Paulo) 15. *P. hispidula*.
      4. Inflorescence of more than 5 umbels, 3° axes usually present; the more distal inflorescence leaves sessile or subsessile; limb of the lateral petals 7–14 (–16) mm long; anterior and anterior-lateral staminode glands longer than wide or as long as wide.
        5. Limb of the posterior petal (4–) 5.2–7.5 mm long, (3.2–) 3.8–4.5 mm wide, oblong, elliptical, or obovate; limbs of the lateral petals with a fimbriate margin.
          6. Petioles glabrous; limbs of the lateral petals orbicular; staminode glands of equal size; anterior style shorter than the posterior two. (Minas Gerais) 11. *P. glabra*.
          6. Petioles golden velutinous; limbs of the lateral petals obovate; anterior and anterior-lateral staminode glands larger than the posterior-lateral two; anterior style equal to the posterior two. (Minas Gerais) 16. *P. irwinii*.
        5. Limb of the posterior petal 7.5–9 mm long, 6.8–10 mm wide, orbicular or obovate; limbs of the lateral petals with a fimbriate and/or denticulate margin.
          7. Pedicels and inflorescence leaves densely white velutinous; limb of the posterior petal 8.5–9 mm long, 8.5–10 mm wide, obovate; limbs of the lateral petals 11–14.5 mm wide, the margin denticulate; filaments of the posterior-lateral staminodes 3.4–3.8 mm long, the glands 1.2–1.3 mm long, 1.1–1.2 mm wide; anterior style inclined toward the posterior petal. (Mato Grosso) 24. *P. psilophylla*.
          7. Pedicels and inflorescence leaves usually golden (sometimes white) velutinous; limb of the posterior petal 7.5–8.3 mm long, 6.8–8 mm wide, orbicular; limbs of the lateral petals 9–12 mm wide, the margin fimbriate and/or denticulate; filaments of the posterior-lateral staminodes 2.8–3.5 mm long, the glands 1–1.1 mm long, 0.9–1 mm wide; anterior style erect. (Goiás) 12. *P. goiana*.
1. Lower surface of the stem leaves pubescent, hairs not restricted to the major veins and margins.
  8. Terminal inflorescence nodes bearing more than 4 flowers.
    9. Glands of the stem leaves borne on the surface of the lamina away from the base and costa, or absent.
      10. Glands of the stem leaves stalked, 0.8–1.5 mm in diameter; anterior and anterior-lateral staminode glands with an indentation across the apex and decurrent on the abaxial face. (Bahia) 1. *P. adenopoda*.
      10. Glands of the stem leaves sessile, 0.2–0.7 mm in diameter; anterior and anterior-lateral staminode glands smooth. (Santa Catarina) 7. *P. catarinensis*.
    9. Glands of the stem leaves borne at the base of the lamina at the costa or halfway on the petiole, or rarely on the petiole just below the lamina.
      11. Each individual umbel 8-flowered, consisting of 4 pairs of flowers, each pair with one pedicel sessile and one pedicel borne on a short primary peduncle (1–2.5 mm long). (Mato Grosso) 21. *P. octoflora*.
      11. Each individual umbel 4-flowered, all pedicels sessile (rarely 1 pedicel in an umbel with a primary peduncle in *P. reticulata*).

12. Anthers of all or of almost all flowers closed. (Minas Gerais, São Paulo, Paraná, southern Goiás, southern and central Mato Grosso, eastern Paraguay, eastern Bolivia) 25. *P. reticulata*.
12. Anthers of all flowers open.
13. Limb of the lateral petals oblanceolate; petioles of the stem leaves 8–13 mm long; anterior and anterior-lateral staminode glands with an indentation across the apex and decurrent on the abaxial face. (Minas Gerais) 3. *P. andersonii*.
13. Limb of the lateral petals orbicular, broadly elliptical, or broadly obovate; petioles of the stem leaves 4–20 (–32) mm long; anterior and anterior-lateral staminode glands smooth.
14. Limb of the lateral petals (4.3–) 5.2–9.5 mm long, (4–) 5–8.5 mm wide; leaves loosely pubescent with T-shaped hairs or loosely tomentose below; lateral umbels always borne on secondary peduncles; all inflorescence leaves petiolate; posterior styles curved toward the anterior-lateral petals; pubescence of the inflorescence axes commonly white (sometimes golden), sparse to moderate (rarely dense). (Minas Gerais, Rio de Janeiro, São Paulo, Paraná) 23. *P. parviflora*.
14. Limb of the lateral petals 9.5–12.3 mm long, 10–11 mm wide; leaves woolly, tomentose, or sometimes pubescent with T-shaped hairs and tomentose below; lateral umbels sessile or borne on secondary peduncles; all or only the distal inflorescence leaves sessile or subsessile, or sometimes all petiolate; posterior styles inclined toward the posterior-lateral petals; pubescence of the inflorescence axes golden, very dense and obscuring the epidermis. (Minas Gerais) 28. *P. tomentosa*.
8. Terminal inflorescence nodes bearing 4 flowers.
15. Inflorescence borne on a short axillary shoot (less than 1 cm long), of 1 or 3 umbels; 2° axes less than 5 mm long or absent. (Goiás) 4. *P. axillaris*.
15. Inflorescence terminal or if axillary borne on a shoot more than 1 cm long, of at least 3 umbels, usually many more (except commonly of 1 or 3 umbels in *P. hispidula*); 2° axes more than 5 mm long.
16. Anthers of all or of almost all flowers closed.
17. Leaf glands borne on the surface of the lamina away from the base and the costa, or one or both glands absent; limb of the posterior petal 5.3–7 mm long. (Minas Gerais, Bahia) 22. *P. paludosa*.
17. Leaf glands borne at the base of the lamina at the costa or halfway on the petiole (sometimes in very large leaves of *P. leptoclada* with a second pair of glands, or rarely only with one pair of glands, borne on the surface of the lamina away from the base and costa); limb of the posterior petal 7.5–12 mm long.
18. Secondary peduncles absent; inflorescence stipules persistent or sometimes deciduous at the most proximal nodes, large, even the most distal 7–17 mm long; limb of the posterior petal with a capitate-glandular margin. (Minas Gerais, Goiás) 18. *P. leptoclada*.
18. Secondary peduncles up to 6 mm long or absent; inflorescence stipules usually deciduous but present at the nodes of recently opened flowers, small, the most distal 5–6 mm long or less; limb of the posterior petal with the margin capitate-glandular in the proximal 1/2–4/5, fimbriate-glandular in the distal 1/5–1/2, or sometimes entirely capitate-glandular. (Minas Gerais, São Paulo, Paraná, southern Goiás, southern and central Mato Grosso, eastern Paraguay, eastern Bolivia) 25. *P. reticulata*.
16. Anthers of all flowers open.
19. Anthers lacking a glandular connective. (Goiás) 2. *P. anadenanthera*.
19. Anthers bearing a glandular connective.
20. All or at least the most distal inflorescence leaves sessile.
21. Laminas sericeous below, the hairs sessile or subsessile; base of the lamina cuneate. (Bahia) 26. *P. sericea*.
21. Laminas pubescent with T-shaped hairs or tomentose or woolly below, the hairs stalked; base of the lamina cordate or subtruncate.
22. Anterior and anterior-lateral staminode glands with an indentation across the apex and decurrent on the abaxial face.

23. Stem leaves sparsely to densely pubescent with T-shaped hairs below; limb of the posterior petal 6.8–8 (–9) mm wide, orbicular or rarely broadly obovate; limbs of the lateral petals with a fimbriate or denticulate margin; posterior-lateral staminode glands 1–1.1 mm long, 0.9–1 mm wide. (Goiás) 12. *P. goiana*.
23. Stem leaves tomentose or woolly below; limb of the posterior petal 4–6.2 mm wide, elliptical or narrowly obovate; limbs of the lateral petals with a fimbriate margin; posterior-lateral staminode glands 1.2–1.4 mm long, 1.1–1.3 mm wide.
24. Anterior and anterior-lateral staminode glands recurved, 1.4–1.6 mm long, 1.3–1.5 mm wide; stem leaves velutinous or tomentulose above, woolly below; anterior style shorter than the posterior two. (Minas Gerais) 8. *P. cipoana*.
24. Anterior and anterior-lateral staminode glands straight, 1.2–1.4 mm long, 1.1–1.3 mm wide; stem leaves velutinous above, tomentose below; styles about equally long. (Minas Gerais) 6. *P. barnebyi*.
22. Anterior and anterior-lateral staminode glands smooth.
25. Hairs of the younger branches and commonly also of the more proximal inflorescence internodes with stalks 0.5 mm or more long (often 1 mm or more long.)
26. Limb of the posterior petal ca 6.5 mm long, ca 5 mm wide, obovate; limbs of the lateral petals 9–9.5 mm long, 8–8.5 mm wide; anterior and anterior-lateral staminode glands equal but larger than the posterior-lateral two; pedicels never arranged around a central glandular mass. (Minas Gerais) 14. *P. hirta*.
26. Limb of the posterior petal ca 8.5 mm long, ca 9 mm wide, orbicular; limbs of the lateral petals 11–11.5 mm long, ca 12 mm wide; all staminode glands equally long, the posterior-lateral two narrower than the anterior and anterior-lateral three; pedicels sometimes arranged around a central glandular mass. (Goiás) 10. *P. gardneri*.
25. Hairs of the stem and inflorescence axes with stalks less than 0.5 mm long.
27. Stem and inflorescence stipules 16–23 mm long, persistent; limbs of the lateral petals 16–16.6 mm long, 15–16 mm wide; posterior styles 5.4–5.5 mm long. (Bahia) 20. *P. megalantha*.
27. Stem stipules 4–13 (–19) mm long, deciduous or sometimes persistent, inflorescence stipules usually smaller, the most distal ca 5–6 mm long or less, deciduous; limbs of the lateral petals 9.6–12 (–15) mm long, 8–12 (–15) mm wide; posterior styles 3.3–4.7 mm long.
28. Limb of the posterior petal 7.5–10 mm long, 6.8–9 mm wide, orbicular or sometimes broadly obovate, ca 2/3–3/4 as wide as the limbs of the lateral petals. (Goiás) 12. *P. goiana*.
28. Limb of the posterior petal 6–7 mm long, 4–5 mm wide, elliptical or slightly obovate, 1/3–1/2 as wide as the limbs of the lateral petals.
29. Limbs of the lateral petals elliptical or obovate, their margins denticulate with the teeth up to 0.3 mm long; anterior style shorter than the posterior two. (Bahia) 5. *P. bahiana*.
29. Limbs of the lateral petals orbicular, their margins fimbriate with the fimbriae up to 0.8 (–1) mm long; styles about equally long. (Minas Gerais) 6. *P. barnebyi*.

20. All inflorescence leaves petiolate.
30. Anterior and anterior-lateral staminode glands with an indentation across the apex and decurrent on the abaxial face.
31. Inflorescence commonly of 1 or 3 or 5 umbels, occasionally more, 3° axes absent; anterior and anterior-lateral staminode glands wider than long; limbs of the lateral petals 13–20 mm long. (Coastal regions from Bahia to São Paulo)  
15. *P. hispidula*.
31. Inflorescence of more than 5 umbels, 3° axes usually present; anterior and anterior-lateral staminode glands longer than wide or as long as wide; limbs of the lateral petals 9.5–14 mm long.
32. Glands of the stem leaves borne on the surface of the lamina away from the base and costa. (Minas Gerais)  
27. *P. spinensis*.
32. Glands of the stem leaves borne at the base of the lamina at the costa.
33. Petioles of the stem leaves 8–13 mm long; limbs of the lateral petals oblanceolate. (Minas Gerais)  
3. *P. andersonii*.
33. Petioles of the stem leaves 2–5 mm long; limbs of the lateral petals orbicular. (Minas Gerais)  
6. *P. barnebyi*.
30. Anterior and anterior-lateral staminode glands smooth.
34. Anterior style 5–9.2 mm long, usually strongly arced toward the posterior petal, bearing an oblong stigma at the apex but laterally on the abaxial surface (or rarely with the apex uncinately and bearing a capitate stigma.)
35. Limbs of the lateral petals 15–17.8 mm long and wide, orbicular; styles 7.3–9 mm long; stem stipules (9.3–) 12–23 mm long. (Goiás, Mato Grosso)  
19. *P. magnifica*.
35. Limbs of the lateral petals 10.5–12 mm long, ca 9–10 mm wide, obovate; styles 5–6.5 mm long; stem stipules ca 6–8 mm long. (Ceará, Piauí, Maranhão, Paraná)  
17. *P. jussieuana*.
34. Anterior style 2.6–5.5 mm long, arced or inclined toward the posterior petal (or rarely toward the anterior sepal) or erect, bearing a capitate stigma, apex never uncinately.
36. Inflorescence stipules large, even the most distal 7–17 mm long, persistent or sometimes deciduous at the most proximal nodes.
37. Pedicels commonly arranged around a central glandular mass up to 2.5 mm in diameter; limb of the posterior petal with the margin capitate-glandular in the proximal 1/2–2/3, fimbriate-glandular in the distal 1/3–1/2; anterior style longer than the posterior two; posterior-lateral staminode glands smaller than the anterior and anterior-lateral three. (Mato Grosso, eastern Bolivia)  
9. *P. cordistipula*.
37. Pedicels never arranged around a central glandular mass; limb of the posterior petal with the margin capitate-glandular; anterior style shorter than the posterior two; staminode glands all equally long but the posterior-lateral two narrower than the anterior and anterior-lateral three. (Goiás, Minas Gerais)  
18. *P. leptoclada*.
36. Inflorescence stipules small, the most distal 5–6 mm long or less, usually deciduous but often present at nodes bearing recently opened flowers.
38. Glands of the stem leaves borne on the surface of the lamina away from the base and costa, or sometimes on some leaves one or both glands absent. (Minas Gerais, Bahia)  
22. *P. paludosa*.
38. Glands of the stem leaves borne at the base of the lamina at the costa or halfway on the petiole.
39. Limb of the posterior petal 7.5–10 mm long, 6.8–9 mm wide, orbicular or sometimes broad-



- ly obovate, ca  $2/3-3/4$  as wide as the limbs of the lateral petals; anterior style shorter than the posterior two. (Goiás) 12. *P. goiana*.
39. Limb of the posterior petal 6–7 mm long, 4–5 mm wide, elliptical, ca  $1/3-1/2$  as wide as the limbs of the lateral petals; styles about equally long. (Minas Gerais) 6. *P. barnebyi*.

**1. *Peixotoa adenopoda* C. Anderson, sp. nov.**

Fig. 12.

Liana. Stipulae vegetativae 7–16 mm longae, acutae vel bifidae, plerumque persistentes. Petioli 4–8 mm longi. Laminae 4.8–9.5 cm longae, 1.3–4.8 cm latae, ellipticae vel parum obovatae vel lanceolatae, rugosae, apice apiculatae vel acuminatae, supra sparsim aureo-velutinae vel sparsim aureo-sericeae, subtus sparsim et laxe aureo-sericeae, ferentes 2 glandulas pedicellatas 1.7–10 mm supra basim 1.2–6 mm a costa. Folia inflorescentiae petiolo brevi, distaliora linearia vel triangularia, apice acuminata vel caudata. Inflorescentia terminalis vel axillaris, umbellis singularibus in nodis subterminalibus, umbellis 3 in nodis terminalibus, pedunculis secundariis 0.5–3 mm longis. Bractea bracteolaeque praesentes. Pedicelli 11–20 mm longi. Sepala 4–5 mm longa. Limbus petalorum lateralium 10–10.5 mm longus, orbicularis, margine glanduloso-fimbriato. Limbus petali postici ca 6 mm longus, ellipticus vel anguste obovatus, margine glandulis capitatis ornato. Glandulae 3 staminodiorum anticorum apice profunde indentatae, indentatione in pagina abaxiali decurrenti. Styli subaequales vel anticus brevior, 2.8–3.6 mm longi, anticus parum arcuatus versus petalum posticum, postici divergentes, inclinati versus petala postico-lateralia; stigmata capitata. Samara ignota.

Vine. Vegetative branches purplish-brown, velutinous, pubescence abraded from older parts. Stem stipules 7–16 mm long, 7.6–17 mm wide, cordate, entire with the apex acute, or bifid, glabrous or finely, sometimes sparsely, velutinous or tomentulose adaxially, appressed sericeous abaxially, usually persistent; inflorescence stipules gradually decreasing in size toward the distal nodes, the smallest not less than 5 mm long, 3 mm wide, commonly persistent. Stem leaves with the petiole 4–8 mm long, densely and loosely golden velutinous, laminae 4.8–9.5 cm long, 1.3–4.8 cm wide, elliptical or slightly obovate to lanceolate, apex apiculate or in the narrower acuminate, base cordate or almost truncate, rugose, sparsely golden velutinous-sericeous above, sparsely golden sericeous below, a pair of stalked glands borne on the surface of the lamina, 1.7–10 mm above the base, 1.2–6 mm from the costa, each gland 0.8–1.5 mm in diameter, stalk 0.8–1 mm high. Inflorescence leaves with the petiole ca 1 mm or more long, laminae abruptly smaller than the cauline, the smallest 1.3 mm long, 0.7 mm wide, the most proximal elliptical or linear-lanceolate, the more distal narrowly triangular or linear, apex acuminate or caudate, sparsely sericeous or glabrous above, sparsely sericeous below, a pair of glands at or near the base at or near the costa, each gland 0.5–1 mm in diameter, the glands stalked in the most proximal, sessile in the more distal. Inflorescence terminal or axillary, the axes loosely sericeous or velutinous, internodes of the primary axis 0.6–3.5 cm long, 2° axes 1–6 cm long, 3° axes 6.5–12 mm long, subsidiary axes absent, at the more distal nodes the 2° and 3° axes usually suppressed, with 1 or 2 umbels sessile or borne on secondary peduncles in the leaf axil, always with 3 umbels at the terminal nodes, or occasionally with only 1 umbel at the terminal node of a 3° axis, each umbel 4-flowered, primary peduncles absent, secondary peduncles up to 3 mm long or absent. Bracts 0.5–1 mm long, 0.2–0.6 mm wide, triangular, glabrous or very sparsely velutinous on both surfaces and on the margins; bracteoles 0.1–0.3 mm long and wide, oblong, triangular or semicircular,

glabrous, sometimes the margins velutinous. Pedicels 11–20 mm long, velutinous. Sepals 4–5 mm long, 1.3–2 mm wide, adaxially very sparsely velutinous or tomentulose, more densely so near the apex, glands 1.2–1.5 mm long. Claw of the lateral petals ca 2 mm long, limb 10–10.5 mm long and wide, orbicular, base attenuate, fimbriae up to 0.3 mm long, glandular, claw of the posterior petal 4–4.3 mm long, limb ca 6 mm long, ca 4 mm wide, elliptical or narrowly obovate, fimbriae up to 0.4 mm long, capitate-glandular. Filaments of the lateral stamens 3.4–3.6 mm long, posterior filament 2.5–2.6 mm long, arced toward the posterior petal, anthers 1.1–1.2 mm long, glandular connectives ca 0.5 mm long. Pollen grains ca 42  $\mu$ m. Filaments of the anterior staminode 4–4.2 mm long, anterior-lateral filaments 3.3–3.7 mm long, posterior-lateral filaments 2.6–2.8 mm long, inflexed between the posterior styles, anterior and anterior-lateral glands ca 1.2 mm long and wide, posterior-lateral glands ca 1.1 mm long, 0.9–1 mm wide, anterior and anterior-lateral glands with a deep indentation across the apex and decurrent on the abaxial face, posterior-lateral glands smooth. Styles 2.8–3.6 mm long, anterior styles ca 0.4 mm wide, sometimes shorter but always a little stouter than the posterior two, slightly curved toward the posterior petal, posterior styles ca 0.3 mm wide, strongly divergent, inclined toward the posterior-lateral petals, all styles velutinous in the proximal 1/3 of their lengths, stigmas 0.4–0.5 mm in diameter, capitate. Samara not seen.

Type. *Jesus* 392. Brazil. Bahia: Maracás, saída de Itiruçu, 20 May 1969 (holotype CEPEC, isotype MICH).

Paratype. *Pinheiro* 1870. Brazil. Bahia: Rod. Itiruçu-Maracás, 8 July 1972 (CEPEC, MICH).

*Peixotoa adenopoda* is known only from the type and the paratype (Fig. 3). It is one of four species in which the terminal inflorescence nodes bear three umbels and thus are 12-flowered. It is readily distinguished from the other three by its stalked leaf glands which are borne on the surface of the lamina away from the base and either away from the costa or adjacent to it. The leaf glands of *P. catarinensis*, *P. parviflora*, and *P. tomentosa* are sessile. None of these species

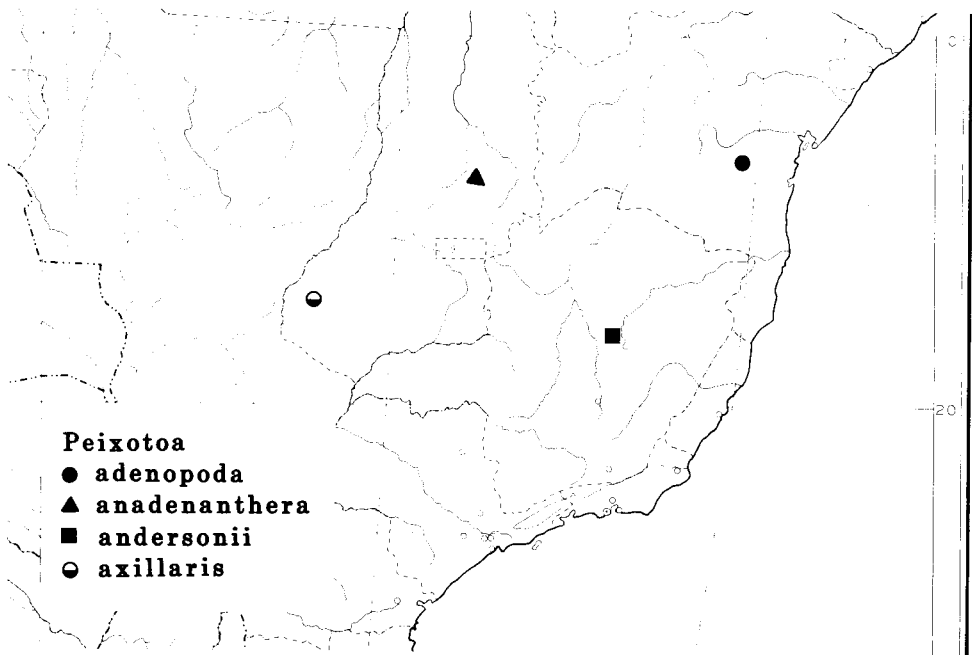


FIG. 3. Distribution of *P. adenopoda*, *P. anadenanthera*, *P. andersonii*, and *P. axillaris*.

occurs in Bahia. The only other species with stalked but basal leaf glands is the glabrous *P. hatschbachii* of south-central Goiás. *P. adenopoda* is also unusual in that its leaves are sericeous. *P. sericea*, also from Bahia, is the only other species in the genus with sericeous leaves. It has sessile leaf glands, and its terminal inflorescence nodes bear a single umbel, i.e., are 4-flowered.

**2. *Peixotoa anadenanthera* C. Anderson, sp. nov.**

Fig. 13.

Frutex pauciramisus usque ad 1.5 m. Caules dense aureo-velutini. Stipulae vegetativae 7.3–7.5 mm longae, anguste triangulares, deciduae. Petioli 2.5–6 mm longi. Laminae 7–11 cm longae, 3.2–5.3 cm latae, anguste ellipticae vel lineari-lanceolatae, supra aureo-velutinae, subtus aureo-tomentosae, basi costae biglandulosae vel glandulis apice petioli. Folia inflorescentiae petiolo brevi vel sessilia, linearia vel subulata, distaliora decurrentia, petiolis basi biglandulosis. Inflorescentia axillaris, umbellis singularibus. Bractee bracteolaeque praesentes. Pedicelli 11–26 mm longi. Sepala ca 5.2 mm longa. Limbus petalorum lateralium 9.5–ca 10 mm longus, late obovatus, margine glanduloso-fimbriato. Limbus petali postici 6.2–6.5 mm longus, obovatus, margine  $\frac{3}{4}$  proximalibus glandulis capitatis ornato,  $\frac{1}{4}$  distali fimbriato vel denticulato, glanduloso vel eglanduloso. Antherae sine connectivo glanduloso. Stylus anticus 3.3–3.5 mm longus, erectus vel parum inclinatus versus petalum posticum, styli postici 3.6–4 mm longi, parum divergentes, parum inclinati versus petala postico-lateralia; stigmata capitata. Samara ignota.

Little-branched shrub to 1.5 m. Vegetative branches densely golden velutinous, pubescence abraded from older parts. Stem stipules 7.3–7.5 mm long, 4–6.5 mm wide, narrowly triangular, apex acute, tomentulose to glabrate adaxially, densely tomentulose-velutinous abaxially, deciduous; inflorescence stipules like the cauline, sometimes smaller, the smallest not less than 3.6 mm long, 3.5 mm wide, persistent (?). Stem leaves with the petiole 2.5–6 mm long, densely velutinous, laminae 7–11 cm long, 3.2–5.3 cm wide, narrowly elliptical or linear-lanceolate, apex apiculate, base truncate, rugose, golden velutinous above, golden tomentose below, a pair of sessile glands hidden in the dense pubescence halfway on the petiole or on the petiole up to 1 mm below the lamina, each gland 0.6–1.2 mm in diameter, or sometimes the glands absent. Inflorescence leaves with a petiole 3.5 mm or less long, or subsessile or sessile, laminae abruptly smaller than the cauline, the smallest not less than 2.5 mm long, 0.1 mm wide, linear to subulate, apex acute or acuminate, the petiolate with the base decurrent, tomentulose and pubescent with T-shaped hairs above, densely tomentulose-velutinous below, a pair of glands at the base of the petiole in petiolate leaves, at the base of the lamina at the costa in sessile leaves, each gland 0.4–0.7 mm in diameter. Inflorescence terminal or axillary, internodes of the primary axis 0.9–5.8 cm long, mature secondary axes not seen, tomentulose-velutinous, subsidiary axes absent; umbels 4-flowered, one umbel per node, primary and secondary peduncles absent. Bracts 0.8–1.1 mm long, ca 0.3 mm wide, narrowly triangular, glabrous; bracteoles ca 0.3 mm long, ca 0.2 mm wide, triangular, glabrous. pedicels 11–26 mm long, densely tomentulose-velutinous. Sepals ca 5.2 mm long, ca 2.3 mm wide, adaxially the proximal  $\frac{1}{3}$  glabrous, the distal  $\frac{2}{3}$  tomentulose, glands 1.8–2.2 mm long, 0.8–1.1 mm wide. Claw of the lateral petals 2–2.5 mm long, limb 9.5–10 mm long and wide, broadly obovate, base briefly attenuate, margin irregularly fimbriate-denticulate, fimbriae/teeth up to 0.5 mm long, glandular. Claw of the posterior petal 3.5–4 mm long, limb 6.2–6.5 mm long, 5.2–5.5 mm wide, obovate, fimbriae up to 0.4 mm long, those of the proximal  $\frac{3}{4}$  capitate-glandular, the distal  $\frac{1}{4}$  fimbriate-denticulate, glandular or eglandular. Filaments of the anterior-lateral and the posterior stamens 3.2–3.5 mm long, posterior filament slightly curved toward the posterior petal,

posterior-lateral filaments 3.6–3.7 mm long, anthers 1.5–1.7 mm long, glandular connectives absent. Pollen grains ca 50  $\mu\text{m}$ . Filaments of the anterior and the posterior-lateral staminodes 3.1–3.3 mm long, posterior-lateral filaments inflexed between the posterior styles, anterior-lateral filaments 3.5–3.6 mm long, anterior gland ca 1.4 mm long and wide, anterior-lateral glands 1.2–1.3 mm long, ca 1.2 mm wide, posterior-lateral glands 1–1.1 mm long, ca 1 mm wide, all glands with the apex and abaxial face smooth. Anterior style 3.3–3.5 mm long, ca 0.4 mm wide, erect or slightly curved toward the posterior petal, sometimes with a few scattered hairs in the proximal  $\frac{1}{4}$  of its length, posterior styles 3.6–4 mm long, ca 0.3 mm wide, somewhat divergent, slightly inclined toward the posterior-lateral petals, glabrous, stigmas 0.4–0.5 mm in diameter, capitate. Samara not seen.

Type. *Hatschbach 36904*. Brazil. Goiás: GO-12, 30 km S of Cavalcante, 26 May 1975 (holotype MBM, isotype MICH).

*Peixotoa anadenanthera* is known only from the type (Fig. 3). It is unique in that its anthers lack the glandular connectives. It also differs from most other species in that the stem stipules are narrow, and in that the leaves tend to be narrowly elliptical. The internodes of the younger branches and branchlets are densely velutinous. The hairs are similar to those of *P. hirta* and *P. gardneri* in that the stalk is usually more than 0.5 mm long.

### 3. *Peixotoa andersonii* C. Anderson, sp. nov.

Fig. 14.

Caules procumbentes usque ad 4 m. Stipulae vegetativae 7–11 mm longae, triangulares, acutae vel bifidae, persistentes. Petioli 8–13 mm longi. Laminae 6.7–15.3 cm longae, 3.3–7.9 cm latae, anguste ellipticae, supra aureo-velutinae, subtus aureo-tomentosae, basi juxta costam biglandulosae. Folia inflorescentiae petiolo brevi vel sessilia, lineari-lanceolata vel anguste triangularia vel subulata. Inflorescentia terminalis, umbellis singularibus, interdum ramis secundariis nodorum distalissimorum multum redactis. Bractee bracteolaeque praesentes. Pedicelli 16–23 mm longi. Sepala (3.8–)4–5.5 mm longa. Limbus petalorum lateralium 12.5–14 mm longus, oblanceolatus, decurrens, margine glanduloso-fimbriato. Limbus petali postici ca 6 mm longus, subrectangularis, margine  $\frac{2}{3}$  proximalibus glandulis capitatis ornato,  $\frac{1}{3}$  distali glanduloso-fimbriato. Glandulae 3 staminodiorum anticorum apice profunde indentatae, indentatione in pagina abaxiali decurrenti. Stylus anticus 4.1–4.3 mm longus, arcuatus versus petalum posticum, styli postici 4.4–4.6 mm longi, parum divergentes, parum inclinati versus petala postico-lateralia; stigmata capitata. Samara ignota.

Stems procumbent, up to 4 m. Vegetative branches golden velutinous, pubescence abraded from older parts. Stem stipules 7–11 mm long, 7–10.6 mm wide, triangular, entire with the apex acute, or bifid, finely tomentulose adaxially, tomentulose-sericeous abaxially, persistent; inflorescence stipules gradually decreasing in size toward the distal nodes, the smallest not less than 3.2 mm long and wide, the most distal sometimes split into two narrow lobes, persistent. Stem leaves with the petiole 8–13 mm long, densely golden velutinous, laminae 6.7–15.3 cm long, 3.3–7.9 cm wide, narrowly elliptical, apex apiculate, base usually truncate, rarely cordate, golden velutinous above, golden tomentose below, a pair of sessile glands at the base at the costa, each gland (1–) 1.5–2.5 mm in diameter. Inflorescence leaves with the petiole 1 mm or more long or the most distal sessile, laminae abruptly smaller than the cauline, the smallest not less than 1.8 mm long, 0.6 mm wide, linear-lanceolate or narrowly triangular or subulate, apex acuminate, sparsely tomentulose above, densely velutinous-tomentulose below, a pair of glands at the base at the costa, these sometimes fused, each gland 0.7–1.2 mm in diameter, sometimes with a second, smaller pair (ca 0.4 mm in diameter) just below the larger pair; rarely the most

distal leaves reduced to sessile, linear or subulate, eglandular bracts, or rarely the most distal nodes bearing split stipules, the leaves absent. Inflorescence terminal or axillary, the axes densely golden velutinous, internodes of the primary axis 2.8–6.5 cm long, 2° axes 2.1–6.1 cm long, 3° axes 0.5–1.1 cm long, subsidiary axes absent, sometimes the most distal axes much reduced; umbels 4-flowered, one umbel per node, primary and secondary peduncles absent. Bracts 0.5–0.8 mm long, 0.2–0.3 mm wide, narrowly triangular, glabrous; bracteoles 0.1–0.2 mm long and wide, linear, glabrous. Pedicels 16–23 mm long, densely golden velutinous. Sepals (3.8–) 4–5.5 mm long, 2–2.3 mm wide, adaxially the proximal  $\frac{1}{2}$  glabrous, the distal  $\frac{1}{2}$  tomentulose, glands 1.4–1.9 mm long, 0.8–1.1 mm wide. Claw of the lateral petals 1.6–2 mm long, limb 12.5–14 mm long, 9–11 mm wide, oblanceolate, base decurrent, fimbriae up to 0.5 mm long, glandular. Claw of the posterior petal 3.7–4 mm long, limb ca 6 mm long, 4–4.6 mm wide, subrectangular, fimbriae up to 0.4 mm long, those of the proximal  $\frac{2}{3}$  capitate-glandular, the distal  $\frac{1}{3}$  fimbriate-glandular. Filaments of the lateral stamens 3.6–4 mm long, posterior filament ca 3 mm long, strongly arced toward the posterior petal, anthers 1.2–1.3 mm long, glandular connectives 0.6–0.7 mm long. Pollen grains ca 50  $\mu$ m. Filament of the anterior and anterior-lateral staminodes 3.6–3.8 mm long, the anterior filament often a little longer than the anterior-lateral two, posterior-lateral filaments 3.2–3.3 mm long, inflexed between the posterior styles, anterior and anterior-lateral glands 1.4–1.5 mm long, 1.3–1.4 mm wide, posterior-lateral glands 1.1–1.2 mm long, ca 1.1 mm wide, anterior and anterior-lateral glands with a deep indentation across the apex and decurrent on the abaxial face, posterior-lateral glands smooth. Anterior style 4.1–4.3 mm long, 0.3–0.4 mm wide, arced toward the posterior petal, posterior styles 4.4–4.6 mm long, 0.3–0.4 mm wide, slightly divergent, slightly curved toward the posterior-lateral petals, all styles with scattered hairs in the proximal  $\frac{1}{3}$  of their lengths, stigmas 0.4–0.5 mm in diameter, capitate. Samara not seen.

Type. *Anderson 11591*. Brazil. Minas Gerais: Mun. Diamantina, steep-sided valley of Biribiri, 1100 m, 25 Feb 1975 (holotype MICH, isotype NY).

*Peixotoa andersonii* is known only from the type (Fig. 3). It forms procumbent stems up to 4 m long which bear erect inflorescences, an unusual habit in this genus. It is unique in that the limbs of the lateral petals are oblanceolate and decurrent on the claw. The anterior and anterior-lateral staminode glands have a deep indentation across the apex and decurrent on the abaxial face. This species is also unusual in that the stem leaves have a petiole at least 8 mm long. Vegetatively it resembles *P. parviflora* and the less densely pubescent forms of *P. tomentosa*. These two species have smooth staminode glands and lateral petals whose limbs are usually orbicular or sometimes elliptical or broadly ovate. They are also distinguished by their inflorescences, in which the terminal node bears three umbels and is thus 12-flowered. In *P. andersonii* the terminal nodes bear one umbel, i.e., are 4-flowered. However, sometimes at some terminal nodes the 2° axes are greatly reduced, the stipules are split into several, often lacerate, strips, and the inflorescence leaves are absent. With such an arrangement the inflorescence branches resemble those of *P. parviflora* and *P. tomentosa*.

This species is named for my husband, William R. Anderson, an expert student of the Malpighiaceae, to whom I am much indebted.

#### 4. *Peixotoa axillaris* C. Anderson, sp. nov.

Fig. 15

Frutex usque ad 1 m. Stipulae vegetativae 10.7–11.5 mm longae, triangulari-cordatae, acutae, deciduae. Petioli 4–8 mm longi. Laminae 7.1–13.4 cm longae, 5.5–9 cm latae, ellipticae vel ovatae vel suborbiculatae, supra velutinae, subtus tomentosae, basi juxta costam biglandulosae. Folia inflorescentiae petiolo brevi vel sessilia, elliptica vel linearia vel subulata. Inflorescentia ex 1–3 umbellis

ramo axillari brevi (2–9 mm longo) constans, umbellis singularibus. Bracteae bracteolaeque praesentes. Pedicelli 10–13 mm longi. Sepala 4.2–4.7 mm longa. Limbus petalorum lateralium 12.5–13 mm longus, late obovatus, margine glanduloso-fimbriato. Limbus petali postici ca 10 mm longus, obovatus, margine  $\frac{1}{3}$  proximali glandulis capitatis ornato,  $\frac{2}{3}$  distalibus glanduloso-fimbriato. Filamenta staminum subaequalia. Styli subaequales, 4.4–4.6 mm longi, anticus erectus, postici divergentes, parum inclinati versus petala postico-lateralia; stigmata capitata. Ala dorsalis samarae 2.7–2.9 cm longa, 1.9–2 cm lata, alae laterales 4.6–5 mm latae, 10–11 mm altae.

Shrub ca 1 m tall. Vegetative branches velutinous-tomentulose. Stem stipules 10.7–11.5 mm long, ca 11 mm wide, triangular-cordate, apex acute, adaxially glabrous or the proximal  $\frac{1}{2}$  finely tomentulose, the distal  $\frac{1}{2}$  glabrous, abaxially tomentulose-velutinous, deciduous; inflorescence stipules like the cauline but smaller, the smallest not less than 4.2 mm long, 5 mm wide, cordate, concave, deciduous. Stem leaves with the petiole 4–8 mm long, densely golden velutinous, laminae 7.1–13.4 cm long, 5.5–9 cm wide, elliptical or ovate or sub-orbicular, apex apiculate, base cordate, velutinous above, tomentose below, a pair of sessile glands at the base at the costa, each gland 1.1–1.6 mm in diameter. Inflorescence leaves with the petiole up to 1.5 mm long or sessile, laminae abruptly smaller than the cauline, the smallest not less than 3.8 mm long, 0.8 mm wide, elliptical or linear or subulate, apex acuminate, glabrous above, densely velutinous-tomentulose below, a pair of glands at the base at the costa, each gland 0.6–0.8 mm in diameter. Inflorescence borne on a short (2–9 mm long) axillary shoot, the terminal umbel sessile or borne on a primary axis, 1–6.5 mm long, solitary or with two lateral sessile umbels, or with a pair of 2° axes 3–3.5 mm long, each bearing one umbel, subsidiary axes absent; umbels 4-flowered, primary and secondary peduncles absent. Bracts 0.6–0.7 mm long, ca 0.7 mm wide, triangular or semicircular, glabrous, sometimes with scattered hairs abaxially and/or on the margins; bracteoles 0.2–0.6 mm long, 0.2–0.3 mm wide, triangular or narrowly so, glabrous, often with scattered hairs on the margins. Pedicels 10–13 mm long, velutinous, up to  $\frac{1}{2}$  again as long in fruit. Sepals 4.2–4.7 mm long, 2.5–2.6 mm wide, adaxially the proximal  $\frac{1}{4}$  glabrous, the distal  $\frac{3}{4}$  tomentulose, glands 1.5–1.7 mm long, 0.8–0.9 mm wide. Claw of the lateral petals 1.7–2 mm long, limb ca 12.5–13 mm long, ca 11.5–12 mm wide, broadly obovate, base attenuate, fimbriae up to 0.6 mm long, glandular. Claw of the posterior petal ca 5 mm long, limb ca 10 mm long, ca 9 mm wide, obovate, fimbriae up to 0.6 mm long, those of the proximal  $\frac{1}{3}$  capitate-glandular, the distal  $\frac{2}{3}$  fimbriate-glandular. Stamen filaments 4.2–4.5 mm long, posterior filament usually a little shorter than the lateral four, very slightly curved toward the posterior petal, anthers 1.5–1.8 mm long, glandular connectives 0.8–1 mm long. Pollen grains 57–66  $\mu\text{m}$ . Filament of the anterior staminode ca 5.2 mm long, anterior-lateral and posterior-lateral filaments 4.8–4.9 mm long, the posterior-lateral two inflexed between the posterior styles, all glands 1.4–1.5 mm long, anterior and anterior-lateral glands 1.2–1.3 mm wide, posterior-lateral glands ca 1 mm wide, all glands with the apex and abaxial face smooth. Styles 4.4–4.6 mm long, 0.3–0.4 mm wide, anterior style usually a little longer and stouter than the posterior two, erect, posterior styles divergent, slightly inclined toward the posterior-lateral petals, all styles glabrous, anterior stigma ca 0.6 mm in diameter, posterior stigmas ca 0.5 mm in diameter, all stigmas capitate. Carpophore up to 3.5 mm long. Torus up to 5.5 mm high. Samara with the dorsal wing 2.7–2.9 cm long, 1.9–2 cm wide, upper margin gently sigmoid, lower margin arched, erose, lateral wings 4.6–5 mm wide, 10–11 mm high, rectangular, areole 5–6 mm long, 6–6.6 mm wide, nut 7–7.5 mm long, 4–5.4 mm in diameter, seed ca 8.5 mm long, outer cotyledon ca 11 mm long, ca 3.2 mm wide, folded at ca  $\frac{1}{3}$  of its length, inner cotyledon ca 5.6 mm long, ca 2.3 mm wide, straight.

Type. *Irwin & Soderstrom 7443*. Brazil. Goiás: Serra de Caiapó, 17°12'S, 51°47'W, ca 60 km S of Caiapônia on road to Jataí, 800–1000 m, 27 Oct 1964 (holotype UB, isotypes MICH, NY).

*Peixotoa axillaris* is known only from the type (Fig. 3). It is readily distinguished by its reduced inflorescence, borne on a short axillary shoot, which is composed of one or three umbels. The terminal umbel may be sessile or borne on a tiny primary axis. The lateral umbels are sessile. The type is apparently an apomict. The closed anthers contain pollen that is mostly aborted and 88–91% non-staining in cotton blue in lactophenol.

The coastal *P. hispidula* is the only other species whose inflorescences may consist of only one or three umbels, but these are never sessile. It is commonly glabrous or only very sparsely pubescent. The limbs of its lateral petals are 13–20 mm long, while the limb of its posterior petal is only 6.5–8.2 mm long. The staminode glands are strongly dimorphic. The anterior and anterior-lateral three have an indentation across the apex and decurrent on the abaxial face. *P. axillaris* is pubescent in all its vegetative parts. The limb of the posterior petal (ca 10 mm long) is only a little smaller than the limbs of the lateral petals (12.5–13 mm long). The staminode glands are subequal and smooth.

##### 5. *Peixotoa bahiana* C. Anderson, sp. nov.

Fig. 14.

Frutex usque ad 2.5 m. Stipulae vegetativae 7.5–13 mm longae, acutae vel bifidae, deciduae. Petioli 2.5–4 mm longi. Laminae 4.5–6.5 cm longae, 2.8–3.8 cm latae, anguste ellipticae vel anguste ovatae, rugosae, supra velutinae, subtus in venis tomentosae, basi juxta costam biglandulosae. Folia inflorescentiae sessilia, subulata. Inflorescentia terminalis, umbellis singularibus. Bracteae bracteolaeque praesentes. Pedicelli (13–)18–23 mm longi. Sepala 4.5–5.8 mm longa. Limbus petalorum lateralium 11–12.3 mm longus, obovatus vel ellipticus, denticulatus, glandulosus vel eglandulosus. Limbus petali postici 6.2–7 mm longus, ellipticus vel parum obovatus, margine glandulis capitatis ornato. Stylus anticus 3.4–3.6 mm longus, erectus, styli postici 4.2–4.3 mm longi, erecti, parum divergentes; stigmata capitata. Samara ignota.

Shrub up to 2.5 m. Vegetative branches finely tomentulose-velutinous. Stem stipules 7.5–13 mm long, ca 9–13 mm wide, cordate, entire with the apex acute, or bifid, finely and sparsely velutinous or velutinous-tomentulose adaxially, densely velutinous-tomentulose abaxially, deciduous; inflorescence stipules like the cauline, usually a little smaller, deciduous. Stem leaves with the petiole 2.5–4 mm long, densely velutinous, laminae 4.5–6.5 cm long, 2.8–3.8 cm wide, narrowly elliptical or narrowly ovate, apex apiculate, base cordate, rugose, velutinous above, tomentose especially on the veins below, a pair of sessile glands at the base at the costa, each gland 0.8–1.6 mm in diameter. Inflorescence leaves of the first and sometimes second node of the primary axis petiolate, the others sessile, laminae abruptly smaller than the cauline, the smallest not less than 4.6 mm long, 0.8 mm wide, the most proximal linear-lanceolate, the more distal subulate, apex acuminate, glabrous above, velutinous-tomentulose below, a pair of glands at the base at the costa, each gland 0.7–1.5 mm in diameter, sometimes with a second, smaller pair (0.3–0.6 mm in diameter) above or below the larger pair. Inflorescence terminal, the axes velutinous or velutinous-tomentulose, internodes of the primary axis 1.2–6.5 cm long, 2° axes 2.9–4.5 cm long, 3° axes 2.2–5.8 cm long, subsidiary axes absent; umbels 4-flowered, one umbel per node, primary and secondary peduncles absent. Bracts 1–1.2 mm long, 0.7–1.1 mm wide, oblong, with a few scattered hairs on both surfaces and along the margin; bracteoles ca 0.2 mm long, 0.1–0.2 mm wide, oblong or triangular, glabrous. Pedicels (13–) 18–23 mm long, velutinous. Sepals 4.5–5.8 mm long,

2.5–2.7 mm wide, adaxially glabrous or tomentulose only in the distal 1/5, glands 1.8–2.2 mm long, 0.9–1.2 mm wide. Claw of the lateral petals 2–2.3 mm long, limb 11–12.3 mm long, 8–11.1 mm wide, obovate or elliptical, base briefly attenuate or truncate, denticulate, the teeth up to 0.3 mm long, glandular or eglandular. Claw of the posterior petal 4–4.3 mm long, limb 6.2–7 mm long, 4.1–4.2 mm wide, elliptical or slightly obovate, fimbriae up to 0.4 mm long, capitate-glandular. Filaments of the lateral stamens 4–4.2 mm long, posterior filament 3.2–3.6 mm long, arced toward the posterior petal, anthers 1.2–1.5 mm long, glandular connectives 0.7–1 mm long. Pollen grains 42–50  $\mu\text{m}$ . Filaments of the anterior and anterior-lateral staminodes 4–4.2 mm long, posterior filaments 3.3–3.6 mm long, slightly curved toward the posterior styles, anterior and anterior-lateral glands 1.1–1.2 mm long and wide, posterior-lateral glands 0.8–1 mm long, 0.7–0.8 mm wide, all glands with the apex and abaxial face smooth. Anterior style 3.4–3.6 mm long, ca 0.4 mm wide, erect or very slightly curved toward the posterior petal, posterior styles 4.2–4.3 mm long, ca 0.3 mm wide, slightly divergent, erect, all styles with some scattered hairs in the proximal 1/4 (rarely 1/3) of their lengths, stigmas 0.4–0.5 mm in diameter, capitate. Samara not seen.

Type. *Irwin et al. 14889*. Brazil. Bahia: Drainage of the Rio Corrente, ca 5 km S of Rio Roda Velha, ca 150 km SW of Barreiras, 900 m, 15 Apr 1966 (holotype UB, isotypes MICH, NY).

Paratype. *Davidse et al. 12208*. Brazil. Bahia: 39 km NE of the Goiás-Bahia border along Highway BR-020, 930 m, 8 April 1976 (MO).

This species is known only from the type and paratype (Fig. 4). In *P. bahiana* the narrowly elliptical leaves are tomentose below, the inflorescence leaves are

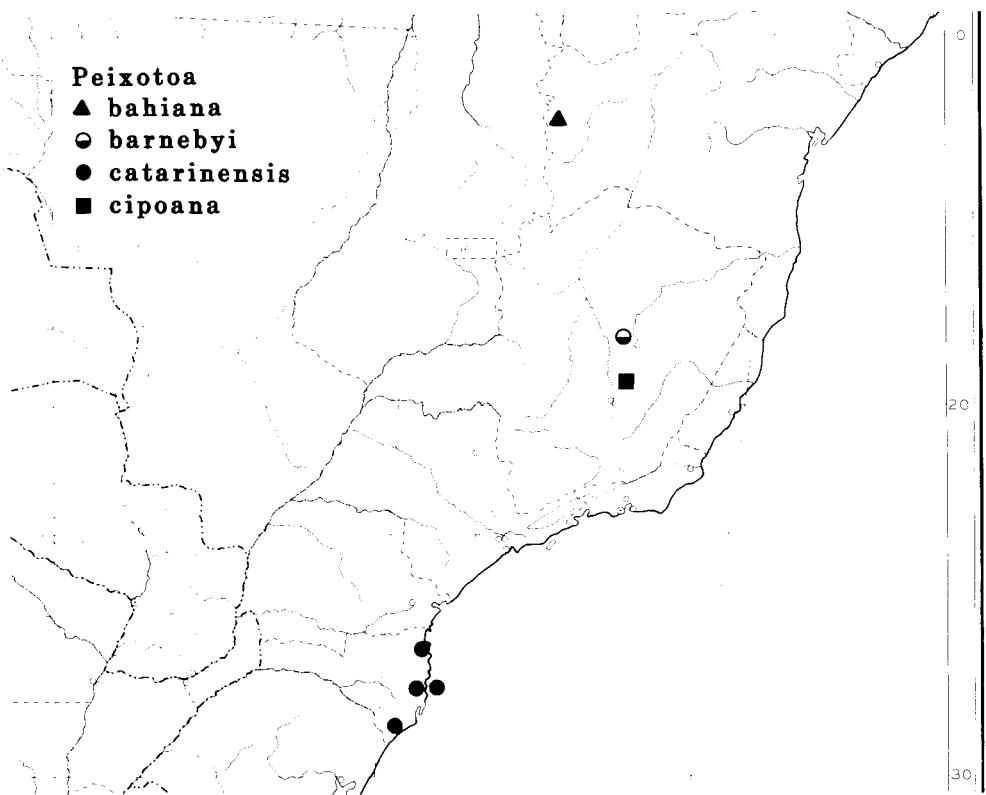


FIG. 4. Distribution of *P. bahiana*, *P. barnebyi*, *P. catarinensis*, and *P. cipoana*.



sessile, and the stipules are deciduous. The elliptical or slightly oblong limb of the posterior petal is relatively small. The margins of the limbs of the lateral petals are denticulate. *P. bahiana* is readily distinguished from the other three relatively small-flowered species that are known from Bahia. *P. adenopoda* and *P. sericea* are both reported from the more eastern part of the state. *P. adenopoda* is recognized by the stalked leaf glands that are borne on the surface of the blade away from the costa and base, and *P. sericea* by the sericeous vesture of its leaves. In *P. bahiana* the leaf glands are sessile and borne at the base at the costa. *P. paludosa* also bears the leaf glands on the surface of the lamina rather than at the base, and has petiolate inflorescence leaves. The inflorescence stipules are often persistent at the more distal nodes.

**6. *Peixotoa barnebyi* C. Anderson, sp. nov.**

Fig. 16.

Caules usque ad 1.5 m. Stipulae vegetativae 6.5–12 mm longae, acutae vel plerumque bifidae, plerumque persistentes. Petioli 2–5 mm longi. Laminae 5.3–10.7 cm longae, 2.5–7.5 cm latae, anguste vel late ellipticae, ovatae vel sub-orbiculares, supra velutinae, subtus dense tomentosae, basi juxta costam biglandulosae. Folia inflorescentiae petiolo brevi, distaliora subsessilia, lanceolata vel linearia. Inflorescentia terminalis, umbellis singularibus. Bractae bracteolaeque praesentes vel interdum absentes. Pedicelli 12–25 mm longi. Sepala (4–) 4.5–5.2 mm longa. Limbus petalorum lateralium 11–13.5 mm longus, orbicularis, margine fimbriato, glanduloso vel e glanduloso. Limbus petali postici 6–7 mm longus, ellipticus, margine glandulis capitatis ornato. Glandulae staminodiorum apice indentatae, indentatione in pagina abaxiali decurrenti. Styli subaequales, 3.8–4.1 mm longi, anticus posticis semper brevior, erectus vel parum inclinatus versus sepalum anticum, postici divergentes, arcuati versus petala postico-lateralia; stigmata capitata. Samaram maturam non vidi.

Shrub to 1.5 m. Vegetative branches purplish-brown, tomentulose. Stem stipules 6.5–12 mm long, 9–12 mm wide, cordate, commonly bifid, sometimes entire with the apex acute, rarely split almost to the base, sparsely tomentulose or glabrate adaxially, tomentose-velutinous abaxially, usually persistent; inflorescence stipules gradually decreasing in size toward the distal nodes, the smallest not less than 3.5 mm long, 3.2 mm wide, glabrous or sparsely velutinous adaxially, tomentulose or tomentulose-velutinous abaxially, deciduous. Stem leaves with the petiole 2–5 mm long, densely velutinous-tomentose, laminae 5.3–10.7 cm long, 2.5–7.5 cm wide, narrowly to broadly elliptical or ovate or sub-orbicular, apex apiculate, base cordate, velutinous above, densely tomentose below, a pair of sessile glands at the base at the costa or halfway on the petiole, each gland 1–1.9 mm in diameter. Inflorescence leaves with a short petiole at the more proximal nodes, the most distal subsessile or sessile, laminae abruptly smaller than the cauline or gradually decreasing in size toward the distal nodes, the smallest not less than 1.2 mm long, 0.8 mm wide, lanceolate or linear, velutinous above, densely velutinous-tomentulose below, a pair of glands halfway on the petiole, each gland (0.4–) 0.7–1.8 mm in diameter. Inflorescence terminal, the axes tomentulose, internodes of the primary axis 2.7–10.8 mm long, 2° axes 3.4–9.6 cm long, 3° axes (0.5–) 2–4.8 cm long, mature 4° axes not seen, subsidiary axes absent; umbels 4-flowered, one umbel per node, primary peduncles absent, secondary peduncles rare, up to 1.5 mm long. Bracts 0.7–1.3 mm long, 0.3–0.5 mm wide, triangular, glabrous; bracteoles 0.1–0.4 mm long and wide, broadly triangular, glabrous; sometimes bracts and bracteoles absent. Pedicels 12–25 mm long, tomentose. Sepals (4–) 4.5–5.2 mm long, 2–3.1 mm wide, adaxially the proximal 1/3–1/2 glabrous, the distal 1/2–2/3 tomentulose, glands 1.6–2.1 mm long, 0.8–1.3 mm wide. Claw of the lateral petals 2–2.5 mm long, limb 11–13.5 mm long, 11–13.8 mm wide, orbicular, base attenu-

ate, fimbriae up to 0.8 (-1) mm long, glandular or eglandular. Claw of the posterior petal 4.5-5 mm long, limb 6-7 mm long, 4-4.5 mm wide, elliptical, fimbriae up to 0.5 mm long, capitate-glandular. Filaments of the lateral stamens 4-4.5 mm long, posterior filament 3.3-3.5 mm long, arced toward the posterior petal, anthers 1.3-1.5 mm long, glandular connectives 0.8-0.9 mm long. Pollen grains ca 50  $\mu$ m. Filaments of the anterior stamens 3.9-4.7 mm long, always exceeding the anterior-lateral two, anterior-lateral filaments 3.7-4.3 mm long, always exceeding the posterior-lateral two, posterior-lateral filaments 3.5-4 mm long, inflexed between the posterior styles, glands 1.2-1.4 mm long, 1.1-1.3 mm wide, the posterior two often a little narrower than the anterior three, all glands with an indentation across the apex and decurrent on the abaxial face, the indentation sometimes very shallow in the posterior-lateral two. Styles 3.8-4.1 mm long, anterior style ca 0.3 mm wide, always a little stouter than the posterior two, erect or slightly inclined toward the anterior sepal, posterior styles ca 0.2 mm wide, divergent, arced toward the posterior-lateral petals, all styles glabrous, stigmas ca 0.4 mm in diameter, capitate. Mature samara not seen.

Type. *Anderson 8623*. Brazil. Minas Gerais: Serra do Espinhaço, 30 km by road SW of Gouvêia, at KM 60 on road to Curvelo, 1150 m, 11 Apr 1973 (holotype UB, isotypes MICH, NY).

Paratype. *Anderson 11537*. Brazil. Minas Gerais: Mun. Gouvêia, ascent of Serra do Espinhaço, on BR-259, 860-1000 m, 23 Feb 1975 (MBM, MICH).

*Peixotoa barnebyi* is known only from the type and paratype (Fig. 4). It is one of three species, all from the Serra do Espinhaço, in which all five staminode glands have an indentation across the apex and decurrent on the abaxial face. In the posterior-lateral glands the indentation may be quite shallow and difficult to detect. *P. spinensis* differs in that the leaf glands are borne on the surface of the blade away from the base and costa. In *P. cipoana* the unusually large staminode glands are recurved. In both species the posterior styles exceed the anterior one. In *P. barnebyi* the leaf glands are borne at the base at the costa, the staminode glands are erect, and the styles are subequal. Mature fruits have not been seen. However, the immature samaras of *Anderson 8623* are similar to those of *P. parviflora* and *P. tomentosa*.

This species is named for Rupert C. Barneby, a distinguished authority on many groups of plants.

## 7. *Peixotoa catarinensis* C. Anderson, sp. nov.

Fig. 17.

Frutex volubilis. Stipulae vegetativae et inflorescentiae 4.5-ca 9 mm longae, deciduae. Petioli 4.5-15 mm longi. Laminae 3-10.2 cm longae, 2.2-7.6 cm latae, late vel anguste ellipticae interdum ovatae vel obovatae interdum lanceolatae, basi cordatae interdum sinu truncato, supra velutinae, subtus sericeae vel tomentosae, biglandulosae 1.2-9.8 mm supra basim 2.3-6.5 mm a costa. Folia inflorescentiae petiolo brevi. Inflorescentia terminalis vel axillaris, umbellis singularibus in nodis subterminalibus, umbellis 3 in nodis terminalibus, pedunculis secundariis ca 1-13 mm longis. Bractee bracteolaeque praesentes. Pedicelli 18-25 mm longi. Sepala 4.2-5 mm longa. Limbus petalorum lateralium 11-12 mm longus, orbicularis, margine glanduloso-fimbriato. Limbus petali postici 8.5-9 mm longus, orbicularis vel late obovatus, margine  $\frac{2}{3}$  proximalibus glandulis capitatis ornato,  $\frac{1}{3}$  distali glanduloso-fimbriato. Filamentum staminis postici erectum vel parum inclinatum versus petalum posticum. Glandulae staminodiorum subaequales. Stylus anticus 3.2-3.8 mm longus, arcuatus versus petalum posticum, styli postici 3.5-4.2 mm longi, semper anticum excedentes, divergentes, inclinati versus petala postico-lateralialia; stigmata capitata. Ala dorsalis samarae 2.3-2.7 cm longa, 1.1-1.2 cm lata, alae laterales 3.2-4.5 mm latae, 9-10 mm altae.

Twining shrub. Vegetative branches purplish-brown, tomentulose and pubescent with T-shaped hairs or velutinous, pubescence abraded from older parts. Stem stipules 4.5–ca 9 mm long and wide, cordate, apex acute, finely, usually sparsely, velutinous-sericeous or glabrate adaxially, sericeous abaxially, deciduous; inflorescence stipules like the cauline, usually more densely pubescent, persistent or eventually deciduous. Stem leaves with the petiole 4.5–15 mm long, loosely but densely velutinous, laminas 3–10.2 cm long, 2.2–7.6 cm wide, narrowly to broadly elliptical, sometimes ovate or obovate, apex apiculate, base cordate, often the sinuses truncate, velutinous above, pubescent with T-shaped hairs or loosely tomentose below, a pair of sessile glands borne on the surface of the lamina 1.2–9.8 mm above the base, 2.3–6.5 mm from the costa, each gland 0.2–0.7 mm in diameter, sometimes one or both glands absent. Inflorescence leaves with the petiole at least ca 1.5 mm long, laminas abruptly smaller than the cauline or gradually decreasing in size toward the distal nodes, the smallest not less than 3.7 mm long, 1.1 mm wide, elliptical or lanceolate, velutinous above, sericeous or sericeous-tomentulose below, in the proximal leaves the pair of glands borne on the surface of the lamina, in the more distal at the base at the costa, each gland 0.2–0.7 mm in diameter. Inflorescence terminal or axillary, the axes velutinous or tomentulose-velutinous, internodes of the primary axis 1–4 (–6.7) cm long, 2° axes 1.7–7.3 cm long, subsidiary axes absent, at the more distal nodes the 2° axes suppressed, with 1 or 2 umbels borne on secondary peduncles in the leaf axil, always with 3 umbels at the terminal nodes, each umbel 4-flowered, primary peduncles absent, secondary peduncles up to 13 mm long. Bracts 0.4–1.9 mm long, 0.4–0.7 mm wide, narrowly to broadly triangular, glabrous, sometimes velutinous on the margins; bracteoles 0.3–0.7 mm long, 0.2–0.3 mm wide, oblong or triangular, glabrous, sometimes velutinous on the margins. Pedicels 18–25 mm long, velutinous or tomentulose-velutinous, equally long in fruit. Sepals 4.2–5 mm long, 1.8–2.5 mm wide, adaxially velutinous or tomentulose or velutinous-tomentulose, glands 1.6–2.5 mm long, 0.8–1 mm wide. Claw of the lateral petals 2–2.5 mm long, limb 11–12 mm long, 11–11.5 mm wide, orbicular, base attenuate, fimbriae up to 0.3 mm long, glandular. Claw of the posterior petal 4–4.5 mm long, limb 8.5–9 mm long and wide, orbicular or broadly obovate, fimbriae up to 0.3 (–0.4) mm long, those of the proximal  $\frac{2}{3}$  capitate-glandular, the distal  $\frac{1}{3}$  fimbriate-glandular. Filaments of the lateral stamens 3.8–4.4 mm long, posterior filament 3.2–3.7 mm long, erect or very slightly curved toward the posterior petal, anthers 1–1.2 mm long, glandular connective 0.6–0.7 mm long. Pollen grains 50–57  $\mu\text{m}$ . Filament of the anterior staminode 3.7–3.9 mm long, anterior-lateral filaments 3.4–3.6 mm long, posterior-lateral filaments 3–3.2 mm long, inflexed between the posterior styles, all glands 1–1.1 mm long, ca 0.9 mm wide, sometimes the anterior gland a little larger than the lateral four, all glands with the apex and abaxial face smooth. Anterior style 3.2–3.8 mm long, ca 0.3 mm wide, always shorter and stouter than the posterior two, arced toward the posterior petal, posterior styles 3.5–4.2 mm long, ca 0.2 mm wide, divergent, inclined toward the posterior-lateral petals, all styles glabrous or with a few scattered hairs in the proximal  $\frac{1}{3}$  of their lengths, stigmas 0.4–0.5 mm in diameter, capitate. Carpophore up to ca 0.7 mm long. Torus up to ca 3.5 mm high. Samara with the dorsal wing 2.3–2.7 cm long, 1.1–1.2 cm wide, upper margin sigmoid, lower margin arced, straight or sigmoid, erose, lateral wings 3.2–4.5 mm wide, 9–10 mm high, rectangular, areole ca 3.5 mm long, ca 3 mm wide, nut ca 6 mm long, ca 3.6 mm in diameter, mature seeds not seen.

Type. *Smith & Reitz 12276*. Brazil. Santa Catarina: Ilha de Santa Catarina, Mun. Florianópolis, Canavieiras, 1–5 m, 28 Mar 1957 (holotype US, isotypes K, NY, P, R, RB).

Distribution. (Fig. 4). Known only from the beaches, dunes and adjacent areas along the coast of Santa Catarina and its islands.

BRAZIL. Santa Catarina: *Barclay 60* (MO, NY); Reserva Florestal dos Pilões, *Duarte 3339* & *Falcão* (RB); Ilha de Santa Catarina, Morro das Pedras, 5 m, *Klein et al. 5834* (P); Ilha de Santa Catarina, Pantano do Sul, 2 m, *Klein & Bresolin 5988* (P); estrada a Itajaí, *Lutz s.n.* (R 129613); Morro da Santa Laguna, *Moreira & Moreira 495* (US); *Raben 443* (BR); Praia Braba, Itajaí, 1 m, *Reitz 3240* (US); Ilha de Santa Catarina, Campeche, *Reitz 5083* (US); Pilões, Palhoça, *Reitz & Klein 2752* (P); Rio dos Pinheiros, Braço do Norte, 100 m, *Reitz & Klein 6779* (P); Mun. Itajaí, Praia Braba, ca 26°58'S, 48°36'W, 3 m, *Smith & Reitz 6085* (R, RB); *Ule 711* (NY, fragment).

*Peixotoa catarinensis* is one of four species in which the terminal inflorescence nodes bear three umbels, i.e., are 12-flowered. The inflorescences are small compared to those of other species and rarely have more than two pairs of 2° axes. 3° axes have not been seen. *P. catarinensis* has unusually small leaf glands (0.2–0.7 mm in diameter), which are borne on the surface of the lamina away from the base and costa; sometimes they are absent. In some of the larger leaves the cordate base has truncate sinuses. *P. catarinensis* is the southernmost species in the genus and is known only from Santa Catarina. It is readily differentiated from the other three species with a similar but usually larger inflorescence. *P. parviflora*, which ranges from Minas Gerais to Paraná, and *P. tomentosa*, of Minas Gerais, have larger, basal leaf glands. In *P. adenopoda* of Bahia the leaf glands are borne on the lamina but are stalked and 0.8–1.5 mm in diameter. The range of the only other beach species, *P. hispidula*, extends from Bahia to São Paulo. It resembles *P. catarinensis* in its small inflorescences which bear petiolate leaves, but differs by its larger flowers and basal leaf glands.

Collected in flower throughout the year; only one fruiting collection (March).

#### 8. *Peixotoa cipoana* C. Anderson, sp. nov.

Fig. 18.

Frutex ascendens. Stipulae vegetativae 7–8.5 mm longae, persistentes. Petioli ca 1–5 mm longi. Laminae 3–9.5 cm longae, 2.7–6.7 cm latae, ovatae vel ellipticae interdum suborbiculares, rugosae, supra tomentulosae vel velutinae, subtam lanatae, basi juxta costam biglandulosae. Folia inflorescentiae subsessilia vel sessilia, distaliora linearia vel subulata. Inflorescentia terminalis, umbellis singularibus. Bractee bracteolaeque praesentes. Pedicelli 10–20 mm longi. Sepala 3.8–6 mm longa. Limbus petalorum lateralium 8.8–10.8 mm longus, orbicularis, margine glanduloso-fimbriato. Limbus petali postici 6–8 mm longus, ellipticus vel anguste obovatus, margine glandulis capitatis ornato. Glandula staminodii antici apice profunde indentata, indentatione in pagina abaxiali decurrenti; glandulae 4 staminodiorum lateralium apice non profunde indentatae. Stylus anticus 3.3–3.7 mm longus, erectus vel parum arcuatus versus petalum posticum, styli postici 3.4–4 mm longi, divergentes, parum inclinati versus petala postico-lateralia, semper anticum superantes; stigmata capitata. Samara ignota.

Scandent shrub. Vegetative branches velutinous-tomentulose. Stem stipules 7–8.5 mm long, (7.2–) 8–12 mm wide, broadly cordate, apex acute, glabrous or sometimes very sparsely velutinous or tomentulose adaxially, tomentulose-velutinous or woolly abaxially, persistent; inflorescence stipules gradually decreasing in size toward the distal nodes, the smallest not less than 4.1 mm long, 4 mm wide, concave, more densely pubescent than the cauline, persistent or sometimes deciduous. Stem leaves with the petioles 1–5 mm long, densely tomentulose-velutinous, laminae 3–9.5 cm long, 2.7–6.7 cm wide, ovate or elliptical, sometimes suborbicular, apex apiculate, base cordate, rugose, tomentulose or velutinous above, woolly below, a pair of sessile glands at the base at the costa, each gland 0.9–2.3 mm in diameter, sometimes with a second, smaller pair (0.6–1.2 mm in diameter) above, below or adjacent to the larger pair. Inflorescence leaves subsessile to sessile, laminae abruptly smaller than the cauline, the smallest

not less than 1.4 mm long, 0.4 mm wide, shape of the more proximal like the cauline, the more distal linear to subulate, apex acuminate, tomentose-velutinous or sparsely so above, woolly below, a pair of glands at the base at the costa, each gland 0.6–2 mm in diameter, sometimes with a second, smaller pair (0.2–0.9 mm in diameter) adjacent to the larger pair, one or both pairs sometimes fused, or sometimes a large gland on the costa with two large or small glands adjacent to it, or these three sometimes fused. Inflorescence terminal or axillary, the axes tomentulose-velutinous, internodes of the primary axis 1.7–8.2 cm long, 2° axes 1.5–13.6 cm long, 3° axes 1.2–2 cm long, subsidiary axes absent; umbels 4-flowered, one umbel per node, primary and secondary peduncles absent. Bracts 0.8–2.2 mm long, 0.2–0.7 mm wide, narrowly triangular, glabrous adaxially, tomentulose-velutinous abaxially; bracteoles 0.1–0.4 mm long, 0.2–0.3 mm wide, linear, oblong, semicircular, or triangular, both surfaces glabrous or with a few scattered hairs, or sometimes tomentulose-velutinous abaxially and/or on the margins. Pedicels 10–20 mm long, tomentose. Sepals 3.8–6 mm long, 1.4–2.7 mm wide, adaxially the proximal  $\frac{1}{2}$ – $\frac{2}{3}$  glabrous, the distal  $\frac{1}{3}$ – $\frac{1}{2}$  tomentulose, glands (1.2–) 1.4–2.2 mm long, 0.7–1.1 mm wide. Claw of the lateral petals 2.3–3 mm long, limb 8.8–10.8 mm long, 8.5–11 mm wide, orbicular, base briefly attenuate, fimbriae up to 0.4 mm long, glandular. Claw of the posterior petal ca 3.7–4 mm long, limb 6–8 mm long, 4.8–6.2 mm wide, elliptical or narrowly obovate, fimbriae up to 0.2 (–0.4) mm long, capitate-glandular. Filaments of the lateral stamens 4–4.3 mm long, posterior filament 3–3.5 mm long, slightly curved toward the posterior petal, anthers 1.2–1.4 mm long, glandular connectives 0.8–1 mm long. Pollen grains 50–57  $\mu$ m. Filament of the anterior staminode 4.1–4.5 mm long, anterior-lateral filaments 3.5–3.8 mm long, posterior-lateral filaments 3–3.5 mm long, slightly inflexed between the posterior styles, anterior and anterior-lateral glands 1.4–1.6 mm long, 1.3–1.5 mm wide, curved posterior-lateral glands 1.2–1.4 mm long, 1.1–1.3 mm wide, slightly curved, anterior gland with a deep indentation across the apex and decurrent on the abaxial face, the anterior-lateral and posterior-lateral glands with a shallower indentation. Anterior style 3.3–3.7 mm long, 0.3–0.4 mm wide, shorter than the posterior two, erect or very slightly inclined toward the posterior petal, posterior styles 3.4–4 mm long, divergent, slightly curved toward the posterior-lateral petals, all styles glabrous or more commonly with scattered hairs in the proximal  $\frac{1}{3}$  of their lengths, stigmas 0.3–0.5 mm in diameter, capitate. Samara not seen.

Type. *Occhioni* 5009. Brazil. Minas Gerais: Serra do Cipó, estrada da Conceição, 26 Jun 1973 (holotype RFA, isotype MICH).

Distribution. (Fig. 4). Known only from the Serra do Cipó of Minas Gerais.

BRAZIL. Minas Gerais: Serra do Cipó, estrada da Reprêsa, *Occhioni* 5054 (MICH, RFA); Serra do Cipó, *Atala* 62, 63 (R), *Damazio* 2054 (RB), *Glassman & Gomes, Jr.* 8064 (SP), *Vidal s.n.* (R 108249).

*Peixotoa cipoana* is unique in the genus in that its large staminode glands are recurved. All five glands have an indentation across the apex and decurrent on the abaxial face. In the posterior-lateral two the indentation is sometimes shallow. *P. cipoana* is also the only species in which the upper surface of the lamina of the stem leaves is sometimes tomentulose. The vestiture is always velutinous in all the pubescent species except for *P. adenopoda* and *P. sericea*, in which it is sericeous. *P. cipoana* is readily separated from the other two species in the Serra do Espinhaço in which the leaves are densely tomentose or woolly below. *P. tomentosa* is recognized by its inflorescence in which the terminal nodes bear three umbels and thus are 12-flowered. Also, its staminode glands are straight and smooth. *P. spinensis* differs, in addition to its smaller, straight staminode glands, in its leaf glands which are borne on the surface of the lamina away from the margin and costa. The leaf glands of *P. cipoana* are basal.

Collected in flower in April, June, and July; two fruiting collections from April and July.

**9. *Peixotoa cordistipula*** Adr. Jussieu, Arch. Mus. Hist. Nat. Paris **3**: 431. 1843.

Fig. 19.

Scandent shrub or subshrub or vine up to 1.5 m. Vegetative branches velutinous or velutinous-tomentose, pubescence sometimes abraded from older parts. Stem stipules 14–30 mm long, 10–20 mm wide, triangular or cordate-triangular, apex acute, notched or sometimes acuminate, velutinous adaxially, densely velutinous-tomentulose abaxially, deciduous; inflorescence stipules like the cauline or sometimes the most distal a little smaller, the smallest not less than 9 mm long, 7.5 mm wide, persistent. Stem leaves with the petiole 4.5–21 mm long, densely velutinous-tomentose, lamina 7–20.3 cm long, 3.5–14.5 cm wide, ovate or elliptical or sometimes orbicular, apex apiculate, base cordate or slightly so, velutinous above, tomentose below, usually densely so, with a pair of sessile glands at the base at the costa or sometimes halfway on the petiole, rarely up to 0.5 mm above the base at the costa, each gland 1–3.3 mm in diameter. Inflorescence leaves with the petiole (0.6–) 1 mm or more long, lamina abruptly smaller than the cauline, the smallest not less than (0.4–) 1.2 mm long, (0.2–) 1 mm wide, shape of the more proximal like the cauline, the more distal ovate or narrowly elliptical or lanceolate or linear, apex acuminate, sparsely velutinous or rarely glabrous above, densely velutinous below, with a pair of glands halfway on the petiole, each gland (0.4–) 0.7–2.1 mm in diameter, sometime with a second pair of smaller glands (0.4–1.4 mm in diameter) above or adjacent to the pair of larger glands. Inflorescence terminal or axillary, the axes densely velutinous, internodes of the primary axis 0.8–10 cm long, 2° axes 2–13 cm long, 3° axes 1–4.6 cm long, 4° axes 1.7–3.2 cm long, 5° axes 0.9–1.6 cm long, subsidiary axes absent; umbels 4-flowered, one umbel per node, primary peduncles absent, secondary peduncles rarely present, up to 1 mm long; pedicels commonly arranged around a large glandular mass up to 2.5 mm in diameter, often sparsely velutinous, or the glandular tissue absent. Bracts (0.2–) 0.4–2.3 mm long, 0.2–0.5 mm wide, triangular or linear, glabrous or tomentulose abaxially or on the margins; bracteoles 0.1–0.4 mm long, 0.1–0.4 mm wide, triangular, linear or subulate, glabrous. Pedicels 11–32 mm long, densely velutinous, usually a little longer in fruit. Sepals 5–7.1 mm long, 2–4 mm wide, adaxially velutinous or sometimes the proximal  $\frac{1}{3}$ – $\frac{1}{2}$  glabrous, the distal  $\frac{1}{2}$ – $\frac{2}{3}$  pubescent with T-shaped hairs, glands 1.5–2.5 mm long, 0.9–1.1 mm wide. Claw of the lateral petals 2.2–3 mm long, limb 13–16 mm long, 11–15 mm wide, orbicular, base briefly attenuate or almost truncate, fimbriae up to 0.5 (–0.7) mm long, glandular. Claw of the posterior petal 3.8–4.5 mm long, limb 9.5–11.5 mm long, 8–11.5 mm wide, obovate, base briefly attenuate, fimbriae up to 0.6 mm long, those of the proximal  $\frac{1}{2}$ – $\frac{2}{3}$  capitate-glandular, the distal  $\frac{1}{3}$ – $\frac{1}{2}$  fimbriate-glandular. Lateral stamen filaments 4–5.2 mm long, posterior filament 3.5–4.5 mm long, usually shorter than the lateral filaments, very slightly inclined toward the posterior petal, anthers 1.4–1.6 mm long, glandular connectives 0.8–1 mm long. Pollen grains 50–57  $\mu\text{m}$ . Anterior staminode filament 4.5–5.3 mm long, exceeding the anterior-lateral two, anterior-lateral filaments 4.2–4.8 mm long, usually exceeding the posterior-lateral two, posterior-lateral filaments 3.7–4 (–4.5) mm long, slightly inflexed between the posterior styles, anterior and anterior-lateral glands (1.3–) 1.5–1.9 mm long, (1.2–) 1.5–1.8 mm wide, posterior-lateral glands 1.1–1.5 mm long, 1.2–1.3 mm wide, all glands with the apex and abaxial face smooth. Anterior style (4.4–) 5–5.3 mm long, 0.3–0.4 mm wide, always at least a little longer than the posterior two, slightly arced toward the posterior petal, posterior styles 4.2–5 mm long, 0.3–0.4 mm wide, divergent, slightly arced

toward the posterior-lateral petals, all styles with scattered hairs in the proximal  $\frac{1}{3}$ – $\frac{1}{2}$  of their lengths, stigmas 0.4–0.5 mm in diameter, capitate. Carpophore up to 4 mm long. Torus up to 7 mm high. Samara with the dorsal wing 2.3–3.4 cm long, 1.6–1.9 cm wide, upper margin arced, lower margin slightly arced or sigmoid, slightly erose, lateral wings 4.5–5.5 mm wide, 9–10 mm high, rectangular, areole 3.5–5 mm long, 4–7 mm wide, nut ca 5.8–ca 6.5 mm long, ca 3–5.5 mm in diameter, mature seeds not seen.

Type. *Martius 656*. Brazil. Mato Grosso: "In morro do Ernesto prope Cujaba [Cuiabá] . . ." (holotype P!, isotypes BM! BR! F! G! GH! K! LE! M! MO! NY! S! W!).

Distribution. (Fig. 5). Central Mato Grosso and eastern Bolivia; cerrado, dry woodlands, and at forest margins.

BOLIVIA. Chiquitos, *D'Orbigny 729* (P). BRAZIL. Mato Grosso: Mun. Rondonópolis, Serra da Petroliva, *Hatschbach 34713* (MBM, MICH); Cáceres, Giran, *Hoehne 158* (R); *Houillet* cat. no. 1051 (P); Serra Azul, ca 85 km S of Xavantina, 550 m, *Irwin et al. 17176* (MICH, NY, UB); Villa Maria, *Kuntze s.n.* (NY); inter Cuyaba [Cuiabá] et Diamantino, *Lindman A3533* (A, F, G, S); Cuyaba [Cuiabá], *Malme 1610, 1919* (S); Santa Ana da Chapada, *Malme s.n.* (S); ca 11 km W of KM 90, Xavantina-Aragarças Road, Vale dos Sonhos, 700 m, *Philcox & Freeman 4696* (K, NY, UB); vicinity of Buriti, Chapada dos Guimarães, 720 m, *Prance et al. 19239* (MICH); Serra da Chapada et Cuyaba [Cuiabá], *Riedel 1013* (I.E, S); Santa Ana da Chapada, *Robert 347b* (K); between São Luiz Cáceres and Mato Grosso, *Sandeman 2134* (K, NY); Rio Juruena, Aripuanã, *Silva 3193* (MO, NY); Cuyaba [Cuiabá], *da Silva Manso (Lhotzky 99)* (G, W, syntype of *P. macrophylla*); Morro do Ernesto, Cuyaba [Cuiabá], *da Silva Manso (Lhotzky 117)* (BR); Santa Ana da Chapada, *Sladen 347* (BM); *H. Smith s.n.* (R 19721); *Veloso 1235, 1311*, (RB).

The dense, white pubescence of the vegetative parts of *P. cordistipula* gives the plants a silvery-grey appearance. The stem stipules are 14–30 mm long and 10–20 mm wide. Those of the inflorescence are also large, at least 9 mm long and 7.5 mm wide, and persist even after the inflorescence leaves and pedicels are shed. In umbels of *P. cordistipula* the pedicels are often arranged around a central, glandular mass, up to 2.5 mm in diameter. The only other species with

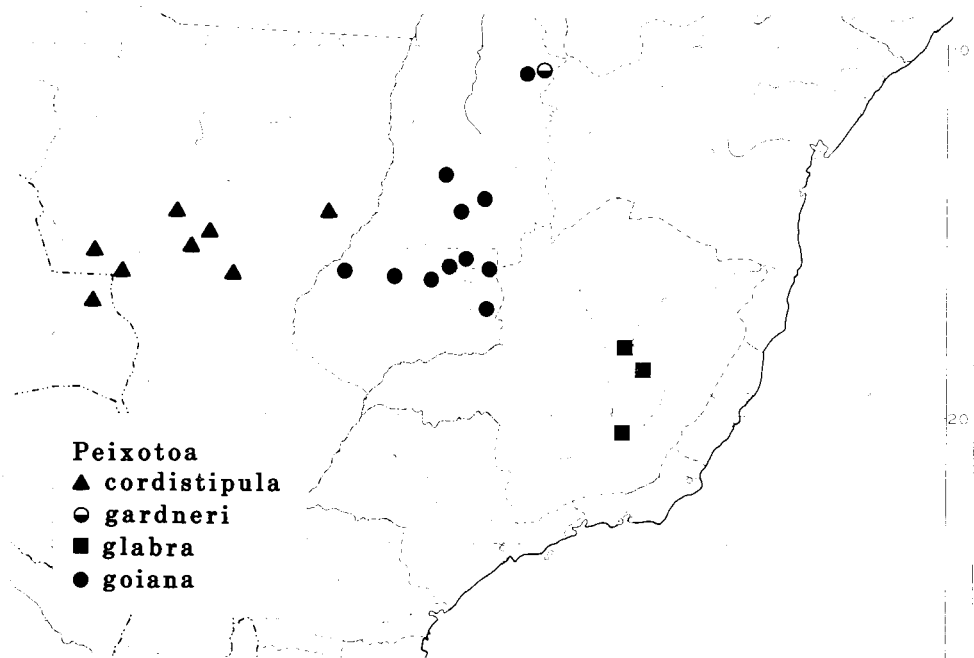


FIG. 5. Distribution of *P. cordistipula*, *P. gardneri*, *P. glabra*, and *P. goiana*.

such glandular tissue is *P. gardneri*, of northwestern Goiás, which has smaller, deciduous stipules. The western part of the range of *P. magnifica* overlaps with the range of *P. cordistipula*. Both species have petiolate inflorescence leaves, and large flowers and fruits. They are readily separated by their styles. Those of *P. magnifica* are 7–9.2 mm long. The anterior one is strongly arced toward the posterior petal and bears an oblong stigma at the apex but laterally on the abaxial surface. The styles of *P. cordistipula* are all less than 5.5 mm long and all stigmas are capitate. Both species produce large inflorescences, but in *P. magnifica* the flowers all open about the same time, while in *P. cordistipula* only a few are open at any one time.

Collections of *P. reticulata* with large stipules and/or from the western part of Brazil, from Bolivia, and from Paraguay have often been assigned to *P. cordistipula*. All the ones seen are apomicts with closed anthers that contain mostly aborted pollen. These plants have smaller and deciduous stipules and shorter staminode filaments than *P. cordistipula*. They lack the central, glandular mass in the umbel.

Collected in flower from April through August, in fruit in June and July.

**10. *Peixotoa gardneri* C. Anderson, sp. nov.**

Fig. 13.

Frutex (?). Rami juniores dense aureo-velutini, vetustiores glabri; pili pes ca 0.5–1 mm longus. Stipulae vegetativae 7.5–10 mm longae, acutae vel bifidae, deciduae vel persistentes. Petioli 3–7 mm longi. Laminae 7.8–11.5 cm longae, 3.7–7 cm latae, ovatae vel anguste ellipticae vel lanceolatae, supra aureo-velutinae, subtus aureo-velutinae necnon ferentes pilos T-formes in venis, basi juxta costam biglandulosae vel interdum glandulis in lamina prope basim. Inflorescentia terminalis, ramis dense aureo-velutinis, umbellis singularibus. Bractee bracteolaeque praesentes. Pedicelli 16–24 mm longi. Sepala 5–7 mm longa. Limbus petalorum lateralium 11–11.5 mm longus, orbicularis, margine glanduloso-fimbriato. Limbus petali postici ca 8.5 mm longus, orbicularis, margine  $\frac{2}{3}$  proximalibus glandulis capitatis ornato  $\frac{1}{3}$  distali glanduloso-fimbriato vel glanduloso-denticulato. Stylus anticus 3.2–3.7 mm longus, posticis semper brevior, erectus, styli postici 3.5–4.2 mm longi, inaequales, erecti vel parum divergentes et inclinati versus petala postico-lateralialia; stigmata capitata. Samara ignota.

Shrub? Vegetative branches densely golden velutinous, stalks of the hairs usually 0.5–1 mm or more long, pubescence abraded from older parts. Stem stipules 7.5–10 mm long, 6.7–7.5 mm wide, cordate, entire with the apex notched, or bifid, glabrous adaxially, densely golden velutinous abaxially, deciduous or persistent; inflorescence stipules gradually decreasing in size toward the distal nodes, the smallest not less than 5.5 mm long, 5.2 mm wide, apex of the more proximal notched, of the more distal acute, adaxially finely tomentulose, densely so in the proximal  $\frac{1}{4}$ – $\frac{1}{3}$ , sometimes the distal  $\frac{2}{3}$ – $\frac{3}{4}$  glabrous or glabrate, abaxially densely golden tomentose or woolly, deciduous. Stem leaves with the petiole 3–7 mm long, densely golden velutinous, laminae 7.8–11.5 cm long, 3.7–7 cm wide, ovate or narrowly so or narrowly elliptical or lanceolate, apex apiculate, base cordate, golden velutinous above, golden velutinous and pubescent with T-shaped hairs on the veins below, a pair of sessile glands at the base at the costa or sometimes on the surface of the lamina up to 2 mm above the base, up to 0.5 mm from the costa. Inflorescence leaves of the proximal nodes petiolate, the more distal sessile, laminae abruptly smaller than the cauline, the smallest not less than 3.2 mm long, 0.6 mm wide, shape of the more proximal lanceolate or linear-lanceolate, of the more distal linear or subulate, apex acuminate, tomentose or sparsely tomentulose or glabrous above, densely golden velutinous-tomentose below, a pair of glands at the base of the



costa, each gland 0.7–2 mm in diameter, sometimes each gland with 1 or 2 smaller glands (0.4–0.5 mm in diameter) above and/or adjacent to it. Inflorescence terminal, the axes golden velutinous or velutinous-tomentulose, internodes of the primary axis (0.7–) 2–9 cm long, 2° axes 0.2–8.7 cm long, 3° axes 0.6–1.5 cm long, subsidiary axes absent; umbels 4-flowered, one umbel per node, primary and secondary peduncles absent; the pedicels sometimes arranged around a glandular mass up to 0.8 mm in diameter, glabrous or sparsely to densely velutinous. Bracts 0.5–1.5 mm long, 0.3–0.7 mm wide, oblong, triangular or semicircular, glabrous adaxially, glabrous or velutinous or tomentose abaxially and/or on the margins; bracteoles 0.2–0.4 mm long, 0.2–0.3 mm wide, triangular, glabrous adaxially, glabrous or velutinous or tomentose abaxially and/or on the margins. Pedicels 16–24 mm long, velutinous or velutinous-tomentose, pubescence often dense. Sepals 5–7 mm long, 2.6–3.4 mm wide, adaxially densely tomentulose or glabrous in the proximal  $\frac{1}{3}$ , the distal  $\frac{2}{3}$  densely tomentulose, glands 1.5–1.8 mm long, 1–1.3 mm wide. Claw of the lateral petals 2.2–2.5 mm long, limb 11–11.5 mm long, ca 12 mm wide, orbicular, base briefly attenuate, fimbriae up to 0.5 mm long, glandular. Claw of the posterior petal 4.2–5 mm long, limb ca 8.5 mm long, ca 9 mm wide, orbicular, fimbriate or denticulate, the fimbriae or teeth up to 0.3 mm long, those of the proximal  $\frac{2}{3}$  capitate-glandular, those of the distal  $\frac{1}{3}$  denticulate- or fimbriate-glandular. Filaments of the lateral stamens 4.2–4.3 mm long, posterior filament ca 3.6 mm long, erect or very slightly inclined toward the posterior petal, anthers 1.3–1.4 mm long, glandular connectives 0.7–0.8 mm long. Pollen grains 50–57  $\mu\text{m}$ . Filaments of the anterior and anterior-lateral staminodes 3.6–3.8 mm long, posterior-lateral filaments ca 2.5 mm long, curved toward the posterior styles but not inflexed, all glands 1.6–1.7 mm long, anterior gland ca 1.5 mm wide, anterior-lateral and posterior-lateral glands 1–1.1 mm wide, all glands with the apex and abaxial face smooth. Anterior style 3.2–3.7 mm long, ca 0.4 mm wide, shorter than the posterior two, erect, posterior styles 3.5–4.2 mm long, unequal, erect or very slightly divergent and inclined toward the posterior-lateral petals, all styles glabrous, stigmas 0.4–0.5 mm wide, capitate. Samara not seen.

Type. *Gardner 3069 p.p.* Brazil. Goiás: Serra da Mangabeira [Chapada das Mangabeiras], Sep 1839 (holotype K, isotype K).

*Peixotoa gardneri* is known only from the type (Fig. 5). It resembles *P. anadenanthera* and especially *P. hirta* in that the hairs of the younger branches have very long stalks which are at least 0.5 mm long, but commonly are 1 mm or more. *P. anadenanthera* is easily recognized, since it is the only species in which the anthers lack the glandular connectives. *P. hirta* differs from *P. gardneri* in its smaller flowers. The limb of the posterior petal is obovate. In *P. gardneri* the limbs of all petals are orbicular. The pedicels of *P. gardneri* are sometimes arranged around a central, glandular mass which is often hidden in the dense pubescence. *P. cordistipula* of Mato Grosso is the only other species in which such glandular tissue is found in the umbel. The staminode glands of *P. gardneri* are unusual in that the adaxial groove extends nearly to the apex. However, this has been observed only in the two individuals of the type collection and may not be typical of the species. Extremely long adaxial grooves occur occasionally also in individuals of other species.

species.

*Gardner 3069* is a mixed gathering. The two specimens deposited at K are *P. gardneri*. The specimen at BM is *P. goiana*.

This species is named for the intrepid George Gardner, one of the important early collectors of the Brazilian flora. He ventured into many remote areas, such as the Chapada das Mangabeiras where *P. gardneri* was collected, which have not been visited by botanists since his time.

**11. *Peixotoa glabra*** Adr. Jussieu in St. Hilaire, Fl. Bras. Mer. **3**: 60. t. 172. 1832 [1833]. Fig. 17.

Erect or procumbent, often virgate shrub up to 2 m. Vegetative branches shiny, purplish-brown, very sparsely velutinous when young, soon glabrous. Stem stipules 8–20 mm long, 7–10 mm wide, cordate or narrowly triangular, bifid or sometimes entire and the apex acute, glabrous adaxially, glabrous or sometimes sparsely velutinous abaxially, persistent; inflorescence stipules gradually decreasing in size toward the distal nodes, the smallest not less than 5 mm long and wide, apex of the most distal acute or notched, commonly persistent. Stem leaves with the petiole 1.5–8.5 mm long, glabrous, lamina 5–12.2 cm long, 2.6–7.5 cm wide, elliptical, narrowly ovate or lanceolate, apex apiculate or acuminate, base cordate, glabrous above and below or rarely with a few scattered hairs along the margins, costa and major veins, a pair of sessile glands at the base at the costa or sometimes halfway on the petiole or rarely on the surface of the lamina up to 1.5 mm above the base, up to 1 mm from the costa, each gland 0.8–2.4 mm in diameter, sometimes one or both glands absent. Inflorescence leaves often petiolate at the most proximal nodes, subsessile or sessile at the most distal nodes, laminae gradually decreasing in size toward the distal nodes, the smallest not less than 1.7 mm long, 0.3 mm wide, lanceolate or triangular or linear or subulate, acuminate or rarely caudate, glabrous above and below or sometimes very sparsely velutinous, a pair of glands at the base, each gland 0.5–1.5 mm in diameter, these sometimes fused, or with 3–4 separate or fused glands, or with a second pair of smaller glands (0.5–0.7 mm in diameter) borne above the pair of larger glands. Inflorescence terminal, the axes glabrous or with a few scattered hairs or sometimes sparsely velutinous, internodes of the primary axis 2.7–10.7 cm long, 2° axes 1.7–9 cm long, 3° axes 0.8–5.9 cm long, 4° axes 1.6–2.6 cm long, 5° axes 0.7–0.9 cm long, subsidiary axes absent; umbels 4-flowered, one umbel per node, primary and secondary peduncles absent. Bracts 0.7–1.6 mm long, 0.4–0.9 mm wide, narrowly triangular, apex obtuse, glabrous or with scattered hairs distally and/or on the margins; bracteoles 0.1–0.3 (–0.6) mm long, 0.2–0.4 mm wide, triangular, apex obtuse, glabrous. Pedicels 11–25 mm long, velutinous, sometimes a little longer in fruit. Sepals (3–) 3.8–6 mm long, (1.3–) 2–2.7 mm wide, adaxially the proximal  $\frac{1}{3}$  glabrous, the distal  $\frac{2}{3}$  tomentulose, glands 1.1–1.9 (–2.7) mm long, 0.8–1.9 mm wide. Claw of the lateral petals (1–) 1.3–3.3 mm long, limb (7.5–) 9.3–14 mm long, (7.4–) 8–14 mm wide, orbicular, base truncate or attenuate, fimbriae up to 0.5 mm long, glandular or eglandular. Claw of the posterior petal (2.5–) 3.3–4.6 mm long, limb (4–) 5.6–7.5 mm long, (3.2–) 3.8–4.5 mm wide, elliptical or oblong or slightly obovate, base truncate, all fimbriae up to 0.5 mm long and capitate-glandular, or those of the distal  $\frac{1}{4}$  up to 0.7 mm long and fimbriate-glandular. Lateral stamen filaments (2.8–) 3–5 mm long, posterior filament 2.5–4 mm long, usually shorter than the lateral four, slightly arced toward the posterior petal, anthers 1–1.4 (1.6) mm long, glandular connectives 0.5–0.9 mm long. Pollen grains 50–54  $\mu\text{m}$ . Anterior and anterior-lateral staminode filaments (3–) 3.5–4.7 mm long, posterior-lateral filaments 3–3.9 mm long, usually shorter than the anterior three, slightly inflexed between the posterior styles, glands 1.1–1.5 mm long, 1–1.5 mm wide, the anterior gland often a little larger than the other four, the anterior and anterior-lateral glands with a deep indentation across the apex and decurrent on the abaxial face, posterior-lateral glands smooth. Anterior style 3–4 mm long, 0.2–0.3 mm wide, gently arced toward the posterior petal, posterior styles 3.4–4.5 mm long, 0.2–0.3 mm wide, divergent, especially the distal  $\frac{1}{2}$  arced toward the posterior-lateral petals, all styles glabrous or sometimes with scattered hairs in the proximal  $\frac{1}{3}$  of their lengths, stigmas 0.4–0.5 mm in diameter, capitate. Carpophore up to 3.7 mm long. Torus up to 4.5 mm high.

Samara with the dorsal wing 1.6–2.7 cm long, 0.9–1.6 cm wide, upper margin gently sigmoid, lower margin straight, sometimes slightly erose, lateral wings 1.5–4 mm wide, 7–12 mm high, areole 3.5–5.5 mm long, 2.7–5.6 mm wide, nut 5.7–6.5 mm high, 4.2–6 mm in diameter, seed 5.7–6.1 mm long, outer cotyledon 7.6–7.9 mm long, 2.6–3 mm wide, folded at ca ½ of its length, inner cotyledon 4.8–5.1 mm long, 1.9–2.2 mm wide, folded at ca ⅔–¾ of its length.

Type. *St. Hilaire s.n.* Brazil. Minas Gerais: "in pascuis juxta Tijuco [Diamantina]" (holotype P!, isotype P!)

Distribution. (Fig. 5). Known only from the central part of the Serra do Espinhaço of Minas Gerais, especially from the environs of Diamantina; cerrado.

BRAZIL. Minas Gerais: ca 18 km SW of Diamantina on road to Curvelo, 1400 m, *Anderson 8511* (MICH, NY); Mun. Gouvêia, 35 km SW of Diamantina on BR-259, 1250 m, *Anderson 11549* (C, MICH); ca 10 km SW of Diamantina, *Anderson et al. 35189* (MO, NY); Diamantina, *Brade 13722, 13775, 13777, 13781* (RB); Serra dos Cristais, Diamantina, *Glaziov 18937* (C, K, NY, P); Mun. Sêrro, rod. MG-2, entre Sêrro e Datas, *Hatschbach 28921* (NY, P); ca 20 km S of São João da Chapada, 1200 m, *Irwin et al. 28371* (MICH, MO, NY); ca 10 km S of São João da Chapada, 1200 m, *Irwin et al. 28412* (MICH, MO, NY); Serra da Lapa, *Langsdorff s.n.* (LE); Serra do São Gonçalo prope Diamantina, *do Linea (Herb. Schwacke 12816)* (RB); just W of Sêrro, on road from Conceição to Diamantina, *Maguire 49144* (MICH, NY); between Diamantina and Gouvêia, *Maguire 49164* (NY); Serra Frio, ad Tejuco [Diamantina], *Martius 1343* (M); Ouro Preto, Villa Rica [Ouro Preto], *Martius s.n.* (two collections) (M); Diamantina, crest of Serra do Rio Grande, 1300 m, *Mexia 5804* (A, BM, F, G, GH, K, MICH, MO, NY, R, S, US); Diamantina, *Pereira 1535* (RB); *Riedel XII p.p.* (LE, S); Serra da Lapa, *Riedel 1156* (LE, S); ad Riacho das Varas prope Diamantina, *Schwacke 8370* (RB); Tejuco [Diamantina], *Vauthier 459* (G, GH, P); Morro dos Cruzeiros, Diamantina, ca 1300 m, *Vidal s.n.* (R 72121).

*Peixotoa glabra* is the only glabrous species in Minas Gerais. The very sparsely pubescent *P. irwinii* and some glabrous forms of *P. reticulata* occur in the same area, but are readily distinguished by the staminode glands. Those of *P. glabra* are of equal size. The anterior and anterior-lateral three have an indentation across the apex and decurrent on the abaxial face. The glands of *P. irwinii* are smaller, unequal, and have a smooth apex. The abaxial face of the anterior and anterior-lateral glands have a shallow, broad depression. Also, the petioles of *P. irwinii* are golden pubescent. Those of *P. glabra* are glabrous. In *P. reticulata* the staminode glands are smooth and usually unequal. Its flowers are usually larger than those of *P. glabra*. *Anderson 8564* is perhaps a hybrid between *P. glabra* and *P. reticulata*. The specimens look like *P. reticulata*, but the foliage and stems are glabrous and the staminode glands are indented. The flowers, as in nearly all collections of *P. reticulata*, have closed anthers containing aborted pollen.

*Peixotoa glabra* has sometimes been confused with the usually glabrous or glabrate *P. hispidula*, which grows along the coast from Bahia to São Paulo. It differs in its usually large flowers born in a single umbel or a small inflorescence. The staminode glands are strongly dimorphic. The inflorescence leaves are all petiolate. Those of *P. glabra* are sessile at the more distal nodes.

Though *P. glabra* is apparently another narrow endemic, it is well represented in herbaria. Diamantina was an important destination for early collectors and still is much visited today. The locality of two Martius collections in the Munich herbarium is given as Ouro Preto, another frequently collected area. While it is tempting to ascribe this to a mistake in labeling, it must be remembered that the flora of Minas Gerais is still only poorly known.

Collected in flower from December through August, in fruit from March through August.

**12. *Peixotoa goiana*** C. Anderson, sp. nov.

Figs. 2, 20.

Suffrutex, caules ascendentes usque ad 2 m. Stipulae vegetativae 4–19 mm longae, acutae vel bifidae, plerumque persistentes. Petioli 1–7(–9) mm longi.

Laminae (4.3–)5–17 cm longae, 2.3–10.6 cm latae, lanceolatae vel ellipticae vel ovatae vel suborbiculares, supra velutinae raro glabrae, subtus ferentes pilos T-formes vel non nisi in venis vel raro glabrae, basi juxta costam biglandulosae vel interdum glandulis in lamina prope basim. Folia inflorescentiae petiolo brevi vel sessilia, in nodis distalibus linearia vel subulata. Inflorescentia terminalis, umbellis singularibus. Bractee bracteolaeque plerumque praesentes interdum absentes. Pedicelli 10–34 mm longi. Sepala 4–6.5 mm longa. Limbus petalorum lateralium 9.6–12(–15) mm longus, orbicularis vel late ellipticus, margine glanduloso-denticulato vel glanduloso-fimbriato interdum eglanduloso. Limbus petali postici 7.5–8.3(–10) mm longus, orbicularis vel interdum late obovatus, margine glandulis capitatis ornato vel margine  $\frac{2}{3}$  proximalibus glandulis capitatis ornato  $\frac{1}{3}$  distali glanduloso-fimbriato vel glanduloso-denticulato. Glandulae 3 staminodiorum anticorum plerumque apice profunde indentatae, indentatione in pagina abaxiali decurrenti, interdum laeves. Stylus anticus (2.6–)3.1–4.3(–4.6) mm longus, plerumque erectus raro parum inclinatus versus petalum posticum, styli postici 3.3–4.7 mm longi, divergentes, plerumque saltem parum inclinati versus petala postico-lateralia, semper anticum superantes; stigmata capitata. Ala dorsalis samarae 1.6–2.7 cm longa, 1.1–1.9 cm lata, alae laterales 0.6–2.5 mm latae, 5.5–9.8 mm altae, erosae interdum dissectae.

Subshrub with one or few ascending stems to 2 m. Vegetative branches densely, usually golden, velutinous or tomentulose-velutinous, rarely glabrous; the pubescence often abraded from older parts. Stem stipules 4–19 mm long, 2.3–16.5 mm wide, cordate or triangular-cordate, sometimes narrowly so, entire with the apex acute or notched, or bifid, finely velutinous or sparsely so or glabrous adaxially, densely velutinous or densely or sparsely tomentose or tomentose-velutinous abaxially, usually persistent; inflorescence stipules of the proximal nodes equal or larger than the cauline, the distal gradually decreasing in size toward the distal nodes, the smallest not less than 5.8 mm long, 5.3 mm wide, cordate, often concave, entire with the apex acute, the most proximal sometimes with the apex notched, or bifid, velutinous or sparsely so adaxially, velutinous-tomentulose abaxially, usually deciduous. Stem leaves with the petiole 1–7 (–9) mm long, densely, usually golden velutinous or rarely glabrous, laminae (4.3–) 5–17 cm long, 2.3–10.6 cm wide, lanceolate or elliptical or narrowly so or ovate or suborbicular, apex apiculate, base cordate, rugose, velutinous or rarely glabrous above, sparsely to densely pubescent with T-shaped hairs or rarely tomentose or rarely the hairs restricted to the veins or rarely glabrous below, hairs usually golden above and below, a pair of sessile glands halfway on the petiole or sometimes at the base at the costa, sometimes borne on the surface of the lamina 1–6 mm above the base, up to 3.8 mm from the costa, rarely at the margin 0.7–1 mm from the costa, each gland 0.5–1.8 mm in diameter, sometimes with a second, smaller pair (0.4–0.5 mm in diameter) below or adjacent to the larger pair. Inflorescence leaves of the proximal nodes with the petiole up to 5 (–6) mm long, the more distal sessile or very rarely with a petiole up to 1.4 mm long, laminae abruptly smaller than the cauline or gradually decreasing toward the distal nodes, the smallest not less than 2 mm long, 0.2 mm wide, the more proximal elliptical or narrowly so, the more distal linear, or subulate, apex acuminate, vesture of the more proximal like the cauline, the more distal glabrous above, densely velutinous below, all with a pair of glands at the base at the costa, the glands rarely fused, each gland (0.2–) 0.5–1.8 mm in diameter, sometimes with a second, smaller pair (0.3–1.2 mm in diameter) above or adjacent to the larger pair, or rarely one large gland borne on the costa with two large glands on either side. Inflorescence terminal, the axes velutinous or tomentulose, usually densely, rarely sparsely so, internodes of the primary axes 3.2–18.4 cm long, 2° axes 1.3–16.5 cm long, 2° subsidiary axes (0.2–) 1.5–3.5 cm long, 3° axes 0.6–7.2 cm long, 4° axes 1–3.8 cm long, 5° axes 0.9–1.8 cm long;

umbels 4-flowered, one umbel per node, primary and secondary peduncles absent. Bracts 0.3–1.3 mm long, 0.3–1.2 mm wide, triangular or semicircular, glabrous, sometimes velutinous or sparsely so abaxially and/or on the margins; bracteoles 0.1–0.5 mm long, 0.2–0.4 mm wide, triangular, glabrous, rarely velutinous abaxially and/or on the margins; bracts and bracteoles sometimes absent. Pedicels 10–34 mm long, (usually golden) densely velutinous or tomentose, becoming up to  $\frac{1}{3}$  again as long in fruit. Sepals 4–6.5 mm long, 2.2–3.3 mm wide, adaxially the proximal  $\frac{1}{4}$ – $\frac{2}{3}$  velutinous or sparsely so, the distal  $\frac{3}{4}$ – $\frac{1}{3}$  tomentulose, sometimes entirely sparsely velutinous, glands 1.6–2.6 mm long, 0.6–1.2 mm wide. Claw of the lateral petals 2.2–3.2 mm long, limb 9.6–12 (–15) mm long, 9–12 (–15) mm wide, orbicular or rarely broadly elliptical, base briefly attenuate, denticulate or fimbriate or both, the teeth and fimbriae up to 0.5 (–0.8) mm long, glandular or eglandular. Claw of the posterior petal 4–5 mm long, limb 7.5–8.3 (–10) mm long, 6.8–8 (–9) mm wide, orbicular or rarely broadly obovate, denticulate or fimbriate, teeth and fimbriae up to 0.6 mm long, those of the proximal  $\frac{1}{2}$ – $\frac{2}{3}$  capitate-glandular, the distal  $\frac{1}{2}$ – $\frac{1}{3}$  denticulate- or fimbriate-glandular, or sometimes all capitate-glandular. Filaments of the lateral stamens (3.3–) 3.8–4.8 mm long, posterior filament 2.6–4.3 mm long, always shorter than the lateral four, erect or very slightly curved toward the posterior petal, anthers 1.5–1.7 mm long, glandular connectives 0.7–0.8 mm long. Pollen grains ca 57  $\mu\text{m}$ . Filament of the anterior staminode 3.5–4.4 mm long, usually exceeding the anterior-lateral two, anterior-lateral filaments 3.2–3.6 mm long, posterior-lateral filaments 2.8–3.5 mm long, always shorter than the anterior-lateral two, inflexed between the posterior styles, anterior gland 1.2–1.5 mm long, 1.2–1.3 mm wide, anterior-lateral glands ca 1.2 mm long, 1.1–1.2 mm wide, posterior-lateral glands 1–1.1 mm long, 0.9–1 mm wide, anterior and anterior-lateral glands with a deep indentation across the apex and decurrent on the abaxial face or sometimes smooth, posterior-lateral glands smooth. Anterior style (2.6–) 3.1–4.3 (–4.6) mm long, 0.3–0.4 mm wide, erect or rarely slightly inclined toward the posterior petal, posterior styles 3.3–4.7 mm long, ca 0.3 mm wide, always longer than the anterior style, divergent, at least slightly inclined toward the posterior-lateral petals, all styles glabrous or with scattered hairs in the proximal  $\frac{1}{2}$  of their lengths, stigmas 0.3–0.5 mm wide, capitate. Carpophore up to 3.6 mm long. Torus up to 6.2 mm high. Samara with the dorsal wing 1.6–2.7 cm long, 1.1–1.9 cm wide, upper margin sigmoid or arced, lower margin sigmoid, arced or semicircular, slightly erose, lateral wings 0.6–2.5 mm wide, 5.5–9.8 mm high, rectangular, erose or irregularly dentate or dissected, areole 4.5–6.1 mm long, 3.5–5.5 mm wide, nut 5.5–7 mm long, 3–5 mm in diameter, seed 6.9–8.2 mm long, outer cotyledon 7.8–10.8 mm long, 1.6–3.3 mm wide, folded at ca  $\frac{2}{3}$  of its length, inner cotyledon 5.1–7.2 mm long, 1.5–2 mm wide, folded at ca  $\frac{2}{3}$ – $\frac{6}{7}$  of its length or straight.

Type. *Irwin et al. 12855*. Brazil. Goiás: Chapada dos Veadeiros, 14°S, 47°W, ca 15 km W of Veadeiros [Alto Paraíso], 1000 m, 14 Feb 1966 (holotype UB, isotypes MICH, NY).

Distribution. (Fig. 5). Central Goiás, especially in the Serra dos Veadeiros, Serra dos Cristais, Serra dos Pirineus, and Serra Dourada, and the Distrito Federal; cerrado and campo.

BRAZIL. Goiás: Chapada dos Veadeiros, ca 20 km N of Alto Paraíso, ca 1600 m, *Anderson 6201* (MICH, NY); Serra dos Cristais, 9 km S of Cristalina on road to Catalão, 1170 m, *Anderson 8090* (NY); Serra Dourada, ca 15 km (str. line) S of Goiás Velho, 1000 m, *Anderson 10024* (MICH, NY); Serra dos Pirineus, ca 15 km (str. line) N of Corumbá de Goiás, 1300 m, *Anderson 10282* (MICH, NY); Chapada dos Veadeiros, 14°S, 47°30'W, 2.5 km E of Alto Paraíso, *Estabrook 8* (MICH); Chapada dos Veadeiros, *Ferreira 6* (UB); Serra dos Pirineus, *Ferreira 8* (UB); Serra da Mangabeira [Chapada das Mangabeiras] *Gardner 3069 p.p.* (BM); Chapada dos Veadeiros, Pouso Alto, 1800 m, *Ferreira 10, 11* (UB); Serra Dourada, *Ferreira 32* (UB); ca 70 km de Brasília, Vale S. Gerônimo, *Ferreira 150, 152* (UB); Chapada dos Veadeiros, mun. Alto Paraíso, 16 km by road N of Alto Paraíso, 1600 m,

14°S, 47°W, *Gates* & *Estabrook 103* (MICH); Serra dos Pirineus, Pirenópolis, *Giulietti* & *Lima 725* (UB); Chapada dos Veadeiros, Pouso Alto, 1800 m, *Graziela [Barroso] 609* (UB); Chapada dos Veadeiros, 65 km N of Brasília, *Harley et al. 11432* (K, NY); Serra do Rio Preto, 16°S, 47°W, ca 5 km E of Goiás boundary on road to Guarapuá, M. G., 1000 m, *Irwin et al. 10291* (MICH); Serra dos Pirineus, 16°S, 49°W, ca 14 km S of Corumbá, 975 m, *Irwin et al. 10773* (NY); Serra Dourada, 20 km SE of Goiás Velho, 800 m, *Irwin et al. 11705* (MICH, NY); Chapada dos Veadeiros, 14°S, 47°W, ca 15 km W of Veadeiros [Alto Paraíso], *Irwin et al. 12351* (MICH, NY); Serra dos Cristais, 17°, 48°W, ca 10 km S of Cristalina, 1200 m, *Irwin et al. 13733* (MICH, NY); ca 87 km SE of Aragarças, 700 m, *Irwin et al. 17562* (MICH); Serra dos Pirineus, 15–20 km N of Corumbá de Goiás on road to Niquelândia, ca 1150 m, *Irwin et al. 18616* (MICH, NY), *19271* (NY); Chapada dos Veadeiros, ca 10 km W of Alto Paraíso, 1000 m, *Irwin et al. 24985* (NY); Chapada dos Veadeiros, ca 19 km N of Alto Paraíso, ca 1250 m, *Irwin et al. 32799* (MICH, NY); Serra dos Pirineus, ca 18–20 km E of Pirenópolis, 1000 m, *Irwin et al. 34061* (MICH, NY), *34096* (NY); 14 km S of Niquelândia, ca 750 m, *Irwin et al. 34743*, *34744* (NY); Niquelândia, *Macêdo 3671* (RB); Chapada dos Veadeiros, 2 km from Veadeiros [Alto Paraíso], *Prance* & *Silva 58200* (MICH, NY); Serra Dourada, *Rizzo 3997*, *4128*, *4442*, *4494*, *4597*, *4638* (RB); mun. Alto Paraíso, Cinturão Verde, Parque Nacional do Tocantins, *Rosa 67* (UB). Distrito Federal: Brasília, *Andrade 318* & *Emmerich 310* (R), *Ferreira 2a*, *46*, *47*, *118* (UB), *Gomes 1056* (RB), *8394* (SP, UB), *Irwin* & *Soderstrom 6083a* (NY), *Martin 407* (GH), *476* (GH, UB), *Occhioni 23* (MICH), *Pires et al. 9086* (UB, US), *Sucre 274* (NY, RB, UB); Braslândia, *Ferreira 4* (UB); summit of Chapada da Contagem, ca 10 km E of Brasília, 1000 m, *Irwin et al. 8221* (MICH); ca 12 km W of Taguatinga on road to Braslândia, 1250 m, *Irwin et al. 10683* (NY); Braslândia, *Macêdo 23* (UB); Chapada da Contagem, along highway DF-5 about 36 km W of intersection with BR-020, 1280 m, *Plowman 9943* (MICH); Fazenda Agua Limpa (Univ. of Brasília field station), near Vargem Bonita, *Ratter et al. 2806*, *2899*, *3129* (MICH); Salinas, *Weddell 2193* (P).

*Peixotoa goiana* is distinguished by its flowers and inflorescence leaves. All the petals have an orbicular (rarely broadly obovate or broadly elliptical) limb. The margins of the lateral limbs are commonly denticulate or sometimes fimbriate. The anterior style is usually erect or sometimes slightly inclined toward the posterior petal. The anterior and anterior-lateral staminode glands of plants from the Distrito Federal, the Serra dos Pirineus and the Serra dos Cristais have an indentation across the apex and decurrent on the abaxial face. Those of the Serra Dourada are smooth. In specimens from the Chapada dos Veadeiros the glands are either indented, often shallowly so, or smooth. The inflorescence leaves of the more distal nodes are linear to subulate and sessile; only *Irwin 17562* has inflorescence leaves with tiny petioles. This collection is from the extreme western part of the range at the Mato Grosso border.

The abundance of hairs on the vegetative parts is highly variable. Most plants are moderately to densely pubescent, but in some the hairs are very sparsely distributed and on the leaves restricted to the major veins. Glabrous forms are rare (*Anderson 8090*, *Irwin 10773*, *Macêdo 3671*). The stem and inflorescence stipules are usually 4–12 mm long. However, in a few collections their length ranges from 9–19 mm.

The samaras have relatively narrow lateral wings which are 0.6–2.5 mm wide. In most specimens the wings are at least 1 mm wide. Only the probably closely related *P. hatschbachii* has more reduced wings. In that species each lateral wing is a narrow strip less than 1 mm wide in the proximal ½ of the nut or a crest, or the lateral wings are absent. In *P. goiana* the wings extend along the entire length of the nut.

In the southern part of its range *P. goiana* overlaps with the apomictic *P. reticulata*. Some plants that are intermediate, especially in floral characters, occur, but all are apparently apomictic.

Collected in flower and fruit throughout the year.

### 13. *Peixotoa hatschbachii* C. Anderson, sp. nov.

Fig. 15.

Frutex erectus usque ad 1.2 m. Caulis glabri. Stipulae vegetativae 17–19.5 mm longae, plerumque bifidae, deciduae vel persistentes. Petioli 6.5–10 mm longi. Laminae 6.2–9.3 cm longae, 4.4–7.5 cm latae, ovatae, rugosae,

glabrae, basi juxta costam 2- vel 4-glandulosae, glandulis pedicellis. Folia inflorescentiae petiolo brevi vel sessilia, distaliora linearia vel subulata, subtus dense velutina, basi juxta costam 2-6-glandulosa. Inflorescentia terminalis (vel axillaris?), umbellis singularibus. Bracteae bracteolaeque praesentes. Pedicelli 18.3-23 mm longi. Sepala 4.5-5.2 mm longa. Limbus petalorum lateralium 9.8-10 mm longus, late obovatus vel suborbicularis, margine glanduloso-fimbriato. Limbus petali postici 3.5-3.8 mm longus, obovatus vel late obovatus, margine  $\frac{1}{2}$  proximali glandulis capitatis ornato,  $\frac{1}{2}$  distali glanduloso-fimbriato. Styli subaequales, 3.6-4 mm longi, anticus parum inclinatus versus petalum posticum, postici divergentes, parum inclinati versus petala postico-lateralia; stigmata capitata. Ala dorsalis samarae 1.7-1.9 cm longa, 1.3-1.4 cm lata, alae laterales absentes vel multo redactae, minus quam 1.5 mm latae, 5.5-7.2 mm altae, extensae e medio nucis ad basim.

Erect shrub to 1.2 m. Vegetative branches shiny, purple, glabrous. Stem stipules 17-19.5 mm long, 18-19 mm wide, cordate, bifid, glabrous, persistent or deciduous; inflorescence stipules gradually decreasing in size toward the distal nodes, the smallest not less than 8.3 mm long, 10.5 mm wide, entire, apex acute, tomentulose adaxially, velutinous abaxially, deciduous. Stem leaves with the petiole 6.5-10 mm long, glabrous, laminae 6.2-9.3 cm long, 4.4-7.5 cm wide, ovate, apex apiculate, base cordate, rugose, glabrous above and below, a pair of stalked glands at or just above the base at the costa, each gland 1-1.2 mm in diameter, stalk 0.8-1.2 mm long, commonly each gland with an adjacent smaller gland, 0.8-1.1 mm in diameter, stalk 0.4-1 mm long. The more proximal inflorescence leaves with a petiole up to 5 mm long, the more distal commonly sessile, laminae abruptly smaller than the cauline, the smallest not less than 5.5 mm long, 0.6 mm wide, shape of the more proximal like the cauline, the more distal linear to subulate, apex acuminate, sparsely velutinous or glabrous above, densely velutinous below, glands sessile, sometimes with a pair of glands at the base at the costa, usually with multiple glands: one pair but each large gland with one or two smaller glands adjacent and/or below it, some or all of these sometimes fused, or sometimes with one large gland on the costa and two smaller glands adjacent on each side, or sometimes with two large glands at each side of the costa, some or all of these fused, and with one or two smaller glands below them, each large gland 1-1.5 mm in diameter, each small gland 0.5-1 mm in diameter. Inflorescence terminal (or axillary?), the axes sparsely velutinous to glabrate, internodes of the primary axis 10-13 cm long, 2° axes 5.8-19 cm long, 2° subsidiary axes up to 2.7 cm long, 3° axes 3.8-7.1 cm long, 3° subsidiary axes 1.2-1.5 cm long, 4° axes 1.8-3.1 cm long, umbels 4-flowered, one umbel per node, primary and secondary peduncles absent. Bracts 1.8-4 mm long, 0.6-9 mm wide, narrowly triangular, glabrous adaxially, sparsely velutinous abaxially; bracteoles 0.2-0.3 mm long, 0.3-0.5 mm wide, semicircular, glabrous. Pedicels 18.3-23 mm long, velutinous, slightly longer in fruit. Sepals 4.5-5.2 mm long, 2.1-2.6 mm wide, adaxially the proximal  $\frac{1}{2}$ - $\frac{2}{3}$  glabrous, the distal  $\frac{1}{2}$ - $\frac{1}{3}$  tomentulose, glands 1.7-2 mm long, 0.6-1 mm wide. Claw of the lateral petals 2-2.2 mm long, limb 9.8-10 mm long, 9-10 mm wide, broadly obovate to suborbicular, base attenuate, fimbriae up to 0.6 mm long, glandular. Claw of the posterior petal 3.5-3.8 mm long, limb 5.5-6.5 mm long, 5-5.8 mm wide, obovate or broadly so, fimbriae up to 0.4 mm long, those of the proximal  $\frac{1}{2}$  capitate-glandular, the distal  $\frac{1}{2}$  fimbriate-glandular. Lateral stamen filaments 3.6-4 mm long, posterior filament (3-) 3.5-3.7 mm long, arced toward the posterior petal, anthers 1.5-1.8 mm long, glandular connectives 0.7-0.9 mm long. Pollen grains 50-57  $\mu$ m. Anterior staminode filament 3.8-4 mm long, anterior-lateral filaments 3.6-3.7 mm long, posterior-lateral filaments 3.2-3.4 mm long, inflexed between the posterior styles, anterior and anterior-lateral glands 1.3-1.4 mm long, 1.1-1.2 mm wide, posterior-lateral glands ca 1.1 mm long, ca 0.8 mm wide,

all glands with the apex and abaxial face smooth. Styles 3.6–4 mm long, equal or the anterior style a little longer or shorter than the posterior two, anterior style ca 0.4 mm wide, slightly inclined toward the posterior petal, posterior styles ca 0.3 mm wide, divergent, slightly inclined toward the posterior-lateral petals, all with some scattered hairs in the proximal  $\frac{1}{4}$  of their lengths, stigmas 0.5–0.6 mm in diameter, capitate. Carpophore up to 3 mm long. Torus up to ca 5 mm high. Samara with the dorsal wing 1.7–1.9 cm long, 1.3–1.4 cm wide, upper margin gently arced, lower margin slightly erose or sometimes entire, lateral wings absent or reduced to a crest or to a narrow, erose strip less than 1.5 mm wide, 5.5–7.2 mm high, usually extending from the middle to the base of the nut, areole 5–5.3 mm long, ca 5 mm wide, nut 6–7 mm long, 4.7–5 mm in diameter, seed ca 6.8 mm long, ca 3 mm wide, outer cotyledon ca 9.7 mm long, ca 2.8 mm wide, folded at  $\frac{1}{2}$  of its length, inner cotyledon ca 5.2 mm long, ca 1.6 mm wide, folded at ca  $\frac{4}{5}$  of its length.

Type. *Hatschbach* 36675. Brazil. Goiás: BR-135, 10 km E of Anápolis, 22 May 1975 (holotype MBM, isotypes C, MICH).

*Peixotoa hatschbachii* is known only from the type (Fig. 6). It is distinguished by its stalked leaf glands and by its glabrous vegetative branches and stem leaves. The samaras are unique in that the lateral wings are absent, or reduced to a crest or a narrow strip of tissue, less than 1.5 mm wide, which usually extends from the middle to the base of the nut. The stipules are unusually large. Those of the stem are 17–19.5 mm long and wide. The smallest inflorescence stipule seen is 8.3 mm long and 10.5 mm wide. *P. hatschbachii* occurs within the range of *P. goiana*, to which it may be closely related. Plants of *P. goiana* are only rarely glabrous. These glabrous forms as well as the glabrous or very sparsely pubescent *P. psilophylla* from east-central Mato Grosso differ from *P. hatschbachii* by their sessile leaf glands, smaller stipules, and larger posterior petals.

This species is named in honor of Gert Hatschbach, an astute student as well as a prolific and discerning collector of the flora of central and southern Brazil.

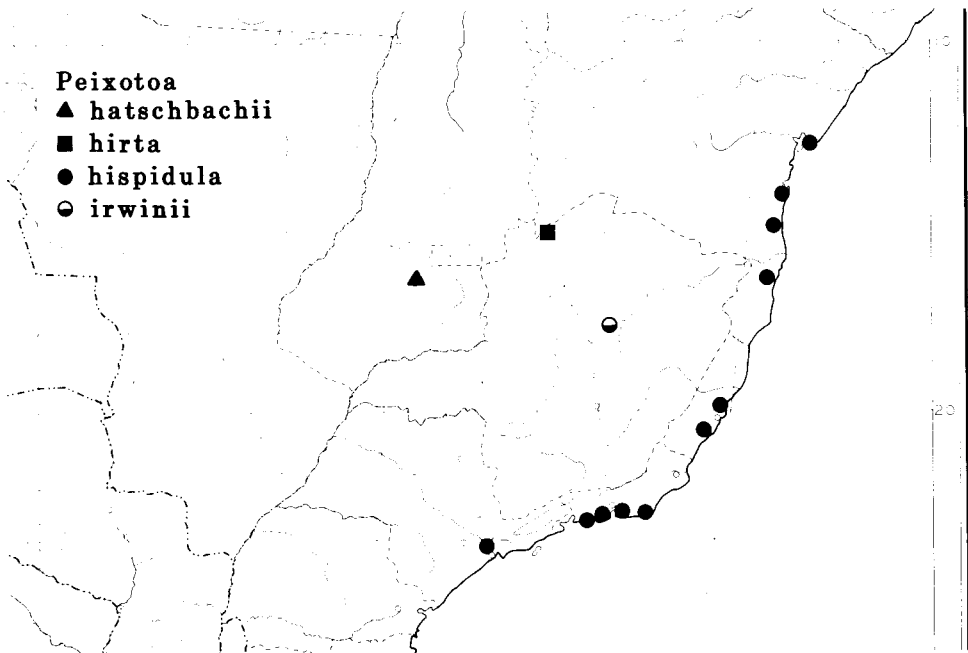


FIG. 6. Distribution of *P. hatschbachii*, *P. hirta*, *P. hispidula*, and *P. irwinii*.



**14. *Peixotoa hirta*** Adr. Jussieu, Ann. Sci. Nat. Sér. II, Bot. 3: 279. 1840.

Fig. 20.

Erect, subscandent shrub, 1–2 m. Vegetative branches densely but loosely golden velutinous, stalks of the hairs usually 0.5–1 mm or more long, pubescence abraded from older parts. Stem stipules 6–9 mm long, 7–9 mm wide, cordate, entire with the apex acute or notched, or bifid, glabrous or sparsely tomentulose adaxially, velutinous and pubescent with T-shaped hairs abaxially, deciduous; inflorescence stipules like the cauline or sometimes a little larger, glabrous adaxially, tomentulose abaxially, deciduous. Stem leaves sessile or with the petiole up to 6.5 mm long, densely golden velutinous, laminae 7.3–9 cm long, 4.7–8.2 cm wide, elliptical or ovate or suborbicular, rugose, apex apiculate, base cordate, loosely golden velutinous and pubescent with golden T-shaped hairs above, densely pubescent with golden T-shaped hairs below, a pair of sessile glands at the base at the costa, each gland 0.6–1.2 mm in diameter. Inflorescence leaves with the petiole up to 3.2 mm long, the more distal sessile, laminae abruptly smaller than the cauline, the smallest not less than 3 mm long, 0.6 mm wide, narrowly lanceolate to subulate, apex acuminate, densely golden velutinous or tomentulose above, very densely pubescent with golden T-shaped hairs below, a pair of glands at the base at the costa, each gland 0.6–2.5 mm in diameter. Inflorescence terminal, the axes densely but loosely golden velutinous, internodes of the primary axis 4.5–10.7 cm long, 2° axes 0.7–4.7 cm long, subsidiary axes absent; umbels 4-flowered, one umbel per node, primary and secondary peduncles absent. Bracts 0.9–1.2 mm long, 0.6–0.8 mm wide, triangular, glabrous; bracteoles ca 0.2 mm long and wide, oblong or triangular, glabrous. Pedicels 11–15 mm long, densely golden tomentulose. Sepals 4.4–5.8 mm long, 2.1–3 mm wide, adaxially glabrous, glands 1.5–2 mm long, 0.6–1.1 mm wide. Claw of the lateral petals 2.2–2.4 mm long, limb 9–9.5 mm long, ca 8–8.5 mm wide, orbicular, base truncate, fimbriae up to 0.5 mm long, fimbriate-glandular, sometimes a few fimbriae of the anterior-lateral petals eglandular. Claw of the posterior petal 2.5–2.6 mm long, limb ca 6.5 mm long, ca 5 mm wide, obovate, fimbriae up to 0.6 mm long, capitate-glandular. Lateral stamen filaments 3.3–3.4 mm long, posterior filament ca 3.2 mm long, erect or very slightly curved toward the posterior petal, anthers 1.7–2 mm long, glandular connectives 1–1.2 mm long. Pollen grains 42  $\mu\text{m}$ . Filaments of the anterior and anterior-lateral staminodes ca 3.4 mm long, posterior-lateral filaments ca 3 mm long, inflexed between the posterior styles, anterior and anterior-lateral glands 1.3–1.4 mm long, 1.2–1.3 mm wide, posterior-lateral glands ca 1.1 mm long, ca 0.8 mm wide, all glands with the apex and abaxial face smooth. Anterior style ca 3.2 mm long, ca 0.4 mm wide, slightly arced toward the posterior petal, posterior styles ca 2.8 mm long, ca 0.3 mm wide, divergent, arced toward the posterior-lateral petals, stigmas 0.5–0.6 mm wide, capitate. Samara not seen.

Type. *Martius s.n.* Brazil. Minas Gerais: "Inter fruticeta ad praedium Ypa [Yha] provinciae Minas Geraeae in Goyasanae confinibus. . ." (holotype M! fragment P-JUSS!).

This species is known only from the type, which was collected in northwestern Minas Gerais near the Goiás border (Fig. 6). Plants of *P. hirta* are densely golden pubescent. The hairs of the stem and vegetative branches and of the upper surface of the larger leaves have unusually long stalks, at least 0.5 mm long and commonly 1 mm or more long. Such hairs are also found in *P. gardneri* of the southern part of the Chapada das Mangabeiras of northeastern Goiás. That species differs from *P. hirta* in its larger flowers in which the petal limbs are orbicular. Its staminode glands are all equally long. In *P. hirta* the limb of the posterior petal is obovate. The anterior and anterior-lateral staminode glands are longer than the posterior-lateral two. *P. anadenanthera* of central Goiás also

has long-stalked hairs, but is easily recognized by its anthers, which lack the glandular connective.

**15. *Peixotoa hispidula*** Adr. Jussieu, Ann. Sci. Nat. Sér. II, Bot. **3**: 279. 1840.

Fig. 17.

- P. hispidula* f. 1. *subtomentosa* Niedenzu, Verz. Vorles. Akad. Braunsberg W-S 1912–1913: 41. 1912. Type. *Gaudichaud 964* (lectotype G!, isotype P!).  
*P. hispidula* f. 2. *subglabrata* Niedenzu, Verz. Vorles. Akad. Braunsberg W-S 1912–1913: 41. 1912. Type. *Martius 1169* (lectotype G!, isotypes BM! BR! F! GH! K! LE! M! MO! NY! P! S! W!).  
*P. hispidula* f. 3. *micrantha* Niedenzu, Verz. Vorles. Akad. Braunsberg W-S 1912–1913: 41. 1912. Type. *Salzmann 93* (holotype B, destroyed; isotype G!).

Erect, scandent or prostrate shrub or subshrub or vine. Vegetative branches loosely velutinous or sparsely so or glabrous when young, older parts glabrous or glabrate. Stem stipules 3.4–13 mm long, 3–11 mm wide, cordate or sometimes triangular, entire with apex acute or notched, or rarely bifid, finely velutinous or tomentulose or glabrous adaxially, sericeous, velutinous or tomentulose, or velutinous-tomentulose abaxially or only on the margins, or glabrous abaxially, usually deciduous, sometimes persistent; inflorescence stipules like the cauline but usually more densely pubescent, eventually deciduous. Stem leaves with the petiole 2–16 mm long, loosely, sparsely or densely, velutinous, sometimes glabrous, lamina 2.3–12 cm long, 1.5–7.3 cm wide, elliptical or ovate, sometimes lanceolate, oblanceolate or orbicular, apex apiculate, base cordate or slightly so, rarely almost truncate, glabrous or glabrate or sparsely sericeous or velutinous or sparsely so above, glabrous or glabrate or loosely or sparsely pubescent with T-shaped hairs or loosely or sparsely tomentulose below, a pair of sessile glands at the base at the costa or halfway on the petiole or on the petiole up to 0.5 mm below the lamina or on the surface of the lamina up to 1.5 mm above the base, up to 0.5 (–2.3) mm from the costa, each gland 0.3–1.6 mm in diameter. Inflorescence leaves with the petiole at least 2 mm long, laminas abruptly smaller than the cauline, the smallest not less than 3.9 mm long, 1.2 mm wide, elliptical or lanceolate or linear-lanceolate or linear, apex acuminate to caudate, finely velutinous or sparsely sericeous to glabrate above, sericeous or sparsely so below, a pair of glands at the base at the costa or halfway on the petiole or sometimes on the petiole just below the lamina, each gland (0.2–) 0.4–1.3 (–1.8) mm in diameter, rarely with a second, smaller pair (ca 0.4 mm in diameter) just below the larger pair. Inflorescence terminal or axillary, the axes usually sparsely velutinous, sometimes sparsely tomentulose, internodes of the primary axis 0.5–5.3 cm long, 2° axes 0.9–4 cm long, 3° axes 1.3–3.2 cm long, commonly the inflorescence with one terminal umbel only or with 2° axes only, subsidiary axes absent; umbels 4-flowered, one umbel per node, primary peduncles absent, secondary peduncles rare, up to 0.5 mm long. Bracts 0.4–1.5 mm long, 0.2–0.5 mm wide, triangular or oblong or linear, glabrous, or sometimes velutinous or tomentose abaxially and/or on the margins; bracteoles 0.1–0.3 mm long, 0.1–0.2 mm wide, triangular or semicircular, glabrous, or bracteoles absent. Pedicels 17–39 mm long, finely or sparsely velutinous, usually a little longer in fruit. Sepals 4.2–6 mm long, 1.2–3 mm wide, adaxially glabrous and the extreme apex tomentulose or the proximal 1/2–4/5 glabrous, the distal 1/2–1/5 tomentulose, glands 1.5–2.5 mm long, 0.6–1.2 mm wide. Claw of the lateral petals 2–3 mm long, limb 13–16 (–20) mm long, 11.5–15 (–18) mm wide, orbicular or broadly elliptical, base attenuate, fimbriae up to 0.5 mm long, glandular. Claw of the posterior petal 4.7–6.6 mm long, limb 6.5–8.2 mm long, 5–7 mm wide, elliptical, sometimes orbicular, fimbriae up to 0.6 mm long, capitate-glandular. Lateral stamen filaments 3.6–5 mm long, posterior filament 2.6–3.3 mm long, usually at

least slightly curved toward the posterior petal, sometimes erect, anthers 1–1.4 mm long, glandular connectives 0.8–0.9 mm long. Pollen grains ca 50  $\mu\text{m}$ . Anterior and anterior-lateral staminode filaments 3.7–5.3 mm long, commonly the anterior filament a little longer than the anterior-lateral two or the three subequal, posterior-lateral filaments 2.4–3.7 (–4.5) mm long, always shorter than the anterior three, slightly curved toward the posterior styles, glands of the anterior and anterior-lateral staminodes 1.1–1.3 mm long, 1.3–1.7 mm wide, always wider than long, posterior-lateral glands 0.8–1.2 mm long, 0.7–1.2 mm wide, the anterior three with a deep or shallow indentation across the apex and decurrent on the abaxial face, posterior-lateral glands smooth. Anterior style (3.4–) 3.7–4.8 mm long, 0.3–0.4 mm wide, longer or shorter but always a little stouter than the posterior two, arced toward the posterior petal, posterior styles (3.7–) 4–5.2 mm long, 0.2–0.3 mm wide, divergent, slightly curved toward the anterior-lateral or posterior-lateral petals, stigmas 0.3–0.4 (–0.5) mm in diameter, capitate. Carpophore up to 3 mm long. Torus up to 5.3 mm high. Samara with the dorsal wing 1.7–2.4 cm long, 0.98–1.6 cm wide, upper margin straight or gently sigmoid, lower margin straight in the proximal  $\frac{1}{2}$ – $\frac{2}{3}$ , the distal  $\frac{1}{3}$ – $\frac{1}{2}$  arced, slightly erose, lateral wings 2–3.3 (–5.5) mm wide, 6–10 mm high, rectangular, erose or irregularly dentate, areole 3.5–5.2 mm long, 3.2–4.2 mm wide, nut ca 4–6.5 mm long, 2.5–3.8 mm in diameter, seed 6.5–7.1 mm long, outer cotyledon 7.6–8.9 mm long, 2.2–2.4 mm wide, folded at ca  $\frac{2}{3}$  of its length, inner cotyledon 5.3–6.2 mm long, 1.5–2.2 mm wide, folded at ca  $\frac{2}{3}$ – $\frac{3}{4}$  of its length.

Type. *Martius 1169*. Brazil. Rio de Janeiro: Between Cabo Frio and Espírito Santo [fide Niedenzu, 1912]. 1841 (Lectotype P!, isotypes BM! BR! F! G! GH! K! LE! M! MO! NY! S! W!).

Distribution. (Fig. 6). Along the coast from Bahia to Rio de Janeiro, two collections from São Paulo; restingas, dunes, beaches.

BRAZIL. Bahia: Mun. Marau, 4 km S of Marau, *Almeida 136* (CEPEC); Marau, *Belém 3456* (CEPEC, MICH, NY); Salvador, Lagôa de Abaeté, *Belém & Mendes 290* (IAN, NY, UB, US); *Blanchet 1908* (G), *116* (W); Itapaba, at Lagôa do Abaeté, E of Salvador, 10–20 m, *Davis 61059* (F); Porto Seguro, *Duarte 5966* (MICH); 5 km SE of Marau at junction with new road N to Ponta do Mutá, 14°08'S, 39°00'W, 0–50 m, *Harley et al. 18510* (MICH); Ilhéus, *Riedel 617* (A, LE, S); *Salzmann 93* (G); *Warara & Maly 142* (W). Espírito Santo: Mun. Serra, entre Nova Almeida e Santa Cruz, *Araujo 311 & Peixoto 181* (RB); Guarapari, *Duarte 3655, 4173* (RB), *Occhioni 7226* (MICH); inter Cabo Frio et Espírito Santo, *Wied-Neuwied s.n.* (BR). Rio de Janeiro: Rio de Janeiro, *Gaudichaud 963* (F, P, P.-JUSS, RB, syntype of *P. hispidula*), *964* (G, P), *Lund 477c* (C, GOET); restinga de Itapú, *Araujo 690 & Peixoto 492* (MICH, RB); restinga de Piratininga, *Brade 12014* (R); Sarangiros dans les bois des Priner, *Glaziou 11819* (P); Lagôa de Piratininga, *Kuhlmann s.n.* (RB 26272); Santa Rosa, *Netto 88* (R); restinga de Aramama, *Occhioni s.n.* (RB 26440); restinga da Marambaia, *Occhioni 3554, 4313* (MICH); restinga de Itapú, *Schwacke 7130* (NY, R); entre Macaé e Rio das Ostras, BR-6, Km 161, *Trinta 966 & Fromm 2042, Trinta 966-A & Fromm 2042-A* (R); Cabo Frio, *Alston-Lutz 56, 57* (R), *Fromm et al. 1334* (R), *Lindeman 6327* (MICH), *Markgraf 3047 & Brade* (RB), *Mello Filho 1129* (R), *Moreira & Angosto s.n.* (R 72184), *Netto et al. s.n.* (R 19558), *Restinga 1-324* (GH, R, US), *1-765* (US), *1-1232* (US), *1-1233* (NY), *Riedel & Luschnath s.n.* (LE), *Segadas & Vianna 4210* (P), *Smith 6570* (R, US), *Sucre 3853, 4921* (MICH), *Ule 4706* (R), *Vidal s.n.* (R 39291); Recreio dos Bandeirantes, *Krapovickas et al. 23197* (F, G, MICH, MO, P), *Lutz 653* (R), *Markgraf 3788 & Brade* (RB), *Mello Filho 830, 980, 981* (R), *Pereira 10525* (M), *Rente 2, 238* (R), *Rodrigues 92* (R), *Santos 5086, 5087, 5088* (R), *Smith 6367* (NY, R, S, US); Restinga de Jacarepaguá, *Araujo 119* (MICH), *124* (RB), *140* (MICH), *Atala 80, 90* (R), *Berg 243* (U), *Brade 11003, 11396* (R), *Cuatrecasas & Duarte 26636 p.p.* (US), *Maas & Carauta 3129* (MICH), *Montalvo 17A* (RB), *Pereira 3569* (RB), *Vianna 135* (NY), *537* (MICH); Mun. Maricá, 2 km from "Amaral Peixoto," *Anderson 11650, 11653* (MICH), Lagôa de Maricá, *Occhioni 6389* (MICH), *Vidal V-100* (R); Praia Grande, Taipú, *Glaziou 1328* (BR, C, P), *3891* (C, F, K, P, R), *11815* (K, LE, US), *Riedel & Luschnath 1304* (LE, S, US); Restinga da Barra da Tijuca, *Anderson 11196* (MICH), *Calvano 11* (R), *Flaster 35* (R), *Kuhlmann 6221* (RB), *Machado 48* (MICH), *Medeiros 15* (MICH), *Miquel et al. 1* (MICH), *Occhioni 650* (MICH), *1153* (RB), *3675* (MICH), *Pereira 55* (R), *536* (MICH), *576* (RB), *Pimentel 14 & Barbosa 15* (RB), *Schott 3677* (W), *Trinta 542 & Fromm 1618* (R, M), *Trinta et al. 1386* (R), *Vianna 15* (R). São Paulo: São Paulo, *Frazão s.n.* (RB 11700); Mogu-guaçu [Moji-Guaçu], *da Silva Manso s.n.* (*Lhotzky 257*) (BR).

One of the few well-collected species, *P. hispidula* is characterized by its large-flowered but small inflorescences. These are commonly composed of one terminal umbel and one or two pairs of secondary branches, each of which bears one terminal umbel only, or of a solitary umbel. 3° axes are rare. The flowers are among the largest in the genus. The limb of the lateral petals varies from ca 13 to 20 mm in diameter. The limb of the posterior petal is about half as long and wide as the limbs of the lateral petals. The staminode glands are strongly dimorphic. The anterior and anterior-lateral glands are wider than long, a condition unique in the genus, and have an indentation across the apex and decurrent on the abaxial face. The posterior glands are smaller, as long as wide, and smooth. The inflorescence leaves are relatively large, mostly lanceolate or narrowly elliptical, and with a petiole commonly 4–6 mm or more long.

*Peixotoa hispidula* is highly variable in habit and density of pubescence. In open areas it forms shrubs or subshrubs with erect, ascending or procumbent branches. Like many other species, it turns into a vine or climber if suitable support from adjacent shrubs and small trees is available. While the vegetative parts are usually glabrous or at most very sparsely pubescent, in some individuals the branches may be velutinous and the leaves velutinous above and sparsely tomentose below. This variation occurs throughout the range and does not merit infraspecific recognition.

The pubescent *P. axillaris*, of south-central Goiás, is the only other species with an inflorescence of one or three umbels. It differs in its smaller flowers whose staminode glands are subequal and smooth. *P. glabra*, from central Minas Gerais, is sometimes confused with *P. hispidula*, but is easily distinguished. It has larger inflorescences, whose distal leaves are sessile or subsessile, and subequal staminode glands.

Collected in flower and fruit throughout the year.

**16. *Peixotoa irwinii* C. Anderson, sp. nov.**

Fig. 14.

Suffrutex; caules procumbentes vel ascendentes usque ad 2 m. Stipulae vegetativae 7–8 mm longae, acutae vel bifidae, deciduae. Petioli 4.5–5.5 mm longi. Laminae 6.3–9.5 cm longae, 3.7–5.6 cm latae, ellipticae vel anguste ovatae, rugosae, supra sparsim aureo-velutinae, subtus in venis ferentes pilos T-formes, basi juxta costam biglandulosae. Folia inflorescentiae petiolo brevi vel sessilia, linearia vel subulata. Inflorescentia terminalis, umbellis singularibus. Bractae bracteolaeque praesentes. Pedicelli 17–26 mm longi. Sepala 3.8–4 mm longa. Limbus petalorum lateralium 8.2–9 mm longus, obovatus, margine glanduloso-fimbriato. Limbus petali postici 5.2–5.8 mm longus, obovatus, margine glandulis capitatis ornato. Glandulae 3 staminodiorum anticorum late sed non profunde indentatae in pagina abaxiali. Styli subaequales, 4.1–4.2 mm longi, anticus arcuatus versus petalum posticum, postici divergentes, parum inclinati versus petala postico-lateralialia; stigmata capitata. Samara ignota.

Prostrate or ascending subshrub to ca 2 m. Vegetative branches coarsely golden velutinous, older parts glabrous. Stem stipules 7–8 mm long, 8–9 mm wide, cordate, entire with the apex acute or notched, or bifid, finely tomentulose adaxially or pubescent only in the distal ½, the proximal ½ glabrous, coarsely golden velutinous-sericeous abaxially, deciduous; inflorescence stipules gradually decreasing in size toward the distal nodes, the smallest not less than 3.6 mm long, ca 2.5 mm wide, the most distal sometimes split into two narrow, acute lobes, persistent. Stem leaves with the petiole 4.5–5.5 mm long, coarsely golden velutinous, laminae 6.3–9.5 cm long, 3.7–5.6 cm wide, elliptical or narrowly ovate, apex apiculate, base cordate, rugose, very sparsely golden velutinous

above, very sparsely pubescent with golden T-shaped hairs on the major veins only below, a pair of sessile glands at the base at the costa, each gland 1–1.5 mm in diameter. Inflorescence leaves of the proximal nodes petiolate, the more distal subsessile or sessile, laminas abruptly smaller than the cauline, the smallest not less than 3.2 mm long, 0.4 mm wide, linear or subulate, apex acuminate, finely velutinous above, sericeous or sericeous-velutinous below, a pair of glands at the base at the costa, each gland 1–1.7 mm in diameter, sometimes the most distal leaves reduced to eglandular, subulate bracts. Inflorescence terminal, the axes coarsely golden velutinous, internodes of the primary axis 3–4.5 cm long, 2° axes 0.9–4.8 cm long, 3° axes 1.3–2 cm long, subsidiary axes absent; umbels 4-flowered, one umbel per node, primary and secondary peduncles absent. Bracts 0.5–1 mm long, 0.3–0.4 mm wide, linear or narrowly triangular, glabrous or sometimes sparsely velutinous on the margins; bracteoles 0.1–0.3 mm long and wide, triangular or oblong, glabrous. Pedicels 17–26 mm long, densely golden velutinous. Sepals 3.8–4 mm long, 2.2–2.6 mm wide, adaxially the proximal  $\frac{1}{3}$  glabrous, the distal  $\frac{2}{3}$  tomentulose, glands 1.4–1.6 mm long, 0.9–1 mm wide. Claw of the lateral petals 1.8–2.3 mm long, limb 8.2–9 mm long, 7–8.7 mm wide, obovate, base briefly attenuate, fimbriae up to 0.3 mm long, glandular. Claw of the posterior petal 4–4.2 mm long, limb 5.2–5.8 mm long, 4.3–4.5 mm wide, obovate, fimbriae up to 0.3 mm long, capitate-glandular. Filaments of the lateral stamens 3.5–4 mm long, posterior filament 3.4–3.5 mm long, very slightly curved toward the posterior petal, anthers 1–1.3 mm long, glandular connectives 0.6–0.7 mm long. Pollen grains 47–50  $\mu\text{m}$ . Filament of the anterior staminode 3.7–4 mm long, arced toward the posterior petal, anterior-lateral filaments 3.4–3.8 mm long, posterior-lateral filaments 3–3.2 mm long, curved toward the posterior styles, anterior gland 1.1–1.2 mm long and wide, anterior-lateral glands 1–1.1 mm long and wide, posterior-lateral glands 0.9–1 mm long and wide, all glands with the apex smooth, anterior and anterior-lateral glands with a broad and shallow indentation on the abaxial face, posterior-lateral glands smooth. Styles 4.1–4.2 mm long, anterior style ca 0.4 mm wide, arced toward the posterior petal, posterior styles ca 0.3 mm wide, very slightly divergent, slightly inclined toward the posterior-lateral petals, stigmas ca 0.5 mm in diameter, capitate. Samara not seen.

Type. *Irwin et al.* 28236b. Brazil. Minas Gerais: Serra do Espinhaço, ca 3 km N of São João de Chapada, 1200 m, 24 Mar 1970 (holotype UB, isotype NY).

*Peixotoa irwinii* is known only from the type (Fig. 6). It is one of the few sparsely pubescent species in the genus, and is known only from the Serra do Espinhaço of Minas Gerais. *P. glabra* and sparsely pubescent forms of *P. reticulata* also occur in the Serra do Espinhaço, but are readily distinguished from *P. irwinii*. The anterior and anterior-lateral staminode glands of *P. irwinii* are unique in that, though the apex of each gland is smooth, the abaxial face has a shallow depression. Its petioles are golden velutinous, the limbs of the lateral petals are obovate, and the styles are subequal. In *P. glabra* the anterior and anterior-lateral staminode glands have an indentation across the apex and decurrent on the abaxial surface, the petioles are glabrous, the limbs of the lateral petals are orbicular, and the styles are unequal. *P. reticulata* has smooth staminode glands and larger petals. The limbs of its lateral petals are ca 12–15 mm long and wide. The limb of its posterior petal is ca 8–12 mm long and wide. The limbs of the lateral petals of *P. irwinii* are 8.2–9 mm long and 7–8.7 mm wide. The limb of the posterior petal is 5.2–5.8 mm long, 4.3–4.5 mm wide.

This species is named for Howard S. Irwin in recognition of his extensive collecting efforts in the Planalto of Brazil.

17. **Peixotoa jussieuana** Adr. Jussieu, Ann. Sci. Nat. Sér. II, Bot. 13: 279. 1840.

Fig. 12.

*P. jussieuana* var. *β velutina* Niedenzu, Verz. Vorles. Akad. Braunschweig W-S 1912–1913: 36. 1912. Type. *Gardner 2067* (lectotype G!, isotypes F! GH! K! P! W!).

Ascending shrub or vine to ca 0.8 m. Vegetative branches loosely or densely velutinous, pubescence abraded from older parts. Stem stipules ca 6–8 mm long, ca 6–7 mm wide, cordate-triangular, apex acute, glabrous adaxially, loosely sericeous-tomentulose abaxially, deciduous; inflorescence stipules 6–ca 9 mm long, 5.3–ca 9 mm wide, cordate or cordate-triangular, finely or sparsely velutinous adaxially, sericeous-tomentulose abaxially, deciduous. Stem leaves with the petiole 2.5–9 mm long, loosely or densely velutinous or velutinous-tomentose, laminae 6–13 cm long, 3–7.5 cm wide, ovate or lanceolate, often the distal  $\frac{1}{3}$  attenuated toward the apiculate apex, base cordate or nearly truncate, sparsely or densely velutinous above, loosely, sparsely or densely pubescent with T-shaped hairs, rarely tomentose, below, a pair of sessile glands at the base at the costa or halfway on the petiole or on the surface of the blade up to 4 mm above the base, up to 5 mm from the costa, each gland 0.5–1.5 mm in diameter, sometimes one or both glands absent. Inflorescence leaves with the petiole 0.5 mm or more long, laminae abruptly smaller than the cauline, the smallest not less than 2.7 mm long, 1 mm wide, shape of the more proximal like the cauline, the more distal linear-lanceolate or linear, apex acuminate, velutinous or sparsely so or sparsely tomentulose or the most distal sometimes glabrous adaxially, densely pubescent with T-shaped hairs abaxially, a pair of glands at the base at the costa or halfway on the petiole, each gland 0.3–1.5 mm in diameter. Inflorescence terminal or axillary, the axes velutinous or tomentulose-velutinous, internodes of the primary axis 0.4–6.5 cm long, 2° axes 0.5–9 cm long, 3° axes 0.4–2.7 cm long, 4° axes 0.4–1.6 cm long, subsidiary axes absent; umbels 4-flowered, one umbel per node, primary and secondary peduncles absent. Bracts 0.2–0.7 (–3) mm long, 0.2–0.5 (–1.2) mm wide, triangular or semicircular, glabrous; bracteoles 0.1–0.3 (–0.5) mm long, 0.1–0.2 mm wide, triangular, glabrous; sometimes bracts and bracteoles absent. Pedicels 9–18 mm long, velutinous or velutinous-tomentulose, sometimes a little longer in fruit. Sepals 4.8–6 mm long, 2.5–3 mm wide, adaxially the proximal  $\frac{1}{4}$ – $\frac{1}{2}$  glabrous, the distal  $\frac{3}{4}$ – $\frac{1}{2}$  velutinous, glands 1.5–2.5 mm long, 0.7–1.3 mm wide. Claw of the lateral petals 2–2.3 mm long, limb 10.5–12 mm long, ca 9–10 mm wide, obovate, base attenuate, fimbriae up to 0.9 mm long, glandular. Claw of the posterior petal 4.2–4.5 mm long, limb 7.5–8 mm long, ca 6 mm wide, obovate or elliptical, fimbriae up to 0.5 mm long, those of the proximal  $\frac{2}{3}$  capitate-glandular, the distal  $\frac{1}{3}$  fimbriate-glandular. Lateral stamen filaments 5.5–7 mm long, the distal  $\frac{1}{5}$ – $\frac{1}{7}$  of the anterior-lateral two curved toward the posterior petal, posterior filament 4.4–5 mm long, strongly arced toward the posterior petal, anthers 1.2–1.4 mm long, glandular connectives 0.8–1 mm long. Pollen grains ca 50  $\mu\text{m}$ . Anterior staminate filament 5.5–6.2 mm long, always exceeding the anterior-lateral two, anterior-lateral filaments 4.5–5.8 mm long, always exceeding the posterior-lateral two, posterior-lateral filaments 4–5.3 mm long, inflexed between the posterior styles, glands 1–1.4 mm long, 0.9–1.2 mm wide, the anterior gland sometimes a little larger than the other four, the posterior-lateral glands sometimes a little narrower than the anterior three, all with the apex and abaxial face smooth. Styles (5–) 5.2–6.5 mm long, 0.3–0.4 mm wide, often the anterior a little longer or sometimes a little shorter but always a little stouter than the posterior two, anterior style strongly arced toward the posterior petal, the stigma oblong, ca 0.4 mm long, borne laterally at the apex on the abaxial surface or very rarely capitate and the style sharply hooked at the apex, posterior styles divergent, the

distal 1/5–1/6 curved toward the posterior-lateral petals, all styles with scattered hairs in the proximal ¼–½ of their lengths, stigmas capitate, ca 0.4 mm in diameter. Carpophore up to 2.3 mm long. Torus up to ca 4 mm high. Samara with the dorsal wing ca 2 cm long, ca 1.1 cm wide, upper margin arched, lower margin straight in the proximal ½, the distal ¾ curved, erose, lateral wings 7–9 mm wide, 9–11 mm high, rectangular, extending up to ca 7 mm below the nut, erose, areole 3.5–4 mm long, 3.5–3.6 mm wide, nut ca 5 mm long, ca 4 mm in diameter, mature seed not seen.

Type. *Martius s.n.* Maranhão: "In sylvis sepibusque ad fluv. Itapicurú prope Caxias . . ." June [1819] (lectotype M! fragment P-JUSS!, isotype M!).

Distribution. (Fig. 7). Ceará, Piauí, and Maranhão, one collection from Paraná; caatingas, woodlands, and at forest margins.

BRAZIL. Ceará: *Allemão & Cysneiros 214* (R); Serra da Ibiapaba, *Mello s.n.* (RB 67422). Maranhão: Mun. Lorêto, "Ilha de Balsas" region, ca 45 km S of Lorêto, 7°26'S, 45°0'W, 250–300 m, *Eiten & Eiten 4835* (SP, US); Grajaú, *Lisbão 2506* (MG). Paraná: Mun. Paraná, estrada Paraná-Panelas, *Hatschbach 1413* (MICH, RB). Piauí: Mun. Picos, ca 30 km E of Picos, 7°7'S, 41°9'W, *Eiten & Eiten 4917* (US); between Boa Esperança and Santa Ana das Mercês, *Gardner 2067* (BM, F, G, GH, K, P, W); Lagôa Comprida, *Gardner 2498* (BM, K); Oeiras, *Jobert 1045, 1053* (P, R); Chapada de Bom Jesus, *Lützelburg 275* (M), *1721* (RB); São João do Piauí, *Lützelburg 1599* (RB); Oeiras, *Martius s.n.* (M, P-JUSS, syntype of *P. jussieuana*); Serra Branca, *Ule 7446* (G, K).

In *P. jussieuana* the anterior style is strongly arched toward the posterior petal and bears an oblong stigma at the apex but laterally on the abaxial surface. The only other species with such an anterior stigma is *P. magnifica* from central and southern Goiás, Mato Grosso and eastern Bolivia. It is probably a close relative. It differs in that its stipules are larger (12–23 mm long), and in that the limbs of its lateral petals are orbicular. The samaras of *P. magnifica* have semicircular lateral wings 10.5–20 mm high. In *P. jussieuana* the stem stipules are ca 6–8 mm long and the lateral petal limbs are obovate. The lateral wings of the samara are rectangular and 8–11 mm high. The leaves of *P. jussieuana* are at times attenuated in the distal one-third.

A surprising disjunct is *Hatschbach 1413* from eastern Paraná. This collection is also atypical in that the tip of the anterior style is uncinat and bears a capitate stigma. Some intermediates between this peculiar style and the usual condition have been noted in some of the flowers. It is unlikely that the specimens labeled *Glaziou 9680* were actually collected in Rio de Janeiro.

This species was named by Martius in honor of Adrien de Jussieu, who published it.

Collected in flower from January through August, in fruit in January and in May through July.

**18. *Peixotoa leptoclada*** Adr. Jussieu, Ann. Sci. Nat. Sér. II, Bot. **13**: 279. 1840.

Fig. 16.

*P. jussieuana* var.  $\alpha$  *glabrescens* Niedenzu, Verz. Vorles. Akad. Braunschweig W-S 1912–1913: 36. 1912. Type. *Mendonça 976* (lectotype, NY!)

Vine or scandent shrub. Vegetative branches tomentulose-velutinous, the older parts glabrous. Stem stipules 10.5–20 mm long, 11–18 mm wide, triangular or broadly cordate, entire with the apex acute or notched, or bifid, finely velutinous or sericeous-velutinous or glabrate adaxially, tomentulose or sericeous-velutinous abaxially, persistent or deciduous; inflorescence stipules gradually decreasing in size toward the distal nodes, the smallest not less than 7 mm long, 7.7 mm wide, or sometime equal to or larger than the cauline, entire with the apex acute or notched, or bifid, more densely pubescent than the cauline, persistent. Stem leaves with the petiole 5–20 mm long, densely golden

velutinous, laminas 6–17.5 cm long, 3–11 cm wide, elliptical or lanceolate or, especially the larger, ovate, apex apiculate, base cordate or almost truncate, golden velutinous above, loosely tomentose or pubescent with T-shaped hairs below, a pair of sessile glands at the base at the costa or on the surface of the lamina up to 4 mm above the base, up to 9 mm from the costa, or sometimes halfway on the petiole, often with a second pair borne on the surface of the lamina, 0.6–17 mm above the base, up to 15 mm from the costa, each gland (0.6–) 0.9–1.8 mm in diameter. Inflorescence leaves with the petiole 0.6 mm or more long, very rarely the most distal sessile, laminas abruptly smaller than the cauline, the smallest not less than 1.3 mm long, 0.4 mm wide, lanceolate or oblanceolate or linear or subulate, apex acuminate and sometimes with a tiny gland, velutinous above, the most distal glabrous above, densely sericeous or velutinous below, a pair of glands at the base at the costa or halfway on the petiole, sometimes the glands obliquely stalked, each gland ca 0.4–1.2 mm in diameter, the larger laminas often with a second, smaller pair of glands (0.3–0.5 mm in diameter) borne on the surface of the lamina or adjacent to or just above or just below the larger pair; sometimes the most distal leaves reduced to sessile, subulate, eglandular bracts, 2.7–3.5 mm long, 0.6–0.8 mm wide. Inflorescence terminal or axillary, the axes velutinous, internodes of the primary axis 1–9.3 cm long, 2° axes 0.8–16.7 cm long, 2° subsidiary axes 2–2.3 cm long, 3° axes 0.8–3.3 cm long, 4° axes 0.9–1 cm long; umbels 4-flowered, one umbel per node, primary and secondary peduncles absent. Bracts 0.2–0.7 mm long, 0.2–0.3 mm wide, narrowly to broadly triangular or semicircular, glabrous, sometimes velutinous or tomentulose abaxially and/or on the margins; bracteoles 0.1–0.3 mm long, 0.1–0.3 mm wide, triangular, glabrous, sometimes the margins velutinous. Pedicels 17–24 (–31) mm long, velutinous or velutinous-tomentulose. Sepals 4.8–6 (–7) mm long, 2.5–3.5 mm wide, adaxially glabrous or the apex tomentulose or the proximal  $\frac{1}{2}$ – $\frac{2}{3}$  glabrous, the distal  $\frac{1}{2}$ – $\frac{1}{3}$  sparsely velutinous, glands 1.8–2.6 mm long, 1–1.5 mm wide. Claw of the lateral petals 2.5–3.2 mm long, limb 11–14 mm long, 10.8–13.7 mm wide, orbicular or broadly obovate, base briefly attenuate, fimbriae up to 0.8 mm long, glandular. Claw of the posterior petal 3.7–4.5 mm long, limb (7–) 7.5–10.5 mm long, (5.2–) 5.8–9.2 mm wide, obovate or broadly so, fimbriae up to 0.6 mm long, capitate-glandular, glands of the apex a little smaller. Filaments of the lateral stamens 4.5–5.2 mm long, posterior filament 4.2–4.5 mm long, always shorter than the lateral four, arced toward the posterior petal, anthers 1.2–1.6 mm long, glandular connectives 0.5–0.9 mm long. Pollen grains 42–50  $\mu\text{m}$ . Filaments of the staminodes (3.2–) 4.1–4.8 mm long, sometimes the anterior a little longer than the lateral four, posterior-lateral filaments inflexed between the posterior styles, glands 1.2–1.5 mm long, the anterior usually a little longer than the other four, anterior and anterior-lateral glands 1.3–1.4 mm wide, posterior-lateral glands 1.1–1.2 mm wide, all glands with the apex and abaxial face smooth. Anterior style (4.3–) 4.7–5 mm long, 0.4–0.5 mm wide, arced toward the posterior petal, posterior styles (4.5–) 5–5.3 mm long, 0.3–0.4 mm wide, always exceeding the anterior style, divergent, arced toward the posterior-lateral petals, all styles velutinous in the proximal  $\frac{1}{5}$  of their lengths, stigmas 0.4–0.5 mm in diameter, capitate. Mature samara not seen.

Type. *Claussen s.n.* Brazil. Minas Gerais. "In sylvis post incendia redivivis (vulgo capueiras) . . ." (holotype P-JUSS!, isotype P!).

Distribution. (Fig. 7). Central Minas Gerais and south-central Goiás; woodlands and gallery forests.

BRAZIL. Goiás: Serra dos Pirineus, ca 15 km (str. line) N of Corumbá de Goiás, 1250–1300 m, *Anderson 10222* (MICH, NY, UB); Fazenda do Palmital, *Glaziou 20749* (BR, C, G, L, P, R); Luziânia, Rio Vermelho a 15 km de cidade, *Heringer 17258* (MICH); Allegrio, *Pohl 2946 (1563d)* (F, K NY, W). Minas Gerais: *Claussen 522* (C, F, GH, P, S), *Claussen 643* (G), *Claussen s.n.* (F 1540004, 1540005), *Claussen s.n.* (G); *Mendonça 976* (NY); *Schwacke s.n.* (R 19578).



*Peixotoa leptoclada* is readily recognized by the large stipules, which are often persistent on the stem and always so at the more distal nodes of the inflorescence. *P. cordistipula* of Mato Grosso also has large, persistent inflorescence stipules but differs in its dense, white pubescence that gives the plants a silvery-grey appearance. Its leaves are usually densely tomentose below. The stem and leaf pubescence of *P. leptoclada* is moderate. In *P. cordistipula* the staminode filaments are unequal: the anterior exceeds the anterior-lateral two, and these exceed the posterior-lateral two. In *P. leptoclada* the staminode filaments are equal or the anterior may exceed the lateral four. The anterior style is longer than the posterior two in *P. cordistipula* but shorter in *P. leptoclada*. Another species with unusually large stipules is *P. hatschbachii* from central Goiás. It is easily distinguished by its glabrous stems and leaves and the stalked leaf glands. Some forms of *P. goiana* have large stipules but these are deciduous in the inflorescence. Also, the inflorescence leaves of *P. goiana* are sessile. Those of *P. leptoclada* are petiolate and often bear the glands slightly and obliquely stalked.

*Peixotoa paludosa* of central Minas Gerais and southern Bahia may be a close relative. Its inflorescence stipules, though smaller, are often persistent. It also has petiolate inflorescence leaves, similar staminodes, and an anterior style that is shorter than or subequal to the posterior two. It differs from *P. leptoclada* in that the leaf glands are borne on the surface of the lamina away from the base and costa. Such glands do occur sometimes in large leaves of *P. leptoclada* but usually in addition to a basal pair. The flowers of *P. leptoclada* are larger than those of *P. paludosa*.

No mature fruits are at hand, but immature samaras show that the dorsal and lateral wings are large and perhaps similar to those of *P. magnifica* and *P. jussieuana*. Samaras of *P. paludosa* also have wide lateral wings.

While the majority of collections seen are presumed to be sexual, *Anderson 10222*, *Glaziov 20749* and *Heringer 17258*, all from Goiás, are apomicts. The pollen, contained in closed anthers, is 81–83% non-staining in cotton blue in lactophenol. These specimens are noticeably more robust than the sexual plants; especially the inflorescence axes appear sturdier and less graceful than in the specimens that Jussieu saw.

### 19. *Peixotoa magnifica* C. Anderson, sp. nov.

Fig. 19.

Frutex scandens vel liana usque ad 8 m. Stipulae vegetativae (10–)12–23 mm longae, cordatae vel triangulari-cordatae, acutae, deciduae, inflorescentiae interdum bifidae. Petioli (6.5–)8–28 mm longi. Laminae 7–28.2 cm longae, 4.7–14 cm latae, ovatae vel ellipticae vel anguste ellipticae interdum suborbiculares interdum obovatae, basi cordatae interdum parum cordatae raro obliquo-cordatae, supra aureo-velutinae, subtus ferentes pilos T-formes vel tomentosae, basi juxta costam biglandulosae interdum 3–4-glandulosae. Folia inflorescentiae petiolo brevi, distaliora anguste lanceolata vel triangularia vel linearia, acuminata vel caudata. Inflorescentia terminalis vel axillaris, umbellis singularibus. Bractae bracteolaeque praesentes interdum absentes. Pedicelli (8–)17–27 mm longi. Sepala 5–8 mm longa. Limbus petalorum lateralium 15–17.8 mm longus, orbicularis, margine glanduloso-fimbriato. Limbus petali postici 9.5–12 mm longus, obtrapezoideus vel orbicularis vel late obovatus, margine glandulis capitatis ornato. Filamenta staminum antico-lateralium inclinata versus petalum posticum, filamentum staminis postici multum arcuatum versus petalum posticum. Styli subaequales vel saepius anticus quam postici longior vel raro brevior, anticus 7.3–9.2 mm longus, arcuatus versus petalum posticum, stigmatate oblongo abaxiali, postici 7.5–9.2 mm longi, divergentes, arcuati versus petala postico-lateralia praesertim  $\frac{1}{4}$  distali, stigmatibus capitatis. Ala dorsalis samarae 2.9–4.2 cm longa, 1.7–2.4 cm lata, alae laterales 7–10 (–12) mm latae, 10.5–20 mm altae, extensae usque ad 8 mm subter nucem.

Climbing or scandent shrub or vine to 8 m. Vegetative branches densely, usually golden, velutinous. Stem stipules (10-) 12-23 mm long, 8.8-22 mm wide, cordate or triangular-cordate, apex acute, velutinous adaxially, most densely so at the apex and base, velutinous-tomentose or velutinous abaxially, deciduous; inflorescence stipules gradually decreasing in size toward the distal nodes, the smallest not less than 5 mm long, 5 mm wide, cordate, concave, entire with the apex acute or apiculate, sometimes bifid, adaxially the proximal  $\frac{1}{4}$ - $\frac{1}{3}$  densely velutinous, the distal  $\frac{3}{4}$ - $\frac{2}{3}$  glabrous or sometimes very sparsely velutinous, abaxially densely velutinous-tomentose or sometimes only velutinous, deciduous or persistent. Stem leaves with the petiole (6.5-) 8-28 mm long, densely, usually golden, tomentose-velutinous, lamina 7-28.2 cm long, 4.7-14 cm wide, ovate or elliptical or narrowly so, sometimes suborbicular or obovate, apex apiculate, base cordate or slightly so, rarely oblique-cordate, golden velutinous above, usually loosely, sparsely, sometimes densely, pubescent with T-shaped hairs or tomentose below, a pair of sessile glands at the base at the costa or halfway on the petiole, rarely on the petiole just below the lamina, rarely borne on the surface of the lamina up to 0.9 mm above the base, up to 1.5 mm from the costa, each gland (0.7-) 1-2 mm in diameter. Inflorescence leaves with the petiole at least 1 mm long, lamina abruptly smaller than the cauline, the smallest not less than 2.3 mm long, 0.6 mm wide, the more proximal elliptical or narrowly so or oblanceolate, the more distal narrowly lanceolate or triangular or linear, apex acuminate or caudate, sparsely velutinous or glabrous above, densely velutinous below, a pair of glands halfway on the petiole or sometimes at the base at the costa, each gland 0.5-1.7 mm in diameter, sometimes with a second, smaller pair (0.4-0.7 mm in diameter) above or below the larger pair. Inflorescence terminal or axillary, the axes usually densely golden velutinous or velutinous-tomentulose, internodes of the primary axis 1.6-11 cm long, 2° axes (0.5) 1.5-17 cm long, 2° subsidiary axes 1.5-5.5 cm long, 3° axes 0.5-5.2 cm long, 4° axes 1.4-1.8 cm long; umbels 4-flowered, one umbel per node, primary and secondary peduncles absent. Bracts 0.3-2.4 mm long, 0.1-0.6 mm wide, triangular or linear, glabrous, sometimes sparsely tomentulose abaxially and/or on the margins; bracteoles 0.1-0.6 mm long, 0.1-0.3 mm wide, triangular, glabrous; sometimes bracts and bracteoles absent. Pedicels (8-) 17-27 mm long, densely velutinous or velutinous-tomentose, usually golden, becoming up to  $\frac{1}{3}$  again as long in fruit. Sepals 5-8 mm long, 2.8-4.2 mm wide, adaxially the proximal  $\frac{1}{2}$ - $\frac{7}{8}$  glabrous, the distal  $\frac{1}{2}$ - $\frac{1}{7}$  velutinous or tomentulose, glands 2.1-3.7 mm long, 1-1.8 mm wide. Claw of the lateral petals (3-) 3.5-5.3 mm long, limb 15-17.8 mm long, 15-17 mm wide, base briefly attenuate or rarely truncate, fimbriae up to 1 mm long, glandular. Claw of the posterior petal 5-7.3 mm long, limb 9.5-12 mm long, 8-12 mm wide, orbicular or broadly obovate or obtusely triangular, fimbriae up to 0.7 mm long, capitate-glandular. Filaments of the lateral stamens 6.5-8.4 mm long, the distal  $\frac{1}{4}$  of the anterior-lateral two curved toward the posterior petal, posterior filament 5-5.6 (-6) mm long, strongly arced toward the posterior petal, anthers 1.4-2 mm long, glandular connectives 0.6-1.1 mm long. Pollen grains 60-63  $\mu$ m. Filament of the anterior staminode (6-) 6.5-7.8 mm long, anterior-lateral filaments (4.8-) 5.5-6.5 mm long, posterior-lateral filaments (4-) 5-6.3 mm long, strongly inflexed between the posterior styles, glands (1-) 1.2-1.6 mm long, 1.2-1.5 mm wide, the posterior-lateral glands usually a little smaller than the anterior three, all glands with the apex and the abaxial surface smooth, rarely bearing 1 or 2 fertile locules, 0.7-1 mm long. Anterior style 7.3-9.2 mm long, ca 0.5 mm wide, strongly arced with especially the distal  $\frac{1}{4}$  tapered and curved toward the posterior petal, the stigma oblong, 0.5-0.6 mm long, borne laterally at the apex on the abaxial surface, posterior styles 7.5-9.2 mm long, 0.4-0.5 mm wide, usually a little shorter than the anterior style, divergent, gently arced, especially the distal  $\frac{1}{4}$ , toward

the posterior-lateral petals, stigmas 0.4–0.5 mm in diameter, capitate, all styles usually with scattered hairs in the proximal  $\frac{1}{3}$  or less of their lengths. Carpopore up to 2.6 mm long. Torus up to 8 mm high. Samara with the dorsal wing 2.9–4.2 cm long, 1.7–2.4 cm wide, upper margin gently arced, lower margin usually falcate, entire or gently erose, lateral wings 7–10 (–12) mm wide, 10.5–20 mm high, semicircular, extending up to ca 8 mm below the nut, areole 4.5–7.8 mm long, 4.4–7 mm wide, nut 5–8 mm long, 5–7 mm in diameter, mature seeds not seen.

Type. *Anderson 9831*. Brazil. Mato Grosso: Ca 12 km ENE of Barra do Garças, ca 840 m, 6 May 1973 (holotype UB, isotypes MICH, NY).

Distribution. (Fig. 7). Southern Goiás, including the Distrito Federal, central and southwestern Mato Grosso, and eastern Bolivia; cerrado and woodlands.

BOLIVIA. Dept. Santa Cruz: Prov. Ñuflo de Chavez, Estancia Novicia, ca 30 km S de Concepción, 62°12'W, 16°29'S, 500 m, *Krapovickas & Schinini 32117* (CTES, MICH); Prov. Velasco, San Ignacio, 60°58'W, 16°22'S, 370 m, *Krapovickas & Schinini 32251* (CTES, MICH); Prov. Velasco, 27 km S de San Ignacio, camino a San Miguel, 61°W, 16°36'S, ca 400 m, *Krapovickas & Schinini 32379* (CTES, MICH); Prov. Chiquitos, 3 km NW de Roboré, 59°46'W, 18°20'S, 300 m, *Krapovickas & Schinini 36399* (MICH); Prov. Velasco, *Kuntze s.n.* (NY). BRAZIL. Distrito Federal: entre Brasília e Niquelândia, *Pires et al. 9709* (UB, US). Goiás: ca 10 km by road W of Iporá, 600 m, *Anderson 9359* (MICH, NY, UB); Serra do Caiapó, ca 5 km (str. line) S of Caiapônia, 850 m, *Anderson 9474* (MICH, NY, UB); Serra Dourada, ca 17 km (str. line) S of Goiás Velho, 6 km NE of Mossamedes, 700–780 m, *Anderson 10162* (MICH, NY, UB); ca 5 km W of Niquelândia, ca 750 m, *Anderson et al. 35028* (MICH,

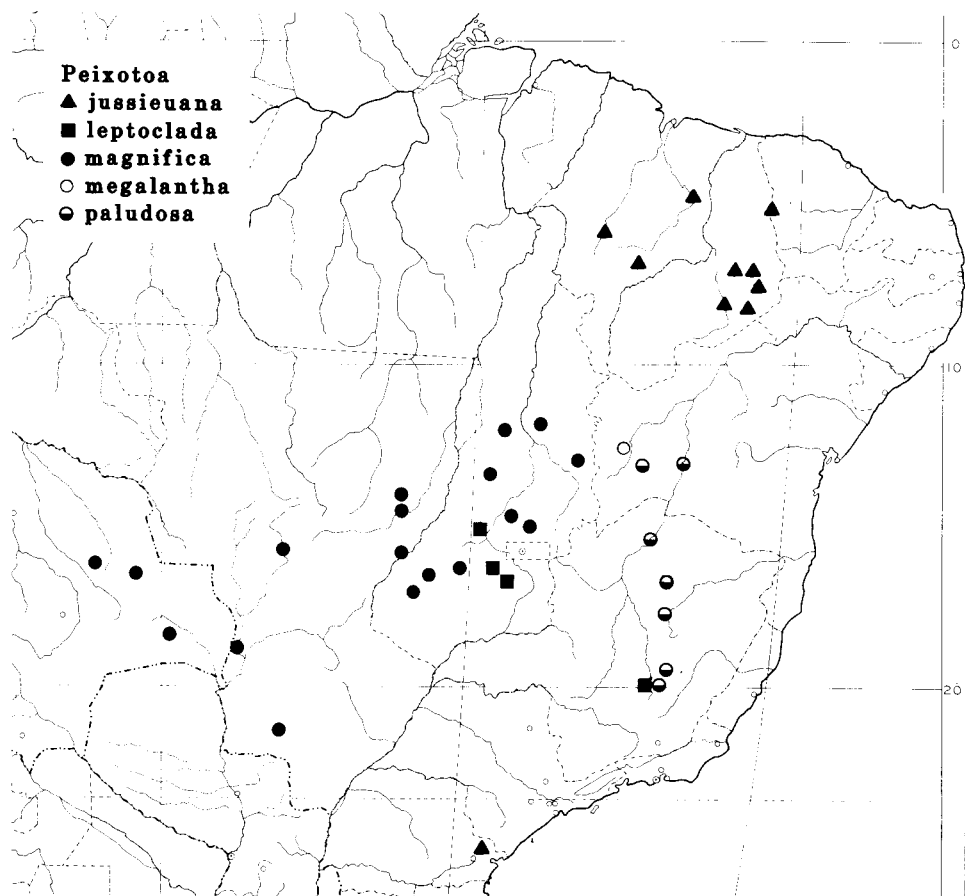


FIG. 7. Distribution of *P. jussieuana*, *P. leptoclada*, *P. magnifica*, *P. megalantha*, and *P. paludosa*.

NY); prope urbem Goyaz [Goiás], *Burchell* 7133-2, 7084-2 (K); Serra Dourada, along affluent of the Rio Canna Brava, 28 km E of Formoso, 48°50'W, 13°45'S, *Dawson* 15005 (LAM); Chapada dos Veadeiros, Pouso Alto, 1800 m, *Ferreira* 215, 216, 217 (UB); Serra da Santa Brida [Brígida], *Gardner* 3623 (K); Caiapônia, *Hatschbach* 37700 (MICH); drainage of the upper Rio Araguaia, ca 70–87 km SE of Aragaças, 700 m, *Irwin et al.* 17494 (MICH, NY, UB), 17554, 17631 (MICH, UB); Barra Pillar, Villa Boa [Goiás], *Pohl* 1739, 3555 (1559d) p.p. (K, W); vicinity of Estrela do Norte, Belém-Brásilia, *Prance & Silva* 58433 (MICH, NY); Natividade, *Rizzo* 9819 (MICH); Salinas, *Weddell* 2024 (P). Mato Grosso: Serra do Roncador, mun. Barra do Garças, 250 km along new road NNE of Xavantina, ca 450 m, *Fiten & Fiten* 9014 (NY, US); Vale do Sonho, Xavantina, acampamento da Fundação Brasil Central, *Fonseca* 276 (NY, UB); Xavantina, *Harley & Souza* 11037 (K, MO, NY, P, UB); Xavantina-Cachimbo road, 85 km from Xavantina, *Hunt* 5700 (NY); neighborhood of Xavantina, *Hunt* 5868 (NY); Serra do Roncador, ca 60 km N of Xavantina, 550 m, *Irwin et al.* 15997 (MICH, NY, UB); Xavantina, 400 m, *Irwin et al.* 16792 (MICH, NY, UB); Cuyabá [Cuiabá], *Malme* 1610x (S); Nioaque, *Ramamoorthy* 618 (NY); ca 3 km S of Xavantina, 52°20'W, 14°44'S, *Ratter* R112 p.p. (K, UB); 1 km S of Xavantina, 52°20'W, 14°44'S, *Ratter & Ramos* 370 (K, NY, P, RB, UB); Pantanal, Rio Paraguai, Fazenda Bela Vista, *Schaller* 89 (NY); Urucum, Corumbá, 600 ft. *Smith* 74 (K).

The usually large inflorescences of *P. magnifica* bear showy flowers most of which are open at about the same time. The unusual anterior style bears an oblong stigma at the apex but laterally on the abaxial surface. *P. jussieuana* from Ceará, Piauí and Maranhão is the only other species in the genus with such a stigma and is probably a close relative. It differs in that its lateral petals have obovate limbs while those of *P. magnifica* are orbicular. The samaras of *P. magnifica* have large, semicircular lateral wings that are recurved and give the fruit an inflated appearance. In *P. jussieuana* the lateral wings are rectangular and smaller. The cauline stipules of *P. magnifica* are 12–23 mm long while those of *P. jussieuana* are 6–8 mm long.

*Peixotoa magnifica* has often been assigned to *P. cordistipula* of central Mato Grosso and eastern Bolivia. They are readily separated on the basis of their styles. Those of *P. cordistipula* all bear the usual capitate stigma and are less than 5.5 mm long. The styles of *P. magnifica* are 7–9.2 mm long. Most striking in *P. cordistipula* are the large inflorescence stipules which persist even after the pedicels have been shed. While *P. cordistipula* also produces large inflorescences, only a few flowers are open at any one time. Its dense white pubescence gives the plants a silvery-grey appearance that is not evident in *P. magnifica*. A structure commonly found in *P. cordistipula* but absent in *P. magnifica* is a central, glandular mass in the umbel.

The staminode glands of *P. magnifica* rarely bear one or even two small locules that remain closed and contain largely aborted pollen.

Collected in flower and fruit from April through December.

## 20. *Peixotoa megalantha* C. Anderson, sp. nov.

Fig. 21.

Frutex caulibus gracilibus usque ad 1.5 m. Stipulae vegetativae 16–23 mm longae, acutae vel bifidae, persistentes, interdum deciduae. Petioli 5–9.5 mm longi. Laminae 10.5–20 cm longae, 7–17.2 cm latae, late ellipticae vel ovatae, rugosae, supra juniores velutinae maturae glabrae, subtus tomentosae, basi juxta costam biglandulosae. Folia inflorescentiae petiolo brevi distaliora sessilia, linearia vel subulata. Inflorescentia terminalis, umbellis singularibus. Bractae bracteolaeque praesentes. Pedicelli 22–27 mm longi. Sepala 6.5–7.6 mm longa. Limbus petalorum lateralium 16–16.6 mm longus, orbicularis, margine glanduloso-fimbriato. Limbus petali postici 9.5–10 mm longus, late obovatus, margine glandulis capitatis ornato. Filamentum staminis postici erectum. Stylus anticus ca 5.2 mm longus, parum inclinatus versus petalum posticum, styli postici 5.4–5.5 mm longi, divergentes, arcuati versus petala postico-lateralia; stigmata capitata. Samara ignota.

Shrub with slender stems to 1.5 m. Vegetative branches tomentose, pubescence abraded from older parts. Stem stipules 16–23 mm long, 14–20 mm wide,

cordate, entire with the apex acute, or bifid, glabrate or tomentulose adaxially, tomentulose-velutinous abaxially, persistent, sometimes deciduous; inflorescence stipules like the cauline, entire with the apex acute or notched, usually more densely pubescent, persistent. Stem leaves with the petioles 5–9.5 mm long, tomentulose-velutinous, laminas 10.5–10 cm long, 7–17.2 cm wide, broadly elliptical or ovate, apex apiculate, base cordate, rugose, the younger leaves velutinous above, the older leaves glabrous above, all tomentose below, a pair of sessile glands at the base at the costa or more commonly halfway on the petiole, each gland 1.6–3 mm in diameter. Inflorescence leaves with a small petiole at the more proximal nodes, the more distal sessile, laminas abruptly smaller than the cauline or gradually decreasing in size toward the distal nodes, the smallest not less than 4.5 mm long, 0.6 mm wide, shape of the more proximal like the cauline, the more distal linear or subulate, apex acuminate, finely velutinous above, tomentose-velutinous below, a pair of glands at the base at the costa, each gland ca 1–2 mm in diameter, sometimes with a second, smaller pair (ca 0.6 mm in diameter) above the larger pair. Inflorescence terminal, the axes tomentulose, internodes of the primary axis 3.8–9.8 cm long, 2° axes 3.6–6.3 cm long, mature 3° axes not seen, subsidiary axes absent; umbels 4-flowered, one umbel per node, primary and secondary peduncles absent. Bracts 0.7–0.8 mm long, ca 0.7 mm wide, triangular, glabrous, sometimes tomentulose on the margins; bracteoles 0.4–0.5 mm long, 0.3–0.4 mm wide, triangular, glabrous. Pedicels 22–27 mm long, tomentose. Sepals 6.5–7.6 mm long, 3.5–4 mm wide, adaxially tomentulose-velutinous, glands 2.3–3.5 mm long, 1.5–1.7 mm wide. Claw of the lateral petals 2.5–2.8 mm long, limb 16–16.6 mm long, 15–16 mm wide, orbicular, base attenuate, fimbriae up to 1 mm, glandular. Claw of the posterior petal ca 5 mm long, limb 9.5–10 mm long, ca 9–9.5 mm wide, broadly obovate or suborbicular, fimbriae up to 0.9 mm long, capitate-glandular, glands of the distal  $\frac{1}{3}$  much smaller. Filaments of the lateral stamens 5–5.3 mm long, posterior filament 4.5–4.7 mm long, erect, anthers 1.6–1.8 mm long, glandular connectives 0.8–0.9 mm long. Pollen grains 63–74  $\mu\text{m}$ . Filaments of the anterior and anterior-lateral staminodes 4.8–5 mm long, posterior-lateral filaments 4.4–4.5 mm long, inclined toward the posterior styles, anterior and anterior-lateral glands 1.4–1.5 mm long, ca 1.4 mm wide, posterior-lateral glands ca 1.2 mm long, ca 1 mm wide, all glands with the apex and abaxial face smooth. Anterior style ca 5.2 mm long, ca 0.4 mm wide, the distal  $\frac{1}{3}$  slightly inclined toward the posterior petal, posterior styles 5.4–5.5 mm long, ca 0.3 mm wide, divergent, the distal  $\frac{1}{3}$  arced toward the posterior-lateral petals, all styles with scattered hairs in the proximal  $\frac{1}{2}$ – $\frac{3}{4}$  of their lengths, stigmas ca 0.5 mm in diameter, capitate. Samara not seen.

Type. *Anderson et al.* 36870. Brazil. Bahia: Espigão Mestre, ca 100 km WSW of Barreiras, 750–800 m, 8 Mar 1972 (holotype UB, isotype NY).

*Peixotoa megalantha* is known only from the type (Fig. 7). It is a coarse, low shrub which is characterized by being larger in nearly all its parts than other species. The persistent stem and inflorescence stipules are 16–23 mm long. The orbicular limbs of the lateral petals are ca 16 mm in diameter. Such large flowers are found in only three other species. *P. hispidula*, which grows along the coast from Bahia to São Paulo, has petiolate inflorescence leaves; those of *P. megalantha* are sessile. *P. magnifica* of Goiás, Mato Grosso and eastern Bolivia has styles 7–9.2 mm long; the anterior style bears an oblong stigma at the apex but laterally on the abaxial surface. The styles of *P. megalantha* are less than 6 mm long and all bear capitate stigmas. In *P. reticulata*, an apomict with usually closed anthers containing mostly aborted pollen, the more distal inflorescence stipules are less than 15 mm long, deciduous, and smaller than the stem stipules. *P. reticulata* has not been reported from Bahia.

**21. *Peixotoa octoflora*** C. Anderson, sp. nov.

Fig. 21.

Suffrutex usque ad 2 m. Stipulae vegetativae deciduae, ignotae, inflorescentiae 7.5–8.2 mm longae, acutae, deciduae. Petioli 10–17 mm longi. Laminae 7.8–11.6 cm longae, 6.6–10.4 cm latae, ovatae vel suborbiculares, supra velutinae, subtus ferentes pilos T-formes interdum laxe tomentosae, basi justa costam biglandulosae. Folia inflorescentiae petiolo brevi, distaliora linearia, supra glabra, subtus dense velutina. Inflorescentia terminalis, umbellis singularibus, 8-floribus; pedicelli 13–26 mm longi, 4 sessiles, 4 pedunculati, pedunculis 1–2.5 mm longis. Bracteae bracteolaeque praesentes. Sepala 7.2–7.8 mm longa. Limbus petalorum lateralium 14.5–15.2 mm longus, orbicularis, margine glanduloso-fimbriato, interdum e glanduloso. Limbus petali postici 10–12 mm longus, orbicularis, margine  $\frac{3}{4}$  proximalibus glandulis capitatis ornato,  $\frac{1}{4}$  distali glanduloso-fimbriato. Filamenta staminum subaequalia. Filamenta staminodiorum anticorum subaequalia postica superantia. Styli subaequales, 4.8–5.3 mm longi, anticus erectus vel parum inclinatus versus petalum posticum, postici divergentes, arcuati versus petala postico-lateralia; stigmata capitata. Samara ignota.

Subshrub to 2 m. Vegetative branches golden tomentulose-velutinous. Stem stipules deciduous, not seen; inflorescence stipules 7.5–8.2 mm long, 8.6–10 mm wide, cordate, apex acute, adaxially the proximal  $\frac{1}{4}$  densely velutinous, the distal  $\frac{3}{4}$  glabrous, abaxially densely velutinous, deciduous. Stem leaves with the petiole 10–17 mm long, densely golden velutinous, laminae 7.8–11.6 cm long, 6.6–10.4 cm wide, ovate or suborbicular, apex apiculate, base cordate, velutinous above, pubescent with T-shaped hairs or sometimes loosely tomentose below, a pair of sessile glands halfway on the petiole, or sometimes at the base at the costa, each gland 1.2–1.4 mm in diameter. Inflorescence leaves with the petiole at least 2 mm long, laminae abruptly smaller than the cauline, the smallest not less than 2.8 mm long, ca 1 mm wide, the more proximal shaped like the cauline but more densely pubescent, the more distal linear, apex acuminate, glabrous above, densely velutinous below, a pair of glands at the base at the costa or halfway on the petiole, each gland 1–1.7 mm in diameter. Inflorescence terminal, the axes densely velutinous, internodes of the primary axis 3.1–7.5 cm long, 2° axes 2.4–14.7 cm long, 3° axes 2.1–5.5 cm long, subsidiary axes absent; umbels 8-flowered, of four pairs, in each pair one pedicel pedunculate, one pedicel sessile, primary peduncles 1–2.5 mm long, secondary peduncles absent. Bracts 0.6–1.2 mm long, 0.8–1 mm wide, triangular, glabrous adaxially, tomentulose abaxially; bracteoles 0.4–0.5 mm long, 0.3–0.5 mm wide, oblong, glabrous adaxially, glabrous or sparsely tomentulose abaxially. Pedicels 13–26 mm long, densely velutinous. Sepals 7.2–7.8 mm long, 0.6–0.8 mm wide, adaxially the proximal  $\frac{1}{2}$  glabrous, the distal  $\frac{1}{2}$  tomentulose, glands 1.3–1.7 mm long, 0.9–1.2 mm wide. Claw of the lateral petals 3.2–3.5 mm long, limb 14.5–15.2 mm long, 14–15 mm wide, orbicular, base briefly attenuate, fimbriae up to 1 mm long, glandular or sometimes e glandular. Claw of the posterior petal 5.5–6 mm long, limb 10–12 mm long, 10–11 mm wide, orbicular, fimbriae up to 1 mm long, those of the proximal  $\frac{3}{4}$  capitate-glandular, the distal  $\frac{1}{4}$  fimbriate-glandular. Lateral stamen filaments 5–6 mm long, posterior filament 4.8–5 mm long, usually a little shorter than the lateral four, arced toward the posterior petal, anthers 1.6–1.7 mm long, glandular connectives 0.7–0.8 mm long. Pollen grains 57–70  $\mu\text{m}$ . Filament of the anterior staminode 5.5–6 mm long, anterior-lateral filaments 5–5.5 mm long, equal to or a little shorter than the anterior filament, posterior-lateral filaments 4.2–4.5 (–5) mm long, inflexed between the posterior styles, anterior and anterior-lateral glands 1.4–1.5 mm long, ca 1.3 mm wide, posterior-lateral glands ca 1.1 mm long, ca 0.9 mm wide, all glands with the apex and abaxial face smooth. Styles 4.8–5.3 mm long, 0.4–0.5 mm wide, anterior style usually a little stouter

than the posterior two, erect or slightly inclined toward the posterior petal, posterior styles divergent, arced toward the posterior-lateral petals, all styles glabrous or with a few scattered hairs near the base, stigmas 0.4–0.6 mm in diameter, capitate. Samara not seen.

Type. *Irwin et al. 16681a*. Brazil. Mato Grosso: Serra do Roncador, ca 60 km N of Xavantina, 550 m, 6 Jun 1966 (holotype UB, isotypes MICH, NY).

*Peixotoa octoflora* is known only from the type (Fig. 8). It is the only species in the genus which bears 8-flowered umbels. Each umbel consists of four pairs of flowers. Each pair has the pedicel of one flower sessile, the other pedicel on a short (1–2.5 mm long) primary peduncle. The type is apparently an apomict. The closed anthers contain pollen that is mostly aborted and 95% non-staining in cotton blue in lactophenol.

**22. *Peixotoa paludosa*** Turczaninow, Bull. Soc. Nat. Moscow **31**(1): 393. 1858.

Fig. 15.

*P. parviflora* var.  $\beta$  *primaeva* Niedenzu, Verz. Vorles. Akad. Braunsberg W-S 1912–1913: 34. 1912. Type. *Glaziov 13598*, pro parte (holotype B, destroyed, isotypes, C! K!).

Vine over 5 m long. Vegetative branches velutinous or tomentulose, pubescence abraded from older parts. Stem stipules ca 10 mm long, ca 9 mm wide, triangular, apex acute, finely velutinous adaxially, velutinous or tomentulose-velutinous abaxially, deciduous; inflorescence stipules gradually decreasing in size toward the distal nodes, the smallest not less than 2.5 mm long, 3 mm wide, densely velutinous in the proximal  $\frac{1}{4}$  and sparsely so or glabrate in the distal  $\frac{3}{4}$  adaxially, tomentulose-velutinous abaxially, very densely white tomentulose along the margins, persistent or eventually deciduous. Stem leaves with the petiole (4–) 5–17 mm long, densely velutinous or densely tomentose, laminae 4.8–14.3 cm long, 3–9.2 cm wide, elliptical or broadly elliptical or obovate, apex apiculate, base slightly cordate or almost truncate, velutinous or densely so above, loosely, sometimes sparsely, pubescent with T-shaped hairs or tomentose below, a pair of sessile glands borne on the surface of the blade 3–29 mm above the base, 1.5–17 mm from the costa, each gland 0.4–1.2 mm in diameter, or one or both glands absent. Inflorescence leaves with the petiole 1.2 mm or more long, laminae abruptly smaller than the cauline or gradually decreasing in size toward the distal nodes, the smallest not less than 1.8 mm long, 0.5 mm wide, shape of the more proximal like the cauline, the more distal narrowly lanceolate or linear, apex acuminate and sometimes with a tiny gland, sparsely velutinous or glabrous adaxially, densely velutinous or sericeous-velutinous abaxially, a pair of glands near or at the base or at the costa or sometimes halfway on the petiole, each gland 0.3–0.8 mm in diameter, rarely the larger laminae with a second pair near the base; rarely the most distal leaves reduced to sessile, linear or subulate, eglandular bracts, 0.7–4 mm long, 0.3–1.6 mm wide. Inflorescence terminal or axillary, the axes velutinous or velutinous-tomentulose, internodes of the primary axes 2.3–10 cm long, 2° axes 0.7–12.5 cm long, 2° subsidiary axes 0.9–8 cm long, 3° axes 0.5–6.2 cm long, 3° subsidiary axes 0.5–20 mm long, 4° axes 0.4–12 mm long; umbels 4-flowered, one umbel per node, primary peduncles absent, secondary peduncles rare, up to 0.1 mm long. Bracts 0.2–0.4 (–1.2) mm long, 0.3–0.9 (–1.2) mm wide, triangular or semicircular, glabrous, sometimes tomentulose on the margins; bracteoles 0.1 mm long and wide, triangular, glabrous; sometimes bracts and bracteoles absent. Pedicels 11–19 mm long, velutinous or velutinous-tomentulose, often a little longer in fruit. Sepals 3.2–4.8 mm long, 1.8–2.5 mm wide, adaxially finely velutinous, or the proximal  $\frac{2}{3}$  glabrous, the distal  $\frac{1}{3}$  velutinous, glands 1.4–2.4 mm long, 0.7–1.3 mm wide.

Claw of the lateral petals 2–2.7 mm long, limb 9–11.5 mm long, 9.3–10 mm wide, broadly obovate or broadly elliptical or suborbicular, base briefly attenuate, fimbriae up to 0.9 mm long, usually glandular, sometimes a few eglandular. Claw of the posterior petal 3.3–4 mm long, limb 5.3–7 mm long, 5–6.3 mm wide, obovate, fimbriae up to 1 mm long, capitate-glandular, or sometimes the proximal  $\frac{1}{2}$  capitate-glandular, the distal  $\frac{1}{2}$  fimbriate-glandular. Stamen filaments 3.6–4.5 mm long, posterior filament equal to or shorter than the lateral four, strongly arced toward the posterior petal, anthers 1.1–1.4 mm long, glandular connectives 0.6–0.7 mm long. Pollen grains ca 50  $\mu\text{m}$ . Anterior staminode filament 3.7–4.3 mm long, always exceeding the lateral four, anterior-lateral and posterior-lateral filaments 3.5–4.1 mm long, posterior-lateral filaments strongly inflexed between the posterior styles, anterior gland 1.4–1.6 mm long, 1.3–1.5 mm wide, anterior-lateral and posterior-lateral glands 1.1–1.4 mm long, anterior-lateral glands 1.1–1.4 mm wide, posterior-lateral glands 0.8–1.3 mm wide, usually narrower than the anterior-lateral two, all glands with the apex and abaxial face smooth. Styles 4–5.5 mm long, 0.3–0.4 mm wide, the anterior style sometimes a little longer and usually a little stouter than the posterior two, strongly arced toward the posterior petal, posterior styles strongly divergent, inclined toward the posterior-lateral petals, stigmas 0.3–0.5 mm in diameter, capitate. Carpophore up to 3 mm long. Torus up to ca 3.5 mm high. Samara with the dorsal wing 2.8–3.1 cm long, 1.5–1.7 cm wide, upper margin arced or straight, lower margin arced or slightly so, erose, lateral wings 6–8.5 mm wide, 12–14 mm high, rectangular or semicircular, entire, erose, or irregularly dentate, areole 3.2–3.5 mm long, 2.7–3.5 mm wide, nut ca 4.5 mm long, 3.5–4 mm in diameter, mature seeds not seen.

Type. *Blanchet* 2867. Brazil. Bahia: “. . . in paludibus d’Ilhabira [Itabira], prope urbem di Barro.” (holotype CW?, isotypes BM! BR! F! G! K! LE! NY! P! W!).

Distribution. (Fig. 7). North-central Minas Gerais, especially the Serro do Espinhaço, and Bahia; cerrado, campo sujo, caatinga, and at forest margins.

BRAZIL. Bahia: type q.v.; ca 35 km N of Bom Jesus da Lapa, on main road to Ibotirama, ca 450 m, 43°19’W, 12°58’S, *Harley et al.* 21561 (MICH); Chapadão Ocidental da Bahia, 37 km SE of Correntina, on road to Jaborandi, ca 600 m, ca 44°28’W, 13°35’S, *Harley et al.* 21964 (MICH). Minas Gerais: 22 km by road W of Januária on road to Serra das Araras, 610 m, *Anderson* 9197 (MICH, NY); Belo Horizonte, *Barreto* 7545 (UB), 8681 (R); *Claussen* 68A (BR, F, W); mun. Santa Luzia, Lagôa Santa, *da Costa s.n.* (R 72044); entre Diamantina, Mendanha e Morro do Ramão, *Glaziou* 13598 p.p. (C, K, type of *P. parviflora* var. *primaeva*); entre Taquaruçú e Serrinha, *Glaziou* 18929 p.p. (C, K, I.E., R); mun. Caimópolis, rod. Fernão Dias, *Hatschbach* 41427 (MICH); Serra do Taquaril, Nova Lima, *Roth* 1587 (RB); *Warming* 238 (C); Contagem, Rio Paraopeba, *Warming s.n.* (C); *Warming s.n.* (C, GOET, P, US); mun. Belo Horizonte, Morro das Pedras, *Williams & Assis* 6490 (GH); mun. Belo Horizonte, Colonia Afonsa Pena, *Williams & Assis* 7231 (GH).

In *P. paludosa* the leaf glands are borne on the surface of the lamina away from the base and costa. Within the range of *P. paludosa* only *P. spinensis* also bears the glands in this manner. It differs in that its leaves are densely tomentose to woolly below, and in that the anterior and anterior-lateral staminode glands have an indentation across the apex and decurrent on the abaxial face. The leaves of *P. paludosa* are more moderately pubescent, and the staminode glands are smooth. Also, the flowers of *P. paludosa* are slightly smaller than those of *P. spinensis*. In *P. leptoclada*, of Minas Gerais and Goiás, the larger leaves sometimes bear the glands on the surface away from the base and costa. This species, which may be a close relative, has similar but larger flowers, but differs most strikingly in its large stipules. Those of the stem are ca 11–20 mm long and wide and are usually persistent. Those of the inflorescence are at least 7 mm long and are persistent at the more distal nodes. In *P. paludosa* the stem stipules are ca 9–10 mm long and wide, and deciduous. Those of the inflorescence are usually less



than 7 mm long and wide (only rarely more), and, while persistent for a while, are eventually deciduous.

*Roth 1587* is unusual in that the specimens are apparently apomictic. The anthers are closed and contain aborted pollen that is 99% non-staining in cotton blue in lactophenol.

The type locality is unknown. According to Urban (1895), during the years 1833–1847 Blanchet sent an assistant on collecting trips along the southern coast of Bahia and as far inland as the Rio São Francisco. Many of the exact localities for the collections made during these expeditions have not been ascertained. Only two additional collections of *P. paludosa* are known from Bahia. These were made by Harley in 1980. The specific epithet is doubtlessly a misnomer. *P. paludosa* has never been collected in wet areas. More likely the type was found in a dry area near the “marais d’Itabira.”

Nieden zu (1912) described *P. parviflora* var. *primaeva* based on *Glaziou 13598*. He considered this variety an ancestral type, because in his material the staminodes had tiny locules (“Androecium fere *Banisteriae* sectionis *Pachyzeugmatis*. . .”). However, *Glaziou 13598* is a mixed collection of *P. paludosa* and of *Banisteriopsis malifolia* (Nees & Martius) Gates var. *malifolia*. The photograph of the holotype (at B, now destroyed) shows a specimen of *P. paludosa* in bud. The isotypes at C and K are also in bud, but flowers of *B. malifolia* are contained in the packets mounted with the specimens. Nieden zu doubtlessly based his description on such flowers supplied with the Berlin specimen.

Collected in flower from January through September, in fruit from April through August.

- 23. *Peixotoa parviflora*** Adr. Jussieu in St. Hilaire, Fl. Bras. Mer. 3: 62. 1832 [1833]. Figs. 2, 18.  
*P. discolor* Grisebach, Linnaea 13: 216. 1839. Type. *Sellow s.n.* [*Sellow III. it. c1313* (28 May 1819), fide Nieden zu, 1912] (holotype, B destroyed, isotype K!).

Scandent shrub or vine to 3 m. Vegetative branches finely or loosely, often golden, velutinous, pubescence abraded from older parts. Stem stipules 5.5–17 mm long, 5–17 mm wide, cordate, apex acute, velutinous or tomentulose adaxially, velutinous-sericeous or velutinous-tomentulose abaxially, deciduous; inflorescence stipules gradually decreasing in size toward the distal nodes, the smallest not less than 3 mm long, 4 mm wide, entire with the apex acute or notched, or rarely bifid, finely velutinous or tomentulose adaxially, sericeous-velutinous or tomentulose-velutinous abaxially, deciduous or persistent. Stem leaves with the petiole 4–32 mm long, (often golden) velutinous or velutinous-tomentulose, lamina 5.5–17.5 cm long, 3–10.6 cm wide, ovate or elliptical, sometimes obovate or orbicular, apex apiculate, base cordate or slightly so or rarely truncate, velutinous to densely so above, loosely pubescent with T-shaped hairs or loosely tomentose below, with a pair of sessile glands at the base at the costa or halfway on the petiole or rarely on the petiole just below the lamina or rarely on the lamina up to 1 mm above the base at the costa, each gland 0.7–2.3 (–4.3) mm in diameter, rarely one or both glands absent. Inflorescence leaves with the petiole (0.6–) 1 mm or more long, laminas usually abruptly smaller than the cauline, sometimes gradually decreasing in size toward the distal nodes, the smallest not less than 3 mm long, 0.6 mm wide, shape of the more proximal like the cauline, the more distal narrowly elliptical or lanceolate or oblanceolate or linear, apex acuminate or sometimes caudate, velutinous or sparsely so above, sericeous or sericeous-velutinous below, a pair of glands at the base at the costa or half-way on the petiole or rarely on the petiole just below the lamina, each gland (0.2–) 0.3–1.5 mm in diameter, rarely with a second, smaller pair (ca

0.4 mm in diameter) borne just above the pair of larger glands; rarely some of the inflorescence leaves reduced to sessile, linear, eglandular bracts, 2.5–3.5 mm long, ca 0.5 mm wide. Inflorescence terminal, the axes velutinous or velutinous-tomentulose, internodes of the primary axis 1–8.3 cm long, 2° axes 0.9–12.5 cm long, 2° subsidiary axes 0.8–4.2 cm long, 3° axes 1–10.8 cm long, 3° subsidiary axes 0.7–2.2 cm long, mature 4° axes not seen, usually at the more distal nodes the 2° and 3° axes suppressed, with 1 or 2 umbels borne on secondary peduncles in the leaf axil, very rarely subsessile, always with 3 umbels at the terminal nodes, each umbel 4-flowered, primary peduncles absent, secondary peduncles 0.5–17 mm long. Bracts 0.3–2.2 (–3) mm long, 0.3–1 mm wide, triangular or linear or rarely semicircular, glabrous or the margin velutinous or tomentulose; bracteoles 0.1–0.7 mm long, 0.1–0.5 mm wide, triangular or linear or oblong, glabrous or the margin velutinous or tomentulose. Pedicels 7–19 mm long, velutinous or sometimes velutinous-tomentulose, often a little longer in fruit. Sepals 2.2–4.7 mm long, 1.2–2 mm wide, adaxially glabrous or with the apex tomentulose or the proximal  $\frac{1}{3}$ – $\frac{1}{2}$  glabrous, the distal  $\frac{2}{3}$ – $\frac{1}{2}$  tomentulose, glands 0.7–2 mm long, 0.4–1.1 mm wide. Claw of the lateral petals 1.5–2.2 mm long, limb (4.3–) 5.2–9.5 mm long, (4–) 5–8.5 mm wide, orbicular or broadly obovate, base briefly attenuate, fimbriae up to 0.5 mm long, usually glandular, sometimes a few eglandular. Claw of the posterior petal (2.2–) 2.7–4 mm long, limb 3.5–6 (–6.8) mm long, 3–6.2 mm wide, obovate or broadly so or suborbicular, fimbriae up to 0.5 mm long, capitate-glandular or sometimes the apex fimbriate-glandular. Lateral stamen filaments 2.2–4 mm long, always exceeding the posterior filament, posterior filament (1.9–) 2.1–3 mm long, arced toward the posterior petal, anthers 0.8–1 mm long, glandular connectives 0.6–0.7 mm long. Pollen grain ca 42  $\mu$ m. Anterior staminode filament 2.1–3.3 (–4) mm long, always exceeding the lateral 4, lateral staminode filaments 1.8–3.2 (–3.8) mm long, the anterior-lateral filaments usually longer, sometimes shorter, than the posterior-lateral two, or sometimes the four lateral filaments subequal, posterior-lateral filaments inflexed or only slightly so between the posterior styles, anterior and anterior-lateral glands (1–) 1.1–1.5 mm long, 1.3–1.4 mm wide, posterior-lateral glands 0.8–1.2 mm long, 0.9–1 mm wide, usually a little shorter but always narrower than the anterior three, all with the apex and abaxial face smooth. Styles 2.3–3.7 mm long, 0.3–0.4 mm wide, the anterior style often a little longer, sometimes a little shorter, than the posterior two, anterior style arced toward the posterior petal, posterior styles divergent, arced (not as strongly as the anterior style) toward the anterior-lateral petals, all styles usually with scattered hairs in the proximal  $\frac{1}{2}$  of their lengths, stigmas 0.3–0.4 mm in diameter, capitate. Carpophore up to 0.5 mm long. Torus up to 3.5 mm high. Samara with dorsal wing 1.6–1.9 cm long, 0.8–0.9 cm wide, upper margin straight or gently sigmoid, lower margin arced or slightly sigmoid, entire or slightly erose, lateral wings 2.5–3.6 mm wide, 6.7–8.8 mm high, rectangular or semicircular, slightly erose to sometimes dentate, areole 3–3.3 mm long, 3–3.5 mm wide, nut 4.5–5 mm long, 2.8–3.5 mm in diameter, seed ca 6 mm long, outer cotyledon ca 6.5 mm long, ca 2.5 mm wide, folded at ca  $\frac{1}{2}$  of its length, inner cotyledon ca 4.2 mm long, ca 2.2 mm wide, folded at ca  $\frac{1}{3}$  of its length.

Type. *St. Hilaire* s.n. Brazil. Minas Gerais: "... in pascuis juxta Conceição [Conceição] . . ." (holotype P!, isotype P!).

Distribution. (Fig. 8). From central and southern Minas Gerais and Rio de Janeiro to eastern São Paulo and eastern Paraná; cerrado, campo, woodlands, and gallery forests.

BRAZIL. Minas Gerais: *Ackermann* s.n. (BR); Morro do Pilar, *Black & Magalhães* 51-12228 (UB); Serra do Taquaral, *Ouro Preto, de Brito, Jr.* s.n. (SP 18835); 4 km W of Morro do Pilar, 20 km from road between Conceição and Belo Horizonte, *Gates* 384 (MICH); Serra de Biribiri, 7 km W of Diamantina, 1200 m, *Glassman & Gomes, Jr.* 8119 (SP); Taquaruçú à Serrinha, *Glaziov* 18929 p.p. (P);

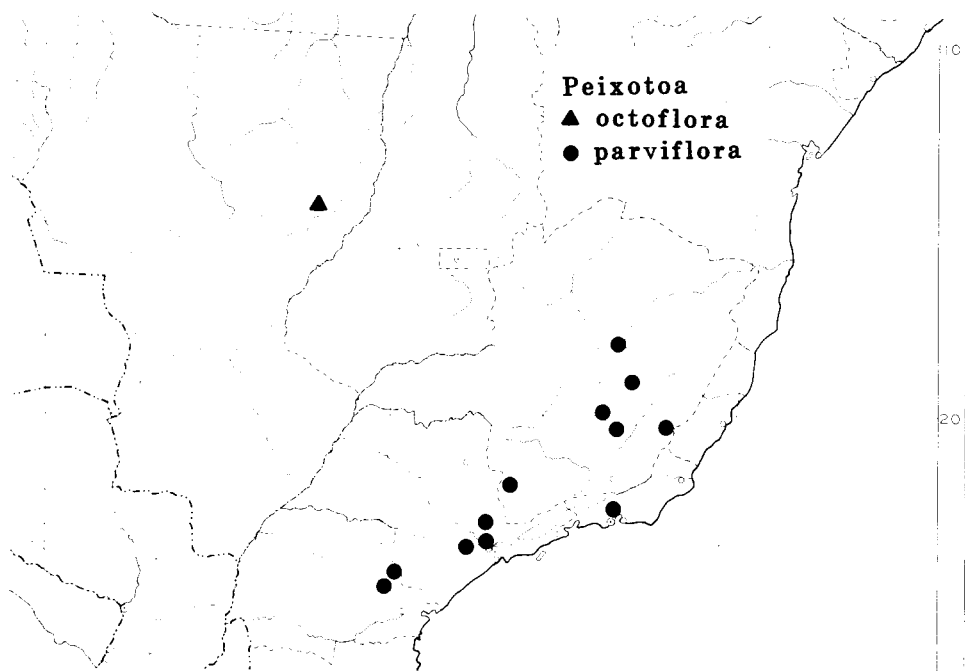


FIG. 8. Distribution of *P. octoflora* and *P. parviflora*.

Diamantina à Tombador, *Glaziou 18930* (C, P, R); Presidente Soares, *Heringer 10295* (UB); Santa Bárbara, *Hoehne s.n.* (SP 5052); Serro Frio, *Martius s.n.* (M); Serra dos Pinheiros, *Pohl 3556 (d. 1557)* (K, W); Caldas, *Regnell-III 118* (US), *III-318* (F, P, S, US); *III-318x* (S), *III-1652* (F, S, U, S, W); Santa Luzia, *Riedel & Luschath I* (LE, S); Serra do Taquaral, Ouro Preto, *Silva Novaes s.n.* (SP 18839); Ouro Preto, *Teixeira s.n.* (SP 18826); Caldas, *Widgren in 1845* (BR, F, K, LE, S, US); *Williams & Assis 6619* (GH). Paraná: 2 km W of intersection of PR-11 and the Rio Itarare at the border of Paraná and São Paulo, 620 m, *Davidse et al. 11371* (MO); Sengés, *Dusén 9942* (GH, S); Jaguariaíva [Jaguariaíva], 740 m, *Dusén 340a* (GH, MO, S), 9225 (A, BM, F, G, GH, K, MO, NY, S, US), 9619 (S), 9690 (F, S), 11685 (A, BM, G, GH, K, MO, NY, S, US), 13032 (S), 13082 (S); mun. Tibagi, Balsa para Pirai, 696 m, *Hatschbach 6028* (US), mun. Tibagi, Fazenda Monte Alegre, Harmonia, *Hatschbach 2831* (MICH, RB); mun. Sengés, Fazenda Morungava, Rio do Funil, *Hatschbach 5347* (MICH, US); Jaguariaíva, *Hoehne s.n.* (SP 23414); 4 km N of Wenceslau Braz, *Lindeman & Haas 3131* (K, MBM, NY); Tibagi, *Reiss 65a* (F); mun. Sengés, Fazenda Morungava, Rio Funil, ca 24°08'S, 49°22'W, 800 m, *Smith et al. 14834* (US). Rio de Janeiro: Rio de Janeiro, *Ackermann 232* (P-JUSS), *Ackermann s.n.* (BR), *Burchell A882* (K); Petrópolis à Santo Antonio, *Glaziou 5785* (C, P), 8581 (C, P), 10371 (BR, C, G, K, LE, P, US); pr. Sumidero, na rodovia BR-3 entre Itaipava e Pedro do Rio, ca 600 m, *Pabst 10321* (RB); Serra dos Órgãos, *Riedel III* (LE, S); *Sellow I. it. [a 1814]* (K?, NY); Petrópolis, mata do Judío, ca 700 m, *Sucre 7560* (MICH); mun. Araras, 850–980 m, *Sucre 10614* (MICH). São Paulo: Jaraguá, *Brade 5949* (S, SP); Campinas, *Campo Novaes 651* (SP, US); Cotia, *Constantino s.n.* (RB 45430); Jaraguá, *Hoehne s.n.* (SP 5479); estrada de Pirapóra à Cabreúva, *Hoehne s.n.* (F, GH, NY, SP 12905); São Paulo, 800 m, *Holway & Holway 1496* (US); Amparo, *Kuhlmann 1192* (SP); Igaratá, *Kuhlmann 2758* (SP); ca 10 km SW de Jundáí, Serra do Japi, *Leitão Filho et al. 3164* (NY, US); *Löfgren 272* (C); mun. Itapeva, Itanguá, ca 1000 m, *Vidal s.n.* (R 72157, R 72400); Sorocaba, *Wacket s.n.* (W); circa Parnaíba [Parnaíba] ad fl. Tieté, ca 700 m, *Wettstein & Schiffner s.n.* (W).

*Peixotoa parviflora* is readily recognized by its inflorescence structure. The terminal nodes bear three umbels and thus are 12-flowered. The lateral umbels and often also the terminal umbels are borne on secondary peduncles. Commonly at the more distal nodes the secondary and tertiary axes are suppressed and one or two umbels are borne on secondary peduncles in each leaf axil. The inflorescence leaves are always petiolate. The flowers are unusual in that the posterior styles are curved toward the anterior-lateral petals instead of toward the posterior-lateral petals. Only three other species share the inflorescence

structure but not the curvature of the styles. *P. adenopoda* from east-central Bahia has stalked leaf glands and staminode glands that have an indentation across the apex and decurrent on the abaxial face. *P. catarinensis* from coastal Santa Catarina has tiny leaf glands (0.2–0.7 mm in diameter) which are borne on the surface of the lamina away from the base and costa. In *P. parviflora* the staminode glands are smooth. The leaf glands are sessile and borne at the base at the costa or halfway on the petiole or rarely entirely on the petiole just below the lamina. They are 0.7–2.3 (–4.3) mm in diameter. *P. tomentosa* is probably closely related and the species most likely to be confused with *P. parviflora*. Its range, the central region of the Serra do Espinhaço of Minas Gerais, falls within that of *P. parviflora*. Its flowers are larger than those of *P. parviflora*. Sessile inflorescence leaves and sessile umbels at the more distal nodes are common. The pubescence of the inflorescence axes and of the lower leaf surface also usually help to separate the two species. The young branches and inflorescence axes of *P. tomentosa* are very densely golden velutinous. In *P. parviflora* the hairs are commonly white and only sparsely to moderately abundant. The leaves of *P. tomentosa* are usually densely tomentose or woolly below while those of *P. parviflora* are sparsely to moderately pubescent with T-shaped hairs or moderately tomentose but never woolly below.

One of the few species that have a relatively wide range, *P. parviflora* shows some geographical variation in flower size. Specimens from Rio de Janeiro tend to have the smallest flowers, those from Paraná the largest.

Collected in flower throughout the year, in fruit in January, June, July, and August.

**24. *Peixotoa psilophylla* C. Anderson, sp. nov.**

Fig. 21.

Suffrutex usque ad 2 m. Stipulae vegetativae 8.6–15 mm longae, acutae vel bifidae, interdum persistentes. Petioli 3.3–6.5(–8.8) mm longi. Laminae (3.7–) 6.3–20.7 cm longae, (3.6–) 5–9.5 cm latae, rugosae, ellipticae vel ovatae vel lanceolatae, supra glabrae vel sparsim velutinae, subtus glabrae vel in venis sparsim velutinae, basi juxta costam biglandulosae. Folia inflorescentiae petiolo brevi vel sessilia, distaliora lineari-lanceolata vel subulata. Inflorescentia terminalis vel axillaris, umbellis singularibus. Bractea bracteolaeque praesentes. Pedicelli 16–34 mm longi. Sepala 4.5–6.5(–7) mm longa. Limbus petalorum lateralium 11.5–15 mm longus, orbicularis, margine denticulato, glanduloso vel eglanduloso. Limbus petali postici 8.5–9 mm longus, late obovatus, margine  $\frac{3}{4}$ – $\frac{1}{4}$  proximalibus glandulis capitatis ornato,  $\frac{1}{3}$ – $\frac{1}{4}$  distali denticulato, glanduloso vel eglanduloso. Filamenta staminum subaequalis. Glandulae 3 staminodiorum anticorum apice non profunde indentatae, plerumque indentatione in pagina abaxiali decurrenti. Stylus anticus 3.2–4 mm longus, saltem parum inclinatus versus petalum posticum, styli postici 3.4–4.3 mm longi, interdum inaequales, divergentes, arcuati versus petala postico-lateralia; stigmata capitata. Samara ignota.

Subshrub to 2 m. Vegetative branches purplish-brown, sparsely tomentulose when young, older parts glabrous. Stem stipules 8.6–12 mm long, 9–15 mm wide, cordate or triangular-cordate, entire with the apex acute or notched, or bifid, finely tomentulose or velutinous adaxially, velutinous-tomentulose abaxially, deciduous, sometimes persistent; inflorescence stipules gradually decreasing in size toward the distal nodes, the smallest not less than 6.3 mm long, 6.2 mm wide, entire with the apex acute or sometimes notched, more densely pubescent than the cauline, eventually deciduous. Stem leaves with the petiole 3.3–6.5 (–8.8) mm long, tomentulose-velutinous or sparsely so, sometimes glabrous, laminae (3.7–) 6.3–20.7 cm long, (3.6–) 5–9.5 cm wide, elliptical or ovate or lanceolate, apex apiculate, base cordate, rugose, glabrous or sparsely

velutinous above, especially along the veins, glabrous or with scattered hairs on the major veins below, especially near the base, a pair of sessile glands at or up to 0.7 mm above the base at the costa or halfway on the petiole, each gland 1–2.1 mm in diameter. Inflorescence leaves petiolate or sometimes sessile at the distal nodes, laminas abruptly smaller than the cauline, linear-lanceolate to linear to subulate, the smallest not less than 3 mm long, 0.6 mm wide, apex acuminate, tomentulose-velutinous above, densely velutinous below, a pair of glands at the base at the costa or halfway on the petiole, each gland 0.8–1.6 mm in diameter, sometimes with a second, smaller pair (0.5–0.6 mm in diameter) below the larger pair, rarely one or both glands absent. Inflorescence terminal or axillary, the axes velutinous-tomentulose, internodes of the primary axis 2.7–15 cm long, 2° axes 2.8–11.1 cm long, 2° subsidiary axes 1.8–2.7 cm long, 3° axes 0.9–3.3 cm long; umbels 4-flowered, one umbel per node, primary and secondary peduncles absent. Bracts 0.4–1.3 mm long, 0.5–1 mm wide, triangular, glabrous or tomentulose, or tomentulose only abaxially and/or on the margins; bracteoles 0.2–0.5 mm long, 0.2–0.4 mm wide, triangular, sometimes linear or semicircular, glabrous or tomentulose, or sometimes tomentulose only abaxially and/or on the margins. Pedicels 116–34 mm long, velutinous, Sepals 4.5–6.5 (–7) mm long, 2.3–2.7 (–3) mm wide, adaxially the proximal  $\frac{1}{3}$ – $\frac{1}{2}$  glabrous, the distal  $\frac{2}{3}$ – $\frac{1}{2}$  velutinous-tomentulose, glands 1.6–2.4 (–2.7) mm long, 0.8–1.2 mm wide. Claw of the lateral petals 2.3–2.6 mm long, limb 11.5–15 mm long, 11–14.5 mm wide, orbicular, base briefly attenuate, denticulate, teeth up to 0.6 mm long, glandular or eglandular. Claw of the posterior petal 4–4.5 mm long, limb 8.5–9 mm long, 8.5–10 mm wide, broadly obovate, margin of the proximal  $\frac{2}{3}$ – $\frac{3}{4}$  capitate-glandular, fimbriae up to 0.3 mm long, margin of the distal  $\frac{1}{4}$ – $\frac{1}{3}$  denticulate, teeth up to 0.1 mm long, glandular or eglandular. Lateral stamen filaments 3.5–4.1 mm long, posterior filament 3.3–3.7 mm long, always at least slightly shorter than the lateral four, slightly arced toward the posterior petal, anthers 1.4–1.5 mm long, glandular connectives 0.6–0.8 (–1) mm long. Pollen grains 50–57  $\mu\text{m}$ . Filament of the anterior staminode 3.8–5 mm long, anterior-lateral filaments 3.6–4.5 mm long, posterior-lateral filaments 3.4–3.8 mm long, always shorter than the anterior three, inflexed between the posterior styles, anterior and anterior-lateral glands 1.3–1.4 mm long and wide, posterior-lateral gland 1.2–1.3 mm long, 1.1–1.2 mm wide, anterior and anterior-lateral glands usually with a shallow indentation across the apex and decurrent on the abaxial face, posterior-lateral glands smooth. Anterior style 3.2–4 mm long, ca 0.4 mm wide, slightly inclined toward the posterior petal, posterior styles 3.4–4.3 mm long, ca 0.3 mm wide, sometimes unequal, always exceeding the anterior style, divergent, arced toward the posterior-lateral petals, all styles usually glabrous, sometimes with scattered hairs in the proximal  $\frac{1}{3}$  of their lengths, stigma of the anterior style 0.4–0.5 mm in diameter, stigmas of the posterior styles 0.3–0.4 mm in diameter, all capitate. Samara not seen.

Type. *Irwin et al. 16860*. Brazil. Mato Grosso: Ca 15 km S of Xavantina, 400 m, 10 Jun 1966 (holotype UB, isotypes MICH, NY).

Distribution. (Fig. 10). Known only from the vicinity of Xavantina of east-central Mato Grosso; cerrado and margins of gallery forests.

BRAZIL. Mato Grosso: Xavantina, 400 m, *Irwin et al. 16778* (NY, UB); ca 70 km S of Xavantina, 500 m, *Irwin et al. 17439* (MICH, NY, UB); ca 3 km S of Xavantina, *Ratter R112 p.p.* (NY); Xavantina, *Richards 6429* (K, NY, P); Chavantina [Xavantina], *Sick B481* (RB).

*Peixotoa psilophylla* is the only species in Mato Grosso with the stem leaves glabrous or very sparsely pubescent when mature. The internodes of the primary inflorescence axis and the slender secondary axes are commonly 5–15 cm long, and give the inflorescence an open appearance. The hairs of the inflorescence and any other part of the plant are white. The anterior and anterior-

lateral staminode glands usually have an indentation across the apex and decurrent on the abaxial face. The margin of the limbs of the lateral petals and of the distal section of the limb of the posterior petal is denticulate. The geographically nearest glabrous species is *P. hatschbachii* of south-central Goiás, which is distinguished by its stalked leaf glands. In *P. psilopylla* the leaf glands are sessile. *P. hatschbachii* also differs in its smaller flowers whose petals are fimbriate, its larger stem stipules (over 17 mm long and wide), and its smooth staminode glands.

Collected in flower in June and July.

- 25. *Peixotoa reticulata*** Grisebach, *Linnaea* **13**: 213. 1839. Figs. 22, 23.  
*P. macrophylla* Grisebach, *Linnaea* **13**: 214. 1839. Type. *Sellow s.n.* [*Sellow IV. it. 5505*, fide Niedenzu, 1912] (Lectotype NY!).  
*P. lateritia* Adr. Jussieu, *Ann. Sci. Nat. Sér. II, Bot.* **13**: 279. 1840. Type. *Claussen s.n.* (holotype P-JUSS!).  
*P. hirta* f. 1. *minor* Niedenzu, *Verz. Vorles. Akad. Braunsberg W-S* 1912–1913: 35. 1912. Type. *Warming s.n.* (23 Sep 1864) (lectotype C!, isotypes F! LE! US!).  
*P. hirta* f. 2. *macrophylla* (Grisebach) Niedenzu, *Verz. Vorles. Akad. Braunsberg W-S* 1912–1913: 35. 1912.  
*P. macrophylla* f. I. *minor* (Niedenzu) Niedenzu, *Das Pflanzenreich IV.* **141**: 524. 1928.  
*P. macrophylla* f. II. *typica* (Grisebach) Niedenzu, *Das Pflanzenreich IV.* **141**: 524. 1928.  
*P. grandiflora* Ferreira, *An. Soc. Bot. Brazil, XX Cong. Nac. Bot. Goiana*: 281. 1969. Type. *Ferreira 2b* (UB 37618) (holotype UB!).

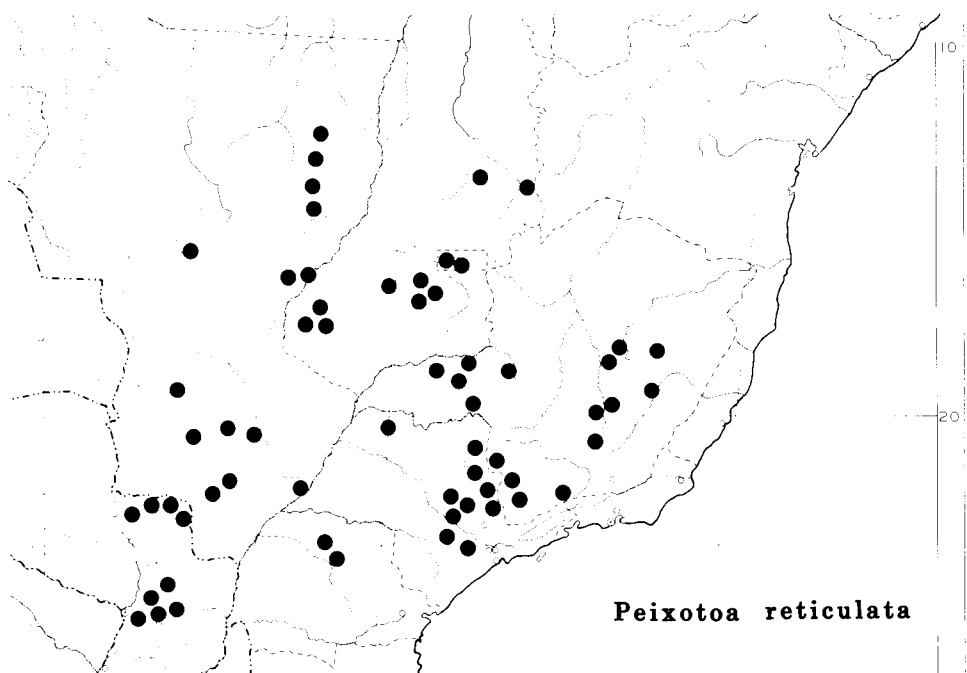
Shrub or subshrub, sometimes scandent, to 3 m. Vegetative branches finely velutinous or tomentulose, older parts usually glabrate. Stem stipules 8–25 mm long, 9.6–25 mm wide, entire with the apex acute, or bifid, velutinous or tomentulose or glabrate adaxially, tomentose-velutinous or sericeous-velutinous abaxially, deciduous; inflorescence stipules gradually decreasing in size toward the distal nodes, the smallest not less than 5.5 mm long and wide, entire with apex acute or notched, or bifid, sometimes the most distal fused at the base, deciduous. Stem leaves with the petiole 3–14 (–15.5) mm long, (sometimes golden) tomentose or velutinous-tomentose, laminae 3.5–17.5 cm long, 2.2–12 cm wide, elliptical, ovate, suborbicular, rarely lanceolate, the smaller sometimes obovate or rhombic, apex apiculate, base cordate or sometimes truncate, rugose, velutinous above, loosely pubescent with T-shaped hairs or loosely tomentose or tomentulose below, rarely the pubescence restricted to the major veins below, a pair of sessile glands at the base at the costa or, more commonly, halfway on the petiole, rarely borne on the surface of the blade up to 1 mm above the base, up to 1.5 mm from the costa, each gland (0.7–) 1–2.2 (–3.2) mm in diameter, rarely with a second smaller pair (0.4–0.8 mm in diameter) immediately above the larger pair. Inflorescence leaves with the more proximal petiolate, usually the more distal sessile, laminae abruptly smaller than the cauline, the smallest not less than 1.4 mm long, 0.6 mm wide, shape of the more proximal like the cauline, the more distal lanceolate or oblanceolate or linear, the most distal usually subulate, apex acuminate, sparsely velutinous or glabrous above, densely velutinous or velutinous-tomentose below, a pair of glands at the base or halfway on the petiole, each gland 0.3–2.3 mm in diameter, rarely with a second, smaller pair (0.6–1 mm in diameter) immediately above or adjacent to the larger pair, rarely one or both glands absent. Inflorescence terminal or axillary, the axes densely velutinous-tomentulose, internodes of the primary axis 1–12.5 cm long, 2° axes 0.7–11.8 (–15.2) cm long, 2° subsidiary axes rare, 2.5–3 cm long, 3° axes 0.5–6.5 cm long, 4° axes 0.4–3.8 cm long, 5° axes

1.1–3.5 cm long; umbels 4-flowered, one umbel per node, primary peduncles rare, up to 1.5 mm long, secondary peduncles up to 6 mm long or absent. Bracts 0.3–3.8 mm long, 0.2–1.3 (–2.3) mm wide, triangular or subulate, glabrous or velutinous or tomentulose or sparsely so on both surfaces or only abaxially or only on the margins; bracteoles 0.1–0.9 mm long, 0.1–0.6 mm wide, triangular or oblong or subulate, usually glabrous, sometimes tomentulose abaxially; bracts and bracteoles rarely absent. Pedicels 8–32 mm long, (sometimes golden) densely tomentulose-velutinous, usually at least slightly longer in fruit. Sepals 4–8.5 mm long, 2–4.3 mm wide, adaxially finely tomentulose or velutinous or pubescent with T-shaped hairs or sparsely so, or the proximal  $\frac{1}{4}$ – $\frac{2}{3}$  glabrous, the distal  $\frac{3}{4}$ – $\frac{1}{3}$  pubescent, glands 1.4–3 mm long, 0.7–1.5 mm wide. Claw of the lateral petals 2.2–2.5 (–3.5) mm long, limb (11.2–) 12–15 (–18) mm long, 12.5–15 (–18) mm wide, orbicular or broadly obovate, base briefly attenuate, fimbriae up to 1.2 mm long, glandular or eglandular. Claw of the posterior petal 3.5–5 mm long, limb 8–10 (–12) mm long, 7–10 (–12) mm wide, orbicular or broadly obovate or broadly elliptical, fimbriae up to 0.8 (–1.0) mm long, those of the proximal  $\frac{1}{2}$ – $\frac{4}{5}$  capitate-glandular, the distal  $\frac{1}{2}$ – $\frac{1}{5}$  fimbriate-glandular or sometimes all capitate-glandular. Filaments of the lateral stamens 3.5–4.7 (–5.3) mm long, posterior filament 3.3–4.7 mm long, usually shorter, sometimes subequal to the lateral four, slightly or strongly arced toward the posterior petals, anthers 1.3–1.7 mm long, glandular connectives 0.6–0.9 mm long. Pollen grains 57–63 (–70)  $\mu$ m. Filaments of the anterior and anterior-lateral staminodes 3.5–4.6 (–4.9) mm long, posterior-lateral filaments 3.2–4.3 mm long, usually a little shorter, sometimes equal to the anterior three, inflexed between the posterior styles, sometimes the anterior-lateral filaments exceeding the other three, glands 1.2–1.6 (–2) mm long, 1.1–1.5 mm wide, the posterior-lateral glands usually a little smaller than the anterior three, all glands with the apex and abaxial face smooth. Styles 3.6–5 mm long, 0.2–0.4 mm wide, equal or the anterior longer or shorter than the posterior two, the anterior style always a little stouter than the posterior two, anterior style arced or at least slightly inclined toward the posterior petal, posterior styles divergent along their entire length or only in the distal  $\frac{1}{3}$ , arced toward the posterior-lateral petals, all styles usually glabrous, sometimes velutinous in the proximal  $\frac{1}{2}$  of their lengths, stigmas 0.4–0.5 mm in diameter, capitate. Samaras variable in size, the smaller usually with the dorsal wing 1.3–2 cm long, 0.9–1.3 cm wide, upper margin straight or gently sigmoid, lower margin arced or nearly so, erose or slightly so, lateral wings 1.3–2.5 mm wide, 6–8 mm high, rectangular, erose or sometimes lacerate, the larger samaras usually with the dorsal wing 2.3–4 cm long, 1.3–2.3 cm wide, upper margin straight, arced or sigmoid, lower margin sigmoid or slightly so or arced, lateral wings (2.7–) 3–7.5 mm wide, 9–15 mm high, rectangular or semicircular, erose or slightly so, all samaras with the areole 3.5–6.5 mm long, 3–6.8 mm wide, nut ca 4–6.5 (–7.5) mm long, 3–5.5 mm in diameter, seed 6.2–7.4 mm long, outer cotyledons 7.4–11.5 mm long, 1.5–2.2 mm wide, folded at ca  $\frac{1}{2}$ – $\frac{2}{3}$  of its length, inner cotyledon 4.2–6 mm long, 1–2 mm wide, folded at ca  $\frac{4}{5}$ – $\frac{5}{6}$  of its length or straight.

Type. *Sellow s.n.* [*Sellow III. it. c. 1310* (2. V 1819), fide Niedenzu, 1912] Brazil. Minas Gerais: “. . . pr. Juesshuy [Suaçui].” (lectotype NY!).

Distribution. (Fig. 9). From central Minas Gerais to Paraná, southern Goiás to central and southern Mato Grosso, eastern Paraguay and eastern Bolivia; cerrado and campo.

BOLIVIA. Prov. Velasco, *Kuntze s.n.* (NY). BRAZIL. Distrito Federal: Brasília, *Ferreira 3, 5, 7, 9, 13* (UB), *Heringer 8410* (UB, US), *11670, 11811* (UB), *Irwin et al. 11103* (MICH, NY), *Irwin & Soderstrom 5067* (MICH, NY), *6117* (MICH), *Martin 407* (GH), *Pires et al. 9086* (UB, US). *Sucre 274* (NY, RB, UB); Braslândia, *Ferreira 4* (UB); Lagôa Paranoá, 1000 m, *Irwin et al. 15340, 26641* (MICH, NY); Braslândia, *Lima et al. 1* (NY, UB); entre Brasília e Fercal, *Pires 58097* (MICH, NY). Goiás:

FIG. 9. Distribution of *P. reticulata*.

Serra do Caiapó, ca 25–30 km S of Caiapônia, 800–1200 m, *Anderson 9391, 9589* (MICH, NY); Serra dos Pirineus, ca 15 km N of Corumbá de Goiás, 1250–1300 m, *Anderson 10260* (MICH, NY); Goiás, *Burchell 7037* (K); Cavalcante, *Burchell 7596* (K); Chapada dos Veadeiros, Pouso Alto, 1800 m, *Ferreira 12* (UB); Goiânia, *Guimarães et al. 292* (MICH, RB); mun. Mineiros, BR-60, *Hatschbach 34639* (MICH); mun. Luzânia, *Heringer 14691* (UB); Rio da Prata, ca 6 km S of Posse, 14°S, 46°W, *Irwin et al. 14340a* (NY); Serra do Caiapó, ca 50 km S of Caiapônia, 1000 m, *Irwin et al. 17830* (MICH); Serra dos Pirineus, 20 km N of Corumbá de Goiás on road to Niquelândia, ca 1150 m, *Irwin et al. 18762* (NY); Serra dos Pirineus, ca 18 km E of Pirenópolis, 1000 m, *Irwin et al. 34248* (MICH, NY); Pirenópolis, cachoeira do Abade, *Onishi et al. 74* (UB); ad S. Pedro, *Pohl 472-2598(1498d)* (K, W). Mato Grosso: ca 5 km N of Barra do Garças, 500 m, *Anderson 9871* (MICH, NY); Campo Grande, *Archer & Gehrt 140* (SP, US); General Caneiro, *Hartmann 113* (SP); Rio Brillhante, *Hatchbach & Guimarães 21770* (C, M, MICH, P); Terenos, *Hatschbach 24625* (MBM, MICH); Casa da Pedra, *Hoehne s.n.* (SP 30256); Campo Grande, *Hoehne & Gehrt s.n.* (SP 35760); Serra do Roncador, ca 210 km N of Xavantina, 500 m, *Irwin et al. 16087* (MICH, NY, UB), ca 87 km N of Xavantina, 550 m, *Irwin et al. 16484* (MICH, NY, UB), ca 60 km N of Xavantina, 550 m, *Irwin et al. 16681b* (MICH, NY); mun. Bataguáçu, 42 km de Porto de 15 de Novembro, *Krapovickas 14392* (C, CTES), *14396* (CTES); 23–40 km E de Aquiduaana, *Krapovickas & Schinini 32918, 32893* (MICH); 4 km E de Ribas do Rio Pardo, *Krapovickas & Cristóbal 34372* (MICH); 6 km de Campo Grande, *Krapovickas & Cristóbal 34542* (MICH); Campo Grande, Lagôa Rica, 600–700 m, *Lutz s.n.* (R 72142); Chapada, *Moore 153* (BM); Campo Grande, *Occhioni 5775* (MICH); mun. Dourados, ca 20 km E of Itaum, *Pedersen 11116* (MICH); Fazenda Sta. Filomena, 56°40'W, 19°13'S, *Prance & Schaller 26269* (NY); 8 km NE of Base Camp (12°54'S, 51°52'W), ca 270 km N of Xavantina, *Ratter et al. 1990* (K); ca 200 km N of Xavantina, Xavantina-São Felix Road, *de Santos & Souza 1637* (K, MO, NY, P, RB, UB); Buriti, NE of Cuiabá, 2250 ft, *Smith 330* (K); mun. Campo Grande, Fazenda das Varzeas, *Sucre 10416* (RB); ca 10 km E. of Campo Grande, *Swallen 9606* (US). Minas Gerais: 6 km N of Gouvêia on road to Diamantina, 1250 m, *Anderson 8564* (MICH, NY); mun. Belo Horizonte, Serra do Taquaril, *Barreto 7577* (F, US), *7578 p.p.* (F); Diamantina, *Brade 13776* (RB); Belo Horizonte, *Brade 14819 & Barreto 1335* (RB); Baú, *Brade 17802 & Altamira* (RB); Diamantina, *Brito 100* (R); *Claussen s.n.* (P-JUSS, lectotype of *P. lateritia*); *Claussen s.n.* (BR, G); Carandaí-Crespo, *Duarte 451* (RB); Patos de Minas, 800 m, *Duarte 2843* (RB); Cachambú, ca 1000 m, *Duarte 3787* (RB); rodovia Uberaba-Uberlândia, a 40 km de Uberaba, *Ferreira 2b* (UB 37618, holotype of *P. grandiflora*); rodovia Goiânia-Brasília, entre Uberaba e Uberlândia, *Ferreira 43* (NY, UB); *Gaudichaud 584* (P); Pouso Alegre, *Hoehne s.n.* (SP 19391); Serra do Espinhaço ca 25 km SW of Diamantina, on road to Gouvêia, 1300 m, *Irwin et al. 22091* (NY), ca 20 km SW of Diamantina, 1200 m, *Irwin et al. 22294* (MICH, NY); Ituiutaba, *Macêdo 38* (MO, S, SP), *2428* (BM, MO, S, US), *4962* (SP); Capão d'Antas, Nova Ponte, *Magalhães 241* (UB);



40 km 0 de Araguari, *Magalhães 19041* (NY); Diamantina, 1250 m, *Mexia 5798* (A, BM, G, GH, MO, NY, US); Belo Horizonte, *Porto & Fagundo 2200* (RB); Baependi, *Rabello 893* (R); Uberava [Uberaba], *Regnell II-28* (US), *II-28a* (S); Baguari, *Regnell II-28d* (F, S, US); Caldas, *Regnell II-28e* (C, R, S); Passos, Serra de Ventania, *Regnell II-28x* (S); Serra do Curral, Belo Horizonte, *Roth 1591* (RB); *Schwacke s.n.* (R 72455); Serra da Mantiqueira, *Vidal 2054* (R); mun. Thermópolis, Chapadão do Jacuhy, *Vidal I-780, I-800, I-836* (R); José Alves, *Warming s.n.* (C); Lagôa Santa, *Warming s.n.* (C, F, I.E, US); outskirts of Belo Horizonte, 1000 m, *Williams & Assis 5827* (GH); mun. Belo Horizonte, Morro das Pedras, 1100 m, *Williams & Assis 6938* (GH). Paraná: Fazenda Lagôa, ca 20 km N of Cianorte, *Anderson 11155* (MICH, NY, UB); mun. Campo Mourão, *Hatschbach 8819* (MICH, US); Fazenda Lagôa, Cianorte, *Hatschbach 14243* (F, MBM, MICH, NY, P, US), *21572* (MICH, P); Campo Mourão, *Labouriau 60* (SP). São Paulo: Mogi-Mirim, *Burchell 5090* (K), *5220* (GOET, K); Araras, *de Andrade s.n.* (SP 24514); Itirapina, *de Paula 111* (SP); Morro Pellado, *Edwall s.n.* (SP 12109); mun. Moji-Guaçu, Fazenda Campininha, ca 4 km NNW of Padua Sales, *575-650* m, *Eiten & Eiten 1901* (NY, SP, US), ca 10 km NNE of Padua Sales, *Eiten & Eiten 2280* (SP); mun. São Carlos, 3.5 km NNW of center of São Carlos, 21°59'S, 57°55'W, 825 m, *Eiten et al. 2914* (K, NY, SP, US); mun. Ibaté, 12.8 km NW of center of city of São Carlos, ca 1 km NE of Ibaté, *Eiten et al. 2928* (MO, NY, SP, US); mun. São Carlos, 13-15 km NW of Santa Eudóxia, *Eiten & Eiten 3291* (NY, SP, UB); mun. São Carlos, near boundary with mun. Araraquara, 19.9 km NW of railroad station at Santa Eudóxia, 625 m, *Eiten & Campos 3449* (NY, SP); mun. Moji-Guaçu, Fazenda Campininha, 6.2 km NNW of Padua Sales, *575-650* m, *Eiten & Eiten 5616* (NY), 10 km NNE of Padua Sales, *Eiten & Eiten 5701* (NY, UB, US); Itirapina, *Gebri s.n.* (SP 8328); mun. Botucatu, 18 km N of Botucatu, 14 km E of São Miguel, ca 550 m, *Gottsberger 6571* (NY); caminho para Sete-Quedas, *Heiner 269* (S); Mogi-Mirim, *Hoehne s.n.* (SP 20525); Amparo, *Hoehne s.n.* (SP 20569); São Simão, *Kuhlmann 4144* (SP), *Lima 6268* (SP); Rio Claro, *Löfgren 587* (C); Sorocaba, *Lund s.n.* (C, UB); Itirapina, *Matos 92* (SP); mun. Moji-Guaçu, Fazenda Campininha, 10 km de Padua Sales, *Mattos 125 & Rizzini* (RB); mun. Moji-Guaçu, Fazenda Campininha, 3.2-3.4 km NNW de Padua Sales, *Mattos & Mattos 8305* (SP, US); São João de Boa Vista, *Mosén 4050* (P, S); Votuporanga, *Pires 57925* (NY, UB); inter Casa Branca et São Simão, *Regnell II-28b, II-28g* (S); Minas, *Riedel 584* (R); Sorocaba et Ypanama [Ipanema], *Riedel & Luschnath 2007* (A, GH, I.E, NY, P, S, US); zwischen Rio Pirituba und Sorocaba, *Sellow IV. it. 5505* (NY, fragment, lectotype of *P. macrophylla*); prope Franca, *Wacket s.n.* (W). PARAGUAY: Cerro Cora, 36 km W of Pedro Juan Caballero, 300 m, *Anderson 11782* (MICH); 3 km N of Río Ypané on road to Pedro Juan Cabellero, 175 m, *Anderson 11790* (MICH); Est. Santa María, Cerro Noaga, *Anisis 2372* (S); dept. Kanendiju, col. Fortuna, 8 km de Kuruguatz, *Arenas 629* (CTES, MICH); dept. Paraguari, Salto de Piraretá, *Arbo et al. 1750* (MICH); Cordillera de Altos, Cerro Chochá, *Fiebrig 390* (A, BM, F, G, K, M); Centurión, zwischen Río Apa und Río Aquidaban, *Fiebrig 4017* (BM, G, GH, K), *4590* (GH); San Luis, zwischen Río Apa und Río Aquidaban, 22-23°S, *Fiebrig 5181* (G, M); camino Bernal-Cué, *Hassler 1141* (G); Cordillera de Altos, *Hassler 2976* (BM, G, NY); Bernal-Cué, *Hassler 4055* (BM, G, K, NY, P); prope fl. Corrientes, *Hassler 4509* (BM, G, K, P); Ipé-hu, *Hassler 5054* (BM, G, K, NY, P); Il. Capibary, *Hassler 5927* (A, BM, F, G, K, MO, NY, P, S, W); prope Chololo, in valle fluminis Y-aca, *Hassler 6774* (A, BM, F, G, K, NY, P, S, W); Río Apa, *Hassler 8166* (A, BM, F, G, K, MO, NY, P, S, W), *8166a* (BM, F, G, K, NY); Sierra de Amambay, *Hassler 9881* (A, G, K, NY, P, W), *9881a* (GH, K), *Conrados Estrella, Hassler 10056* (G); dept. San Pedro, 43 km de San Estanislao Norte, *Krapovichkas et al. 14265* (CTES, MO); dept. Paraguari, Piraretá, *Schinini 4348* (F, MICH, P); dept. San Pedro, Ruta 3, 2 km S de Tacuara, *Schinini 8809* (MICH), 34 km N de Tacuara, *Schinini 8887* (MICH); dept. Amambay, camino entre Ruta 5 y Bella Vista, 9 km N de Ruta 5, *Schinini 8956* (MICH).

*Peixotoa reticulata* is a widespread taxon of which almost all of the known collections are apomictic. The anthers remain closed and contain mostly aborted pollen that is 80-97% non-staining in cotton blue in lactophenol. In a few exceptions this percentage is much lower (see also the section Apomixis). Rarely a few flowers of a specimen (e.g. *Fiebrig 4590*) will have a few or all of the anthers open. Pollen fertility may be higher than or the same as in samples from closed anthers. Only in two collections, *Mexia 5798* and *Occhioni 5775*, do all flowers have all anthers open. The pollen of *Mexia 5798* is 45-98% non-staining, while that of *Occhioni 5775* is almost 100% staining. The Occhioni collection is perhaps a rare, sexual individual.

Chromosome counts of the pollen mother cells of a collection from Paraguay (*Anderson 11790*) show that while  $2n=30$ , the separation of anaphase I/ telophase I is highly irregular. Most frequently 17 and 13 or 16 and 14 pairs would move to the opposite poles, but figures with 15 and 15 were also seen (W. R. Anderson, pers. comm.). In the only sexual species counted, *P. glabra* (*Anderson 11549*),  $n=10$  (W. R. Anderson, pers. comm.). Since Gates (1981) found that

in *Banisteriopsis*, the most likely ancestor of *Peixotoa*,  $n=10$  in nearly every count, this is probably also the base number for *Peixotoa*. *P. reticulata* may be the product of a cross between a diploid and a tetraploid. The resulting sterile triploid was then propagated apomictically. Such crosses may have happened several times. Also, as noted in the section on apomixis, it appears that hybridization between *P. reticulata* and sexual species does take place. Thus, *P. reticulata* as circumscribed here is probably polyphyletic. Such a history would account for its considerable morphological variation, which is reflected by a number of regional types. Their distinctions are summarized in Table I. These groupings are not absolute, but indicate the combination of characters most likely to be encountered in each region. The extremes are quite distinct, yet are linked by many intermediate forms.

The samaras are extremely variable in the shape and the size of the wings. Those from the eastern part of the range tend to have the dorsal wing with the upper and lower margin straight or sigmoid and often parallel to each other. The lateral wings are 3–5 mm wide. Those from the more western part tend to have an arced or sigmoid upper margin and usually a semicircular or arced lower margin; their lateral wings are 4–7.5 mm wide. Perhaps these reflect hybridization with the large-winged *P. cordistipula* and *P. magnifica*. The variation in size is striking. In *Hatschbach 2465* from Terenos in southern Mato Grosso the dorsal wing is ca 3.5–4 cm long and ca 2–2.5 cm wide. The lateral wings are ca 1.6 cm high and ca 6–7 mm wide. In *Hatschbach 21770* from Rio Brillhante, south of Terenos, the dorsal wing is ca 1–1.5 cm long and ca 1 cm wide. The lateral wings are ca 6–6.5 mm high and ca 2 mm wide. These fruits appear immature or aborted, yet contain mature, apparently normal embryos.

In the past plants of *P. reticulata* from the western part of the range have often been assigned to *P. cordistipula* of central Mato Grosso and eastern Bolivia. This species differs from *P. reticulata* in its larger and persistent inflorescence stipules, longer staminode filaments, and the commonly present glandular mass in the center of the umbel. Also, the dense, white pubescence gives *P. cordistipula* a silvery-grey appearance.

Grisebach based his *P. reticulata* on two Sellow collections from east-central Minas Gerais. These were deposited at Berlin, but are no longer extant. A fragment of *Sellow III. it. c. 1310*, consisting of a leaf and flowers, is at NY and is here designated lectotype. Photographs of the Berlin specimen are at F, MICH, and NY. *Mexia 5798* is an excellent match for this collection. It is noteworthy that the flowers of the NY fragment have open anthers.

Collected in flower and fruit throughout the year.

## 26. *Peixotoa sericea* C. Anderson, sp. nov.

Fig. 12.

Liana (?). Stipulae vegetativae deciduae, inflorescentiae 6–10 mm longae, acutae, persistentes. Petioli 8–10 mm longi. Laminae 7.1–10.3 cm longae, 3.3–5 cm latae, ellipticae vel anguste ellipticae, supra sparsim appresso-sericeae vel glabratae, subtus appresso-sericeae, biglandulosae 4.5–9 mm supra basim juxta vel prope costam. Folia inflorescentiae petiolo brevi, distaliora sessilia, linearia. Inflorescentia terminalis vel axillaris, umbellis singularibus. Bractae bracteolaeque absentes. Pedicelli 13–15 mm longi. Sepala 3.8–4.5 mm longa. Limbus petalorum lateralium ca 10 mm longus, ellipticus, margine glanduloso-fimbriato. Limbus petali postici 6–6.5 mm longus, ellipticus vel anguste obovatus, margine glandulis capitatis ornato. Styli subaequales, 4–4.5 mm longi, anticus arcuatus versus petalum posticum, postici divergentes, inclinati versus petala postico-lateralia; stigmata capitata. Samara ignota.

Vine? Vegetative branches finely sericeous-tomentulose when very young, soon becoming glabrous. Stem stipules deciduous, not seen; inflorescence

Table 1. Summary of the regional morphological types of *P. reticulata*.

	central Minas Gerais	western & southern Minas Gerais, & São Paulo	Paraná	Goiás	central Mato Grosso	southern Mato Grosso	Paraguay
shape of stem laminae	ovate, elliptical, suborbicular, rhombic	ovate, elliptical, suborbicular	ovate, elliptical, suborbicular	ovate, elliptical.	ovate, elliptical, lanccolate	ovate, elliptical	ovate, elliptical
abundance of hairs on lower surface of stem lamina	sparse to moderate	dense	moderate	moderate to dense	sparse to dense	sparse to dense	moderate
presence of petioles in inflorescence leaves	—	+/-	+/-	+/-	-	+	+
presence of secondary peduncle	rare	common	common	rare	rare	rare	almost always present
shape of limb of posterior petal	obovate, elliptical	obovate, orbicular	orbicular	obovate	elliptical	obovate	orbicular, oblate
margin of limb of posterior petal	capitate- or fimbriate- glandular	capitate- glandular	capitate- glandular	capitate- or fimbriate- glandular	capitate- glandular	capitate- glandular	capitate- or fimbriate- glandular
curvature of anterior style	arced toward posterior petal	arced toward posterior petal	arced toward posterior petal	arced toward posterior petal	slightly inclined toward posterior petal	erect or slightly inclined toward posterior petal	erect or slightly inclined toward posterior petal

stipules 6–10 mm long, 6–8 mm wide, cordate or triangular-cordate, apex acute, sparsely and finely velutinous or sericeous adaxially, sericeous abaxially, persistent. Stem leaves with the petiole 8–10 mm long, densely velutinous, laminae 7.1–10.3 cm long, 3.3–5 cm wide, elliptical or narrowly so, apex apiculate, base attenuate, sparsely appressed-sericeous to glabrous above, appressed-sericeous below, a pair of sessile glands borne 4.5–9 mm above the base at the costa or on the surface of the lamina up to 0.4 mm from the costa. Inflorescence leaves of the proximal nodes petiolate, the more distal sessile, laminae abruptly smaller than the cauline, the smallest not less than 2.2 mm long, 0.6 mm wide, the proximal narrowly elliptical, the distal linear, apex acuminate, glabrous above, densely sericeous-velutinous below, a pair of glands at the base at the costa or borne on the surface of the lamina up to 1 mm above the base, up to 0.4 mm from the costa, each gland 0.3–0.9 mm in diameter. Inflorescence terminal or axillary, the axes finely and densely tomentulose-velutinous, internodes of the primary axis 2–4 cm long, 2° axes 1.7–6.8 cm long, subsidiary axes absent; umbels 4-flowered, one umbel per node, primary and secondary peduncles absent. Bracts and bracteoles absent. Pedicels 13–15 mm long, densely golden velutinous. Sepals 3.8–4.5 mm long, 1.7–1.8 mm wide, velutinous adaxially, sparsely so near the base, glands 1.1–1.2 mm long, 0.7–0.8 mm wide. Claw of the lateral petals 2–2.2 mm long, limb ca 10 mm long, ca 7.5 mm wide, elliptical, base attenuate, fimbriae up to 0.4 mm long, glandular. Claw of the posterior petal ca 4 mm long, limb 6–6.5 mm long, 4.5–5 mm wide, elliptical or narrowly obovate, fimbriae up to 0.5 mm long, capitate-glandular. Filaments of the lateral stamens 4.5–4.8 mm long, posterior filament ca 3 mm long, strongly arced toward the posterior petal, anthers 1.3–1.4 mm long, glandular connectives 0.6–0.7 mm long. Pollen grains 42–50  $\mu\text{m}$ . Anterior staminode filament 4.5–5 mm long, anterior-lateral filaments 3.3–4 mm long, posterior-lateral filaments 3–3.3 mm long, always shorter than the anterior lateral two, inflexed between the posterior styles, anterior and anterior-lateral glands ca 1.2–1.3 mm long, ca 1.1–1.2 mm wide, posterior-lateral glands ca 1 mm long, ca 0.8 mm wide, all glands with the apex and abaxial face smooth. Styles 4–4.5 mm long, ca 0.3 mm wide, anterior style arced toward the posterior petal, posterior styles divergent, inclined toward the posterior-lateral petals, all styles densely pubescent with basifixed hairs in the proximal  $\frac{1}{3}$  of their lengths, stigmas ca 0.3–0.4 mm in diameter, capitate. Samara not seen.

Type. *Eupunino 120*. Brazil. Bahia: Santa Cruz de Cabralia, Reserva Biológica do Pau-brasil, 5 Jan 1972 (holotype CEPEC, isotype MICH).

*Peixotoa sericea* is known only from the type (Fig. 10). It is one of two species in the genus with sericeous leaves. The hairs are sessile or subsessile and have a straight, stiff trabecula. The lamina is very sparsely pubescent above but more densely so below. Yet, to the naked eye the leaves may appear glabrous. The leaves are also atypical for the genus in that the base is cuneate instead of cordate or subtruncate. The glands of the stem leaves are borne above the base but at the costa, usually at different levels from each other. *P. adenopoda*, the other species with sericeous leaves, differs in that the leaf glands are stalked and borne on the surface of the lamina away from the base and costa. Also, the terminal inflorescence nodes bear three umbels, i.e., are 12-flowered. Those of *P. sericea* bear a single umbel and thus are 4-flowered.

Unfortunately, the collector of the type did not note the habitat. According to Mori and Silva (1979), the reserve at Santa Catarina Cabralia consists largely of *mata higrófila* (tropical wet forest). Perhaps *P. sericea* grows at the forest edge or in the adjacent restingas. Cerrado, the vegetation type in which *Peixotoa* is most commonly collected, is not found in this area.

*Peixotoa hispidula* is the only other coastal species in Bahia. It has the typically

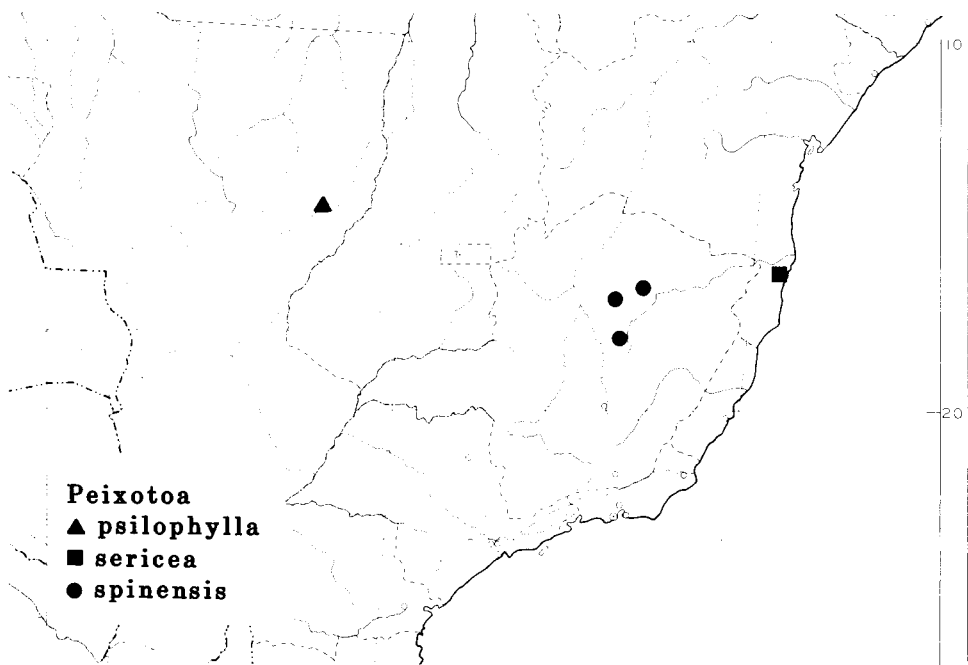


FIG. 10. Distribution of *P. psilophylla*, *P. sericea*, and *P. spinensis*.

cordate leaves which are usually glabrous or nearly so or may be variously pubescent but never sericeous. Its large flowers are borne in a solitary umbel or in only slightly more elaborate inflorescences.

**27. *Peixotoa spinensis* C. Anderson, sp. nov.**

Fig. 16.

Frutex vel suffrutex caulibus usque ad 2 m longis, prostratis, ascendentibus vel volubilibus. Stipulae vegetativae 3–10.5 mm longae, cordatae vel triangulares, acutae vel bifidae, deciduae interdum persistentes. Petioli 2–8 mm longi. Laminae 3.6–9.3 cm longae, 1.8–6.5 cm latae, ellipticae vel ovatae vel lanceolatae, supra velutinae raro tomentoso-velutinae, subtus tomentosae vel lanatae, ferentes 2 (interdum 3–4) glandulas (2.2–)3–20 mm supra basim 0–14 mm a costa. Folia inflorescentiae petiolo brevi raro sessilia, linearia vel subulata. Inflorescentia terminalis vel axillaris, umbellis singularibus. Bractae bracteolaeque praesentes. Pedicelli 8–28 mm longi. Sepala 3–6.1 mm longa. Limbus petalorum lateralium 9.5–13.5 mm longus, orbicularis, margine glanduloso-fimbriato vel glanduloso-denticulato, interdum praesertim apice eglanduloso. Limbus petali postici 6–8.3 mm longus, ellipticus vel late ellipticus, raro sub-orbicularis, margine glandulis capitatis ornato vel apice glanduloso-fimbriato. Glandulae staminodiorum apice profunde indentatae, indentatione in pagina abaxiali decurrenti, interdum postico-lateralibus laevibus. Stylus anticus 3.1–4.2 mm longus, erectus vel parum inclinatus versus petalum posticum, styli postici 3.4–4.5 mm longi, semper anticum excedentes, divergentes, inclinati versus petala postico-lateralia; stigmata capitata. Ala dorsalis samarae ca 2 cm longa, ca 1.4 cm lata, alae laterales 2.3–3.5 mm latae, 7.3–8 mm altae.

Shrub or subshrub with ascending, twining or prostrate stems to 2 m. Vegetative branches densely tomentulose-velutinous, pubescence abraded from older parts. Stem stipules 3–10.5 mm long, 3.5–10 mm wide, cordate or triangular, entire with the apex acute, or bifid, finely velutinous-tomentulose,

sparsely so adaxially, densely so abaxially, deciduous or sometimes persistent; inflorescence stipules like the cauline, sometimes more densely pubescent, deciduous. Stem leaves with the petioles 2–8 mm long, densely tomentose-velutinous, lamina 3.6–9.3 cm long, 1.8–6.5 cm wide, elliptical or ovate to lanceolate, apex apiculate or in narrow leaves acuminate, base cordate, velutinous or rarely velutinous-tomentose above, tomentose or woolly below, a pair of sessile glands borne on the surface of the lamina (2.2–) 3–20 mm above the base, up to 14 mm from the costa, sometimes with one or two additional glands, each gland 0.5–1.5 (–2.3) mm in diameter. Inflorescence leaves with the petiole 0.2 mm or more long, rarely sessile, lamina abruptly smaller than the cauline, the smallest not less than 1.4 mm long, 0.7 mm wide, shape of the more proximal like the cauline, the more distal lanceolate to linear to subulate, apex acuminate, velutinous or sparsely so adaxially, densely velutinous abaxially, a pair of glands borne on the surface of the lamina in the larger leaves, at the base at the costa or halfway on the petiole in the smaller leaves, each gland 0.3–1.3 mm in diameter, sometimes with one or two smaller glands (0.4–0.6 mm in diameter) above, below or adjacent to the larger pair. Inflorescence terminal or axillary, the axes tomentulose-velutinous, internodes of the primary axis 2–8.5 cm long, 2° axes 1.9–8.7 cm long, 2° subsidiary axes 1.2–2 cm long, 3° axes 0.7–3.3 cm long; umbels 4-flowered, one umbel per node, primary and secondary peduncles absent. Bracts 0.3–1.6 mm long, 0.2–0.7 mm wide, linear, triangular or sometimes semicircular, glabrous, sometimes velutinous on the margins; bracteoles 0.1–0.5 (–0.7) mm long, 0.1–0.4 mm wide, triangular or semicircular, glabrous. Pedicels 8–28 mm long, densely tomentulose-velutinous, the smaller ones up to twice again as long in fruit. Sepals 3–6.1 mm long, 1.6–3.5 mm wide, adaxially the proximal  $\frac{1}{2}$ – $\frac{2}{3}$  glabrous, the distal  $\frac{1}{2}$ – $\frac{2}{3}$  tomentulose, glands 1–2.1 mm long, 0.7–1.2 mm wide. Claw of the lateral petals 2.5–3.5 mm long, limb 9.5–13.5 mm long, 10–13 mm wide, orbicular, base attenuate, fimbriate and/or denticulate, fimbriae and teeth up to 0.4 mm long, glandular, sometimes eglandular, especially at the apex. Claw of the posterior petal 3.2–4.3 mm long, limb 6–8.3 mm long, 5.2–7.2 mm wide, elliptical or broadly so, rarely sub-orbicular, fimbriae up to 0.3 (–0.5) mm long, capitate-glandular, sometimes the apex fimbriate-glandular. Filaments of the lateral stamens 3.5–4.6 mm long, posterior filament 3.2–4 mm long, always shorter than the lateral four, arced toward the posterior petal, anthers 1.1–1.4 mm long, glandular connectives 0.6–0.8 mm long. Pollen grains ca 50  $\mu$ m. Filament of the anterior staminode 3.5–4 mm long, always exceeding the anterior-lateral two, anterior-lateral filaments 3.2–3.8 mm long, always exceeding the posterior-lateral two, posterior-lateral filaments 3–3.5 mm long, inflexed between the posterior styles, anterior and anterior-lateral glands 1.2–1.4 mm long, 1.2–1.5 mm wide, the anterior gland often a little larger than the anterior-lateral two, posterior-lateral glands 0.8–1.2 mm long, ca 1 mm wide, all glands with an indentation across the apex and abaxial face or sometimes the posterior-lateral two smooth. Anterior style 3.1–4.2 mm long, 0.3–0.4 mm wide, always shorter and a little stouter than the posterior two, erect or very slightly inclined toward the posterior petal, posterior styles 3.4–4.5 mm long, ca 0.3 mm wide, divergent, inclined toward the posterior-lateral petals, all styles glabrous or sometimes with scattered hairs in the proximal  $\frac{1}{3}$  of their lengths, stigmas 0.4–0.5 mm in diameter, capitate. Carpophore up to 1.7 mm long. Torus up to ca 4.5 mm high. Samara with the dorsal wing ca 2 cm long, ca 1.4 cm wide, upper margin arced, lower margin straight, slightly erose, lateral wings 2.3–3.5 mm wide, 7.3–8 mm high, rectangular, margin erose to lacerate, areole 4.2–4.5 mm long and wide, nut ca 5.6 mm long, ca 3.5 mm in diameter, mature seeds not seen.

Type. *Anderson 8730*. Brazil. Minas Gerais: Serra do Espinhaço, 25 km by

road NE of Diamantina, ca 1.5 km from Rio Jequití, 790–900 m, 12 Apr 1973 (holotype UB, isotypes MICH, NY).

Distribution. (Fig. 10). Known only from the northern and central part of the Serra do Espinhaço of Minas Gerais; cerrado.

BRAZIL. Minas Gerais: 25 km by road E of Diamantina, 2 km W of Rio Jequití, 790 m, *Anderson 8364* (MICH, NY, UB); estrada para Grão Mogul, *Graziela [Barroso] s.n.* (RB 171697); mun. Grão Mogul, Rio Itacambiruçu, *Hatschbach 41240* (MICH); mun. Grão Mogul, rod. Cristália, *Hatschbach 41394* (MICH); ca 18 km W of Grão Mogul, 950 m, *Irwin et al. 23662* (MICH, NY, UB); ca 3 km N of São João da Chapada, 1200 m, *Irwin et al. 28236c* (NY); slopes N of Grão Mogul, *Maguire 49285* (MICH, NY); entre Montes Claro e Riacho dos Machados, *Santos s.n.* (NY).

*Peixotoa spinensis* is easily recognized by the leaf glands that are borne on the surface of the lamina away from the base and costa. The laminas are densely tomentose or woolly below. All or only the anterior and anterior-lateral staminode glands have an indentation across the apex and decurrent on the abaxial face. *P. paludosa* is the only other species of the Serra do Espinhaço in which the leaf glands are borne on the surface of the lamina. It differs in that its leaves are only moderately pubescent and in that its staminode glands are smooth. Also, its inflorescence stipules are usually persistent at the more distal nodes. The inflorescence stipules and also commonly the inflorescence leaves of *P. spinensis* are deciduous. The larger leaves of *P. leptoclada* sometimes have the glands borne on the lamina but usually in addition to a basal pair. *P. leptoclada* is distinguished by its large (at least 7 mm long), persistent inflorescence stipules.

Collected in flower in February through April, also in August and September, in fruit in February.

- 28. *Peixotoa tomentosa*** Adr. Jussieu in St. Hilaire, Fl. Bras. Mer. **3**: 61. 1832 [1833]. Fig. 18.  
*P. tomentosa*  $\beta$  *oligothrica* Adr. Jussieu in St. Hilaire, Fl. Bras. Mer. **3**: 62. 1832 [1833]. Type. *St. Hilaire 392* (lectotype P!).  
*P. tomentosa*  $\beta$  *rotundifolia* Grisebach, Linnaea **13**: 212. 1839. Type. *Sellow s.n.* [*Sellow III. it. B1840 c1306* (26 Dec 1818), fide Niedenzu, 1912] (holotype B, destroyed, fragment of holotype, NY!).  
*P. phlomooides* Adr. Jussieu, Ann. Sci. Nat. Sér. II, Bot. **13**: 280. 1840. Type. *Martius s.n.* (holotype M!).  
*P. tomentosa* f. 2. *cuneata* Niedenzu, Verz. Vorles. Akad. Braunschweig W-S 1912–1913: 38. 1912. Type. *Sellow IV. it. 5504* (lectotype NY!).  
*P. tomentosa* f. 3. *gracilior* Niedenzu, Verz. Vorles. Akad. Braunschweig W-S 1912–1913: 38. 1912. Type. *Glaziou 16731* (lectotype C!, isotypes BR! K! I.E! P! R!).

Erect, ascending or prostrate shrub or subshrub to 2 m. Vegetative branches loosely or densely golden velutinous or velutinous-tomentose when young, pubescence faded to white and often abraded from older parts. Stem stipules (2.5–) 3.1–9.5 mm, 3.2–10 mm wide, cordate or cordate-triangular or triangular, entire with the apex acute or notched, or bifid, glabrous or finely velutinous or tomentulose adaxially, densely velutinous-tomentulose abaxially, deciduous; inflorescence stipules like the cauline, sometimes a little larger, usually more densely pubescent, often persistent. Stem leaves with the petiole (1–) 2–9 mm long, densely golden velutinous or velutinous-tomentose, lamina 4.5–10.8 cm long, 2.6–8.7 cm wide, ovate or elliptical or suborbicular or sometimes narrowly elliptical or lanceolate or oblanceolate or rhombic, apex apiculate, base cordate or slightly cordate or almost truncate, densely golden velutinous above, tomentose or sometimes also pubescent with T-shaped hairs or woolly below, a pair of

sessile glands at the base at the costa or halfway on the petiole or sometimes on the petiole just below the lamina, each gland 0.8–2 (–2.5) mm in diameter. Inflorescence leaves with the petiole 0.5 mm or more long or the most distal sessile or sometimes sessile, laminas abruptly smaller than the cauline, the smallest not less than 3.8 mm long, 1 mm wide, shape of the more proximal like the cauline, the more distal lanceolate or linear, the most distal sometimes subulate, apex acuminate or caudate, velutinous or sparsely so above, densely velutinous or velutinous-tomentulose below, a pair of glands at the base at the costa or halfway on the petiole or rarely on the petiole just below the lamina, each gland 0.8–1.8 mm in diameter, sometimes with a second, usually smaller, pair (0.3–1.3 mm in diameter) immediately above the pair of larger glands. Inflorescence terminal, the axes densely golden velutinous or velutinous-tomentulose, internodes of the primary axes 1.5–8.8 cm long, 2° axes 1.4–18.3 cm long, 3° axes 2.4–3.5 cm long, subsidiary axes absent, usually at the more distal nodes the 2° and 3° axes suppressed, with 1 or 2 umbels sessile or borne on secondary peduncles in the leaf axil, always with 3 umbels at the terminal nodes, each umbel 4-flowered, primary peduncles absent, secondary peduncles up to 12.5 cm long or absent. Bracts 0.6–1.8 mm long, 0.3–0.8 mm wide, triangular or narrowly triangular, usually glabrous, sometimes tomentulose abaxially or on the margins; bracteoles 0.1–1 mm long, 0.1–0.3 mm wide, triangular or narrowly triangular or semi-circular, usually glabrous, sometimes sparsely tomentulose on the margins; bracts and/or bracteoles sometimes absent. Pedicels 8–21 (–29) mm long, densely golden velutinous or velutinous-tomentulose, sometimes a little longer in fruit. Sepals 3.3–6 mm long, 1.9–2.8 mm wide, adaxially velutinous or tomentulose or pubescent only in the distal 1/8–1/2, the proximal 1/2–7/8 glabrous, glands 1.2–2.2 mm long, 0.8–1.3 mm wide. Claw of the lateral petals 1.5–2.7 mm long, limb 9.5–12.3 mm long, 10–11 mm wide, orbicular or broadly elliptical, base briefly attenuate, fimbriae up to 0.5 mm long, glandular or eglandular. Claw of the posterior petal 3–3.5 mm long, limb 6.6–9.5 (–10.2) mm long, 5.9–9 (–9.6) mm wide, orbicular or broadly obovate, fimbriae up to 0.7 (–1) mm long, capitate-glandular in the proximal 1/2–2/3, the distal 1/3–1/2 fimbriate-glandular. Lateral stamen filaments 3.2–4.5 mm long, usually subequal, sometimes the posterior-lateral filaments longer or shorter than the anterior-lateral two, posterior filament 2.8–4 mm long, usually shorter than the lateral four, arced toward the posterior petal, anthers 1–1.2 (–1.4) mm long, glandular connectives 0.6–0.9 mm long. Pollen grains ca 50  $\mu$ m. Anterior staminode filament 3.7–4.7 mm long, exceeding the anterior-lateral two at least slightly, anterior-lateral filaments 3.2–4.3 mm long, usually longer than or sometimes subequal to the posterior-lateral two, posterior-lateral filaments 3.1–4 mm long, inflexed between the posterior styles, anterior and anterior-lateral glands 1.1–1.4 mm long, 1.1–1.4 mm wide, the anterior gland often a little larger than the anterior-lateral two, posterior glands 1.1–1.2 mm long, 0.8–1.2 mm wide, always a little smaller than the anterior three, all glands with the apex and abaxial face smooth. Anterior style 3.4–4.2 mm long, 0.3–0.4 mm wide, equal to or exceeding the posterior two, arced toward the posterior petal, posterior styles 3.2–4 mm long, 0.2–0.3 mm wide, divergent, inclined toward the posterior-lateral petals, stigmas 0.3–0.5 mm in diameter, capitate. Carpophore up to 2.8 mm long. Torus up to ca 5 mm high. Samara with the dorsal wing 1.5–2.2 cm long, 1.1–1.5 cm wide, upper margin straight, sigmoid or arced, lower margin arced, erose, lateral wings 2.3–5.2 mm wide, 7.2–14 mm high, rectangular or semicircular, slightly erose, areole 2.2–5 mm long, 2.5–4 mm wide, nut 3.5–6 mm long, 2.8–4.5 mm in diameter, seed 5.8–7 mm long, outer cotyledon 4.9–7.9 mm long, 1.8–2.3 mm wide, folded at 2/3–3/4 of its length, inner cotyledon 4.5–6.1 mm long, 1.6–2.2 mm wide, folded at 2/3–4/5 of its length.



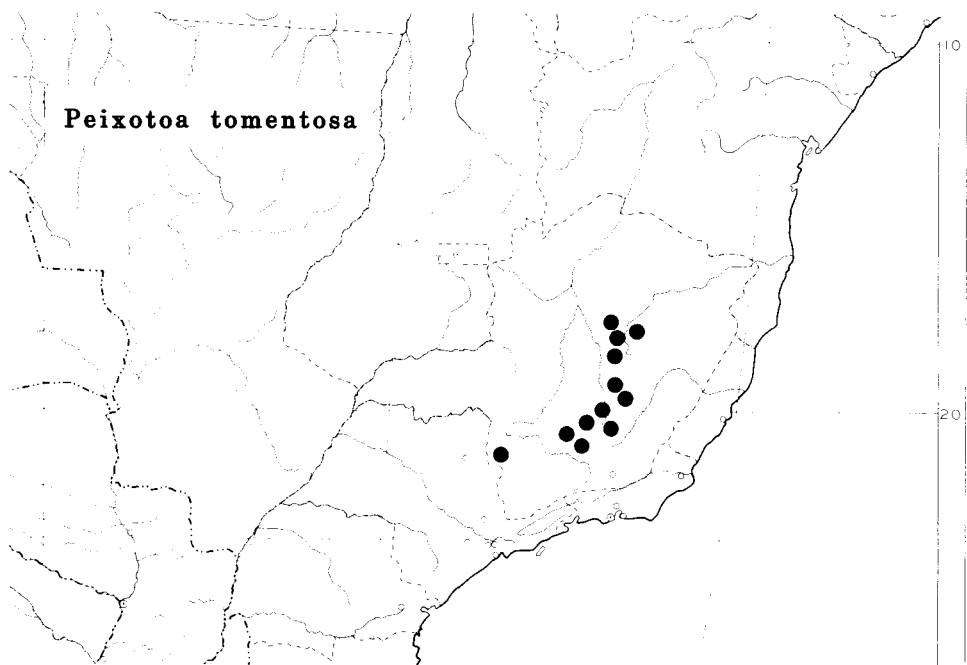


FIG. 11. Distribution of *P. tomentosa*.

Type. *St. Hilaire s.n.* Brazil. Minas Gerais: "In montibus . . . Serra da Caraça et Serra d'Ouro Branco necnon pagum Nossa Sñra da Penha (Minas Novas) . . ." (lectotype P!).

Distribution. (Fig. 11). Known mostly from the central section of the Serra do Espinhaço of Minas Gerais; cerrado, campo, and along gallery forests.

BRAZIL. Minas Gerais: 12 km by road W of Diamantina on road to Curvelo, 1450 m, *Anderson 8430* (MICH, NY); 7 km W of Diamantina, KM 299 on MG-259, 1350 m, *Anderson 35155* (MICH, NY); mun. Belo Horizonte, Serra do Taquaril, *Barreto 7578 p.p.* (RB), 7622 (F); São Sebastião do Paraíso, Morro do Liso, *Beta 97* (R); Belo Horizonte, *Brade 11822* (R); São Sebastião do Paraíso, Baú, *Brade 17810* & *Altamira* (RB); Ouro Preto, *Campos s.n.* (SP 18825); circa Cachoeira do Campo, *Casaretto 2711* (G); Ouro Branco, *Castellanos 25616 et al.* (NY); *Claussen 14* (P), 35 (G, P), 75A (BR), 76A (BR), 131 (BM, BR, GH, MO, S, W), 131c (W), 141 (BM), 157 (BM), 197 (BR, G, P, W), 414 (BR, G, W); de Rodrigo Silvio, *Damazio 922* (G); ca 50 km N of Congonhas along highway 135 to Belo Horizonte, 1270 m, *Davidse & Ramamoorthy 10795* (MICH, MO); mun. Ouro Preto, between Itabirita and Belo Horizonte, KM 15, ca 1200 m, *Davis & Shepherd D59601* (E); Serra do Cipó, KM 132, 1330 m, *Duarte 2206* (RB, S); Serra do Cipó, mun. Jaboticatubas, along road at KM 111, 19°19'S, 43°36'W, 1000–1050 m, *Eiten & Eiten 6837* (K, NY, UB, US), along road at KM 116–117 from Almeida to Conceição do Mato Dentro, 1150 m, *11072* (MICH); mun. Caeté, fazenda Geriza, *Felippe 31* (SP, US); Serra da Pinheiro, près de São João del Rei, *Glaziou 16731* (BR, C, K, I.E, R); Serra d'Ouro Branco, São Julião, *Glaziou s.n.* (BM, P); Serra do Cipó, mun. Santa Ana do Riacho, *Hatschbach 35286* (MICH); Serra São João del Rei, Itacolumit, *Helmenreichen s.n.* (W); Miguel Burnier, *Hoehne s.n.* (SP 5117); Serra do Itabarito, ca 45 km SE of Belo Horizonte, ca 1500 m, *Irwin et al. 19514* (MICH, NY); Serra do Cipó, ca KM 112, ca 135 km N of Belo Horizonte, 1200 m, *Irwin et al. 20436* (MICH, NY); ca 18 km NE of Diamantina on road to Mendanha, 1300 m, *Irwin et al. 22676* (MICH, NY); ca 7 km NE of Diamantina on road to Mendanha, 1300 m, *Irwin et al. 22833* (MICH, NY); 8 km E of Diamantina, 1175 m, *Irwin et al. 27661* (MICH, NY); ca 3 km N of São João da Chapada, 1200 m, *Irwin et al. 28236a* (MICH, NY); Serra da Caraça, 10 km W of Barão de Cocais, 1400 m, *Irwin et al. 28891* (MICH, NY), 28976 (NY), 29081 (MICH, NY); Serra do Cipó, mun. Jaboticatubas, KM 123 rodovia Lagôa Santa-Conceição do Mato Dentro-Diamantina, *Joly & Semir 3592* (E.), KM 112 rodovia Lagôa Santa-Conceição do Mato Dentro-Diamantina, *Joly et al. 1009, 1401* (E.); mun. Ouro Preto, 1150 m, *Krapovickas & Cristóbal 33538* (MICH); Serra do Cipó, *Kuhlmann & Edmundo 8* (RB); Belo Horizonte, *Labouriau 1013* (RB); *Langsdorff s.n.* (I.E, P); Serra da Caraça, Santa Bárbara, *Leithao Filho et al. 9568* (BM); Serra do São José, São João del Rei, *Lutz 45* (R); Serra do

Itaiaia, Ouro Preto, *Magalhães 1124* (RB); Serra Rola Moça, Betim, *Magalhães 17015* (MICH); Serra do Curral e Mutuca, Nova Lima, *Magalhães 19496* (UB); Serra Rola Moça, 8 km from Belo Horizonte, 4300 ft, *Maguire 44619* (MICH, NY); 3 mi from Diamantina on road to Curvelo, 4300 ft, *Maguire 44770* (MICH, NY); Serra do Mutuca, Belo Horizonte, 1200 m, *Markgraf et al. 3541* (F, RB); Serra do Taquaril, Belo Horizonte, *Markgraf et al. 3585* (RB); Congonhas do Campo, *Martius s.n.* (M, holotype of *P. phlomoides*); Serro Frio, Sepes, *Martius s.n.* (M); Cachoeira do Campo, *Martius 1168* (BR, G, I.F., M, NY); prope Sabará, *Netto 80* (R); Serra da Moeda, 26 km de Belo Horizonte, 1300 m, *Pabst 7117* (NY); Pico de Itabirito, 1400–1600 m, *Palacios et al. 3853* (R); Serra do Curral, *Pereira 2462* & *Pabst 3298* (RB); Serra da Moeda, BR-3, *Pereira 7525* (M); ad Oliveira, *Pohl 358* (F, NY, W); Ouro Branco, *Porto 1259* (RB); Tejuco [Diamantina], *Riedel 1258* (I.F., S, US); *Riedel XIII* (I.F., S); Cachoeira do Campo, *Riedel s.n.* (BR); Penha, *St. Hilaire s.n.* (P, syntype of *P. tomentosa*); Serra da Carassa [Caraça], *St. Hilaire s.n.* (P, syntype of *P. tomentosa*); Serra d'Ouro Branco, *St. Hilaire s.n.* (P, syntype of *P. tomentosa*); *St. Hilaire s.n.* [392] (P, lectotype of *P. tomentosa*  $\beta$  *oligothrica*); São Julião, *Schwacke s.n.* (R 19579); Pico d'Itabira, *Schwacke s.n.* (R 72391); Serra do Cipó, mun. Jaboticatubas, KM 110, rodovia Lagõa Santa-Conceição do Mato Dentro-Diamantina, *Sazima* & *Semir 3845* (E); Serra da Moeda, *Sellow B1840 c1306* (NY, fragment of holotype of *P. tomentosa*  $\beta$  *rotundifolia*); Serra do Cipó, mun. Jaboticatubas, KM 112, rodovia Lagõa Santa-Conceição do Mato Dentro-Diamantina, *Semir* & *Sazima 564* (E); Serra do Pinheiro, *Silveira 21* (R, RB); Serra do São João del Rei, 3500–5500 ft, *Stephan s.n.* (K); Belo Horizonte, *Texeira s.n.* (SP 18829); Serra do Curral, mun. Belo Horizonte, *Vidal s.n.* (R 129614, R 129617); Serra do Cipó, Chapéu de Sol, 1060 m, *Vidal II-6302, V-6* (R); Serra do Cipó, Fazenda do Cipó, *Vidal V-75, V-91* (R); *Weddell 1208 p.p.* (G, P); vicinity of Lagõa Seca, 20 km S of Belo Horizonte, *Williams 5458* (GH); mun. Betim, Serra da Caveira, 1600 m, *Williams* & *Assis 6238* (BR, GH); Serra do Mutuca, mun. Belo Horizonte, ca 8 km beyond Lagõa Seca, 1100 m, *Williams* & *Assis 6281* (GH); Serra do Curral, mun. Nova Lima, 1300 m, *Williams* & *Assis 6394* (GH); mun. Nova Lima, Lagõa Grande, 1300–1500 m, *Williams* & *Assis 6536* (GH, SP, US); mun. Nova Lima, Pico de Belo Horizonte, 1300 m, *Williams* & *Assis 7147* (GH); mun. Betim, Serra da Caveira, 1300 m, *Williams* & *Assis 7494* (F, GH, MO, NY, S).

*Peixotoa tomentosa* is readily recognized by its inflorescence structure. Each terminal node bears three, commonly sessile, umbels and thus is 12-flowered. At the more distal nodes the secondary and tertiary axes are usually suppressed and one or two umbels are borne sessile or on secondary peduncles in each leaf axil. The young branches, the petioles, and the inflorescence axes are densely golden velutinous or velutinous-tomentulose. The leaves are golden velutinous above and usually densely white or greyish tomentose or woolly below. The hairs of the lower surface are often so abundant that the epidermis is obscured and only the larger veins and costa are visible. The leaves vary in shape from ovate to broadly or narrowly elliptical to obovate to suborbicular to rhombic or less commonly to lanceolate or oblanceolate. Plants from the Serra do Cipó, especially, tend to be more robust than others and are more likely to have suborbicular or broadly ovate laminas. However, this variation extends throughout the range and does not justify recognition of infraspecific taxa. Niedenzu also recognized a form, *gracilior*, for plants with particularly long and slender pedicels, which are indeed striking. However, the size of the pedicel is highly variable in this and all other species.

Three other species have a similar inflorescence structure, but none are as densely pubescent as *P. tomentosa*. *P. adenopoda* of east-central Bahia differs in that its leaf glands are stalked and borne on the surface of the lamina away from the base and costa, and in that its staminode glands have an indentation across the apex and decurrent on the abaxial face. In *P. catarinensis*, from coastal Santa Catarina, the leaf glands are also borne on the lamina but are very small, 0.2–0.7 mm in diameter. In *P. tomentosa* the staminode glands are smooth. The leaf glands are sessile, 0.8–2.5 mm in diameter, and borne at the base at the costa or halfway on the petiole or sometimes on the petiole just below the lamina. The northern range of *P. parviflora* coincides with the range of *P. tomentosa*. *P. parviflora* is probably a close relative and the species most likely to be confused with *P. tomentosa*. Its flowers, which are smaller than those of *P. tomentosa*, are unusual in that the posterior styles curve toward the anterior-lateral petals instead of toward the posterior-lateral petals. The pubescence of the inflorescence

branches is commonly white, though sometimes golden, and much sparser. The inflorescence leaves are always petiolate, never sessile as is common in *P. tomentosa*, and the umbels are always borne on secondary peduncles.

Collected in flower throughout the year, in fruit from November through April and in July.

#### EXCLUDED AND DOUBTFUL SPECIES

*P. cordobensis* Kuntze, Rev. Gen. 3(2): 28. 1898. *Cordobia argentea* (Grisebach) Niedenzu, Verz. Vorles. Ak. Braunsberg 1912–1913: 41. 1912.

See section *Relationships within the Family*.

*P. microphylla* Turczaninow, Bull. Soc. Nat. Moscow 36(1): 584. 1863.

According to Turczaninow, the type of this species was collected by "Hoker" or "Loker" and was seen by him in Robert Brown's herbarium. All attempts to locate this type have been unsuccessful. The description is too vague to allow this name to be assigned to any known species of *Peixotoa*. Perhaps the type does not belong to this genus at all. The author does not mention such structures as the cordate stipules, the four-flowered umbels or the unique androecium. Moreover, in his brief discussion, he does speak of pedicels that are bibracteolate in the middle, a condition unknown in *Peixotoa*.

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   **20-21**, 83  
 P. axillaris C. Anderson 6, 10, 11, 14, 18, **21-**  
   **23**, 44, 84  
 P. bahiana C. Anderson 15, **23-25**, 83  
 P. barnebyi C. Anderson 15, 16, 17, 24, **25-26**,  
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 P. catarinensis C. Anderson 5, 6, 9, 13, 18, 24,  
   **26-28**, 60, 74, 86  
 P. cipoana C. Anderson 5, 11, 15, 24, 26, **28-**  
   **30**, 87  
 P. cordistipula Adr. Juss. 5, 10, 16, **30-32**, 33,  
   49, 52, 66, 88  
 P. cordobensis O. Kuntze 1, 75  
 P. discolor Griseb. 57  
 P. gardneri C. Anderson 3, 15, 20, **32-33**, 41,  
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 P. glabra Adr. Juss. 3, 9, 13, **34-35**, 44, 65, 86  
 P. goiana C. Anderson 8, 10, 13, 15, 17, 33,  
   **35-38**, 40, 49, 89  
 P. grandiflora Ferreira 62  
 P. hatschbachii C. Anderson 3, 6, 11, 12, 13,  
   19, **38-40**, 49, 62, 84  
 P. hirta Adr. Juss. 3, 5, 15, 20, 33, 40, **41-42**,  
   89  
 P. hirta f. 1. *minor* Nied. 62  
 P. hirta f. 2. *macrophylla* (Griseb.) Nied. 62  
 P. hispidula Adr. Juss. 6, 9, 11, 13, 16, 23, 28,  
   35, 40, **42-44**, 53, 68, 86  
 P. hispidula f. 1. *subtomentosa* Nied. 42  
 P. hispidula f. 2. *subglabrata* Nied. 42  
 P. hispidula f. 3. *micrantha* Nied. 42  
 P. irwinii C. Anderson 8, 12, 13, 35, 40, **44-45**,  
   83  
 P. jussieuana Adr. Juss. 5, 8, 9, 12, 16, **46-47**,  
   49, 51, 52, 81  
 P. jussieuana var.  $\alpha$  *glabrescens* Nied. 47  
 P. jussieuana var.  $\beta$  *velutina* Nied. 46  
 P. lateritia Adr. Juss. 62  
 P. leptoclada Adr. Juss. 5, 10, 14, 16, **47-49**,  
   51, 56, 71, 85  
 P. macrophylla Griseb. 62  
 P. macrophylla f. 1. *minor* (Nied.) Nied. 62  
 P. macrophylla f. 11. *typica* (Griseb.) Nied. 62  
 P. magnifica C. Anderson 8, 9, 10, 12, 16, 32,  
   47, **49-52**, 53, 66, 88  
 P. megalantha C. Anderson 15, 51, **52-53**, 90  
 P. microphylla Turcz. 75  
 P. octoflora C. Anderson 6, 10, 11, 13, **54-55**,  
   59, 90  
 P. paludosa Turcz. 5, 9, 10, 14, 16, 25, 49, 51,  
   **55-57**, 71, 84  
 P. parviflora Adr. Juss. 6, 8, 9, 12, 14, 18, 21,  
   26, 28, **57-60**, 74, 87  
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 P. phlomooides Adr. Juss. 71  
 P. psilophylla C. Anderson 3, 13, 40, **60-62**,  
   69, 90  
 P. reticulata Griseb. 6, 9, 10, 12, 13, 14, 32, 35,  
   38, 53, **62-67**, 91, 92  
 P. sericea C. Anderson 3, 5, 9, 11, 14, 25, 29,  
   **66, 68-69**, 81  
 P. spinensis C. Anderson 5, 16, 26, 29, 56, **69-**  
   **71**, 85  
 P. tomentosa Adr. Juss. 6, 14, 18, 21, 26, 28,  
   29, 60, **71-75**, 87  
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 P. tomentosa f. 3. *gracilior* Nied. 71  
 P. tomentosa  $\beta$  *oligothrica* Adr. Juss. 71  
 P. tomentosa  $\beta$  *rotundifolia* Griseb. 71  
 Stigmaphyllon Adr. Juss. 3



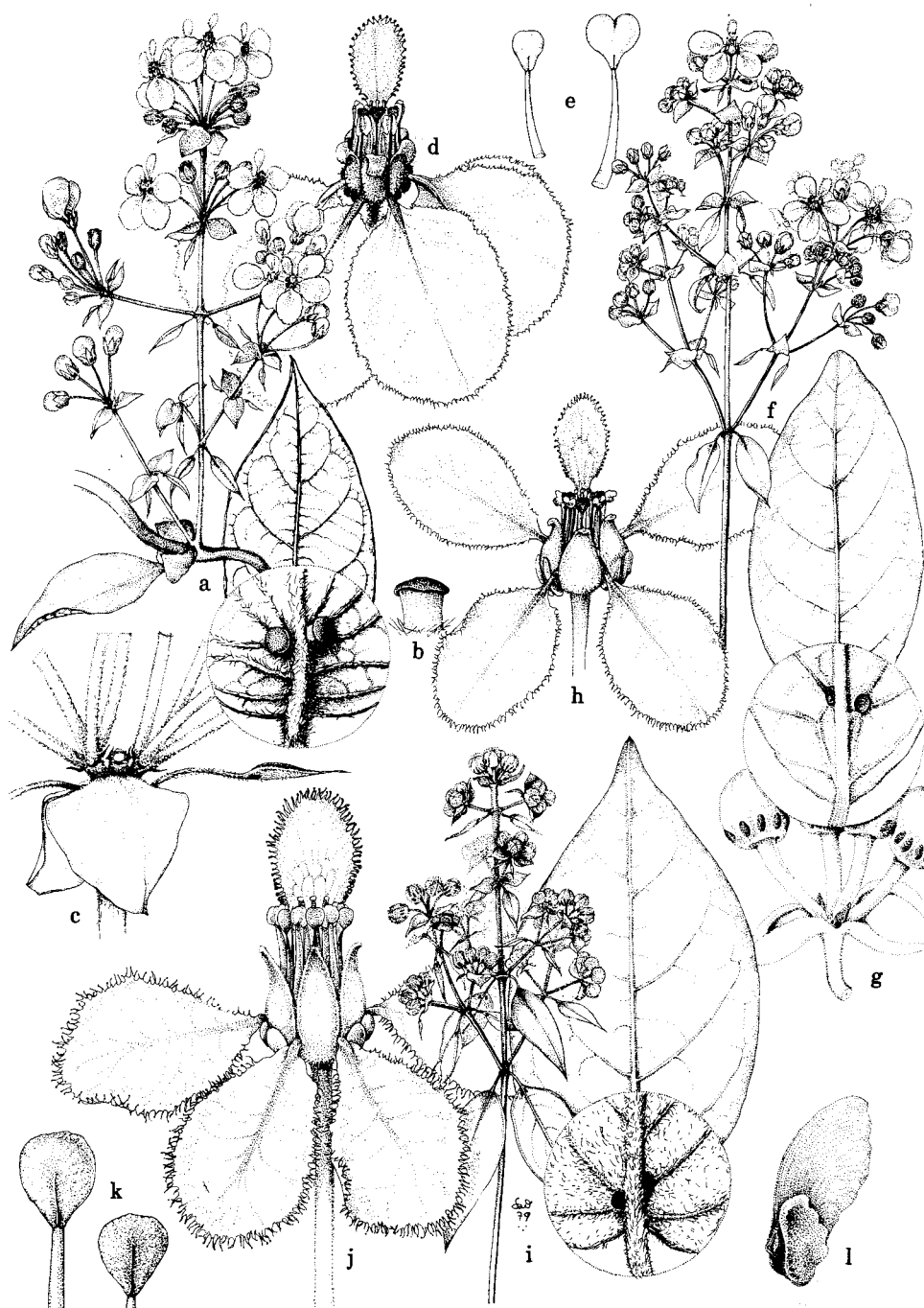


FIG. 12. *P. adenopoda*, *P. sericea* and *P. jussieuana*. a-c, *P. adenopoda*: a) flowering branch and stem leaf,  $\times 0.5$ , detail  $\times 2.5$ ; b) leaf gland,  $\times 5$ ; c) base of a distal umbel,  $\times 2.5$ ; d) flower,  $\times 2.5$ ; e) posterior-lateral (left) and anterior (right) staminodes,  $\times 5$ . f-h, *P. sericea*: f) flowering branch and stem leaf,  $\times 0.5$ , detail  $\times 2.5$ ; g) base of a distal umbel,  $\times 2.5$ ; h) flower,  $\times 2.5$ . i-l, *P. jussieuana*: i) flowering branch and stem leaf,  $\times 0.5$ , detail  $\times 2.5$ ; j) flower,  $\times 2.5$ ; k) anterior (left) and posterior-lateral (right) staminode glands,  $\times 10$ ; l) samara,  $\times 1$ . a-e from Jesus 392, f-h from Eupunino 120, i-k from Eiten & Eiten 4835, l from Lützelburg 275.

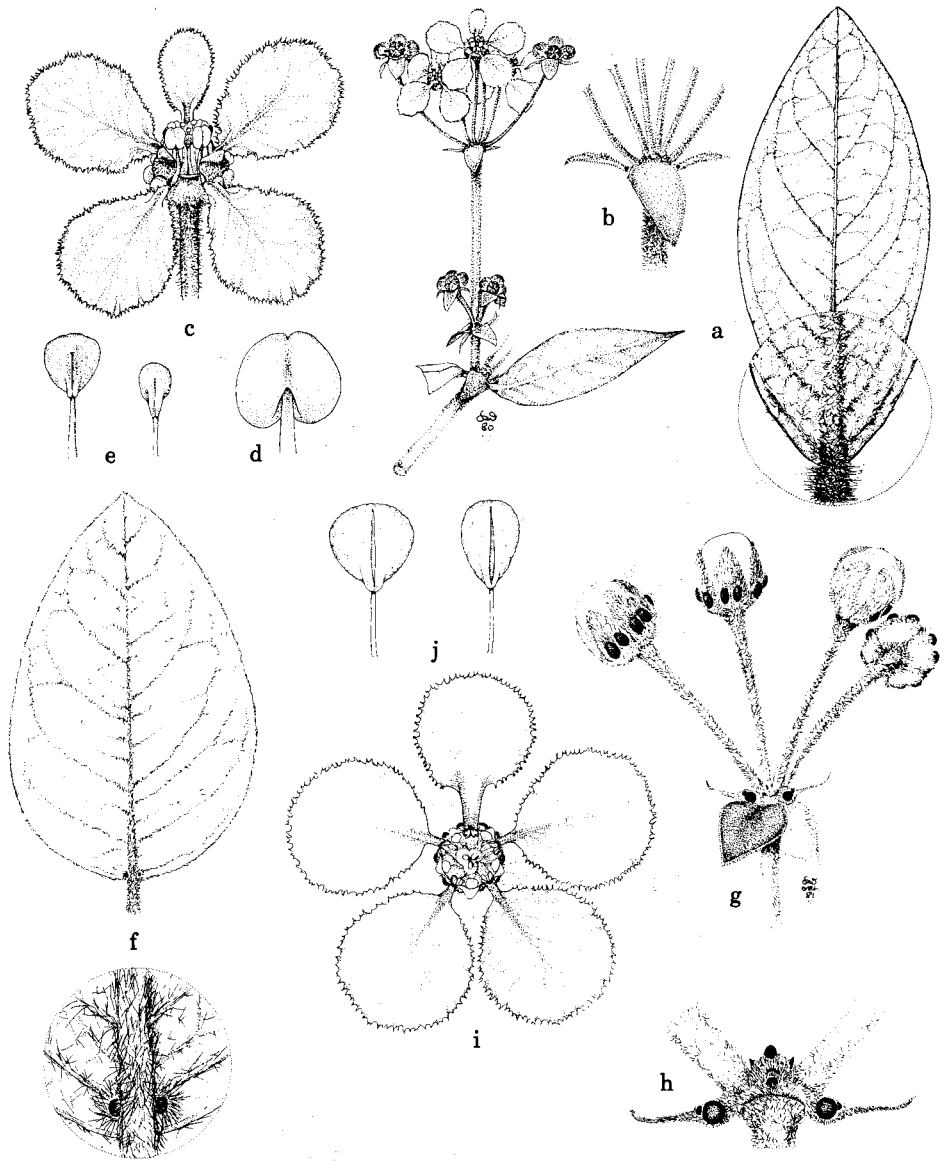


FIG. 13. *P. anadenanthera* and *P. gardneri*. a-e, *P. anadenanthera*: a) flowering branch and stem leaf,  $\times 0.5$ , detail  $\times 2.5$ ; b) base of a distal umbel,  $\times 1.5$ ; c) flower,  $\times 1.75$ ; d) abaxial view of anther,  $\times 7.5$ ; e) anterior (left) and posterior-lateral (right) staminode glands,  $\times 7.5$ . f-j, *P. gardneri*: f) stem leaf,  $\times 0.5$ , detail  $\times 2.5$ ; g) base of a distal umbel,  $\times 1.5$ ; h) terminal node with bases of secondary axes, all pedicels shed,  $\times 2.5$ ; i) flower,  $\times 1.5$ ; j) anterior (left) and posterior-lateral (right) staminode glands,  $\times 7.5$ . a-e from *Hatschbach 36904*, f-j from *Gardner 3069 p.p.*

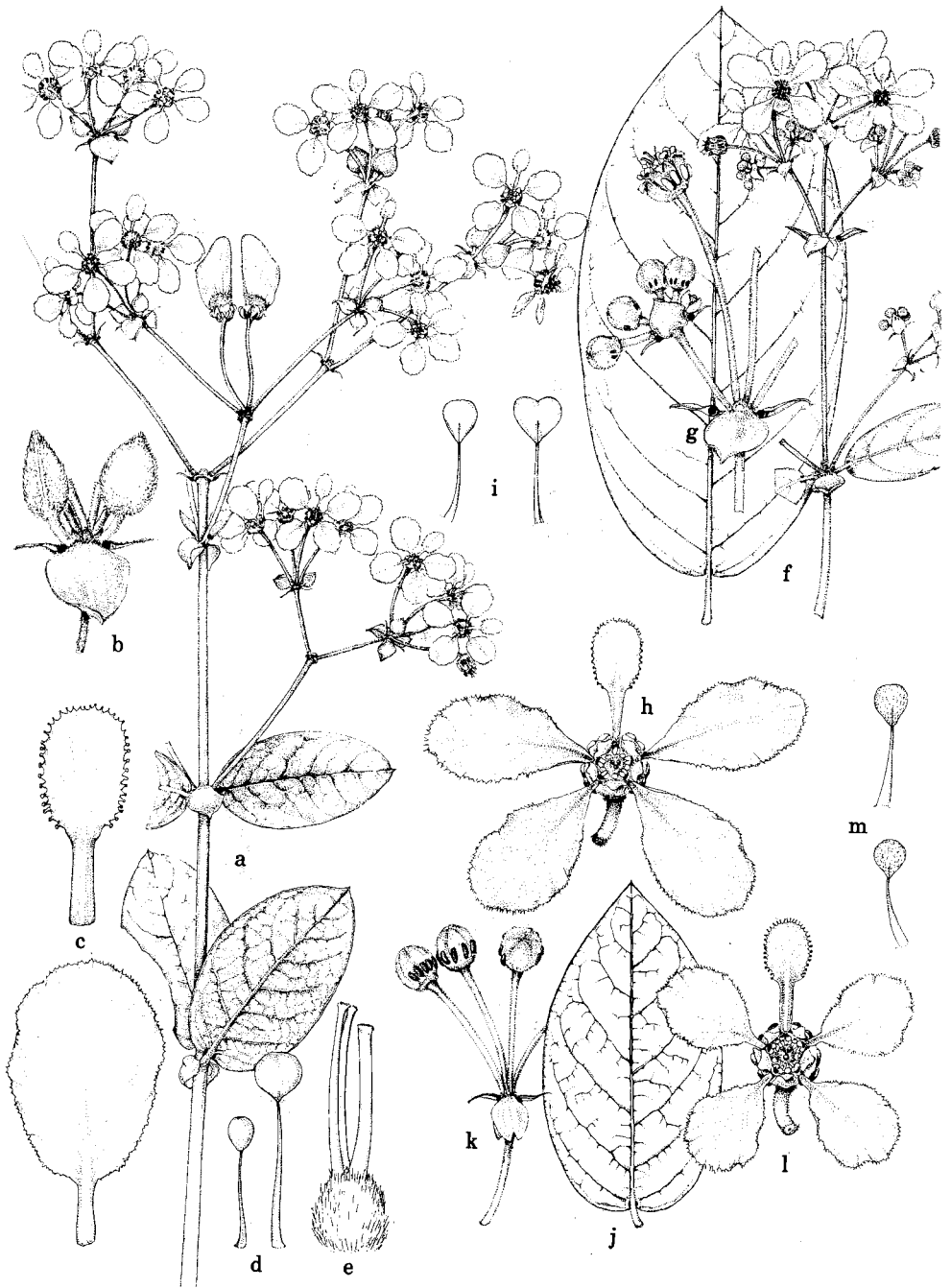


FIG. 14. *P. bahiana*, *P. andersonii* and *P. irwinii*. a-e, *P. bahiana*: a) flowering branch,  $\times 0.5$ ; b) base of a distal umbel,  $\times 1.5$ ; c) posterior (above) and anterior-lateral (below) petals,  $\times 3$ ; d) posterior-lateral (left) and anterior (right) staminodes,  $\times 5$ ; e) gynoecium, anterior style to right,  $\times 5$ . f-i, *P. andersonii*: f) flowering branch and stem leaf,  $\times 0.5$ ; g) base of a distal umbel,  $\times 1.5$ ; h) flower,  $\times 1.5$ ; i) posterior-lateral (left) and anterior (right) staminodes,  $\times 5$ . j-m, *P. irwinii*: j) stem leaf,  $\times 0.5$ ; k) base of a distal umbel,  $\times 1.5$ ; l) flower,  $\times 1.5$ ; m) anterior (above) and posterior-lateral (below) staminodes,  $\times 5$ . a-e from Irwin et al. 14889, f-i from Anderson 11591, j-m from Irwin et al. 28236b.

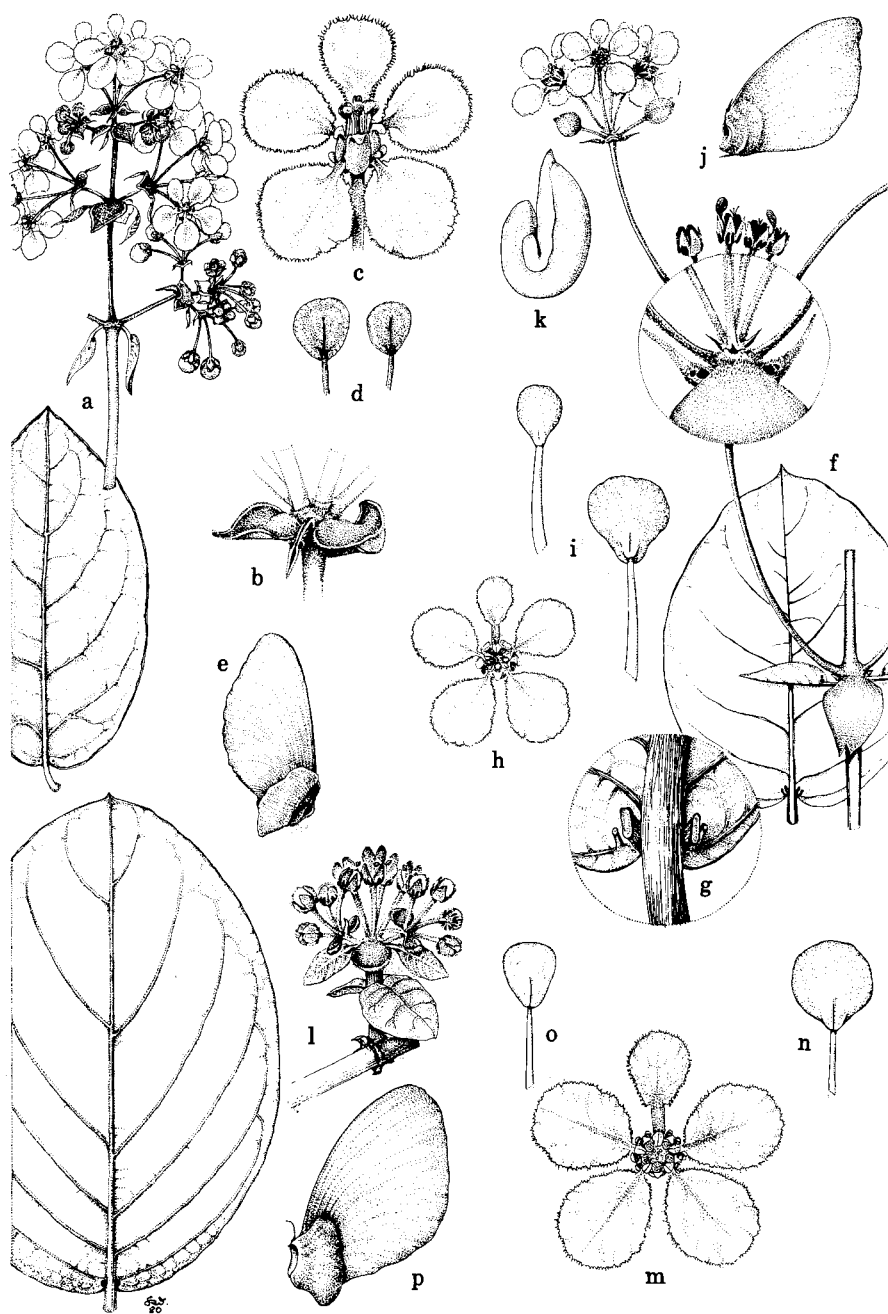


FIG. 15. *P. paludosa*, *P. hatschbachii* and *P. axillaris*. a–e, *P. paludosa*: a) flowering branch and stem leaf,  $\times 0.5$ ; b) base of a distal umbel,  $\times 2.5$ ; c) flower,  $\times 1.5$ ; d) anterior (left) and posterior-lateral (right) staminode glands,  $\times 5$ ; e) samara,  $\times 0.75$ . f–k, *P. hatschbachii*: f) flowering branch and stem leaf,  $\times 0.5$ , detail  $\times 1.5$ ; g) base of stem leaf,  $\times 2.5$ ; h) flower,  $\times 1$ ; i) posterior-lateral (above) and anterior (below) staminodes,  $\times 7.5$ ; j) samara,  $\times 1$ ; k) embryo,  $\times ca. 5$ . l–p, *P. axillaris*: l) flowering shoot and stem leaf,  $\times 0.5$ ; m) flower,  $\times 1$ ; n) anterior staminode gland,  $\times 7.5$ ; o) posterior-lateral staminode gland,  $\times 7.5$ ; p) samara,  $\times 1$ . a flowering branch from Williams & Assis 6940, leaf from Barreto 8681, b–d from Williams & Assis 6940, e from Warming s.n., f–k from Hatschbach 36675, l–p from Irwin & Soderstrom 7443.

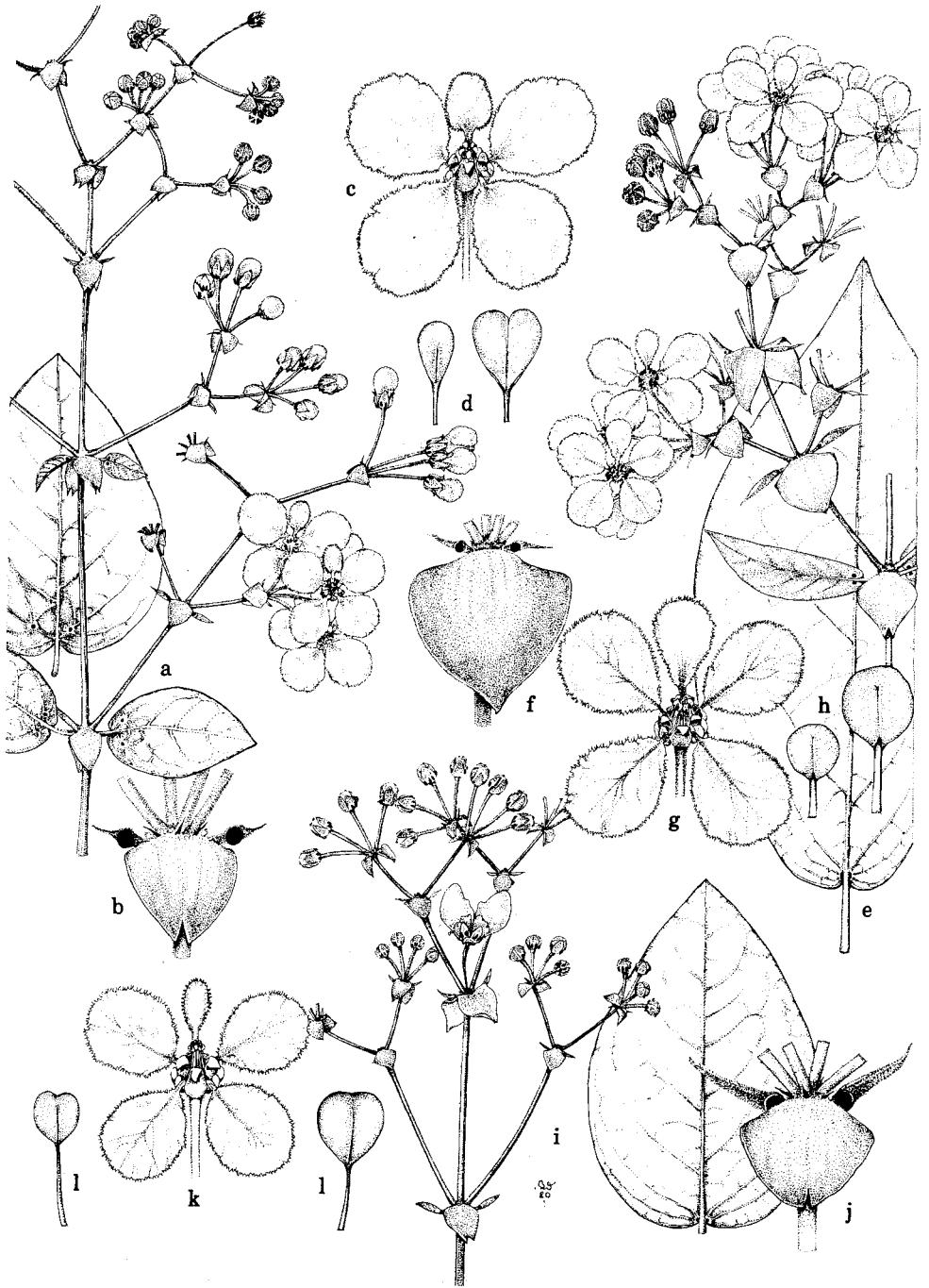


FIG. 16. *P. spinensis*, *P. leptoclada* and *P. barnebyi*. a-d, *P. spinensis*: a) flowering branch and stem leaf,  $\times 0.5$ ; b) base of a distal umbel,  $\times 2.5$ ; c) flower,  $\times 1$ ; d) posterior-lateral (left) and anterior (right) staminode glands,  $\times 7.5$ . e-h, *P. leptoclada*: e) flowering branch and stem leaf,  $\times 0.5$ ; f) base of a distal umbel,  $\times 2.5$ ; g) flower,  $\times 1$ ; h) posterior-lateral (left) and anterior (right) staminode glands,  $\times 7.5$ . i-l, *P. barnebyi*: i) flowering branch and stem leaf,  $\times 0.5$ ; j) base of a distal umbel,  $\times 2.5$ ; k) flower,  $\times 1$ ; l) posterior-lateral (left) and anterior (right) staminode glands,  $\times 7.5$ . a-d from Anderson 8730, e-h from Pohl 2946, i-l from Anderson 8623.

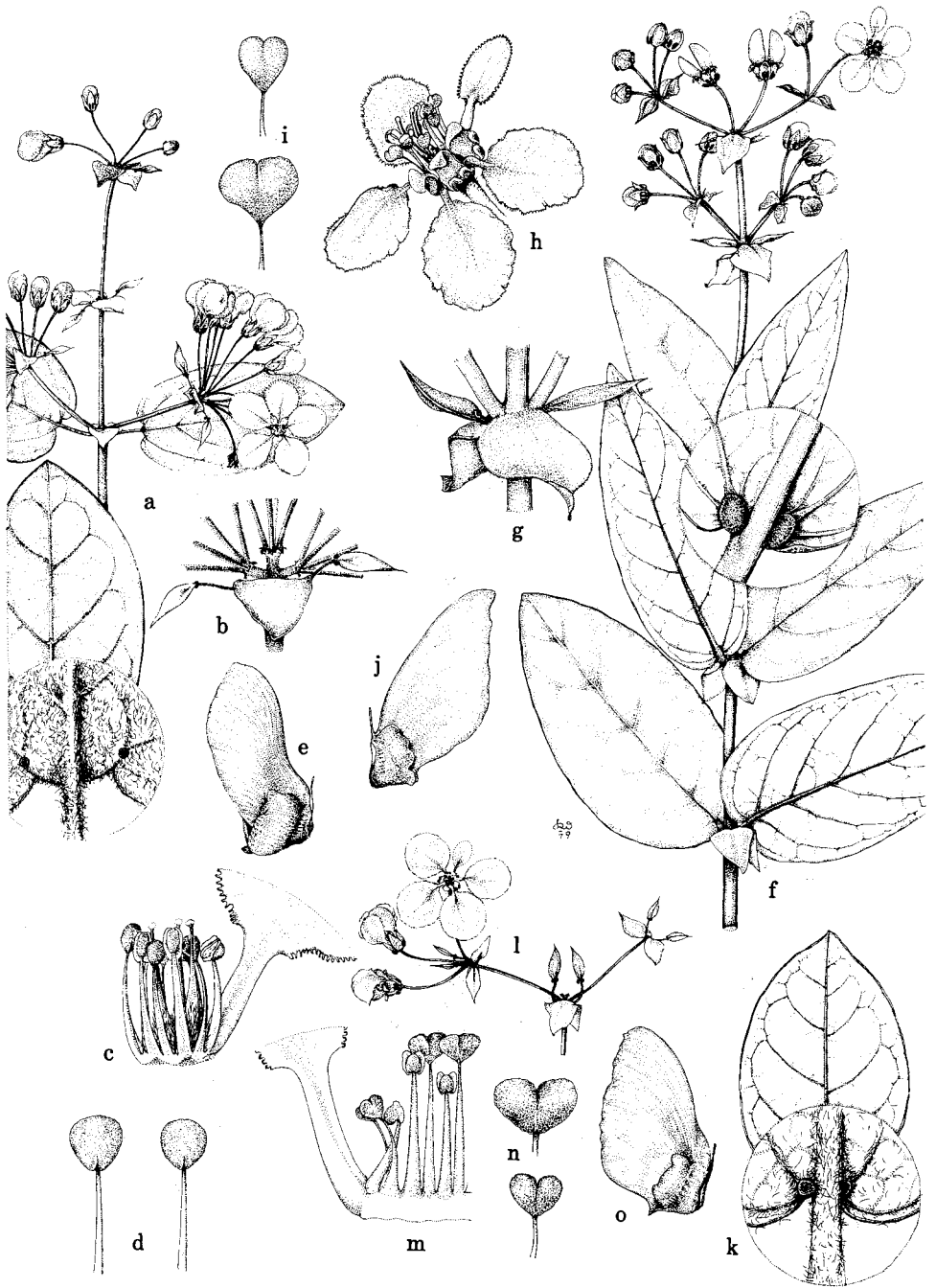


FIG. 17. *P. catarinensis*, *P. glabra* and *P. hispidula*. a-e, *P. catarinensis*: a) flowering branch and stem leaf,  $\times 0.5$ , detail  $\times 2.5$ ; b) base of a distal umbel,  $\times 1.5$ ; c) androecium and gynoecium, claw of posterior petal,  $\times 3.5$ ; d) anterior (left) and posterior-lateral (right) staminodes,  $\times 7.5$ ; e) samara,  $\times 1$ . f-j, *P. glabra*: f) flowering branch,  $\times 0.5$ , detail  $\times 2.5$ ; g) base of a distal umbel,  $\times 1.5$ ; h) flower,  $\times 1.5$ ; i) posterior-lateral (above) and anterior (below) staminode glands,  $\times 7.5$ ; j) samara,  $\times 1$ . k-o, *P. hispidula*: k) stem leaf,  $\times 0.5$ , detail  $\times 2.5$ ; l) flowering branch,  $\times 0.5$ ; m) claw of posterior petal, androecium opened out, with 1 posterior-lateral and 1 anterior-lateral stamen and 1 anterior-lateral staminode removed,  $\times 3.5$ ; n) anterior (above) and posterior-lateral (below) staminode glands,  $\times 7.5$ ; o) samara,  $\times 1$ . a branch from Smith & Reitz 12276, leaf from Reitz 3240, b-e from Smith & Reitz 12276, f-i from Irwin et al. 28371, j from Irwin et al. 28412, k-n from Harley et al. 18510, o from Araujo 140.

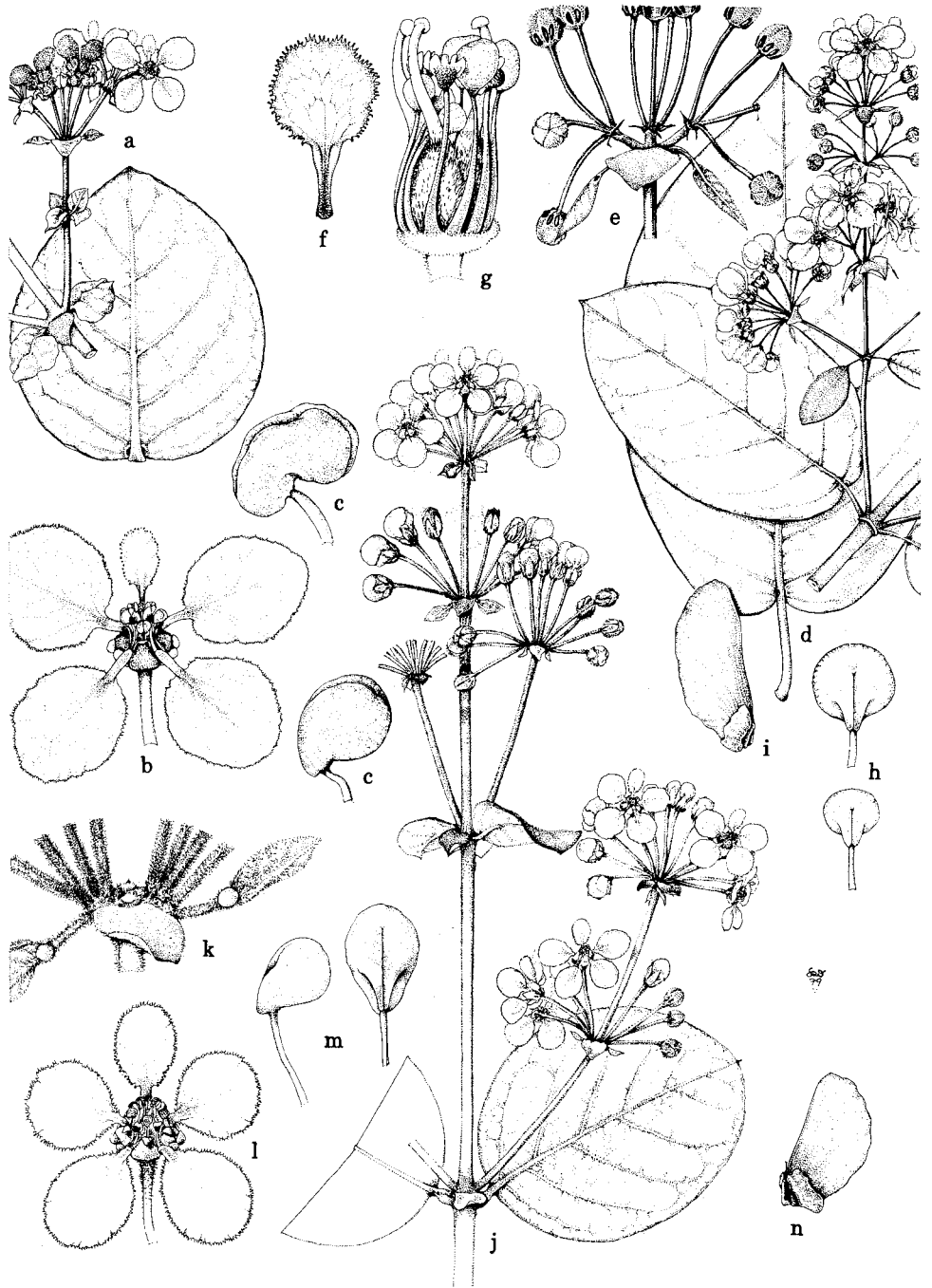


FIG. 18. *P. cipoana*, *P. parviflora* and *P. tomentosa*. a-c, *P. cipoana*: a) flowering branch and stem leaf,  $\times 0.5$ ; b) flower,  $\times 1.5$ ; c) anterior (above) and posterior-lateral (below) staminode glands,  $\times 10$ . d-i, *P. parviflora*: d) flowering branch and stem leaf,  $\times 0.5$ ; e) base of a distal umbel,  $\times 1.5$ ; f) posterior petal,  $\times 3.5$ ; g) androecium and gynoecium, with posterior styles to left,  $\times 7.5$ ; h) anterior (above) and posterior-lateral (below) staminode glands,  $\times 10$ ; i) samara,  $\times 0.75$ . j-n, *P. tomentosa*: j) flowering branch,  $\times 0.5$ ; k) base of a distal umbel,  $\times 2.5$ ; l) flower,  $\times 1.5$ ; m) posterior-lateral (left) and anterior (right) staminode glands,  $\times 10$ ; n) samara,  $\times 0.75$ . a from *Atala* 62, b, c from *Vidal R108249*, d flowering branch from *Dusen* 9225, leaf from *Widgren s.n.*, e from *Glaziou* 10371, f-h from *Sucre* 7560, i from *Widgren s.n.*, j from *Langsdorff s.n.*, k from *Irwin et al.* 28236a, l, m, from *Eiten & Eiten* 11072, n from *Maguire* 44770.

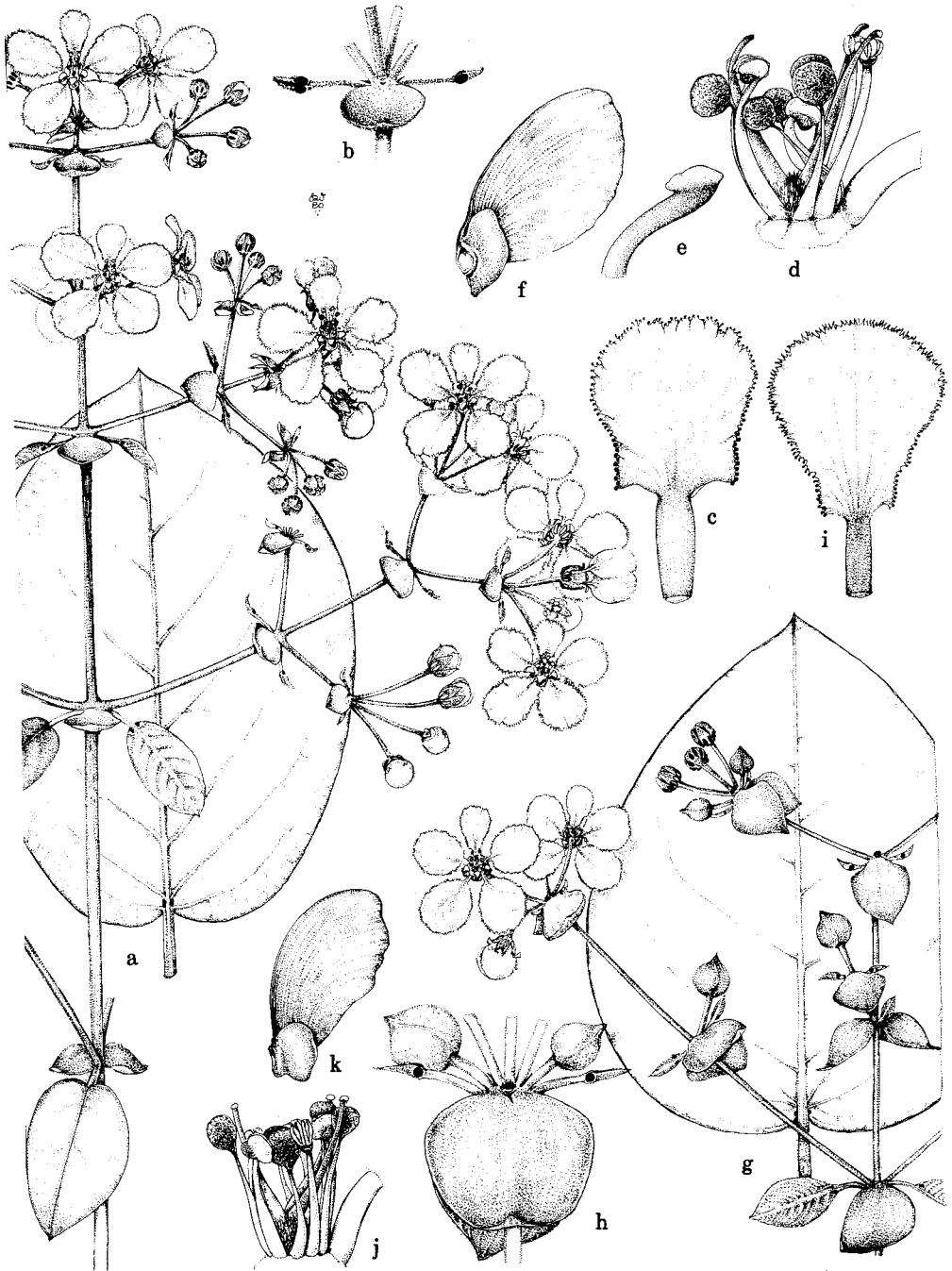


FIG. 19. *P. magnifica* and *P. cordistipula*. a-f, *P. magnifica*: a) flowering branch and stem leaf,  $\times 0.5$ ; b) base of a distal umbel,  $\times 1.5$ ; c) posterior petal,  $\times 2.5$ ; d) androecium and gynoecium, claw of posterior petal,  $\times 3$ ; e) stigma of anterior style,  $\times 15$ ; f) samara,  $\times 0.75$ . g-k, *P. cordistipula*: g) flowering branch and stem leaf,  $\times 0.5$ ; h) base of a distal umbel,  $\times 1.5$ ; i) posterior petal,  $\times 2.5$ ; j) androecium and gynoecium, claw of posterior petal,  $\times 3$ ; k) samara,  $\times 0.75$ . a, b from Anderson 9831, c-e from Anderson 9474, f from Irwin et al. 17631, g branch from Lindman A3533, leaf from Malme 1919, h-j from Lindman A3533, k from Kuntze s.n.



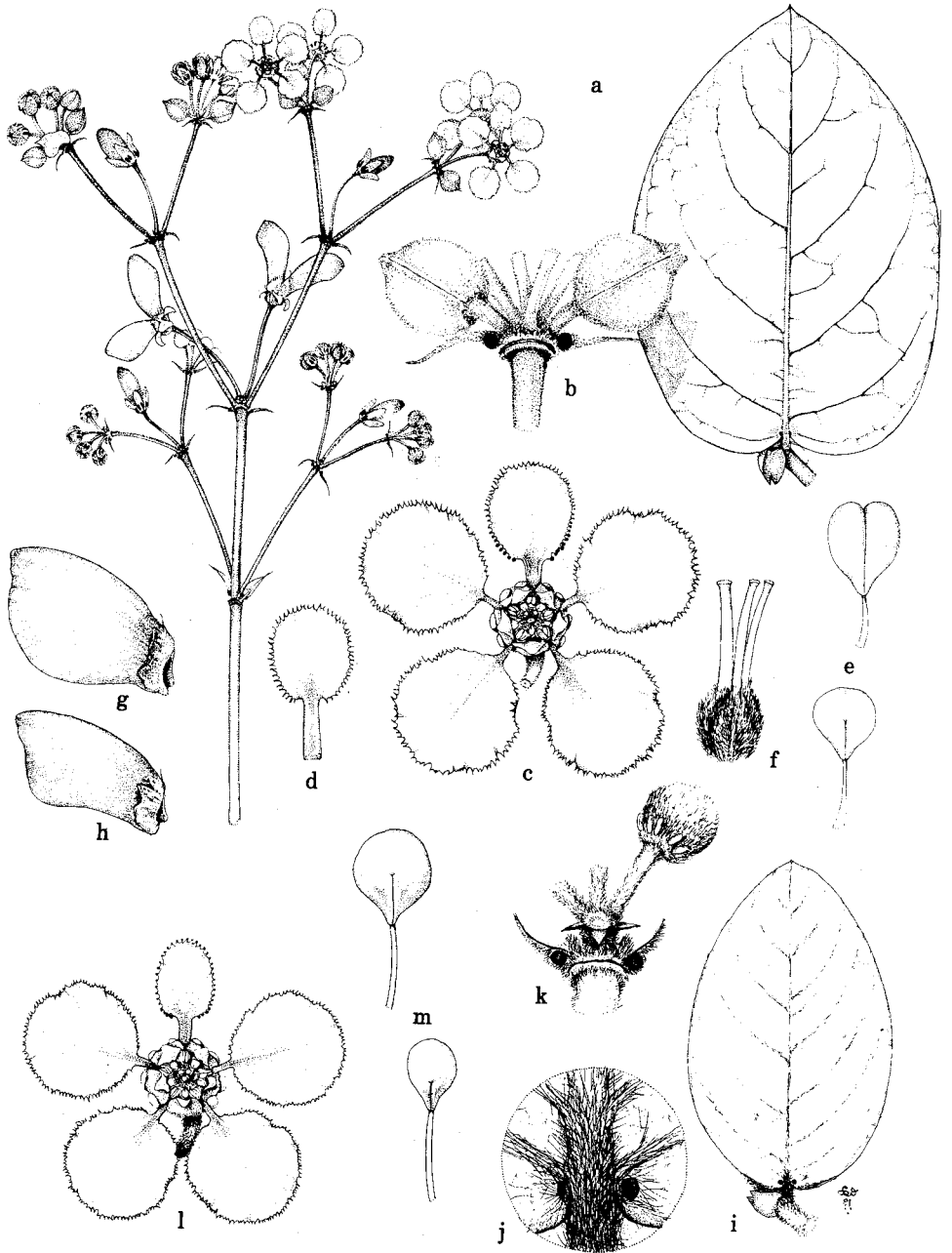


FIG. 20. *P. goiana* and *P. hirta*. a–h, *P. goiana*: a) flowering branch and stem leaf,  $\times 0.5$ ; b) base of a distal umbel,  $\times 2.5$ ; c) flower,  $\times 1.5$ ; d) posterior petal,  $\times 1.5$ ; e) anterior (above) and posterior-lateral (below) staminode glands,  $\times 10$ ; f) gynoeceium, anterior style to left,  $\times 5$ ; g, h) samaras,  $\times 1$ . i–m, *P. hirta*: i) stem leaf,  $\times 0.5$ ; j) base of stem leaf,  $\times 2.5$ ; k) base of a distal umbel,  $\times 2.5$ ; l) flower,  $\times 1.5$ ; m) anterior (above) and posterior-lateral (below) staminodes,  $\times 10$ . a branch from Irwin *et al.* 18616, leaf from Irwin *et al.* 34601, b–c, e–f from Irwin *et al.* 18616, leaf from Lima *et al.* 5, h from Irwin *et al.* 12351, i–m from Martius *s.n.*

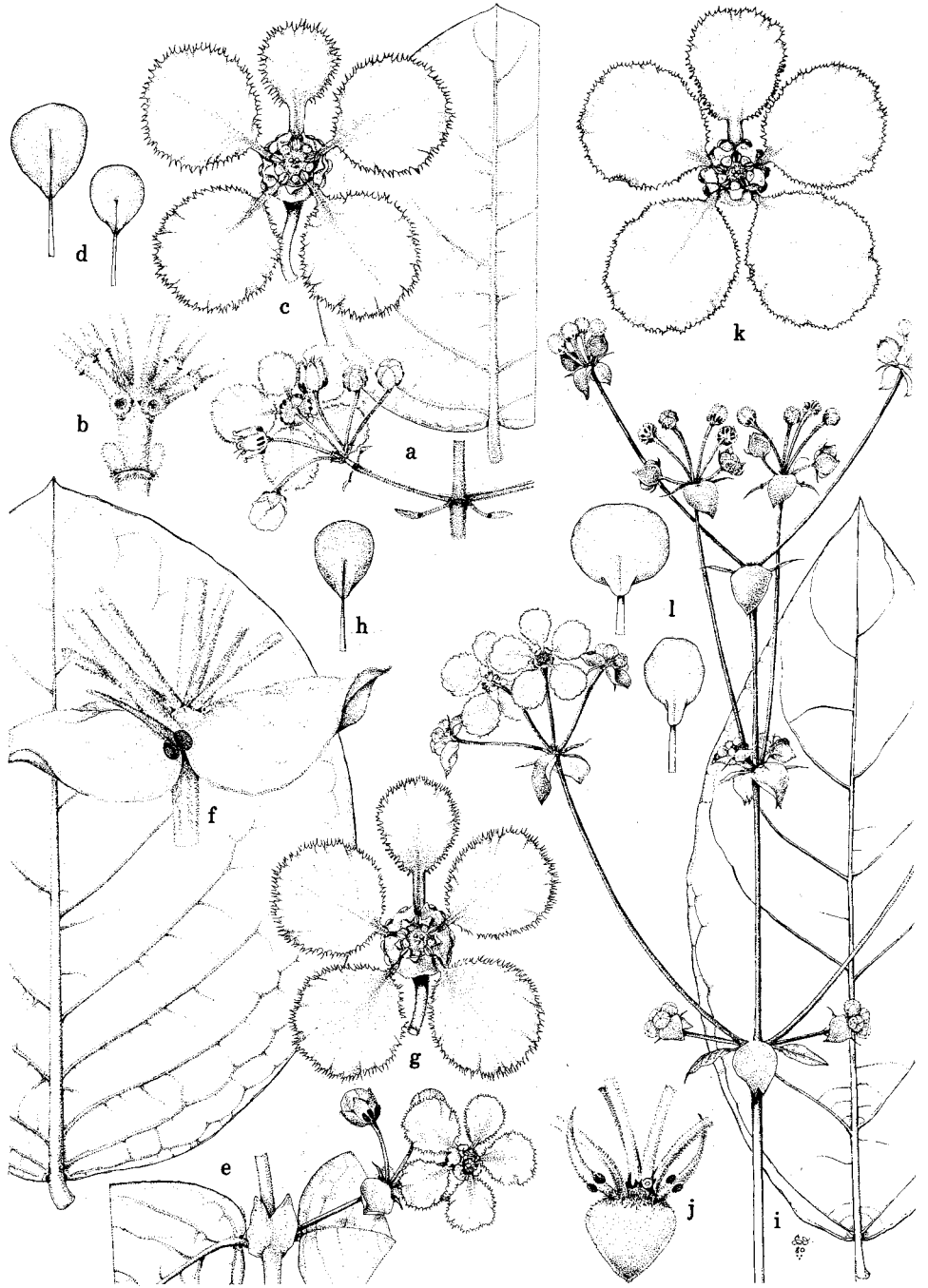


FIG. 21. *P. octoflora*, *P. megalantha* and *P. psilophylla*. a-d, *P. octoflora*: a) flowering branch and stem leaf,  $\times 0.5$ ; b) base of distal umbel (with 2 flowers removed),  $\times 2$ ; c) flower,  $\times 1$ ; d) anterior (left) and posterior-lateral (right) staminode glands,  $\times 7.5$ . e-h, *P. megalantha*: e) flowering branch and stem leaf,  $\times 0.5$ ; f) base of a distal umbel,  $\times 2$ ; g) flower,  $\times 1$ ; h) anterior staminode gland,  $\times 7.5$ . i-l, *P. psilophylla*: i) flowering branch and stem leaf,  $\times 0.5$ ; j) base of a distal umbel,  $\times 2$ ; k) flower,  $\times 1.5$ ; l) anterior (above) and posterior-lateral (below) staminode glands,  $\times 7.5$ . a-d from Irwin *et al.* 16681a, e-h from Anderson *et al.* 36870, i branch from Irwin *et al.* 16778, leaf from Sick B481, j from Irwin *et al.* 16778, k, l from Irwin *et al.* 16860.

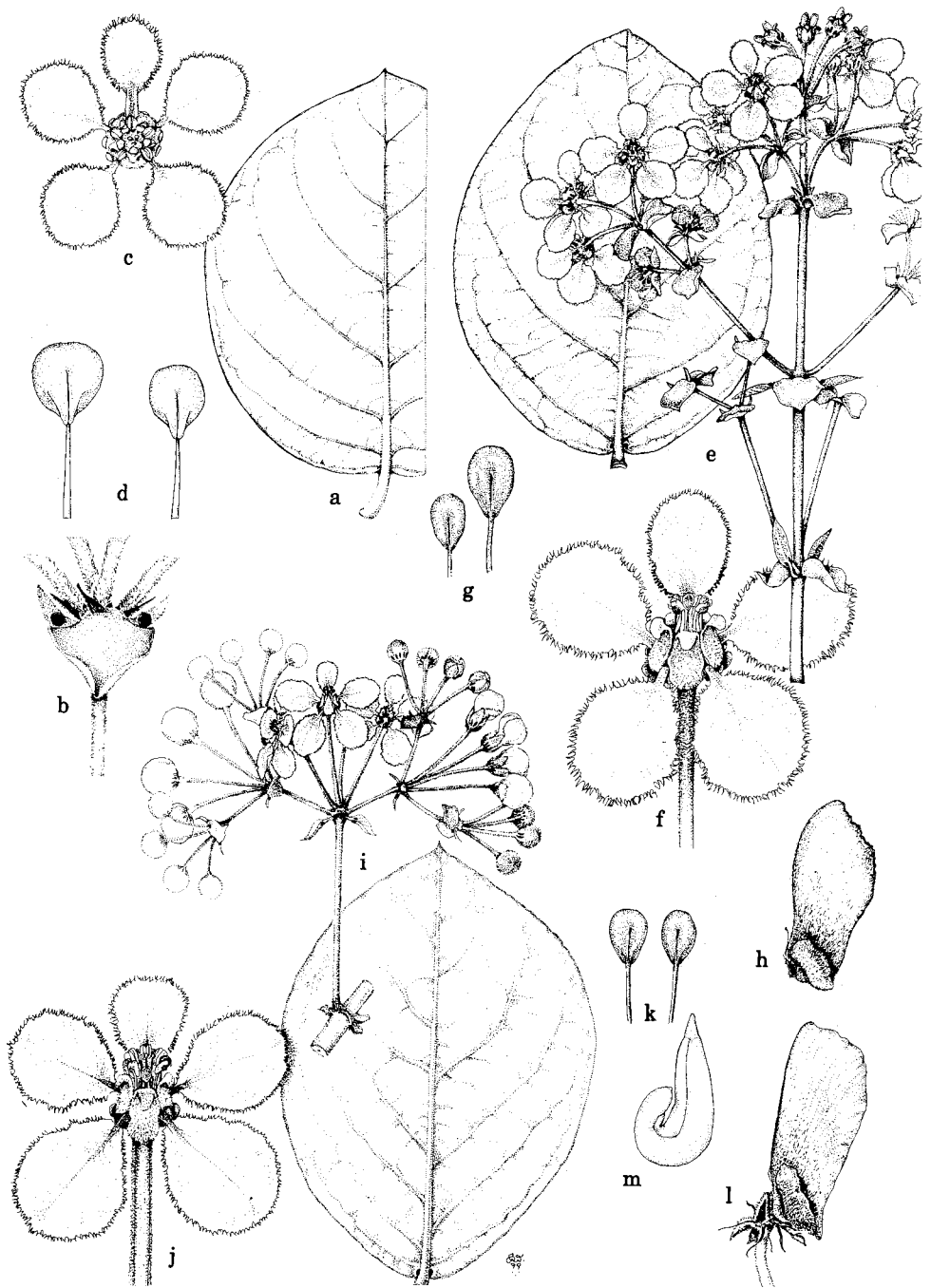


FIG. 22. *P. reticulata*. a-d, from east-central Mato Grosso: a) stem leaf,  $\times 0.5$ ; b) base of a distal umbel,  $\times 2$ ; c) flower,  $\times 1$ ; d) anterior (left) and posterior-lateral (right) staminodes,  $\times 7.5$ . e-h, from Minas Gerais: e) flowering branch and stem leaf,  $\times 0.5$ ; f) flower,  $\times 1.5$ ; g) posterior-lateral (left) and anterior (right) staminode glands,  $\times 5$ ; h) samara,  $\times 0.75$ ; i-m, from São Paulo: i) flowering branch and stem leaf,  $\times 0.5$ ; j) flower,  $\times 1.5$ ; k) anterior (left) and posterior-lateral (right) staminode glands,  $\times 5$ ; l) samara on torus,  $\times 0.75$ ; m) embryo,  $\times 3.5$ . a-d from Irwin *et al.* 16681b, e branch from Mexia 5798, leaf from Brade 14819, f-h from Mexia 5798, i from Eiten & Eiten 3291, j, k from Eiten & Eiten 2914, l m, from Eiten & Eiten 2928.

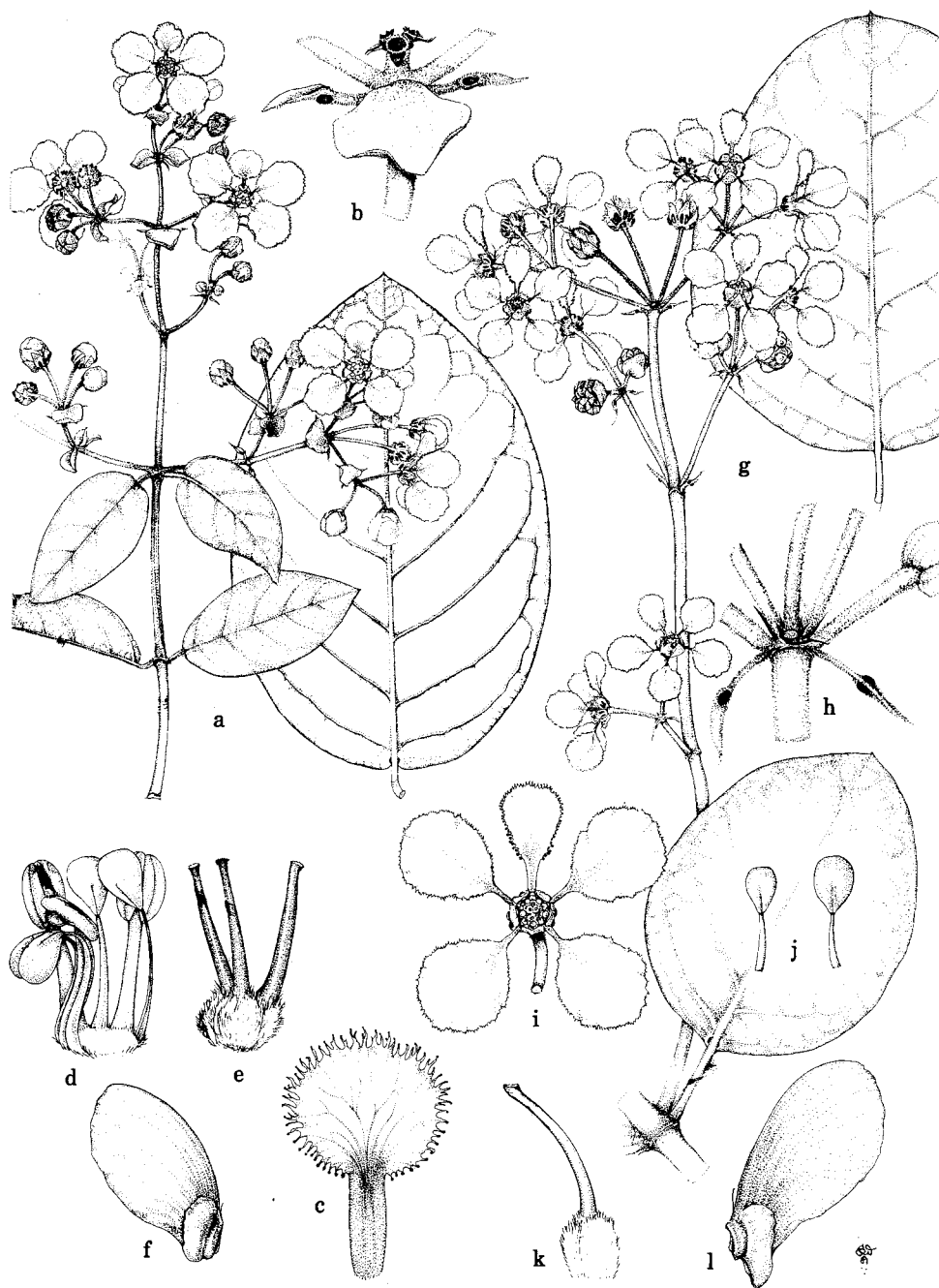


FIG. 23. *P. reticulata*. a-f, from Paraguay: a) flowering branch and stem leaf,  $\times 0.5$ ; b) base of a distal umbel,  $\times 2.5$ ; c) posterior petal,  $\times 2.5$ ; d) androecium (posterior-lateral stamen and anterior-lateral staminode and stamen removed),  $\times 5$ ; e) gynoecium, anterior style to right,  $\times 5$ ; f) samara,  $\times 0.75$ . g-l, from southern Mato Grosso: g) flowering shoot and stem leaf,  $\times 0.5$ ; h) base of a distal umbel,  $\times 2.5$ ; i) flower,  $\times 1$ ; j) posterior-lateral (left) and anterior (right) staminode glands,  $\times 5$ ; k) anterior carpel,  $\times 5$ ; l) samara,  $\times 0.75$ . a branch from Hassler 8166, leaf from Hassler 4055, b-e from Hassler 8166, f from Hassler 9881a, g-l from Hatschbach 24625.