REVISION OF *LOUTERIDIUM* (ACANTHACEAE)

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ABSTRACT

Louteridium is limited to the New World tropics and shows a preference for steep rocky slopes in wet forests. In the present revisionary treatment the nine species are recognized in two sections: Sect. Tetrandrium comprising the four-staminate *L.* ***brevicalyx***, *L. koelzii*, and *L. chartaceum*; Sect. Louteridium comprising the two-staminate *L. costaricense*, *L. tamaulipense*, *L. conzattii*, *L. parayi*, *L. mexicanum*, and *L. donnell-smithii*.

INTRODUCTION

Louteridium is a New World tropical member of the Acanthaceae, subfamily Acanthoideae, tribe Ruellieae. As treated here, the genus comprises nine woody species, two of which have been described during the course of this study.

The species are poorly known and have been infrequently collected, probably because of the inconspicuous inflorescences, and the difficult terrain in which the plants grow. Thus, specimens from the eight major herbaria housing neotropical collections yielded only one collection of *L. chartaceum*, one of *L. conzattii*, one of *L. costaricense*, one of *L. parayi*, two of *L. brevicalyx*, two of *L. koelzii*, six of *L. tamaulipense* (all from the same population), fourteen of *L. mexicanum*, and forty-three of *L. donnell-smithii*. *L. tamaulipense* was the only species examined in the field.

ECOLOGY

Geographic locations of the species are indicated on Figure 1. Information concerning habitat preference of the genus was obtained from herbarium label data and from personal observation of one population in the field. The reports, though fragmentary, indicate a preference for steep rocky limestone and volcanic slopes in wet tropical forests.

Field Observations: The only population from which collections have been made of *L. tamaulipense* is located near Gómez-Farías, Tamaulipas, Mexico. The habitat at Gómez-Farías is described by Martin (1958) as a tropical semi-evergreen and evergreen forest, and he suggests that this is the northernmost forest of this type. The plants were growing in shade and full sun. There was no apparent difference in the vegetative growth of the plants growing in shade or sun, but those growing in full sun or lightly shaded places were more floriferous. The terrain was limestone, steep and rocky. The plants were sprawling and sending out adventitious roots on the rocks; however, none of these were epiphytic in trees, as reported of *L. parayi* (Miranda, 1954).

Hourly observations were made from 6:00 P.M. on 8 September 1969 to 8:00 A.M. on 9 September 1969. There was no rainfall. The corollas began opening at sunset and began to fall in the early morning. There was no detectable scent from the flowers, and no nectar was found in the gibbous throat of the corolla. The gland located at the base of the ovary had an intensely sweet taste. A hummingbird visited the flowers at dusk and again in the early morning.

Pollinator: Comments as to the adaptive pollinator must be highly tentative because of the lack of information. The position and size of the sex organs suggest a large pollinator such as a bird, with the pollen carried on the dorsal surface of the pollinator.

Some of the characteristics of ornithophilous species cited by Faegri and Van der Pijl (1966) are (1) diurnal anthesis, (2) vivid colors, (3) lip or margin curved back, (4) no odor, and (5) abundant nectar. (1) As

Figure 1. Distribution of the genus *Louteridium*.

was indicated by my observations, the corolla of *L. tamaulipense* is open at times when hummingbirds are active. (2) As to color, many bird-visited flowers are white (Faegri and Van der Pijl, 1966). In addition, the two species which I consider most advanced on the basis of morphology and distribution have some color. According to herbarium label data, the corolla of *L. mexicanum* is greenish-white tinged with pale lilac inside. There are different color forms of *L. donnell-smithii* which vary from greenish white to dark purple. (3) The revolute condition of the corolla lobes is a characteristic of the genus. (4) The flowers were odorless to me. (5) There is not an abundance of nectar. However, the open flower on the panicle is slightly elevated from the horizontal. In this position, it could catch rain water which would be held in the gibbous throat, dissolving the concentrated sugars around the glandular disc.

In summary, the flowers exhibit some of the generally accepted characteristics of ornithophilous species; and hummingbird visitation has actually been observed by me in one population. No other potential pollinators are known to visit the flower.

Generic Relationships

Literature concerning the Acanthaceae has been summarized by Grant (1955) and, more recently by Long (1970). Watson (1888), Lindau (1895), and Bremekamp and Nannenga-Bremekamp (1948) concur in placing *Louteridium* in the subfamily Acanthoideae. Watson placed the genus in the tribe Ruellieae. Lindau subsequently treated it as the sole genus in the tribe Louterideae. More recently Bremekamp and Nannenga-Bremekamp restored *Louteridium* to the subtribe Ruelliinae of the tribe Ruellieae on the basis that Lindau overemphasized a single character, that of pollen type.

Taxonomic Treatment

LOUTERIDIUM Wats.

Louteridium Wats., Proc. Amer. Acad. Arts 23:283. 1888 (Type species, *Louteridium donnell-smithii* Wats.).

Neolindenia Baill., Bull. Mens. Soc. Linn. Paris 2:851. 1889 (Type species, *Neolindenia mexicana* Baill.).

Shrub or soft-wooded tree, seasonally deciduous at least in some species. Leaves simple, opposite, decussate, estipulate; dark green on upper surface, light green on lower surface; cystoliths present, more prominent on upper surface, particularly along midrib and veins; midrib and veins more prominent on lower surface. Inflorescence a terminal, cymose, bracteate panicle with a pair of cymes arising from each node. Calyx 3-lobed. Corolla somewhat laterally compressed, sympetalous, 5-lobed, contorted (as defined by McLean & Ivimey-Cook, 1956) in bud, 2-lipped with 2 lobes above and 3 below; opening at dusk and falling at sunrise; tube short; throat prominently gibbous. Stamens 2 and coalescent with a sterile filament at the base, or 4 and diadelphous, adnate to the corolla, alternate with the lobes, 6–9.4 cm long; anthers exserted, locules 2, opening longitudinally. Pollen grains spherical, 125–230 μ in diam; periporate; regular or irregular echinoid pectinaceous protrusions through the pores; gemmate; the surface microrugulate. Ovary slightly flattened, 0.4–0.7 cm tall, 0.1–0.2 cm across; sessile on a glandular disc; carpels 2, locules 2; ovules numerous, anatropous in 2 series, placentation axile. Styles 5.6–8.2 cm long. Stigma 2-lobed, exserted, usually slightly beyond the stamens. Fruit a loculicidal capsule, flattened; retinacula falcate, 0.3–0.5 cm long. Seeds discoid to subdiscoid.

Key to the Species

1. Stamens 4, diadelphous ..... Section Tetrandrium (Fig. 2) (2)
1. Stamens 2, each coalescent with a sterile filament ..... Section Louteridium (Fig. 6) (4)

2 (*1*). Calyx lobes lanceolate or ovate, the length less than 3 times the width ..... (3)

2. Calyx lobes linear, the length ca 6 times the width ..... 3. *L. chartaceum* (Fig. 5)

3 (*2*). Calyx lobes equal, lanceolate, without prominent dark longitudinal veins ..... 1. *L. brevicalyx* (Fig. 3)

3. Calyx lobes unequal, ovate, with prominent dark longitudinal veins ..... 2. *L. koelzii* (Fig. 4)

4 (*1*). Calyx lobes equal or subequal and leaflike; dorsal lobe not conduplicate ..... (5)

4. Calyx lobes unequal, not leaflike, dorsal lobe conduplicate ..... (6)

5 (*4*). Inflorescence glabrous, bracts persistent, stigmatic lobes equal ..... 4. *L. costaricense* (Fig. 7)

5. Inflorescence pubescent, bracts caducous, stigmatic lobes unequal ..... 5. *L. tamaulipense* (Fig. 8)

6 (*4*). Bracts of the inflorescence cordate, large and leaflike throughout ..... 6. *L. conzattii* (Fig. 9)

6. Bracts of the inflorescence not cordate, not large nor leaflike throughout (sometimes so at the first node only) ..... (7)

7 (*6*). Plants glabrous; dorsal calyx lobe with a basal pair of globose glands ..... 7. *L. parayi* (Fig. 10)

7. Plants pubescent or puberulent; dorsal calyx lobe not glandular ..... (8)

8 (*7*). Plants puberulent with 1-celled or occasionally 2-celled hairs; stalks of the lateral branches of the inflorescence reduced and compacted throughout, ca 0.2 cm long ..... 8. *L. mexicanum* (Figs. 11, 12)

8. Plants pubescent with several-celled hairs; stalks of the lateral branches of the inflorescence up to 12 cm long at the base, becoming reduced and compacted only at the apex ..... 9. *L. donnell-smithii* (Figs. 13, 14)

Section **Tetrandrium** A. Richardson, sect. nov.

Stamina 4. Corolla alba vel flavo-viridis ca 4.5 cm longa vel brevior; faux aliquantum gibba; lobi apice rotundati longitudine latitudineque aequalibus (Fig. 2). Calycis lobi laminiformes non conduplicati. Nodia alternatim conferta remotaque.

Stamens 4. Corolla white to yellowish-green, ca 4.5 cm or less in length; throat somewhat gibbous; lobes rounded at the apex, length and width ca equal (Fig. 2). Calyx lobes leaflike, not conduplicate. Internodes of the stem reduced, in clusters separated by a single, longer internode or terminated by the inflorescence (stems of *L. brevicalyx* not examined).

Type species: L. chartaceum Leonard.

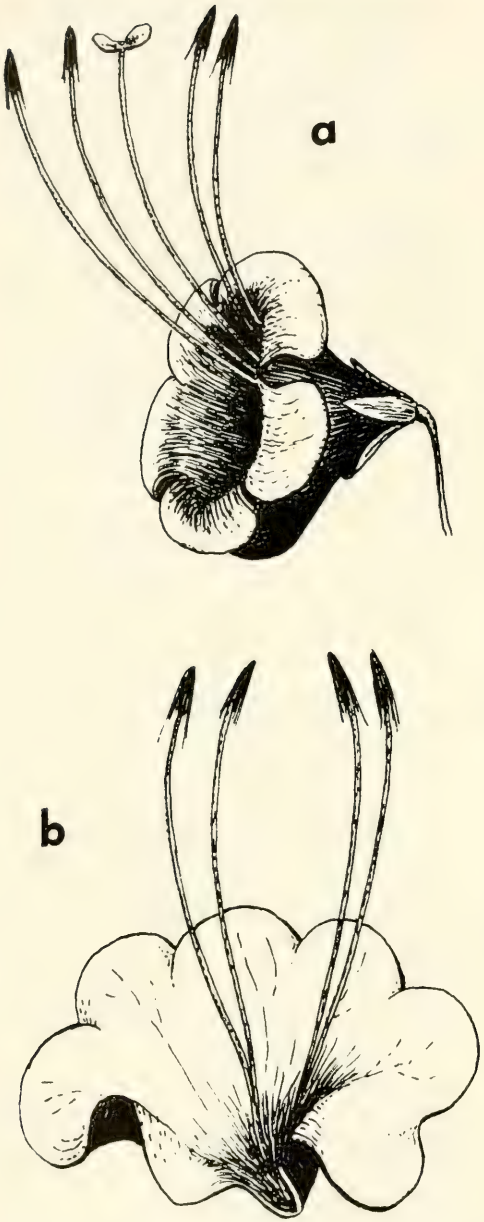

Figure 2. Drawings of *Louteridium brevicalyx* A. Richardson, representative of Section Tetrandrium, by Mr. Geza Knipfer. A. Perianth, from pressed herbarium specimen. B. Corolla laid open.

Presumably the leaves become clustered toward the end of the growing season and are deciduous; before the next foliage-growing spurt the inflorescence appears. Then the branches from the clustered nodes send out rapidly growing shoots with long internodes at first, then clustered leaves.

1. ***Louteridium brevicalyx*** A. Richardson, sp. nov.

Arbor usque ad 3 m alta. Inflorescentia elongata glandulosa. Calyx parvus lobis lanceolatis aequalibus ca 0.5 cm latis, ca 1.2 cm longis. Stamina 4. Fructus magnus ca 0.8 cm latus, ca 4.2 cm longus.

(Holotype US!) Mexico. Michoacán: Aquila, district of Coalcomán, 200 m, 21 Mar 1941, Geo. B. Hinton 15825.

A tree to 3 m tall, viscid, with brittle branches. Foliage unknown. Inflorescence elongate and slender, pubescent with glandular hairs (Fig. 15, E & F); bracts caducous, ca 0.6 cm long, outer surface glandular; stalk of lateral branches up to ca 4 cm long but usually less. Pedicels ca 4.3 cm long. Calyx brown, chartaceous; lobes ca equal, lanceolate, reduced, ca 1.2 cm long, ca 0.5 cm wide and joined at the base for ca 0.2 cm, loosely enclosing the bud. Corolla white; tube ca 0.9 cm long, ca 0.7 cm in diam; throat moderately gibbous, ca 2.2 cm long, ca 2.5 cm across; lobes equal, ca 1.5 cm long, ca 1.5 cm wide, somewhat recurved (Fig. 2). Stamens 4, diadelphous, glabrous; anthers ca 0.9 cm long. Pollen grains 125–210 μ in diam, sometimes with irregular echinoid protrusions. Ovary glabrous. Stigmatic lobes equal, ca 2.5 mm long, ca 2 mm wide. Fruit large, ca 4.2 cm long, ca 0.8 cm wide, retinacula ca 0.4 cm long. Seeds subdiscoid, ca 0.6 cm across, thickened for about 0.5 mm around the margin.

Distribution: Known only from the type locality, cited above (Fig. 1). According to herbarium label, the plants were seen frequently, and were growing only on rock on a cliff, from 200–400 m.

Described from flowering specimens without leaves. *L. brevicalyx* can be quickly identified by its 4 stamens, its equal and reduced calyx lobes, and its large fruits (Fig. 3). The pollen grains often have echinoid protrusions through the pores, but they are irregular in length and in distribution over the surface of the grains; therefore they are easily distinguished from those of *L. donnell-smithii.*

Additional specimen examined: MEXICO. MICHOACÁN: Aquila, district of Coalcomán, 400 m, 24 Mar 1941, Hinton 15843 (US).

Figure 3. Photograph of *L. brevicalyx* A. Richardson, holotype.

Figure 4. Photograph of *L. koelzii* McVaugh & Miranda, holotype.

2. *Louteridium koelzii* Miranda & McVaugh, Anales Inst. Biol. Univ. Nac. Mexico 32: 182. 1962. (Holotype MICH! isotype MEXU) Mexico. Jalisco: Steep rocky mountainsides, on limestone, 8 mi SW of Pihuamo, 500–600 m, 6 Dec 1969, R. McVaugh & W. N. Koelz 1507.

A tree to 6 m tall, the trunk 15 cm in diameter, with stubby, upright branchlets. Leaves entire, glabrous; blades 11–19 cm long, 5.5–9 cm wide, ovate to elliptic, attenuate and curved downward at the apex, the base acute, petiole 2.5–6.5 cm long. Leaf scars prominent, hippocrepiform. Internodes of the stem 0.2–0.3 cm long arranged in clusters separated by a single longer internode 1–7 cm long, or terminated by the inflorescence (Fig. 4). Inflorescence pubescent with several-segmented hairs (Fig. 15, I & J); bracts caducous: stalk of lateral branches of axis reduced, 1 cm or less in length. Pedicel ca 2.5 cm long, pubescent. Calyx pale green with prominent dark longitudinal veins, pubescent on both surfaces, loosely enclosing the bud, lobes ovate, acute at the apex, the base truncate; upper lobe ca 2.4 cm long, ca 1.2 cm wide; lateral lobes ca 1.9 cm long, ca 1 cm wide. Corolla pale green, lightly pubescent; lobes ca equal with rounded tip. Stamens 4, filaments pubescent at the base; anthers ca 0.9 cm long, lightly pubescent. Pollen grains 140–200 μ in diam. Ovary heavily pubescent; style lightly pubescent; stigmatic lobes subequal; upper lobe ca 0.75 mm long, ca 1 mm wide; lower lobe ca 1 mm long, ca 1 mm wide.

Distribution: Known only from the type locality, cited above (Fig. 1). According to herbarium label, it is abundant on steep rocky limestone mountainsides in a high dense forest dominated by *Brosimum.*

Described from specimens in bud only. *L. koelzii* is most easily distinguished from the other 4-staminate species by its unequal, darkly-veined calyx lobes (Fig. 4).

Additional specimen examined: MEXICO. JALISCO: Steep rocky mountainsides, on limestone, 8 mi SW of Pihuamo, 500–600 m, 15 Dec 1959, McVaugh & Koelz 1797 (MICH).

Figure 5. Photograph of *L. chartaceum* Leonard, holotype.

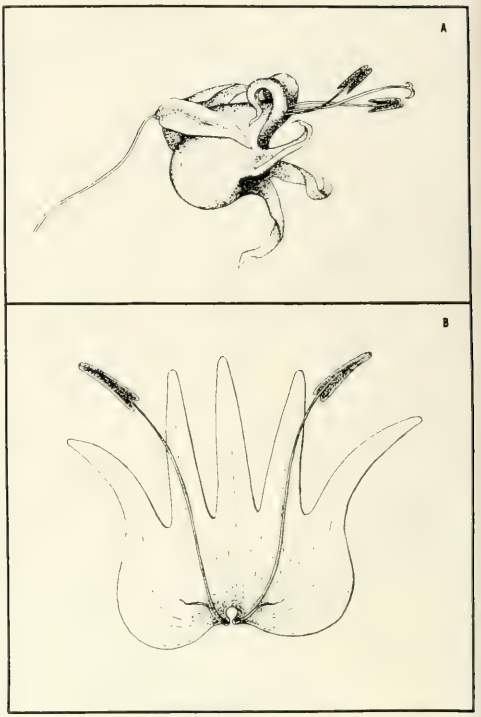

Figure 6. Drawings of *L. tamaulipense* A. Richardson, representative of Section Louteridium, by Mr. Geza Knipfer. A. Pressed flower. B. Corolla laid open.

3. *Louteridium chartaceum* Leonard, Publ. Carnegie Inst. Wash. 461:197. 1936. (Holotype US! Isotypes A! MICH!) British Honduras. Gracie Rock, Sibun River, 24 Mar 1935, Percy H. Gentle 1526.

A woody, glabrous plant. Leaves entire; blade 14.5–18.5 cm long, 4.5–6 cm wide, elliptic, attenuate and curved downward at the apex, decurrent on the petiole; petiole 2.5–4.5 cm long. Leaf scars prominent, hippocrepiform. Internodes of the stem 0.2–0.3 cm long arranged in clusters separated by a single longer internode 1.5–2.8 cm long, or terminated by the inflorescence (Fig. 5). Inflorescence long and slender with few flowers; bracts small and caducous and leaving prominent scars; a pair of small, leaf like bracts sometimes present at the first node of the axis; stalks of lateral branches of axis reduced, 0.1–0.3 cm long. Pedicel 3.2–5.2 cm long. Calyx greenish or brown; lobes equal, chartaceous, linear, acute at the apex, the base truncate, 2.2–2.5 cm long, 0.3–0.4 cm wide. Corolla yellowish-green (according to Leonard), but brown on dried specimens; tube ca 0.5 cm long, ca 0.5 cm diam; throat ca 1.5 cm long, ca 2 cm across; lobes revolute, ca equal, ca 1.3 cm wide at the base, ca 1.3 cm long, rounded at the apex. Stamens 4, filaments minutely puberulent toward the base; anthers ca 0.7 cm long. Pollen grains 140–200 μ in diam. Stigmatic lobes unequal; upper lobe ca 1 mm long, ca 1.5 mm wide; lower lobe ca 1.5 mm long, ca 1.5 mm wide. Fruit ca 2.5 cm long, ca 0.5 cm wide; retinacula 0.3 cm long; seeds discoid, ca 0.4 cm across, thickened for about 0.3 mm around the margin.

Distribution: Known only from the type locality, cited above (Fig. 1). *L. chartaceum* can be readily distinguished from the other 4-staminate species by its linear, equal calyx lobes whose length is ca 6 times the width (Fig. 5). In the other two 4-staminate species, the calyx lobes have a length not exceeding 3 times the width.

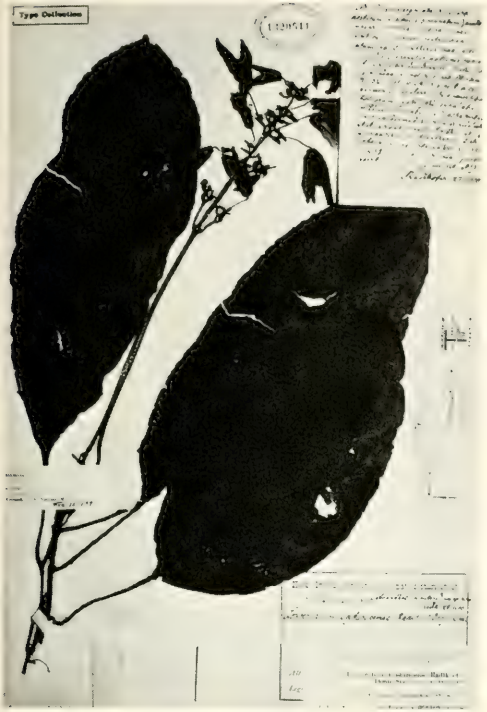

Figure 7. Photograph of *L. costaricense* Radlk & Donn-Sm., holotype.

Figure 8. Photograph of *L. tamaulipense* A. Richardson, holotype.

Section Louteridium

Stamens 2. Corolla white to purple, 5 cm or more in length; throat prominently gibbous; lobes rounded at the apex, elongate, length 3 times the width or greater (Fig. 6). Calyx lobes leaf-like and not conduplicate in 2 species, but conduplicate and not leaflike in 4 species. Internodes of the stem not in clusters.

Type species: L. donnell-smithii Wats.

The rather stable internode lengths in this section tend to indicate a long growing season and perhaps that these plants are evergreen.

4. *Louteridium costaricense* Radlk. & Donn.-Sm., Bot. Gaz. (Crawfordsville) 37:422. 1904. (Holotype US!) Costa Rica. Tucurrique, Las Vueltas, 1000 m, Mar 1899, Tonduz 8123.

A woody plant, glabrous in all parts. Leaves entire or irregular; blade 21–26.5 cm long, 9.5–11 cm wide, elliptic, attenuate at the apex, the base attenuate; petiole 5.5–6.5 cm long. First internode of inflorescence elongate; stalk of lateral branches of axis reduced, ca 1.5 cm long or less; bracts sessile, opposite, connate for ca 0.5 mm at the base, persistent. Calyx brown, chartaceous, lobes loosely enclosing the bud, narrowly elliptic, acute at the apex, subequal; upper lobe ca 4 cm long, ca 1.1 cm wide; lateral lobes ca 3.4 cm long, ca 1 cm wide. Stamens 2, anthers ca 0.9 cm long. Pollen grains 170–190 μ in diam, sometimes with irregular echinoid protrusions from the pores. Stigmatic lobes equal, ca 3 mm wide.

Distribution: Known only from the type locality, cited above (Fig. 1).

Described from a specimen in bud only. *Louteridium costaricense* is morphologically similar to *L. tamaulipense* (Figs. 7 & 8), although the 2 species are widely separated geographically (Fig. 1). They are most easily distinguished by the glabrous inflorescence of *L. costaricense* and the pubescent inflorescence of *L. tamaulipense.*

5. *Louteridium tamaulipense* A. Richardson, Sida 3:448. 1969 (Holotype, consisting of 4 sheets TEX! 272981, 272982, 272983, 272984; Isotypes F! GH! MEXU! MICH! NY! UC!) Mexico. Tamaulipas: Rocky limestone slope in a wet forest about 5 km by road NW of Gómez Farías, 370 m, 30 Jun 1969, A. Richardson 1388.

Soft-wooded shrub 2–2.5 m tall. Old stems prostrate and sprawling on the rocks and sending out adventitious roots. Current season's growths arising singly and erect from the nodes. Leaves and stems glabrous. Leaves entire to finely denticulate; blade 15–23 cm long, 6–10.5 cm wide, ovate, attenuate at the apex, the base acute to attenuate; petiole 4–7 cm long. First internode of inflorescence axis glabrous, elongate, about five times the length of the second internode, with a pair of glabrous, sessile, leaflike bracts subtending the first pair of cymes; stalk of lateral branches of axis 6 cm long or less; the axis and branches at and above the first node moderately viscid, and pubescent with several-celled glandular white hairs (Fig. 15, C & D); bracts caducous. Calyx greenish white on living plants but on pressed specimens green, chartaceous, pubescent on both surfaces, loosely enclosing the bud but enclosing the fruit more tightly; lobes equal, lanceolate, ca 3.6 cm long, ca 1.1 cm wide. Corolla greenish-white on living plants but on pressed specimens brown, lightly pubescent; tube ca 0.3 cm long, ca 0.7 cm diameter; throat ca 2.5 cm long, ca 2.3 cm across; lobes unequal, 2.7–3.2 cm long and tapering, with the upper 2 revolute and the lower 3 contorted (Fig. 6). Stamens 2, glabrous; anthers ca 1.5 cm long. Pollen grains 130–180 μ in diam, sometimes with irregular echinoid protrusions from the pores. Ovary pubescent with glandular hairs especially above, and on the lower part of the style; stigmatic lobes unequal; upper lobe ca 2 mm long, ca 0.5 mm wide; lower lobe ca 3.4 mm long, ca 0.5 mm wide. Fruit ca 3.3 cm long, ca 0.8 cm wide, retinacula ca 0.3 cm long; seeds discoid, 0.4–0.5 cm across and thickened for about 0.5 mm around the margin.

Distribution: Known only from the type locality, cited above (Fig. 1). This species grows on rocky limestone slopes in a forest described by Martin (1958) as a tropical semi-evergreen and evergreen forest characterized by *Abutilon* sp, *Achatocarpus mexicanus*, *Brosimum alicastrum*, *Celtis monoica*, *Dendropanax arboreus*, *Enterolobium* sp, *Ficus* sp, *Gymnanthes actinostemoides*, *Iresine tomentella*, *Quercus germana*, *Tabernaemontana citrifolia*, *Ungnadia speciosa*, and *Viburnum* sp.

Louteridium tamaulipense and *L. costaricense* are not as easily distinguished as are the other 7 species. However, they are widely separated geographically (Fig. 1), and the former is pubescent on the inflorescence, whereas the latter is completely glabrous.

6. *Louteridium conzattii* Standl., Contr. U.S. Natl. Herb. 23:1338. 1926. (Holotype US! Isotype US!) Mexico. Oaxaca: Between Jalapa and La Raya, on left bank of Rio Grande, district of Tuxtepec, 450 m, 3 Nov 1919, E. Conzatti 3788.

Leaves glabrous; blade 20.5–21.5 cm long, 16.5–17.5 cm wide, cordate, attenuate and curved downward at the apex, finely crenulate and undulate, many cystoliths prominent on both surfaces; petiole ca 4.5–6.2 cm long. Inflorescence pubescent only at the nodes (Fig. 15A); heavily bracteate, bracts glabrous, persistent, sessile, leaflike in shape and veining, ca 5.5 cm long, ca 3 cm wide at the base but smaller toward the apex; stalk of lateral branches of axis somewhat reduced, ca 1.4 cm long or less. Pedicel ca 3.9 cm long. Calyx imbricate, closely enclosing the bud; upper lobe ovate, acuminate at the apex, the base truncate, ca 2.2 cm long, ca 1.2 cm wide, conduplicate to enclose the upper halves of the 2 lateral lobes; lateral lobes falcate, ca 2 cm long, ca 0.9 cm wide. Corolla lightly pubescent with glandular hairs. Stamens 2, each coalescent with a much reduced sterile filament; filaments pubescent at the base; anthers ca 1 cm long. Pollen grains 190–200 μ in diam, sometimes with irregular echinoid protrusions from the pores. Stigmatic lobes equal, ca 1.5 mm long, ca 1.5 mm wide.

Distribution: Known only from the type locality, cited above (Fig. 1).

Described from specimens having only detached leaves and an inflorescence with flowers in bud. *Louteridium conzattii* can be quickly identified by its 2 stamens, conduplicate dorsal calyx lobe, and its cordate,

Figure 9. Photograph of *L. conzattii* Standl., holotype.

Figure 10. Photograph of *L. parayi* Miranda, isotype.

glabrous leaves and bracts (Fig. 9). *L. donnell-smithii* occasionally has subcordate leaves, but they are heavily pubescent.

A sterile specimen, Steyermark 37024 (F) has been included here with some reservation. It resembles *L. conzattii* but has some characters which suggest a relationship with *L. donnell-smithii*. The leaves are subcordate and pubescent along the veins with several-celled (occasionally one-celled) hairs, especially on the immature leaves. This specimen could represent a variant within *L. conzattii*, an undescribed species, or a hybrid between *L. conzattii* and the widespread *L. donnell-smithii*.

Additional specimen examined: GUATEMALA. SAN MARCOS: Between Todos Santos and Finca El Porvenir, on lower to middle slopes of Volcán Tajumulco, between 1300–3000 m, 1 Mar 1940, J. A. Steyermark 37024 (F).

7. *Louteridium parayi* Miranda, Ceiba 4: 140. 1954. (Isotype F!) Mexico. Chiapas: Evergreen forest near the Suspiro, about 9 km NW of Berriozabal, 950 m, 9 Jun 1953, L. Paray & Miranda 7834.

A glabrous, woody, sparsely branched epiphytic tree 1–3 m tall; cystoliths prominent on all parts. Leaves entire; blade 15–16 cm long, 3.5–4.5 cm wide, glabrous on upper surface (reported sparsely pilose on lower surface by Miranda), oblanceolate, acuminate at the apex, the base attenuate and decurrent on the petiole; petiole 1.25–1.5 cm long. Inflorescence glabrous, bracteate, bracts orbiculate, connate-perfoliate, ca 0.8 cm long, persistent. Calyx 3-lobed and enclosing the bud; upper lobe oblong, acute at the apex, the base truncate, ca 1.2 cm wide, ca 3 cm long, conduplicate, enclosing a small portion of the lateral lobes until the bud emerges, a pair of globose glands ca 0.2 cm in diam on the outer surface at the point of attachment to the pedicel; lateral lobes oblong, acute at the apex, the base truncate, ca 0.8 cm wide, ca 3 cm long, parting to about 45° from the dorsal lobe at anthesis. Corolla brown (reported pale yellow by Miranda); tube ca 0.1 cm long, ca 0.8 cm in diam; throat ca 3.3 cm long, ca 4.8 cm across; lobes ca 2.5 cm long and partially revolute. Stamens 2, pubescent

at the base with several-segmented hairs; anthers ca 1.5 cm long. Pollen grains 170–230 μ in diam. Ovary glabrous; stigmatic lobes equal, ca 5 mm long, ca 3 mm wide, pubescent.

Distribution: Known only from the type locality, cited above (Fig. 1).

Described from a specimen lacking a complete inflorescence. *Louteridium parayi* can be identified by its 2 stamens, the conduplicate, glandular dorsal lobe of the calyx, and the small, oblanceolate, glabrous leaves (Fig. 10).

8. *Louteridium mexicanum* (Baill.) Standl., Contr. U.S. Natl. Herb. 23:1338. 1926.

   Neolindenia mexicana Baill., Bull. Mens. Soc. Linn. Paris 2:851. 1889. Type from Mexico. Chiapas: Zacualpán.

   Louteridium purpusii T. S. Brandegee, Univ. Calif. Publ. Bot. 6:68. 1914. (Holotype UC! Isotypes F! GH! US!) Mexico. Chiapas: Finca Irlanda, Aug 1913, C. A. Purpus 6969.

Shrub or soft-wooded tree, 1.2–9.2 m tall; all parts glabrate or minutely puberulent. Leaves minutely puberulent on the lower surface with one-celled (rarely 2-celled) hairs, or sometimes glabrate, finely denticulate or entire; blade 18.5–40.5 cm long, 5.5–11.5 cm wide, obovate, acuminate at the apex, decurrent almost to the base of the petiole; petiole and midrib dull rose-purplish, veins greenish-white. Inflorescence finely puberulent with one-celled (rarely 2-celled) hairs (Fig. 15, H), and having small persisting bracts 0.5–1.5 cm long; first internode about twice the length of the succeeding one, the included node usually carrying only scars from deciduous bracts and aborted cymes, but rarely carrying leaflike bracts or a pair of cymes; stalk of lateral branches of axis reduced and compacted, ca 0.2 cm long. Pedicels 2.5–5 cm long. Calyx purplish-green, finely puberulent on both surfaces (Fig. 15, G), closely enclosing the bud; upper lobe ca 2.8 cm long, ca 1.6 cm wide, oblong, acute at the apex, the base truncate, conduplicate, enclosing the greenish-white upper halves of the 2 lateral lobes and remaining so at anthesis; lateral lobes falcate, ca 3.3 cm long, ca 0.9 cm wide. Corolla minutely puberulent, greenish-white outside, greenish-white tinged with pale lilac inside, protruding below the lateral lobes of the calyx; tube ca 0.8 cm diam, ca 0.8 cm long; throat ca 2.2 cm long, ca 4 cm across; lobes 2–2.5 cm long, the upper 4 revolute and the lower fifth lobe protruding downward at anthesis. Stamens 2, filaments pubescent; anthers ca 1.1 cm long. Pollen grains 190–200 μ in diam. Ovary pubescent, ca 0.5 cm long, ca 0.2 cm wide; style pubescent below. Stigmatic lobes unequal; upper lobe ca 2 mm long, ca 1.5 mm wide; lower lobe ca 2.5 mm long, ca 1.5 mm wide. Fruit ca 2.7 cm long, ca 0.6 cm wide. Retinacula ca 0.3 cm long. Seeds discoid, ca 0.4 cm across and thickened for about 0.5 mm around the margin.

Distribution: GUATEMALA, Depts. of San Marcos and Quezaltenango; and MEXICO, state of Chiapas, in wet wooded ravines, between 900–2000 m (Fig. 1).

The type specimen of *Neolindenia mexicana* has not been examined. However, the description by Baillon (1889) agrees with that of *Louteridium mexicanum*, and this was confirmed by Standley (1926).

A sterile specimen, Steyermark 36789 (F) has been included here with some reservation. The leaves are similar in shape to *L. mexicanum*, but differ from *L. mexicanum* in having a much longer petiole, and in being densely pubescent with several-celled hairs. It could represent an undescribed species or a possible hybrid between *L. mexicanum* and *L. donnell-smithii*, since the plant was collected in an area where the two species have overlapping distribution.

Louteridium mexicanum can be distinguished from the other 2-staminate species by its conduplicate dorsal lobe of the calyx, its greatly reduced and compacted stalks of the lateral branches of the inflorescence, and its minute puberulence (Figs. 11 & 12).

Representative specimens: GUATEMALA. SAN MARCOS: Finca El Porvenir, 11 Mar 1940, Steyermark 37501 (F); between Tajumulco and Tecutla, 27 Feb 1940, Steyermark 36789 (F). QUEZALTENANGO: Palmar, 14 Oct 1934, Skutch 1451 (A, F, US); Finca Pireneos, 1–2 Jan 1940, Steyermark 33435 (F); Finca Pireneos, 11 Mar 1939, Standley 68259 (A, F, US).

MEXICO. CHIAPAS: Chicharras, 6 Feb 1896, Nelson 3749 (GH, US); Finca Nubes, 2 Dec 1941, Miranda 1723 (US).

9. *Louteridium donnell-smithii* Wats., Proc. Amer. Acad. Arts 23:283. 1888. (Holotype US! Isotypes NY! US!) Guatemala,

Figure 11. Photograph of *L. mexicanum* (Baill.) Standl. (type for *L. purpusii* Brandg.).

Figure 12. Photograph of *L. mexicanum* (Baill.) Standl., representative specimen of the species.

Dept. Alta Verapaz: Pansamala, 1170 m, Feb 1886, H. von Tuerckheim 856.

Shrub or soft-wooded tree, 1.0–9.2 m tall, trunk up to 12.75 cm in diameter. Young floral parts, leaves, and stems densely soft-pubescent with several-celled hairs which often persist on older parts (Fig. 15 B). Leaves viscid, finely denticulate or sinuate; blade 11–42 cm long, 6.5–24.5 cm wide, ovate to subcordate, the apex acuminate; petiole 4–11.5 cm long. Inflorescence bracteate, bracts caducous; stalks of the lateral branches up to 12 cm long at base of panicle, ca 0.1 cm long at the apex. Pedicel 3–8.7 cm long. Calyx green, pubescent on dorsal lobe and on lower half of lateral lobes, closely enclosing the bud; dorsal lobe oblong, acute at the apex, the base truncate, ca 3.4 cm long, ca 1.2 cm wide, conduplicate and enclosing the upper, greenish-white halves of the 2 lateral lobes and remaining so after anthesis; lateral lobes falcate, ca 3 cm long, ca 0.7 cm wide. Corolla greenish-white to dark purple, protruding below the lateral lobes of the calyx, glabrous; tube ca 1 cm long, ca 0.7 cm in diam; throat 3–3.5 cm long, ca 5 cm across; lobes ca 1.7 cm long, revolute at anthesis. Stamens 2, filaments pubescent; anthers ca 1.4 cm long. Pollen grains 150–210 μ in diam, with echinoid protrusions which are regular in length and in distribution over the surface. Ovary ca 0.4 cm long, ca 0.2 cm in diameter, with glandular hairs. Stigmatic lobes unequal; upper lobe ca 2 mm long, ca 1 mm wide; lower ca 2.3 mm long, ca 1.3 mm wide. Fruit ca 2.5 cm long, ca 0.6 cm wide; retinacula ca 0.5 cm long; seeds ca 0.5 cm across and thickened for about 0.5 mm around the margin.

Distribution: BRITISH HONDURAS; GUATEMALA; HONDURAS; MEXICO, southern part. Commonly found on steep, rocky slopes in rain forests at altitudes of 60–1550 m (Fig. 1).

L. donnell-smithii can be distinguished from the other species with 2 stamens and

Figure 13. Photograph of *L. donnell-smithii* Wats., holotype.

Figure 14. Photograph of *L. donnell-smithii* Wats., representative specimen of the species.

conduplicate dorsal lobes of the calyx by its densely pubescent, ovate to subcordate leaves (Figs. 13 & 14).

Representative specimens: BRITISH HONDURAS. TOLEDO: Fern Hill, 8 Jan 1933, Schipp 1110 (A, F, GH, MICH, NY, UC); Edwards Road beyond Columbia, 6 Jan 1948, Gentle 6355 (F, UC); 27 Mar 1907, Peck 780 (GH, NY).

GUATEMALA. ALTA VERAPAZ: Chucaneb, Apr 1889, J.D.S. 1620 (US); Cobán, 1908, Tuerckheim 2033 (GH, NY, US); vicinity of Cobán, 23 Mar–19 Apr 1941, Standley 91236 (F); N of Cobán, 15 Feb 1941, Hunnewell 17,320 (GH); near Cobán, 25 Feb 1942, Steyermark 44171 (F, US); Cubilquitz, Jan 1901, Tuerckheim 7936 (GH, NY, US); Pansamala, Apr 1889, J.D.S. 1621 (US); S of Santa Cruz, 28 Mar 1941, Standley 90192 (F); Sepacuite, 12 Dec 1904, Goll 155 (US); near the Finca Sepacuite, 27 Mar 1902, Cook & Griggs 205 (US); Sepacuite, 14 Jan 1904, Maxon 3282 (GH, NY, US); near Sepacuite, 18 May 1905, Pittier 320 (NY, US); Tactic, 9 Apr 1939, Standley 71094 (F); NW of Tactic, 15 May 1963, Molina R. & Molina 12303 (F); E of Tactic, 9 Apr 1939, Standley 71343 (F); near Tenahú, 16 Jan 1905, Maxon 3296 (NY, US); below Tenahú, 10 Apr 1941, Standley 91746 (F); Finca Trece Aguas, 10 Feb 1939, Wilson 180 (F). HUEHUETENANGO: Cerro Chiblac, 22 Jul 1942, Steyermark 49180 (F, US). IZABAL: W of Livingston, 16 Apr 1940, Steyermark 39562 (F); SSW of Puerto Barrios, 28 Feb 1966, Gregory 612 (F, US). PETÉN: Fallabón-Yaxha road, 22 Mar 1933, Lundell 2081 (F, MICH); Naranjo, 21 Mar 1922, Cook & Martin 79 (US). EL PROGRESO: Near Finca Caieta, 10 Feb 1942, Steyermark 43768 (F, MICH, US). VERA PAZ: 1885, Watson 292 (GH, US). ZACAPA: Volcán de Monos, 10 Jan 1942, Steyermark 42400 (F, US).

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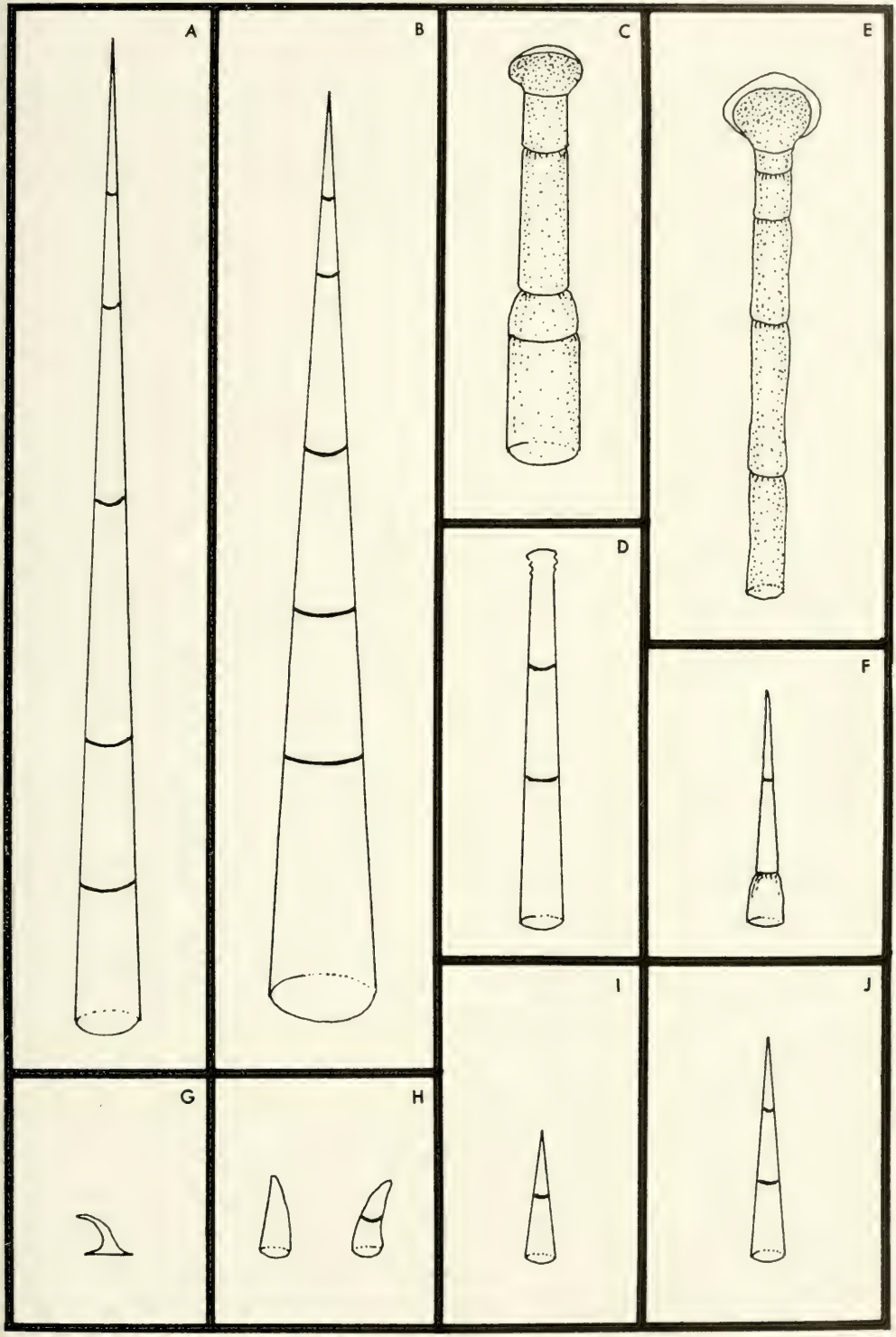
Figure 15. Drawings of hairs on *Louteridium*. 2 cm = 100 microns. A. Hair found on nodes of the inflorescence of *L. conzattii*. B. Hair of *L. donnell-smithii*. C. Glandular hair of *L. tamaulipense*. D. Glandular hair of *L. tamaulipense*. E. Glandular hair of *L. brevicalyx*. F. Hair on corolla and inner surface of calyx and bracts of *L. brevicalyx*. G. Hair on calyx of *L. mexicanum*. H. Hairs on inflorescence of *L. mexicanum*. I. Hair on inflorescence and calyx of *L. koelzii*. J. Hair on inflorescence and calyx of *L. koelzii*.


A
B
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HONDURAS. COMAYAGUA: Pito Solo, 18 Apr 1945, Rodriguez 2940 (F); near Pito Solo, 11 Apr 1951, Williams & Molina R. 17730 (F); Siguatepeque, 24 Mar 1933, Edwards P-589 (A, F); near Taulabe, 8 Apr 1947, Standley, Williams, Molina R., & Chacon P. 7001 (F). CORTES: Near Pito Solo, 22 Mar 1962, Molina R. 10619 (F). SANTA BARBARA: Cerro Santa Barbara, 4 Apr 1951, Armour, Chable, & Allen 6047 (F, GH, US).

MEXICO. CHIAPAS: Ocosingo, 14 Apr 1967, Breedlove 15709 (US); San Quintín, 21 Mar 1955, Sohns 1684 (MICH, NY, UC, US).

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