

Four New Species of *Mimosa* (Leguminosae) from the Central Highlands of Brazil

Marcelo F. Simon,^{1,2,3} Colin E. Hughes,¹ and Stephen A. Harris¹

¹Department of Plant Sciences, University of Oxford, South Parks Road, Oxford, OX1 3RB United Kingdom

²Embrapa Recursos Genéticos e Biotecnologia, PqEB, Caixa Postal 02372, Brasília, Distrito Federal, 70770-917 Brazil

³Author for correspondence (msimon@cenagen.embrapa.br)

Communicating Editor: Fernando Zuloaga

Abstract—Four new species of *Mimosa* are described and illustrated: *M. kalunga*, *M. pseudosetosae*, *M. viperina*, and *M. diminuta* (all from section *Habbasia*, series *Pachycarpae*). All of them are apparently narrowly restricted endemics from the Chapada dos Veadeiros in Goiás, central Brazil. In addition, more complete data and an illustration are presented for *M. pycnocomma* Benth., previously incompletely known only from the type collection. The new species described here, as well as the new data on *M. pycnocomma*, provide interim increments to our knowledge of a group of around 55 *Mimosa* species, combining Barneby's (1991) series *Setosae* and *Pachycarpae*, that remains poorly and incompletely understood.

Keywords—Cerrado, Chapada dos Veadeiros, endemism, Mimosoideae.

Mimosa L., with around 530 species, is one of the most diverse genera in the Leguminosae, and one of around 57 large angiosperm genera with more than 500 species (Frodin 2004). High levels of species diversity, including many narrowly restricted endemic species of *Mimosa*, are found in the incompletely botanically explored Central Brazilian highlands (Simon and Proença 2000; Simon and Hay 2003). It is thus not surprising that new species of *Mimosa* continue to be described, and poorly known species rediscovered from this region (Barneby 1993; Barneby 1997; Queiroz and Lewis 1999; Simon and Amaral 2003), despite the availability of a relatively recent monographic treatment of the genus (Barneby 1991).

Nowhere is this dense local endemism more apparent than on the rocky hills of the Chapada dos Veadeiros in Goiás, (Simon and Proença 2000; Simon and Amaral 2003), where the four new species described here were collected in the municipality of Cavalcante, in a northern extension of the Chapada dos Veadeiros. This region is characterized by elevations often above 1,000 m, where open campo rupestre vegetation grows on rocky and acidic soils. This article adds additional taxa to an already species-rich region (Simon and Proença 2000), where many narrow endemics in *Mimosa* series *Pachycarpae* Benth. proliferate in open formations of cerrados and campo rupestre. *Mimosa* is frequently a conspicuous element in the woody layer at the Chapada dos Veadeiros region, and it is common to find several species growing in close sympatry. These new discoveries highlight just how poorly known the regional flora remains; field studies are likely to reveal additional new taxa in these extremely endemic-rich and poorly collected areas of northern Goiás (Munhoz and Felfili 2006).

These new species are all based on what appear to be first field collections, since they were not found in an extensive survey of *Mimosa* holdings in Brazilian and other key herbaria (Simon and Proença 2000). In addition to the description of the new species, data are presented on *M. pycnocomma* Benth., a species previously known only from type material collected more than 180 yr ago, which was rediscovered at the same site in Cavalcante. Photographs of some of the species described here are presented in Fig. 1.

All four new species, as well as the rediscovered *M. pycnocomma*, show affinities to the morphologically and ecologically adjacent series *Pachycarpae* and *Setosae* Barneby of section *Habbasia* DC. Barneby (1991) distinguished these two series essentially on fruit morphology, the crucial unifying diagnostic

character for series *Pachycarpae* being a tough-walled, valvately dehiscent pod with a stout non-indentated replum at least 1–7 mm wide, while series *Setosae* have typical craspedia breaking into one-seeded articles. However, more recent molecular data indicate that while species of series *Pachycarpae* and *Setosae* are placed together as a well supported monophyletic group, neither series is in itself monophyletic (Bessega et al. 2008; Simon et al. 2009). The four new species described here are placed in this combined *Setosae/Pachycarpae* clade (Fig. 2). Furthermore, it is also clear that valvate fruit dehiscence does not provide the unique diagnostic, apomorphic character envisaged by Barneby for series *Pachycarpae*. At the time of Barneby's (1991) revision, pods of 17 of the 39 species of series *Pachycarpae* remained unknown or insufficiently known to infer mode of dehiscence. After re-evaluating Barneby's monograph and more recent herbarium material, including recent findings of segmented craspedia in *M. humivagans* Barneby (*M. F. Simon* 737), *M. pycnocomma* (*M. F. Simon* 868, see below) and *M. kalunga* (*M. F. Simon* 451, see below), it is now clear that fruits of several species of series *Pachycarpae* do not have valvate fruit dehiscence. In addition, other *Pachycarpae* and some *Setosae* have valves that break entire except for a segment at the base that is retained (*M. foliolosa* Benth., *M. antrorsa* Benth., *M. decorticans* Barneby, *M. setosissima* Taub., and *M. densa* Benth.). Furthermore, some species such as *M. decorticans*, *M. prorepens* Barneby, and *M. humivagans* have pods with thin papery valves that resemble varieties of the *M. setosa* Benth. complex, and contrast with the typically thick-valved *Pachycarpae*. *Mimosa setosa* var. *urbica* Barneby is similar, with valves that open and coil towards the base, frequently not breaking into individual articles, but which are retained entire (Barneby 1991 describes these pods as "reluctantly breaking into articles"). *Mimosa accedens* Barneby has craspedial dehiscence typical of series *Setosae* but a stout replum reminiscent of series *Pachycarpae*, suggesting the syndrome of *Pachycarpae* pod characters can vary independently. This is further emphasized by some of the species described here which have clear affinities to series *Pachycarpae* but a pod breaking into segments.

There is thus substantial morphological overlap in pods between species from series *Setosae* and *Pachycarpae*. In fact, the pods of *Setosae/Pachycarpae* can be better understood as a continuum from thin fragile papery valves that often break into individual articles, to thick stout valves that always separate entire from the replum. The combined molecular and

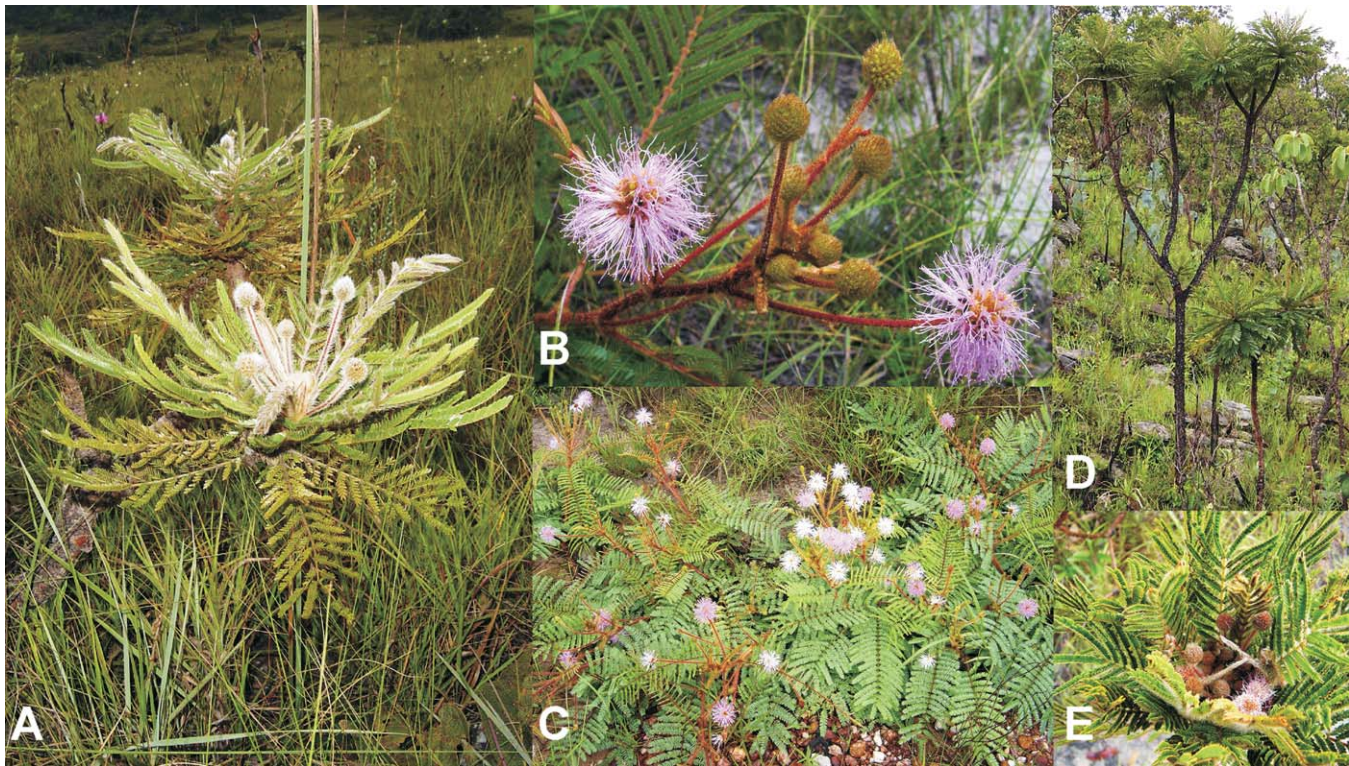


FIG. 1. Diverse growth habits among the new and rediscovered species of *Mimosa* from northern Goiás, Brazil. A. *Mimosa kalunga*, a dwarf pachycaul subshrub. B–C. *Mimosa pseudosetosae* a prostrate subshrub growing from a xylopodium: detail of inflorescence (B) and habit (C). D–E. *Mimosa pycnocomma*, a pachycaul rosette tree (D) with the capitula nestling within rosettes of ample leaves crowded at tips of branches (E).

morphological evidence suggests that series *Setosae* should be incorporated into *Pachycarpae*, as suggested by Bessega et al. (2008). However, formal reclassification must await ongoing efforts to integrate new phylogenetic data (Simon et al. 2009) with re-evaluation of key morphological characters (Simon et al. unpubl.), especially as many well-supported groups are likely to defy easy morphological definition due to the great variation in growth habit, leaf formula, indumentum and

armature that is apparent within many such clades (Barneby 1991).

TAXONOMIC TREATMENT

Mimosa kalunga M. F. Simon & C. E. Hughes, sp. nov.—TYPE: BRAZIL. Goiás: Cavalcante, Vila Engenho, caminho para cachoeira Santa Bárbara, campo-sujo, solo arenoso, 13°32' S 47°29' W, 1,070 m, 12 Oct 2002 (fl, fr), M. F. Simon 456 (holotype: UB; isotypes: CEN, FHO, K).

Mimosa pycnocomma Benth. similis sed frutice pumilo, ramulis juvenibus cum cortice persisti, pinnis (12–)15–21-jugis (non, ut in *M. pycnocomma*, plus quam 25-jugis), foliolis longissimis, pedunculis 4–8 cm longis, capitulis insuper foliis differt.

Unarmed, prostrate subshrub 20–50 cm with ascending stems, sometimes becoming a short-stemmed dwarf pachycaul shrub, the stem attaining a maximum of 8 cm diam (near the base), the crown of sparse irregular stout defoliate branches bearing a rosette of crowded microphyllous leaves and a short terminal pseudoraceme of globose capitula crowded at the tips of branchlets, the annottinous shoots 1–1.5 cm in diam, transversely ridged by leaf and stipule scars, the bark thick and slightly corky. Young leaves, peduncles and developing fruits densely lanate-silky with 8–12 mm long white or canescent ascending hairs. Stipules early deciduous, slender triangular or lanceolate 10–14 × 2.4 mm, externally densely covered with 4–6 mm long lanate hairs, internally glabrous with 7–10 weakly prominent longitudinal nerves. Leaves bipinnate, leafstalks 6–12 cm, petiole including broad pulvinus 1–2 cm long, the longer interpinna segments 0.7–1.3 cm,

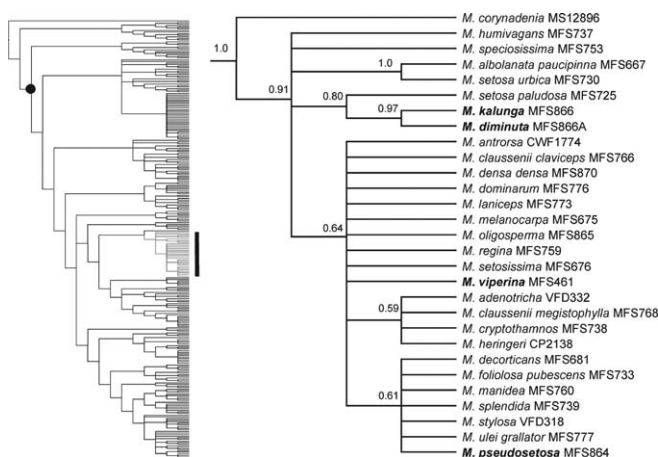


FIG. 2. Phylogeny of *Mimosa* based on sequences of the *trnD-trnT* noncoding plastid locus for 250 species of *Mimosa* (from Simon et al. 2009) showing the 50% majority-rule consensus tree from a Bayesian analysis (left). The *Setosae/Pachycarpae* clade highlighted in the large phylogeny and its sister species (*M. corynadenia* Britton & Rose) are shown in detail (right), with the new species described here in bold. Numbers above nodes correspond to posterior probability support values. The black circle in the left diagram represents the crown node of *Mimosa*.

interpinnal spicules absent; pinnae of larger leaves (6–)8–14 pairs, the rachis of longer pinnae 3.5–5(–6) cm, the longer interfoliolar segments 1.5–2 mm. Leaflets of longer pinnae (12–)15–21 pairs, linear-oblong, 5–7 × 1.5–2 mm, apex acute, margins setulose-ciliate, otherwise glabrous, venation scarcely visible above, midrib and one primary vein only below. Peduncles 4–8 cm long, densely setulose, capitula globose 12–15 mm in diam prior to anthesis. Floral bracts spatulate, 5 mm long, densely covered with 3–5 mm long basally dilated setulae dorsally, slightly exerted in bud, the young capitula cone-like. Flowers, 4-merous, 8-androus, the calyx pappiform, the setae 1.5–3 mm, the tube 0.7 mm irregularly and bluntly denticulate, pilosulous at the base with 0.5–1 mm setulae; corolla 4–5 mm, the narrow tube glabrous, the ovate concave 1-nerved lobes 0.5–1 mm, distally setulose; stamen filaments 10 mm long, pink. Pods 1–5 per capitulum, sessile, 2.5–3.5 × 0.8 cm, 4–5-seeded, linear-oblong, mucronate at apex, covered with dense fine setulae, breaking into 2–5 one-seeded segments to leave a persistent 1 mm wide, densely setulose replum; seeds round or ovoid 5 × 3.5 mm, the testa smooth, castaneous. Figure 3.

In campo sujo (shrubby grassland) on sandy soils just above 1,000 m, known only from the type locality about 26 km N of Cavalcante, northern Goiás, Brazil, where it is locally frequent. *Mimosa kalunga* grows in open vegetation dominated by grasses and other herbs, such as *Bulbostylis* spp. and *Rynchospora* spp. (Cyperaceae), with sparse small shrubs such as *Palicourea rigida* Kunth (Rubiaceae). Flowering October to March. Fruiting January to March.

Mimosa kalunga can be distinguished from other species of series *Pachycarpae* by a unique combination of characters, namely a prostrate or sometimes dwarf shrub habit associated with precocious flowering, lanate-silky indumentum

covering the leaves, peduncles and developing fruits, and a pod breaking into individual articles (craspedium), which is only known from a few species of series *Pachycarpae*. It resembles the poorly known and sympatrically occurring *M. pycnocoma* in many respects (pubescence, foliage, flower and pod dehiscence), but can be distinguished from that species by a persistent, as opposed to exfoliating epidermis, on the young branches; a prostrate/dwarf shrubby (Fig. 1a), as opposed to arborescent habit; smaller leaflets; and the arrangement of the inflorescence, with capitula on 4–8 cm long peduncles exposed above the leaves, rather than 3.5 cm long peduncles nestling within the dense foliage (Fig. 3 and see *M. pycnocoma* below). *Mimosa kalunga* can readily be distinguished from the other pachycaul rosette species of *Pachycarpae* with condensed foliate axes at the end of stout defoliate branches, such as *M. manidea* Barneby and *M. oedoclada* Barneby (this with similar leaf formula), by the reduced habit and the segmented pod which is unusual in this group of predominately valvately dehiscent species. Apart from *M. pycnocoma*, the only other species of *Pachycarpae* with the dense whitish or canescent lanate-silky indumentum on the young developing leaves and inflorescence is *M. laniceps* Barneby, which can be distinguished by valvately dehiscent pods, smaller and more numerous leaflets, and an arborescent, multibranching habit.

The species epithet refers to the Kalunga people, the descendants of nineteenth-century escaped slaves, who established several isolated communities in northern Goiás, and are still present in the region where *M. kalunga* grows.

Additional Specimens Examined—BRAZIL. Goiás: Cavalcante, Vila Engenho, caminho para cachoeira Santa Bárbara, campo-sujo, solo arenoso, 13°32' S 47°29' W, 1,070 m, 12 Oct 2002 (fl), *M. F. Simon* 451 (CEN, FHO, HUEFS, UB); Cavalcante, cerca de 30 km ao norte de Cavalcante, caminho para cachoeira Santa Bárbara, 13°32'27" S, 47°29'17" W, 1,060 m, 5 Jan 2007 (fl), *M. F. Simon* 866 (CEN, FHO, HUEFS, K, NY, UB).

The following key separates *M. kalunga* from other species of series *Pachycarpae* with lanate-silky indumentum:

1. Longer pinnae with 14–25(–30) pairs of small 2.5–4(–4.5) × 0.7–1 mm leaflets; pods valvately dehiscent. *M. laniceps* Barneby
1. Longer pinnae with (12–)15–21 pairs of larger 5–7 × 1.5–2 mm leaflets; pods breaking into individual articles. 2
2. Pachycaul rosette tree or arborescent shrub 2–3 m; epidermis of young branches exfoliating; inflorescences deeply nested within the foliage, peduncles 3.5 cm. *M. pycnocoma* Benth.
2. Prostrate subshrub with ascending stems or short-stemmed dwarf pachycaul shrub 20–50 cm; epidermis of young branches persistent; inflorescences exposed above the leaves, peduncles 4–8 cm. *M. kalunga* sp. nov.

Mimosa pseudosetososa M. F. Simon & C. E. Hughes, sp. nov.—
TYPE: BRAZIL. Goiás, Município de Cavalcante, Vila Engenho, caminho para cachoeira Santa Bárbara, campo sujo, solo arenoso, 13°32' S 47°29' W, 1,070 m, 12 Oct 2002 (fl, fr imm), *M. F. Simon* 453 (holotype: UB; isotypes: CEN, FHO, K).

Mimosa setosa Benth. similis sed pedunculis (4–)8–12 cm longis (non, ut in *M. setosa* subsp. *setosa*, 1.5–3.5(–6) cm longis), sine setae glandulosis, stipulis triangularibus dense setosis 4 mm latibus (non, ut in *M. setosa*, 0.8–2.5 mm latibus) differt.

Unarmed subshrubs growing from a xylopodium with procumbent woody shoots to 1 m, these with thick corky, horizontally or irregularly fissured bark, giving rise to pliantly humifuse herbaceous few-branched stems, these deeply tinged maroon and amply leafy from the base upwards to above middle, thence distally incurved or assurgent with leaf

development suppressed, the young developing leaves subtending long-pedunculate shortly ellipsoid capitula. Shoots, leafstalks, and peduncles densely rusty golden strigose or pilose with horizontal or weakly descending basally dilated 3–5 mm long rufous setae admixed with shorter sparse white hairs on leaf axes and peduncles, the leaflets short ciliolate with scattered longer setulae. Stipules triangular acuminate 10–12 × 4 mm, densely strigose dorsally with basally dilated setae, internally glabrous exposing 5 faintly prominent nerves. Leaf-stalks of fully expanded leaves 13–23(–28) cm long, but much shorter (9–13 cm) in younger individuals, the petiole (2–)3–5 cm, the rachis grooved adaxially with a continuous channel, longer interpinnal segments 0.8–1.5 cm, spicules ± 2 mm long, linear setulae present between each pair of pinnae. Pinnae of longer leaves (6–)10–19(–22) jugate, proximally decrescent, the pinnular rachis (3–)4–6(–7.5) cm, leaflets of longer pinnae (20–)23–29 pairs, linear-oblong, 1.5–2.5 × 6–8(–10) mm, acute at apex, asymmetric at base,

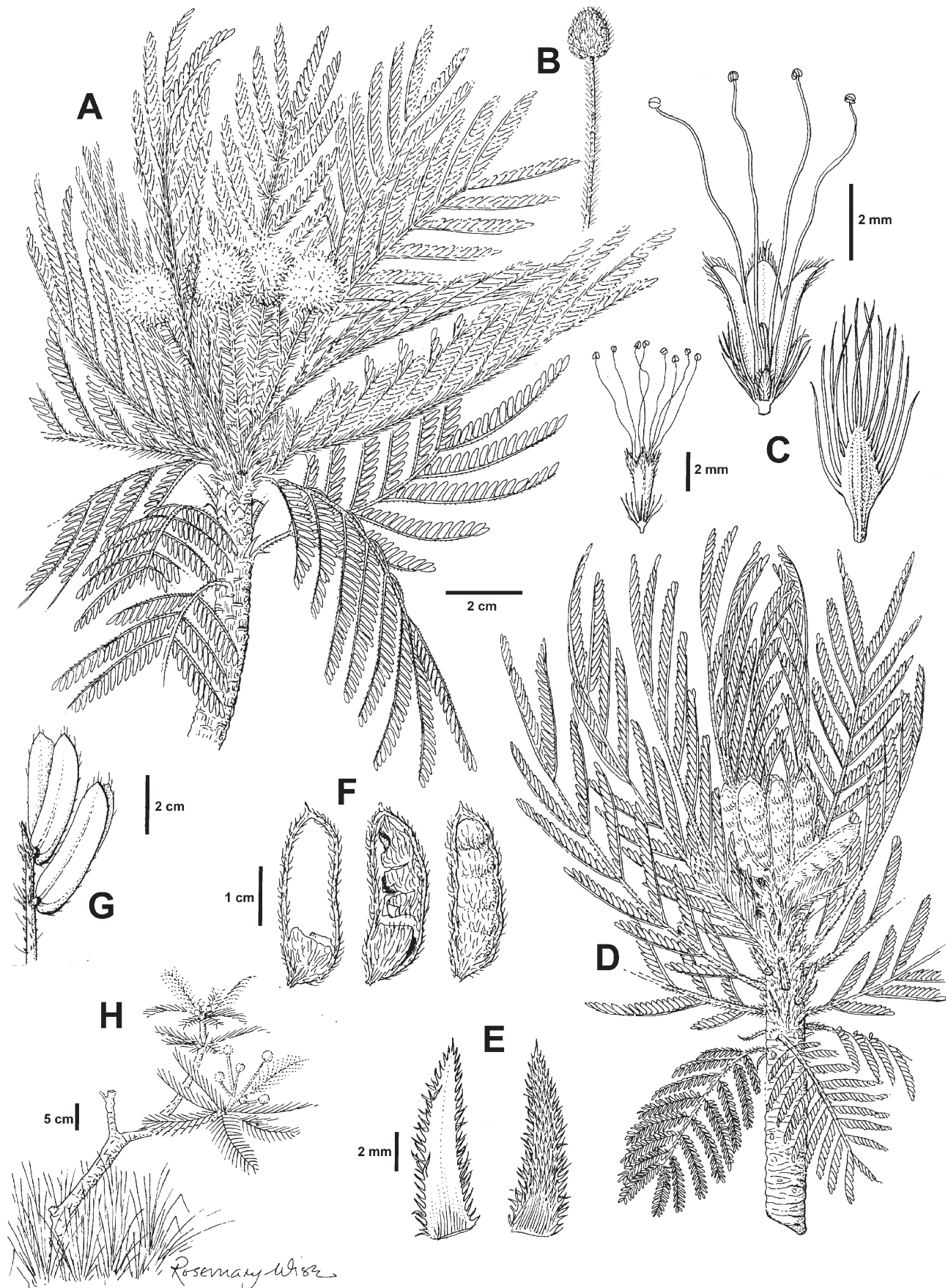


FIG. 3. *Mimosa kalunga* M. F. Simon & C. E. Hughes. A. Flowering branch. B. Unopened capitulum. C. Flower and bract. D. Fruiting branch. E. Stipule, ventral and dorsal views. F. Fruit. G. Detail of leaflets. H. Shrubby pachycaul habit found in some individuals. C and E from *M. F. Simon 456*, all the others from *M. F. Simon 451*.

the distal pair smaller with a rounded apex, glabrous and slightly lustrous on both faces, ciliate with minute hairs, and occasional sparse short setulae, faintly 3-nerved above, more prominently below, paraphyllidia absent. Peduncles in fascicles of 1–2(–3) in axils of young developing leaves, (4–)8–12 cm, capitula prior to anthesis conelike with shortly emergent bracts, these lanceolate 1–2 × 4–6 mm, dorsally densely covered with ± 1.5 mm long setulae, the capitula shortly ellipsoid at anthesis, 2 cm diam excluding filaments. Flowers 4-merous 8-androus, calyx pappiform to 1 mm, externally glabrous, setose ciliate to 1 mm, corolla 4–6 mm long, petals 1-nerved, glabrous except on ovate concave lobes where thinly villosulous distally. Filaments ± 1.5 m long when exerted, pink, united at base to 0.5 mm, ovary thinly pilose to 2 mm. Fully developed pods not known, but early developing ones densely covered with basally dilated setae. Figure 4.

In campo sujo on sandy soils around 1,000 m, locally abundant at type locality in the municipality of Cavalcante, where it grows in open vegetation dominated by grasses and is sympatric with *M. oligosperma* Barneby, *M. gracilis* Benth var. *invisiformis* Barneby and *M. diminuta* (see below). A second population, also forming a large stand (Fig. 1c), was found on the roadside between Teresina and Alto Paraíso (40 km directly SE of the type locality), which suggests that the species is more widespread in the region. Flowering October to March. Fruiting unknown.

Mimosa pseudosetososa resembles unarmed members of the *M. setosa* complex in habit, setose indumentum, foliage and leaf formula, and also in having interpinnal spicules. It differs from *M. setosa* in the longer peduncles of (4–)8–12 cm (not 1.5–3.5(–6) cm); the absence of glandular setae (although *M. setosa* subsp. *urbica* has eglandular indumentum) and in large, trian-

gular, 4 mm wide, densely setose stipules. The dense covering of brownish setae on the immature pods of *M. pseudosetososa* suggests affinity with members of ser. *Pachycarpae* although mature fruits are still needed to clarify this. Given the marked differences, *M. pseudosetososa* is described as a distinct species, rather than as a variety of *M. setosa*. This decision is reinforced by preliminary evidence that suggests that the *M. setosa* complex may itself be polyphyletic and represent several distinct species (Fig. 2). In habit, *M. pseudosetososa* resembles the humifuse members of ser. *Pachycarpae*, *M. humivagans*, *M. lithoreas* Barneby, *M. prorpens*, and *M. pseudofoliola* Barneby. However, *M. pseudosetososa* can be distinguished from these four species by the presence of interpinnal spicules on the leaf rachis, longer peduncles (except the allopatric *M. lithoreas* which has peduncles up to 7.5 cm), and larger leaves. *Mimosa pseudosetososa* and *M. albolanata* overlap in leaf formula and prostrate habit, but the latter produces a long pseudoraceme (20–100 cm) bearing capitula on much shorter peduncles. Once again, these inconsistencies and overlapping characters between *Setosae* and *Pachycarpae* are indicative of the non-monophyly of these two series which are better treated as a single group. Apparently abnormal inflorescences have been noted on some individuals in the field, with clustered sessile capitula instead of a pseudoraceme with the characteristic long peduncles.

The epithet refers to the close resemblance of *M. pseudosetososa* to *M. setosa*.

Additional Specimens Examined—BRAZIL. Goiás: Cavalcante, cerca de 30 km ao norte de Cavalcante, caminho entre Vila Engenho e cachoeira Santa Bárbara, 13°32'27" S, 47°29'17" W, 1,050 m, 5 Jan 2007 (fl), *M. F. Simon* 864 (CEN, FHO, HUEFS, K, UB); Alto Paraíso, 50 km ao norte de Alto Paraíso rumo à Teresina de Goiás, 13°50' S, 47°15' W, 1,000 m, 7 Jan 2007 (fl), *M. F. Simon* 871 (FHO, UB); Município de Cavalcante, estrada de chão entre Cavalcante e Araí, 13°35'59" S, 47°31'30" W, 1,190 m, 13 Apr 2004 (fl) *R. C. Mendonça et al.* 5528 (IBGE, UB).

The following key separates *M. pseudosetososa* from unarmed species of series *Pachycarpae* and *Setosae* with interpinnal spicules:

1. Stipules barbate with 6–12 mm-long orange-red setae. 2
2. Erect pachycaul treelets 1–2 m. *M. splendida* Barneby
2. Acaulescent or prostrate shrubs with leaves and peduncles arising from ground level. *M. irwinii* Barneby
1. Stipules strigose or pilose with pallid, yellowish, or bronze setae almost always less than 6 mm, sometimes glabrate. 3
3. Corolla lobes glabrous externally. 4
4. Shrubs branched, 1.5–5 m tall, Serra do Espinhaço, Minas Gerais. *M. maguirei* Barneby
4. Subshrubs wandlike, with basal leaves and distally efoliate stems, central Goiás. *M. ulei* Barneby
3. Corolla lobes hispidulous, setulose or glandular-setulose externally. 5
5. Habit of pachycaul treelets 2–3 m. *M. dominarum* Barneby
5. Habit variable, but usually subshrubs and shrubs less than 2 m. 6
6. Peduncles 1.5–3.5(–6) cm, glandular setae present (except in *M. setosa* subsp. *urbica*), stipules lanceolate-attenuate or rarely ovate-acuminate 4–11(–15) × 0.8–2(–2.5) mm. 7
7. Calyx-tube externally glabrous, the rim ciliate; articles at middle of craspedium 3–6 mm long; flowering primarily in September–March; unarmed subsp. of *M. setosa* Benth.
7. Calyx-tube densely setulose externally as well as ciliate; articles at middle of craspedium 6–11 mm long; flowering primarily in May–July. *M. melanocarpa* Benth.
6. Peduncles (4–)8–12 cm, glandular setae absent, stipules triangular acuminate 10–12 × 4 mm. *M. pseudosetososa* sp. nov.

Mimosa viperina M. F. Simon & C. E. Hughes, sp. nov.—
TYPE: BRAZIL. Goiás, Município de Cavalcante, estrada 60 km ao norte de Cavalcante em direção à cachoeira do Prata. Campo sujo sob solo encharcado, 13°25' S 47°39' W, 1,077 m, 3 Mar 2003 (fl, fr), *M. F. Simon* 461 (holotype: UB; isotypes: CEN, FHO, HUEFS, NY, K).

Species habitibus humifusis, pinnis plerumque 3-jugis, pedunculis longis et corollis strigosis dense a conge-

neribus diversa. Foliorum *Mimosa ulei* Taub. et *M. nitens* Benth., a *M. ulei* caulibus humifusis et petiolis espiculatis differtibus, a *M. nitens* caulibus humifusis et inflorescentiis longis efoliatis differtibus.

Unarmed ample-leaved functionally herbaceous trailing subshrub with pliantly humifuse linear few-branched stems from a xylopodium, the inflorescences in fascicles of long-pedunculate capitula in axils of coevally developing leaves,

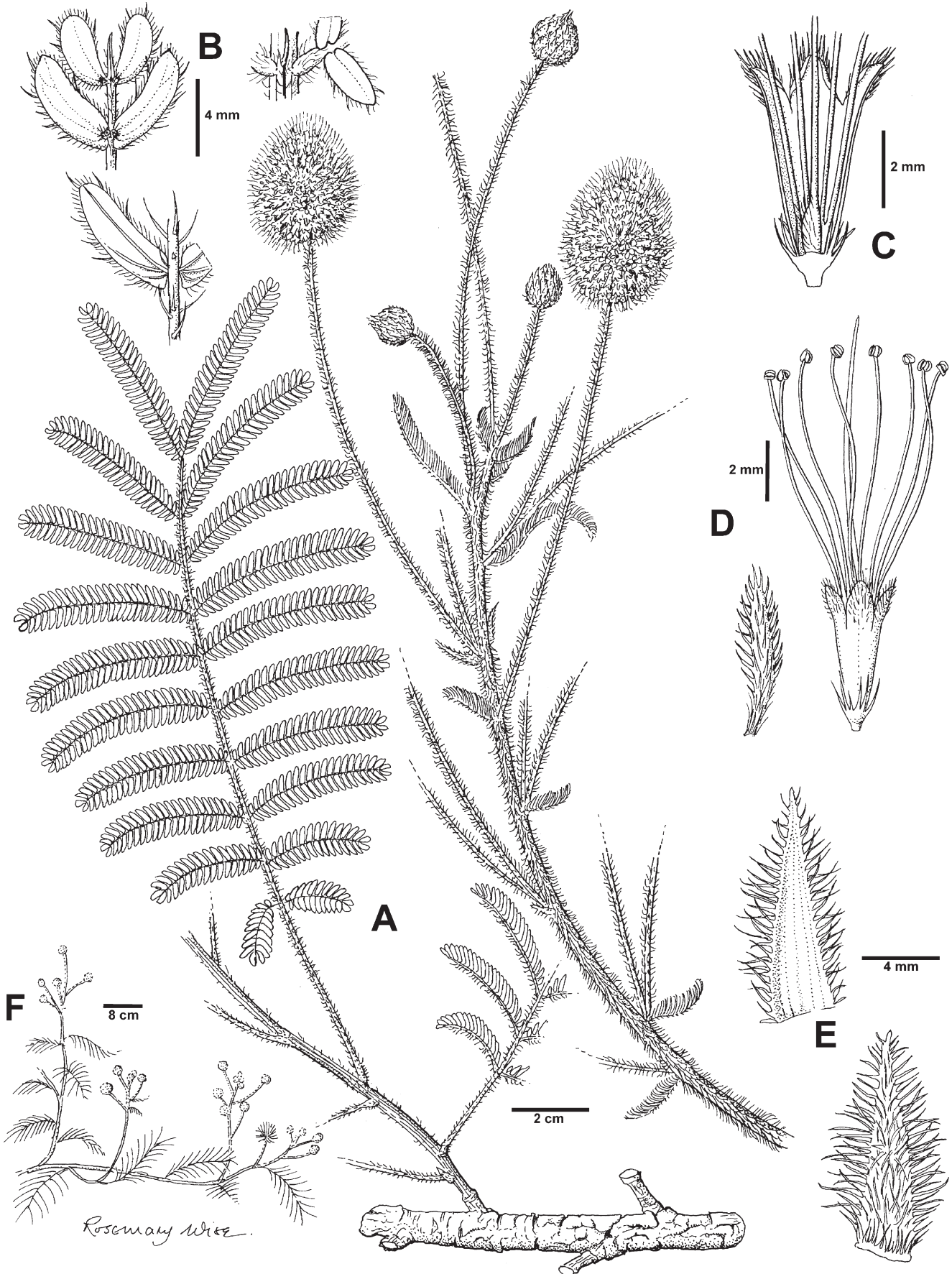


FIG. 4. *Mimosa pseudosetosa* M. F. Simon & C. E. Hughes. A. Flowering branch. B. Leaflets and details of the interpinnal spicule. C. Longitudinal section of flower. D. Flower and bract. E. Stipule, ventral and dorsal views. F. Habit. All from M. F. Simon 453.

erect and held above foliage, the shoots, leafstalks, and peduncles densely hispid with spreading or weakly retrorse, orange-brown, basally slightly dilated, setae 4–6(–8) mm long, admixed with minute white pubescence on younger shoots. Stipules persistent, triangular acuminate, sometimes ovate, papery 3–4 × 10–15 mm, dorsally densely covered with appressed ± 4 mm setae, glabrous and slightly glossy within, striate with 6–10 weakly visible parallel veins, sometimes glabrous on both faces, occasionally bifid, splitting from the middle of the blade. Leafstalks of larger leaves (5–)8–13(–20) cm long, including a (5.5–)6–7.5(–9.5) cm long petiole, the pulvinus marked, drying livid blackish, the rachis deeply grooved adaxially with a continuous channel, ending in a setulose linear 7–9 mm spicule, the longer interpinnal segments 2–3.5 cm, spicules absent. Pinnae of most leaves 3-jugate, exceptionally 4, the rachis (6–)9–13(–19) cm, including a markedly livid setose pulvinule, the longer interfoliolar segments 4–5(–9) mm, the first pair ± 3 mm distant from the minute 1 mm long linear paraphyllidia. Leaflets (18–)20–25(–27)-jugate, linear oblong, apex acute, base asymmetrical, 9–15(–20) × 3–5(–7) mm in fully developed leaves, essentially glabrous and lustrous on both faces, sparsely ciliolate with short setulae and minute hairs, 4–6-veined on abaxial face, the pulvinules dark blackish on dried material and setulose. Peduncles (5–)7–10(–14) cm, (1–)2 in axils of coevally developing leaves, the leaves fully developed only after anthesis, capitula excluding filaments 0.8–1 cm diam, prior to anthesis conelike due to the prominent exerted bracts subtending flowers, these rhombic-obovate, 2 × 6 mm, margins and dorsal face densely covered by ± 2 mm long setulae, internally glabrous, weakly striate. Flowers 4-merous, 8-androus; calyx tube irregularly denticulate, to 1 mm, the rim ciliolate with uneven setulae to 1–1.4 mm long; corolla 3–5 mm, petals united into a tube to 3 mm, both tube and lobes externally strigose with yellowish setulae, lobes ovate concave, 1-, or sometimes clearly 3-nerved (only visible on the inside), stamen filaments 10–13 mm long, pink, monadelphous through ± 1 mm around the base of ovary, staminate flowers frequent. Pods 1–2 per capitulum, sessile or subsessile, oblong-elliptic, 4–5(–6) × 1–1.5 mm, apex mucronate to ± 2 mm long, probably breaking entire into flat 2 mm thick valves although fully mature pods not seen, the 1 mm wide replum straight or sometimes shallowly indented between seeds, the whole pod hispid when immature, apparently becoming puberulent when ripe, 6–8-seeded, the seeds ovoid, 6 × 3–4 mm, pleurogram nearly complete, dark brown. Figure 5.

In campo sujo on sandy seasonally flooded soils around 1,000 m, known only from the type collection near Rio Prata, a small tributary of the Tocantins river, ca 50 km NW of Cavalcante, Goiás, Brazil. Although known from just a single locality, *M. viperina* is locally frequent in open vegetation dominated by grasses and small shrubs, including several sympatric species of *Mimosa*, such as *M. adenophylla* Taub., *M. clausenii*, and *M. foliolosa*. Flowering in March, possibly following the rainy season.

The placement of *M. viperina* within the series *Setosae* and *Pachycarpae* clade (Fig. 2) confirms its affinities to section *Habbasia*. The one to three faintly nerved corolla lobes could suggest placement in series *Bipinnatae*, where one species with valvate pod dehiscence, *M. brachycarpa* Benth., is already known. However, the affinities of *M. viperina* to members of the combined *Setosae/Pachycarpae* clade is strongly supported by a set of characteristics that are not uncommon in these groups, such as a humifuse habit, setose indumentum, large capitula and flowers, triangular stipules, and the wide pod. This distinctive mimosa can be readily recognized by a combination of humifuse habit, ample leaves with only three pairs of pinnae and relatively large leaflets, long peduncles, and a densely strigose corolla. The foliage of *M. viperina* resembles *M. ulei* Taub. and *M. nitens* Benth. However, *M. viperina* is easily distinguished from *M. ulei* by its prostrate humifuse, as opposed to upright wand-like shrubby habit, and by the lack of interpinnal spicules. It also differs in habit from *M. nitens*, which is an erect subshrub. From the other *Pachycarpae* species with humifuse habit (including *M. pseudosetosae* described here), *M. viperina* can be immediately distinguished by its distinctive leaves with just three pairs of pinnae and a strigose corolla. *Mimosa viperina* also shares similarities in pubescence and pod characters with some varieties of the *M. setosa* complex, but differs in having broader stipules, leaves with fewer pairs of pinnae, and larger leaflets. A similar habit, long peduncles, and few pinnae are also present in members of section *Mimosa* such as *M. procurrentis* Benth. (subser. *Hirsutae* (Benth.) Barneby) and *M. flagellaris* Benth. (subser. *Pedunculosae* (Benth.) Barneby), but all of these differ from *M. viperina* in having haplostemonous flowers, suggesting independent derivation of this combination of characters.

The epithet refers to the procumbent habit of the plant, and the long slender stems that weave their way through the grass like a snake.

The following key separates *M. viperina* from other humifuse subshrub members of series *Pachycarpae*:

1. Corolla lobes glabrous externally. *M. lithoreas* Barneby
1. Corolla lobes hispidulous or setulose externally. 2
2. Leaves with only 3(–4) pairs of pinnae, leaflets of fully developed leaves 9–15(–20) × 3–5(–7) mm. *M. viperina* sp. nov.
2. Leaves with more than seven pairs of pinnae, leaflets of fully developed leaves not larger than 10 × 2 mm. 3
3. Peduncles 7.5–12 cm. 4
4. Habit diminutive, the shoots just 12–16 cm long; leaves crowded towards tips of short axes, internode segments reduced to < 1 cm, leafstalks of larger leaves (4–)5–8(–9.5) cm, longer interpinnal segments 7 mm. *M. diminuta* sp. nov.
4. Habit a subshrub with procumbent woody shoots to 1 m; leaves evenly spaced along shoots; leafstalks of larger leaves 13–23(–28) cm long, longer interpinnal segments 0.8–1.5 cm. *M. pseudosetosae* sp. nov.
3. Peduncles not over 5.5 cm. 5
5. Leaves petiolate, the petiole including pulvinus 4–11 mm; leaflets of longer pinnae 26–50 pairs; capitula excluding filaments 8–10 mm diam *M. prorepens* Barneby
5. Leaves subsessile, the petiole including pulvinus 1.5–3.5 mm; leaflets of longer pinnae 10–18 pairs; capitula excluding filaments 4–7 mm diam 6
6. Gland-tipped setae of stems 0.8–1 mm; leaf-formula xii–xvii/14–18; rachis of longer pinnae 7–10 mm and largest leaflets less than 2 mm *M. pseudofoliolosa* Barneby
6. Gland-tipped setae of stems absent or less than 0.5 mm; leaf-formula vii–xii/10–15; rachis of longer pinnae 13–21 mm and largest leaflets 3–5 mm *M. humivagans* Barneby

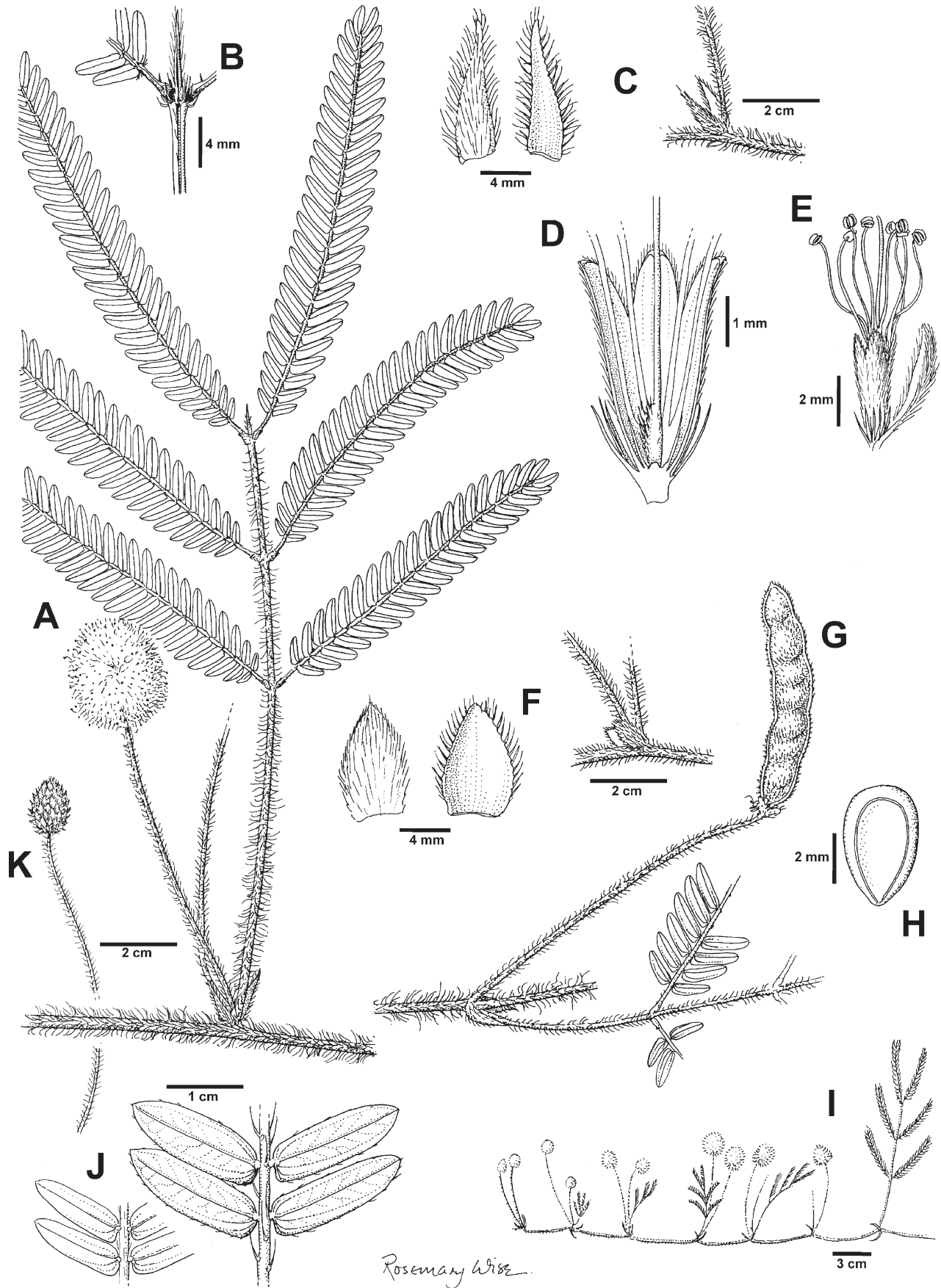


FIG. 5. *Mimosa viperina* M. F. Simon & C. E. Hughes. A. Flowering branch (mid stem). B. Detail of leaf rachis and paraphyllidia. C. Narrow stipules (dorsal and ventral views) and detail of leaf node. D. Longitudinal section of flower. E. Flower and bract. F. Broad stipules (dorsal and ventral views) and detail of leaf node. G. Fruit. H. Seed. I. Habit. J. Detail of leaflets. K. Unopened capitulum. All from *M. F. Simon 461*.

Mimosa diminuta M. F. Simon & C. E. Hughes, sp. nov.—
TYPE: BRAZIL. Goiás, Município de Cavalcante, cerca de 30 km ao norte de Cavalcante, caminho entre Vila Engenho e cachoeira Santa Bárbara. Campo sujo sob solo arenoso escuro, 13°32'27" S 47°29'17" W, 1,060 m, 5 Jan 2007 (fl, fr), M. F. Simon 866A (holotype: UB; isotype: FHO).

Mimosa rava Barneby similis sed habite pumilo prostrato, foliis aggregatis apice, internodiis brevibus, rhachidibus 5–8 cm longis (non, ut in *M. rava*, 2–5.5 cm longis), pinnis (6–)7–8(–10)-jugis (non, ut in *M. rava*, 4–7-jugis), foliolis glabris, pedunculis 7.5–9 cm longis (non, ut in *M. rava*, 2–4 cm longis), leguminibus 4–5-seminalis (non, ut in *M. rava*, 9–12-seminalis) differt.

Dwarf unarmed subshrubs, arising from a xylopodium, the shoots 12–16 cm long and less than 5 mm in diam, woody at base, shoots unbranched, horizontal but weakly ascending towards the tips, the whole plant just 15–20 cm tall, the long-pedunculate capitula held ± erect above foliage in axils of coevally developing or fully developed leaves, the leaves crowded at shoot tips, the older leaf and pinnular rachis marcescent after leaflets fall leaving distinctive skeletal remains. The stems, leafstalks, peduncles, and pods densely strigose with slender, basally dilated setae, 2–4(–7) mm long, 0.1–0.3 mm in diam at base, erect or weakly retrorse golden or rusty orange-brown, these sometimes bifid or trifid, mixed with minute inconspicuous glandular stipitate hairs to ± 0.2 mm. Stipules narrowly lanceolate-acuminate, long-pointed, 7–9 (–11.5) × 1.5–2 mm, dorsally densely strigose and with minute glandular hairs, persistent. Foliage dense, crowded towards tips of short axes, internode segments reduced to < 1 cm, leafstalks of larger leaves (4–)5–8(–9.5) cm, the petiole 5–10 mm, or sometimes absent, the longer interpinnal segments 7 mm, spicules absent; pinnae (6–)7–8(–10)-jugate, markedly acresent distally, rachis of longer pinnae 3.5–4.5 cm, the first pair of pinnae about half of the length of the longer middle ones, paraphyllidia absent; leaflets 26–34 pairs per pinnae (fewer in the first pinnae pairs), oblong, 3.5–5 × 1.5–2 mm, slightly asymmetric, essentially glabrous on both faces except for scattered submarginal setulae on abaxial side, long ciliolate with 1–2 mm setulae and minute hairs, brightly glossy above, faintly 2-nerved below. Inflorescence of solitary, axillary, globose capitula, the stout peduncles 7.5–9 cm long, 2 mm in diam, bracts spatulate, 5–6 × 1.5 mm (without setulae), dorsally covered with 3.5 mm long pale cream-white setulae, striate within, exerted to form conelike capitula in bud. Flowers (described from annotinous remnants) 4-merous, 8-androus, often marcescent around base of capitula as pods develop; diminutive pappiform calyx to ± 0.5 mm, with fine setae ± 1 mm, corolla 4–5 mm, the lobes ovate concave, weakly setulose dorsally, petals 1-nerved. Filaments 10–12 mm long, probably pink, monadelphous to 0.5 mm. Pods sessile, 1–3 per capitulum, 4–5-seeded, linear-oblong, long-acuminate with a 4 mm mucro at apex, the margins almost straight with minimal indentation, 4 × 0.6–0.8 cm, the valves stout and densely hispid, the replum 1.1–1.5 mm wide also densely hispid, valvately dehiscent. Seeds not seen. Figure 6.

In sandy soils in open campo sujo vegetation, apparently rare and highly localized as it is known only from the type locality near Cavalcante, Goiás. *Mimosa diminuta* is found in the same habitat as *M. pseudosetosa* (see above), where they grow in sympatry. However, *M. diminuta* appears to be rarer,

since only two individuals have been found and collected. Fruiting all year.

The valvately dehiscent pods suggest placement in series *Pachycarpae* and this is confirmed in the molecular phylogeny where *M. diminuta* is placed as sister to *M. kalunga* within the combined *Pachycarpae/Setosae* clade (Fig. 2). These species differ fundamentally in habit and leaf formula, with *M. diminuta* a dwarf subshrub having more numerous leaflets per pinnae, and fewer pairs of pinnae per leaf (see descriptions above). Other *Pachycarpae* of similar habit differ in leaf formula and in lacking the crowded leaves, which confer a densely foliate appearance to *M. diminuta*. In foliage, flowers and pods, *M. diminuta* most closely resembles *M. rava* Barneby (a narrowly-restricted endemic from the Distrito Federal, 300 km to the south), but can be clearly distinguished by the dwarf prostrate habit (*M. rava* is an erect shrub to 50 cm tall), the foliage densely crowded at shoot tips with very short internode segments, larger leaves (leafstalks 5–8 cm as opposed to 2–5.5 cm) more pinnae per leaf (7–8 as opposed to 4–7), glabrous as opposed to softly pubescent leaflets, longer peduncles (7.5–9 cm as opposed to 2–4 cm), and fewer seeds per pod (4–5 as opposed to 9–12). Together with the putatively closely related *M. aurirebis* Barneby, these three species, all narrowly restricted Cerrado endemics known only from their type collections, apparently form a small alliance separated essentially by habit and leaf differences. The poorly known *M. diminuta* deserves further field studies in order to improve our understanding of the morphological range of this species.

The epithet refers to the reduced stature of *M. diminuta* plants, which like *M. pumilio* Barneby, *M. longipes* Benth. and *M. demissa* Barneby form diminutive subcaulescent endemic subshrubs from the Chapada dos Veadeiros region in northern Goiás.

See key above to separate *M. diminuta* from its closest congeners.

MIMOSA PYCNOCOMA Benth., J. Bot. (Hooker) 4: 405. 1842.—
TYPE: Serra do S. Felix prope Rio Trahiras, Pohl 1819 (K).

Mimosa pycnocoma has long been known only from the type collection. The species was rediscovered and recollected at the same locality in 2007 [BRAZIL. Goiás: Cavalcante, cerca de 30 km ao norte de Cavalcante, caminho entre Vila Engenho e cachoeira Santa Bárbara, 13°32'42" S, 47°29'03" W, 1,060 m, 5 Jan 2007 (fl, fr), M. F. Simon 868 (UB, FHO, CEN, K, HUEFS).], 188 yr after its first collection. The new material was compared with the type at K. The species was described by Benthham in 1842, and although subsequently equated with *M. clausenii* (Benthham 1875), the status of *M. pycnocoma* as a distinct species was confirmed by Barneby (1991) who provided a detailed description. However, key features of the habit, pod and seeds were unknown to Benthham and Barneby. These are described here and the species is illustrated for the first time (Fig. 7).

Mimosa pycnocoma is, as predicted by Barneby (1991), a small tree. It forms small pachycaul rosette trees or arborescent shrubs to 2–3 m height with a blackish trunk to 10 cm diam and a ± symmetrical crown formed of stout whorled ascending leafless candelabriform branches 4–7 cm in diam (Fig. 1d), the crowded pseudoraceme of subglobose capitula nestling within rosettes of ample leaves crowded at tips of the branchlets, the stems with epidermis sometimes exfoliating in pieces to expose a reddish-brown underbark. The leaf formula of the specimen collected is xi–xvii/14–21. Pods few per capitulum,

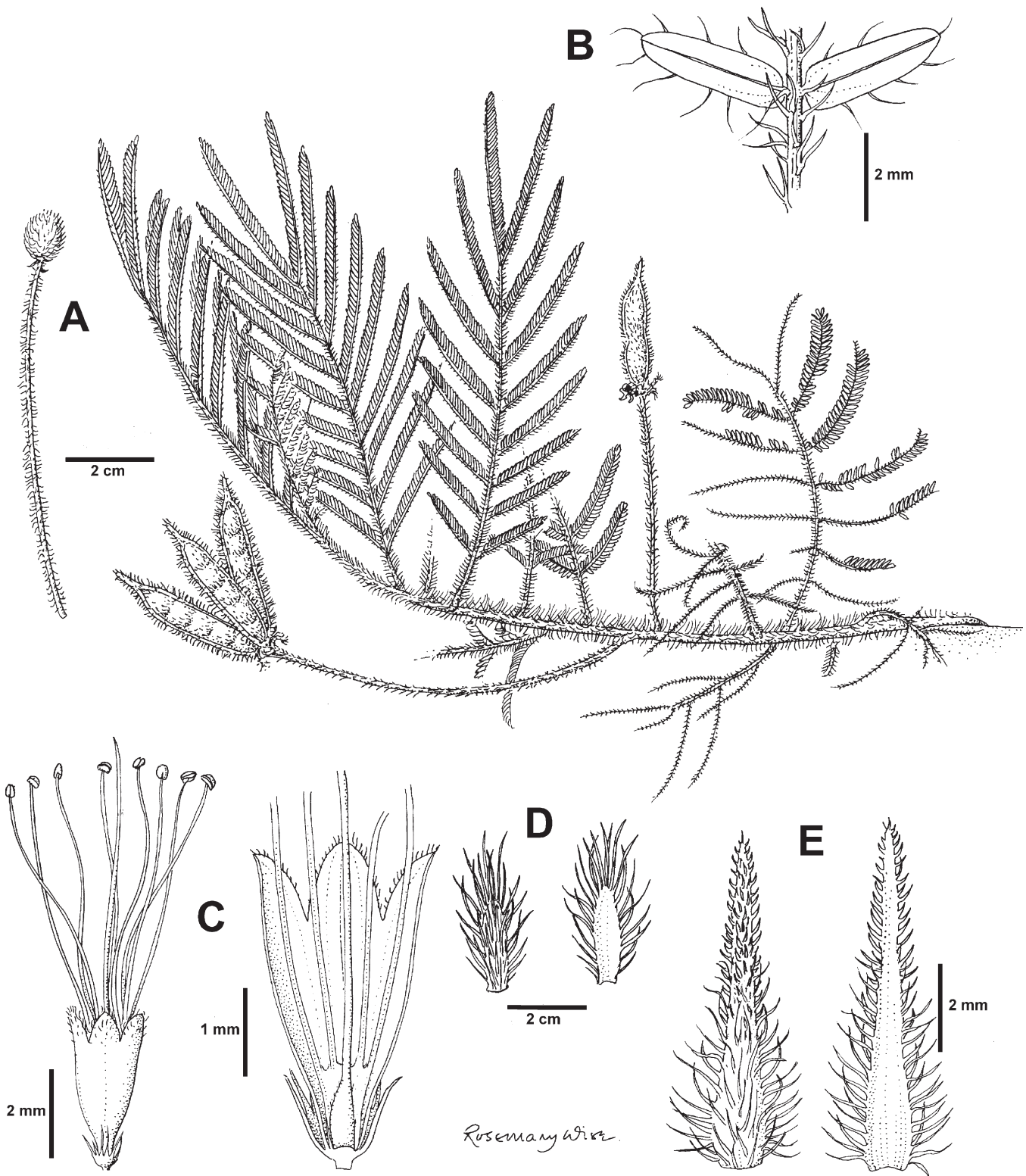


FIG. 6. *Mimosa diminuta* M. F. Simon & C. E. Hughes. A. Habit of an individual in fruit, and unopened capitulum. B. Detail of leaflets and pubescence. C. Flower. D. Bract, dorsal and ventral views. E. Stipule, dorsal and ventral views. All from M. F. Simon 866A.

sessile, 2.5–4.1 × 0.7 cm, 2–4-seeded, linear-oblong, contracted distally into a 4–5 mm cusp, covered with dense fine basally dilated setulae, sometimes breaking into 2–4 one-seeded membranous < 1 mm thick segments, leaving a persistent 0.8 mm wide, densely setulose replum; seeds round ovoid 5 × 4 mm, the testa smooth light brown.

The habit of *M. pycnocomma* is strongly reminiscent of several other *Pachycarpae*, notably *M. oedoclada*, *M. manidea*, *M. clausenii* var. *claviceps* Barneby, *M. dominarum* Barneby, *M. regina* Barneby and *M. splendida* Barneby in their similarly stout branches, and *M. capito* Barneby in the arrangement of the capitula. The capitula of *M. pycnocomma* are so deeply nested in

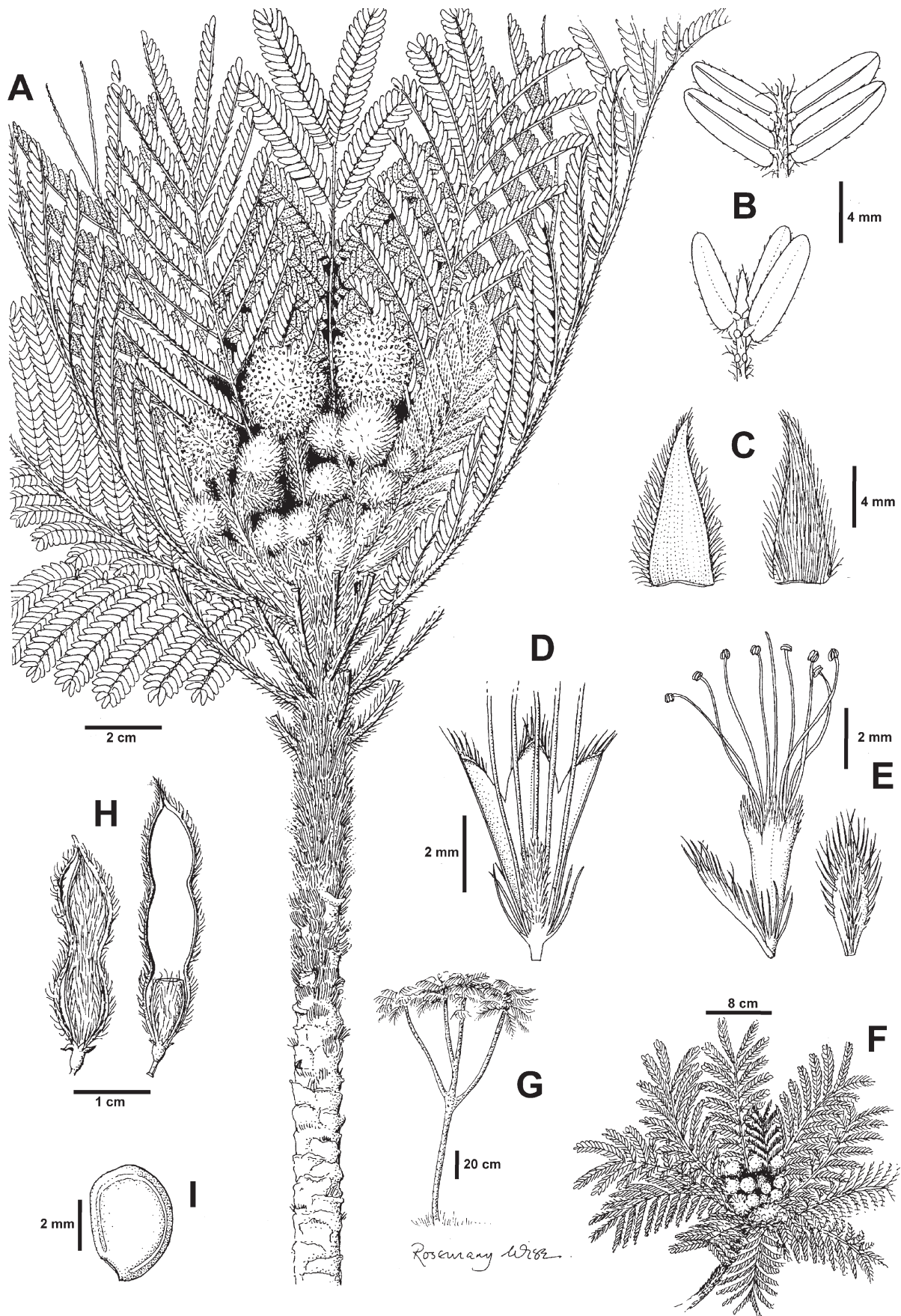


FIG. 7. *Mimosa pycnoma* Benth. A. Flowering branch. B. Detail of leaflets. C. Stipule, ventral and dorsal views. D. Longitudinal section of flower. E. Flower and bract. F. View of a flowering branch from above, showing the inflorescences nested within the foliage. G. Habit. H. Fruit. I. Seed. All from *M. F. Simon 868*.

the terminal rosette of ample leaves as to remain largely invisible to the casual observer (Figs. 1e and 7f). This concealment of the flowers may explain in part why this species remained uncollected for 188 yr since the first collection. However, it is also clear that this part of Goiás is severely under-collected and that this species is almost certainly very narrowly restricted in distribution. It grows on gentle slopes of cerrado with rock outcrops, with few other species of shrubs and small trees (*Vellozia* spp., *Mimosa oligosperma*, and *Vochysia* spp.).

Although *M. pycnocomma* is strongly reminiscent of the other pachycaul rosette trees of series *Pachycarpae* and undoubtedly has affinities to those species, it does not have the valvately dehiscent pods typical of that group. The pods of *M. pycnocomma* (described here from remnants of the previous season) have a narrow (< 1 mm wide) replum and valves that at least partially break up into one or more segments. Unfortunately, attempts to extract DNA from silica-dried leaf material of this species always produced unexpectedly poor quality DNA.

ACKNOWLEDGMENTS. We thank Rosemary Wise for the illustrations and Carolyn Proença (UB) for her kind support, and two reviewers and the editor for helpful comments on the manuscript. The Brazilian Institute for the Environment (IBAMA) provided authorization for this research project (n. 02001.007621/2005). MFS thanks the Clarendon Fund, Wolfson College, and the Systematics Association for financial support during his D.Phil. at the University of Oxford. CEH was supported by the Royal Society.

LITERATURE CITED

- Barneby, R. C. 1991. *Sensitivae censitae: a description of the genus Mimosa Linnaeus (Mimosaceae) in the New World. Memoirs of the New York Botanical Garden* vol. 65. New York: New York Botanical Garden.
- Barneby, R. C. 1993. Increments to the genus *Mimosa* (Mimosaceae) from South America. *Brittonia* 45: 328–332.
- Barneby, R. C. 1997. Toward a census of genus *Mimosa* (Mimosaceae) in the Americas: a new species from Mexico (Baja California Sur) and two from planaltine Brazil (Goiás, Minas Gerais). *Brittonia* 49: 452–457.
- Bentham, G. 1875. Revision of the suborder Mimosae. *Transactions of the Linnean Society London* 30: 335–664.
- Besega, C., H. E. Hopp, and R. H. Fortunato. 2008. Toward a phylogeny of *Mimosa* (Leguminosae: Mimosoideae): a preliminary analysis of southern South American species based on chloroplast DNA sequence. *Annals of the Missouri Botanical Garden* 95: 567–579.
- Frodin, D. G. 2004. History and concepts of big plant genera. *Taxon* 53: 753–776.
- Munhoz, C. B. R. and J. M. Felfili. 2006. Floristics of the herbaceous and subshrub layer of a moist grassland in the Cerrado biosphere reserve (Alto Paraíso de Goiás), Brazil. *Edinburgh Journal of Botany* 63: 343–354.
- Queiroz, L. P. and G. P. Lewis. 1999. A new species of *Mimosa* L. (Leguminosae: Mimosoideae) endemic to the Chapada Diamantina, Bahia, Brazil. *Kew Bulletin* 54: 983–986.
- Simon, M. F. and C. Proença. 2000. Phylogeographic patterns of *Mimosa* (Mimosoideae, Leguminosae) in the Cerrado biome of Brazil: an indicator genus of high-altitude centers of endemism? *Biological Conservation* 96: 279–296.
- Simon, M. F. and J. D. Hay. 2003. Comparison of a common and rare species of *Mimosa* (Mimosaceae) in Central Brazil. *Austral Ecology* 28: 315–326.
- Simon, M. F. and M. F. Amaral. 2003. *Mimosa splendida* Barneby (Mimosoideae, Leguminosae) rediscovered in Central Brazil: preliminary studies for conservation of a rare species. *Revista Brasileira de Botânica* 26: 93–96.
- Simon, M. F., R. Grether, L. P. Queiroz, C. Skema, R. T. Pennington, and C. E. Hughes. 2009. Recent assembly of the Cerrado, a neotropical plant diversity hotspot, by in situ evolution of adaptations to fire. *Proceedings of the National Academy of Sciences USA* 106: 20359–20364.