



# Synoptic revision of *Stenanona* (Annonaceae)

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## Key words

Annonaceae  
conservation  
Neotropical  
*Stenanona*  
taxonomy

**Abstract** Preparation of a treatment of the *Annonaceae* for the Flora Mesoamericana necessitates the description of five new species of *Stenanona* (*S. carrillensis*, *S. hondurensis*, *S. monticola*, *S. tuberculata* and *S. tubiflora*); three additional new species are described from Colombia (*S. columbiensis* and *S. narinensis*) and Mexico (*S. wendtii*). A key to the 14 recognized species in the genus is presented, as well as notes on potential relationships, distribution, and conservation status.

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## INTRODUCTION

The genus *Stenanona* was described by Standley in 1929 to accommodate the unusual petal morphology of a species from Panama. The long, narrow petals with a drawn-out, caudate apex were unlike those of any other Neotropical *Annonaceae* known at that time. Fries (1931) re-examined the material during the course of his revisions of the genera of *Annonaceae*, augmenting the original description substantially to include partial fusion of the petals and a deltoid, tongue-like connective apex as important generic features. Fries's subsequent description in 1941 of a second species of *Stenanona* from Costa Rica was in full agreement with his initial generic conception, as reflected ultimately in his synthesis of the family *Annonaceae* for Die Natürlichen Pflanzenfamilien (Fries 1959). However, examination of recent collections from Colombia, Costa Rica, Honduras, Mexico, and Panama, as well as re-evaluation of three species assigned to the purportedly related genera *Desmopsis* Saff., *Sapranthus* Seem., and *Reedrollinsia* J.W.Walker, has resulted in a new, expanded generic concept (Schatz 1987), with the three species subsequently transferred to *Stenanona* (Schatz in Maas et al. 1994). With the description of a flagelliflorous species of *Stenanona* from Mexico (Schatz & Wendt 2004), and the description of seven new species herein, the following synoptic revision recognizes a total of fourteen species of *Stenanona* ranging from southern Mexico to southern Colombia.

Neither petal fusion nor the deltoid, tongue-like connective apex remains as defining generic characteristics. With the exception of two of the newly described species (*S. columbiensis* and *S. tubiflora*), all other *Stenanona* species here recognized differ from the two original species (*S. panamensis* and *S. costaricensis*) in possessing free petals, and several also lack the deltoid, tongue-like connective apex, instead possessing a discoid one (*S. carrillensis*, *S. cauliflora*, *S. hondurensis*). Westra (1985) has described both discoid and deltoid connective apices in *Tetrameranthus* R.E.Fr. Moreover, several of the *Stenanona* species exhibit an intermediate condition in having both discoid and deltoid connective apices (*S. stenopetala*), and/or have a

deltoid connective apex oriented in the horizontal (toward the gynoeceum) rather than vertical direction. Therefore, a suite of characters including overall leaf morphology, petal texture and venation, pollen morphology, and seed coat morphology (Van Setten & Koek-Noorman 1992), now better define the genus *Stenanona*.

Leaves of *Stenanona* exhibit a brochidodromous venation and an indument composed of simple, often golden brown hairs, and are borne on a distinctly swollen petiole, with the leaf base abruptly rounded and subcordate at the point of attachment with the petiole. Neither Standley nor Fries described the longitudinal venation present (sometimes faintly so) on the outer surface of the petals, which is otherwise exhibited by *Mosannona* and *Sapranthus* among the Neotropical genera of *Annonaceae*. Petal texture, a combination of the degree of fleshiness, thickness, and pliability, is consistent among all *Stenanona* species, and lies somewhat intermediate between *Sapranthus* (petals thin and membranous) and *Desmopsis* (petals thick and stiff). Flower colour of *Stenanona* varies from pink to wine red to deep blood red to rarely purple (*S. tubiflora*), with the loss of colour, i.e., white petals, either throughout or in part, exhibited by *S. carrillensis*, *S. hondurensis* and *S. narinensis*. In *Sapranthus*, petal colour ranges from light brownish to deep maroon purple or rarely cream-yellow, with one species retaining green petals (*S. viridiflorus*), whereas petals of *Desmopsis* are nearly uniformly yellow at anthesis (greenish white in *D. verrucipes*). In all species of *Stenanona*, the sepals dry a light tan, and thus contrast markedly with the much darker drying petals. The pollen of *Stenanona* is globose and inaperturate with a verrucate exine, whereas *Sapranthus* pollen is saucer-shaped and disulcate with a thin, smooth exine, and *Desmopsis* pollen is boat-shaped and disulcate with a finely verrucate exine (Schatz 1987). The seed coat of *Stenanona* species is usually flaky rugose to bullate as opposed to smooth to finely verrucate in *Sapranthus* and *Desmopsis*.

Recent molecular phylogenetic studies of *Annonaceae* (Mols et al. 2004) indicate strong support for the placement of *Stenanona* within a clade (the Miliusoid clade) of predominantly Asian genera, but also including the Mesoamerican genera *Desmopsis*, *Sapranthus* and *Tridimeris*.

The conservation status of each species has been assessed according to the Categories and Criteria defined by the IUCN (2001). The extreme rarity and restricted distributions of all but two species have resulted in preliminary threatened assess-

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ments for eleven species, all of which are known from four subpopulations or less: seven extremely narrowly distributed species (*S. carrillensis*, *S. flagelliflora*, *S. hondurensis*, *S. panamensis*, *S. tuberculata*, *S. tubiflora*, *S. wendtii*) are deemed Critically Endangered (CR); three slightly more widespread species on limestone (*S. cauliflora*, *S. humilis*, *S. monticola*) are assessed as Endangered (EN); and two poorly known species (*S. columbiensis*, *S. narinensis*) are evaluated as at least Vulnerable (VU) pending further information. Only the widespread *S. costaricensis* and *S. stenopetala* are considered to be of Least Concern (LC).

## SYSTEMATIC TREATMENT

### Stenanona

*Stenanona* Standl. (1929) 205. — Type: *Stenanona panamensis* Standl.  
*Reedrollinsia* J.W.Walker (1971) 461. — Type: *Reedrollinsia cauliflora*  
 J.W.Walker (= *Stenanona cauliflora* (J.W.Walker) G.E.Schatz).

Dwarf to small trees, rarely clonal and then spreading vegetatively by underground shoots; young branches and petiole densely covered with golden brown, erect or appressed, simple hairs. *Leaves*: distichous, simple, entire, shortly petiolate, exstipulate; lamina medium-sized, narrowly elliptic to narrowly obovate, membranous to chartaceous, base acute to rounded, or slightly cordate, often somewhat oblique, apex acuminate to sometimes acute, upper side glabrous or sparsely covered with white, appressed or erect hairs, lower side densely to sparsely covered with white or golden brown, erect, simple hairs (velutinous), venation brochidodromous, primary vein flat to impressed above, strongly raised below, secondary veins mostly distinct, 7–20 on either side of the primary vein, tertiary veins reticulate to percurrent. *Inflorescence* a rhpidium, terminal, but appearing subopposite to supra-axillary, on leafless branches, from the main trunk, basiflorous, or flagelliflorous, flowers nodding or pendulous; peduncle short (3–4 mm long), or absent; pedicels short to long (3–190 mm long), bearing up to several minute bracts near the base. *Indument*: peduncle, pedicels, and outer side of bracts, sepals, and petals often densely covered with golden brown, erect hairs. Flowers actinomorphic, bisexual, perianth consisting of one whorl of sepals and two whorls of petals; sepals 3 or 4, valvate, free or basally connate, narrowly triangular to broadly ovate or triangular, mostly much smaller than the petals; petals 6 or 8, valvate, salmon pink to wine- or blood-red, purple, or cream, free or connate, and then with the margins of the inner petals fused to the inner surface of the outer petals toward their middle, margins of the outer petals free, relatively thin and only moderately fleshy, with slightly elevated longitudinal venation outside, verrucose or smooth inside, linear, apex acute, obtuse, acuminate, or caudate, the inner and outer petals subequal or unequal; torus depressed ovoid, cylindrical, or cushion-shaped; stamens few to numerous, spirally arranged, attached to the torus by a helical, thread-like fibre, extrorse, filament very short, apical part of connective expanded above the thecae, discoid, or deltoid and tongue-like, either horizontal and directed toward the gynoeceum, or vertical; pollen globose, apolar, radiosymmetric, inaperturate with coarse verrucate exine sculpturing; carpels few to many (4–120), spirally arranged, free, ovary 1-locular with 1–8 uniseriate or rarely biseriate ovules, ellipsoid to prismatic, densely covered with erect or appressed hairs, stigma globose, napiform, or pyriform, minutely tuberculate-papillate, densely to sparsely covered with erect hairs. *Fruit* apocarpous, composed of few to many, free monocarps, often with persistent sepals; monocarps 2–80, berry-like, globose to ellipsoid, green, yellow, orange, to red, smooth or covered by laminar, lacerate excrescences, densely to sparsely covered

with erect hairs to glabrous, rarely verrucose, wall 0.5–2 mm thick, stipes of monocarps 0–16 mm long. *Seeds* 1–4(–8), lateral, ellipsoid to discoid, often flattened, seed coat usually covered with fruit wall remnants, flaky rugose to bullate, rarely smooth, ruminations spiniform to peg-shaped.

*Distribution* — Fourteen species ranging from Mexico (Veracruz) in the north to Colombia (Nariño) in the south.

*Habitat & Ecology* — In tropical moist forest. At elevations of 0–1250 m.

*Note* — The genus was named *Stenanona* by Paul Standley (1929) because of its “remarkably elongate and narrow petals”.

## KEY TO THE SPECIES OF STENANONA

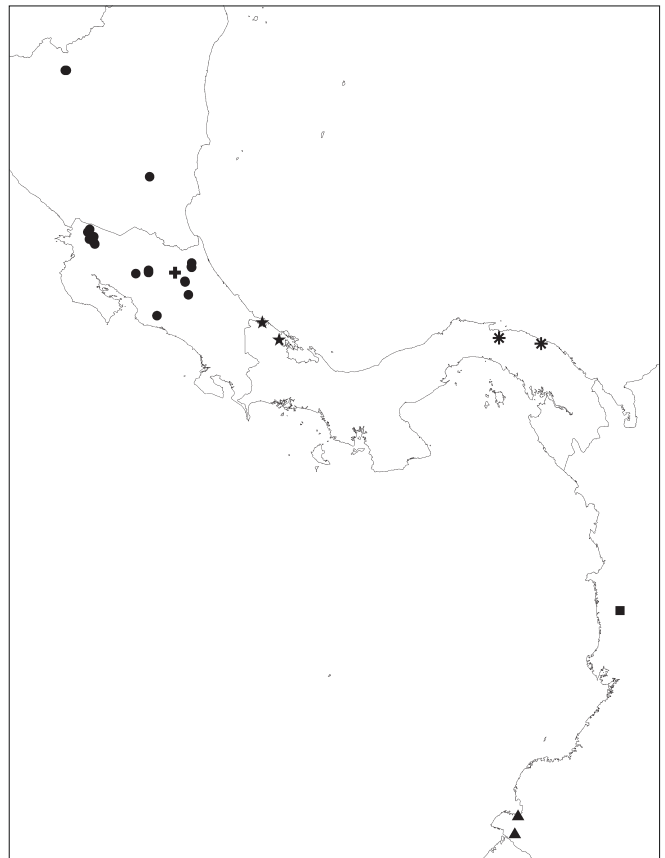
1. Inner and outer petal whorls fused for some portion of their length . . . . . 2
1. Inner and outer petal whorls free . . . . . 5
2. Inner and outer petal whorls fused for 17 mm or more, i.e., for nearly 50 % of their length or more; carpels c. 30; monocarps shortly stipitate with stipes 2–4 mm long . . . . . 3
2. Inner and outer petal whorls fused for 4–5 mm, i.e., for less than 10 % of their length; carpels 2–10; monocarps sessile . . . . . 4
3. Inner and outer petal whorls fused for nearly 1/2 of their length; sepals 9–22 mm long; keel on the inside of the petals lacking. — Colombia (Chocó) . . . . 3. *S. columbiensis*
3. Inner and outer petal whorls fused for nearly 3/4 of their length; sepals 24–26 mm long; keel on the inside of the petals present. — Panama . . . . . 13. *S. tubiflora*
4. Bracts alternate, 1 mm apart; inflorescences mostly borne on horizontal branches (ramiflorous); ovules 2–4, uniseriate; monocarps smooth. — Panama, Costa Rica . . . . . 10. *S. panamensis*
4. Bracts opposite; inflorescences mostly borne on the main trunk (cauliflorous); ovules c. 8, biseriate; monocarps bearing lamellar, lacerate excrescences. — Nicaragua, Costa Rica . . . . . 4. *S. costaricensis*
5. Inflorescences borne on flagella running over the surface of the ground (flagelliflorous); petals < 15 mm long, lacking a long drawn-out apex. — Mexico (Oaxaca, Veracruz) . . . . . 5. *S. flagelliflora*
5. Inflorescences borne among leaves, on horizontal branches, or on the main vertical trunk; petals > 20 mm long, with a long, drawn-out apex . . . . . 6
6. Inner and outer petals equal to subequal, linear to linear-triangular; plants not clonal; ovules > 2 . . . . . 7
6. Inner and outer petals unequal, the outer petals linear to narrowly triangular, the inner ones narrowly ovate-triangular; plants clonal, spreading vegetatively by underground stolons (unknown for *S. monticola*); ovule 1 . . . . . 12
7. Flowers 3-merous (very rarely 4-merous in *S. stenopetala*); sepals free . . . . . 8
7. Flowers 4-merous; sepals basally connate . . . . . 10
8. Lamina with 7–9 secondary veins on either side of primary vein; monocarps with distinct stipes 10–13 mm long. — Colombia (Nariño) . . . . . 9. *S. narinensis*
8. Lamina with 10–17 secondary veins on either side of primary vein; monocarps sessile or with stipes up to 3 mm long . . . . 9
9. Pedicels 9–23 mm long; sepals 2–3 mm long; monocarps ellipsoid to subglobose, stipitate, the surface smooth and verrucose. — From Mexico to Belize . . 11. *S. stenopetala*
9. Pedicels 2–5 mm long (but to 10 mm in fruit!); sepals 6–15 mm long; monocarps subglobose, sessile, the surface irregularly tuberculate. — Honduras . . . . 12. *S. tuberculata*

10. Lamina glabrous below; inflorescences borne on the main vertical trunk (cauliflorous); pedicels 8–12 mm long. — Mexico (Chiapas, Tabasco) . . . . . 2. *S. cauliflora*
10. Lamina densely covered with erect, golden brown hairs (velutinous) below; inflorescences borne among leaves; pedicels 60–200 mm long . . . . . 11
11. Secondary veins 13–20 on either side of primary vein; petals 5–8 mm wide at base, cream throughout. — Costa Rica . . . . . 1. *S. carrillensis*
11. Secondary veins 9–13 on either side of primary vein; petals 2–4 mm wide at base, dark purple to wine red for basal 1/3 and then cream to ochre yellow above. — Honduras . . . . . 6. *S. hondurensis*
12. Pedicels 3–7 mm long; petals 5–11 mm long. — Mexico (Oaxaca, Veracruz, 230–700 m) . . . . . 14. *S. wendtii*
12. Pedicels 9–21 mm long; petals 10–44 mm long . . . . . 13
13. Petals 23–44 mm long; sepals c. 3 mm long; pedicels sparsely hairy; plants without minute, lens-like warts. — Mexico (Chiapas, Veracruz, 100–140 m) 7. *S. humilis*
13. Petals 10–20 mm long, sepals 1.5–2 mm long; pedicels (rather) densely hairy; leaves and monocarps covered with minute, lens-like warts. — Mexico (Chiapas, 1000–1250 m) . . . . . 8. *S. monticola*

**1. *Stenanona carrillensis*** G.E.Schatz & Maas, *sp. nov.* — Plate 1; Map 1

Arbor 2–6-metralis, floribus tetrameris, pedicellis pendulis gracilibus 60–125 mm longis, petalis liberis; *Stenanonae hondurensis* similis sed nervis lateralibus utrinque 13–20 (nec 9–13), petalis basi 5–8 mm latis (nec 2–4 mm latis) et omnino cremeis (nec bicoloribus) differt. — Typus: Schatz & Young 962 (holo WIS; iso CR), Costa Rica, Heredia, Braulio Carrillo National Park extension to La Selva Biological Station, between the Río Guacimo and Río Peje, about a 5 hour walk S of La Selva Biological Station, 370 m, 10 Feb. 1984.

Tree 2–6 m tall; young twigs and petiole densely covered with golden brown, erect hairs (velutinous). *Leaves*: petiole 10–20 mm long, swollen, weakly canaliculate; lamina narrowly elliptic to narrowly ovate, 19–33 by 5–10 cm, chartaceous, dark glossy green in vivo, greyish green above, pale brown below, glabrous above, densely covered with erect, golden brown hairs (velutinous) below, margins very densely so, and slightly rolled inwards, base rounded to obtuse, apex acuminate (acumen 20–30 mm long) to acute, primary vein slightly impressed above, secondary veins 13–20 on either side of primary vein, slightly raised to impressed above, tertiary veins percurrent, at an angle of almost 90° with the primary vein. *Inflorescence* leaf-opposed or almost so, 1-flowered, to 2–5-flowers in succession. Indument: peduncle, pedicels, and outer side of sepals and bracts densely covered with erect, golden brown hairs (velutinous), outer side of petals sparsely covered with appressed hairs, margins ciliate. Flowers pendulous; peduncle c. 4 mm long; pedicels slender, 60–125 mm long, lower bract ovate, to c. 3.5 by 1.5 mm, apex acute, upper bract at c. 1/8 from the base, ovate or broadly ovate, 1–2 mm long; sepals 4, basally connate, triangular, 5–10 by 2–7 mm, apex acuminate; petals 8, cream ('off-white'), free, flat, thin, narrowly triangular, 53–60 long, 5–8 mm wide at the truncate base, tapering evenly to < 1 mm broad just below the acuminate apex, the inner petals somewhat longer and narrower than the outer ones, concave proximally and pressed tightly against the stamens, with 5 longitudinal veins visible outside; stamens pink, c. 120, c. 2 mm long, apical part of connective discoid, minutely tuberculate; carpels c. 30, ovary densely covered with erect, golden brown hairs; stigma pyriform, c. 2 by 1 mm, minutely papillate-tuberculate, fused into a head abscising as a unit, ovules 2 or 3, uniseriate. *Monocarps* c. 10, dark blackish brown in sicco, obliquely ellipsoid to ovoid, c. 15 by 10 mm, rather densely to sparsely



**Map 1** Distribution of *Stenanona carrillensis* G.E.Schatz & Maas (+), *S. costaricensis* R.E.Fr. (●), *S. columbiensis* Arist. ex G.E.Schatz & Maas (■), *S. narinensis* G.E.Schatz & Maas (▲), *S. panamensis* Standl. (★) and *S. tubiflora* G.E.Schatz & Maas (\*).

covered with erect, brown hairs (velutinous), stipes 3–4 mm long. *Seeds* 4 or 5, not studied.

*Distribution* — Costa Rica (Heredia), known only from 5 individuals at the type locality in the Braulio Carrillo National Park.

*Habitat & Ecology* — In tropical moist forest, at a steep west-facing slope. At elevations of 340–370 m.

*Conservation status* — Since its initial discovery in 1983, no additional populations of *S. carrillensis* have been found. With a known single population of 5 individuals, *S. carrillensis* can be assessed as Critically Endangered (CR D).

*Note* — The only known population of *S. carrillensis* was discovered by the first author in 1983 during the initial expedition into what is now the extension of Braulio Carrillo National Park to the southern boundary of the La Selva Biological Station of the Organization for Tropical Studies (Pringle et al. 1984). Among the *Stenanona* species with free petals, *S. carrillensis* resembles *S. hondurensis* most closely, from which it can be distinguished by its leaves with more numerous secondary veins, and its broader petals that are creamy white throughout.

*Other specimens examined.* COSTA RICA, **Heredia**, Zona Protectora La Selva, 6 km by road from Río Peje crossing, 5 km SSE of Magsasay, c. 340 m, Schatz & Grayum 615, 711, 712 (DUKE); Braulio Carrillo National Park extension to La Selva Biological Station, between the Río Guacimo and Río Peje, about a 5 hour walk S of La Selva Biological Station, 370 m, Schatz & Fletcher 1045 (CR, WIS); Braulio Carrillo National Park extension to La Selva Biological Station, between the Río Guacimo and Río Peje, about a 5 hour walk S of La Selva Biological Station, 370 m, Schatz 1129 (WIS).

**2. *Stenanona cauliflora*** (J.W.Walker) G.E.Schatz — Map 2

*Stenanona cauliflora* (J.W.Walker) G.E.Schatz in Maas et al. (1994) 465. — *Reedrollinsia cauliflora* J.W.Walker (1971) 461. — Type: Walker 357 (holo GH; iso K (2 sheets), MEX (2 sheets), NY, U, US), Mexico, Chiapas, Montaña del Carbon, 3 miles W of Pichucalco on the road from Villahermosa to Tuxtla Gutierrez, 330 m, 20 Mar. 1966.

Distribution — Mexico (Northern Chiapas and adjacent Tabasco).

Habitat & Ecology — In tropical moist forest. At elevations of 50–330 m.

Conservation status — Known from only 4 collections, *S. cauliflora* has an approximate Extent of Occurrence of no more than 800 km<sup>2</sup> and an Area of Occupancy of less than 500 km<sup>2</sup>, and thus can be assessed as Endangered (EN B1ab(iii)+2ab(iii)). One population is protected within the Reserva Especial de la Biosfera Selva El Ocote in Chiapas.

Notes — Walker (1971) based the genus *Reedrollinsia* solely on the unusual number of petals, stated to be from 7–9. Re-examination of the type material and a second flowering collection reveals that a 4-merous perianth is the normal state. The occasional flower with 7 or 9 petals is merely a developmental abnormality, often encountered in flowers of *Annonaceae*.

The 4-merous condition itself is not uncommon in the family, both as a consistent species-specific character, and as an occasional occurrence in normally 3-merous species, as in members of *Cymbopetalum* Benth. (Murray 1993, Schatz 1985). The genus *Tetrameranthus* R.E.Fr. is partly characterized by the 4-merous state, although both 3- and 5-merous flowers are occasionally found (Westra 1985). Kral (1960) states that in a population of *Asimina tetramera* Small, initially described as exclusively 4-merous, about as many 3-merous as 4-merous flowers are found.

Among the *Stenanona* species with free petals, in addition to *S. carrillensis*, *S. cauliflora* and *S. hondurensis* have thus far proved to be consistently 4-merous, while *S. stenopetala* occasionally produces 4-merous flowers. From these species, which appear to be its closest relatives, *S. cauliflora* is easily distinguished by its essentially glabrous leaves.

### 3. *Stenanona columbiensis* Aristeg. ex G.E.Schatz & Maas, sp. nov. — Fig. 1; Map 1

Petalis exterioribus cum interioribus in dimidio inferiore coalitis et monocarpis verrucosis distincta. — Typus: *Fuchs et al.* 22042 (holo US (2 sheets); iso COL, U), Colombia, Chocó, estuary of Río Baudó, near Quebrada Paulita (according to field notes by collector: area of Río Baudó, trail from Carpio to La Sierpe, near Pizarro), sea level, 23 Feb. 1967.

Cauliflorous tree c. 5 m tall; young twigs and petiole densely covered with golden brown, erect hairs (velutinous). *Leaves*: petiole 5–9 mm long, conspicuously swollen; lamina narrowly obovate, 15–28 by 6–11 cm, chartaceous, sparsely covered with some erect hairs along primary vein above, becoming glabrous at age, rather densely covered with erect hairs below, densely so along primary and secondary veins, base obtuse to rounded, slightly oblique, apex long-acuminate (acumen to 30 mm long), primary vein impressed above, secondary veins 14–16 on either side of primary vein, slightly raised above. *Inflorescence* from the trunk, sessile, rhpidium becoming branched in age, 1- (or 2-)flowered, to c. 12 flowers in succession, sympodial rachis 10–15 mm long. Indument: pedicels, sympodial rachis, and outer side of bracts and sepals densely covered with golden brown, erect and appressed hairs (velutinous), outer side of petals rather densely to sparsely so. Flowers pendulous; pedicels c. 7 mm long, fruiting pedicels 12–15 mm long, borne in the axil of a narrowly ovate bract 3–4 mm long, apex long-acuminate, and bearing a second minute, broadly ovate bract < 1 by 1–2 mm, at c. 2 mm from the base, apex truncate to rounded, margins ciliate; sepals 3, free, ovate, 9–22 by 5–9 mm, apex long-acuminate (acumen 5–8 mm long); petals 6, dark purple ('morado'), in 2 subequal whorls, linear to linear-triangular, 40–50 mm long, 8–12 mm wide at the truncate base, apex obtuse to acute, with 3–5 slightly elevated longitudinal veins outside, the margins of the

inner petals fused in the lower half with the inner side of the outer petals; stamens c. 45, c. 2.5 mm long, apical part of connective deltoid, tuberculate, projecting toward the gynoecium; carpels c. 30, ovary densely covered with erect and appressed hairs, ovules 2–4, uniseriate, stigma globose to clavate, c. 1.1 by 0.5 mm. *Monocarps* green, maturing yellow to red in vivo, oblong-ellipsoid, c. 25 by 17 mm, verrucose, densely to sparsely covered with golden brown, erect and appressed hairs, stipes 2–4 mm long. *Seeds* 1 or 2, lunate to depressed globose, 10–14 by 8–10 by 6–10 mm.

Distribution — Colombia (Chocó).

Habitat & Ecology — In tropical moist forest. At sea level.

Conservation status — *Stenanona columbiensis* is known only from the type collection from an area that currently has no protected status. Thus, based solely on this single record, until additional information is gathered, it should be considered potentially threatened or at least Vulnerable (VU D2).

Note — The partial fusion of inner and outer petal whorls in *S. columbiensis* agrees with the original conception of the genus as emended by Fries (1931), and clearly places it near *S. costaricensis*, *S. panamensis* and *S. tubiflora*. It can be distinguished from these other species with connate petals by the degree of petal fusion (to half of their length), as well as by the shortly stipitate, oblong-ellipsoid, verrucose monocarps.

### 4. *Stenanona costaricensis* R.E.Fr. — Map 1

*Stenanona costaricensis* R.E.Fr. (1941) 103. — Type: *Kupper* 569 (holo M; iso S), Costa Rica, Limón, Siquirres, 400 m, 6 Feb. 1931.

Distribution — Costa Rica (Alajuela, Guanacaste, Heredia, Limón, San José) and Nicaragua (Jinotega, Zelaya).

Habitat & Ecology — In tropical moist forest. At elevations of 40–1100 m.

Conservation status — Known from more than ten localities, including seven protected areas, within an Extent of Occurrence of over 41 900 km<sup>2</sup>, *S. costaricensis* can be assessed as Least Concern (LC).

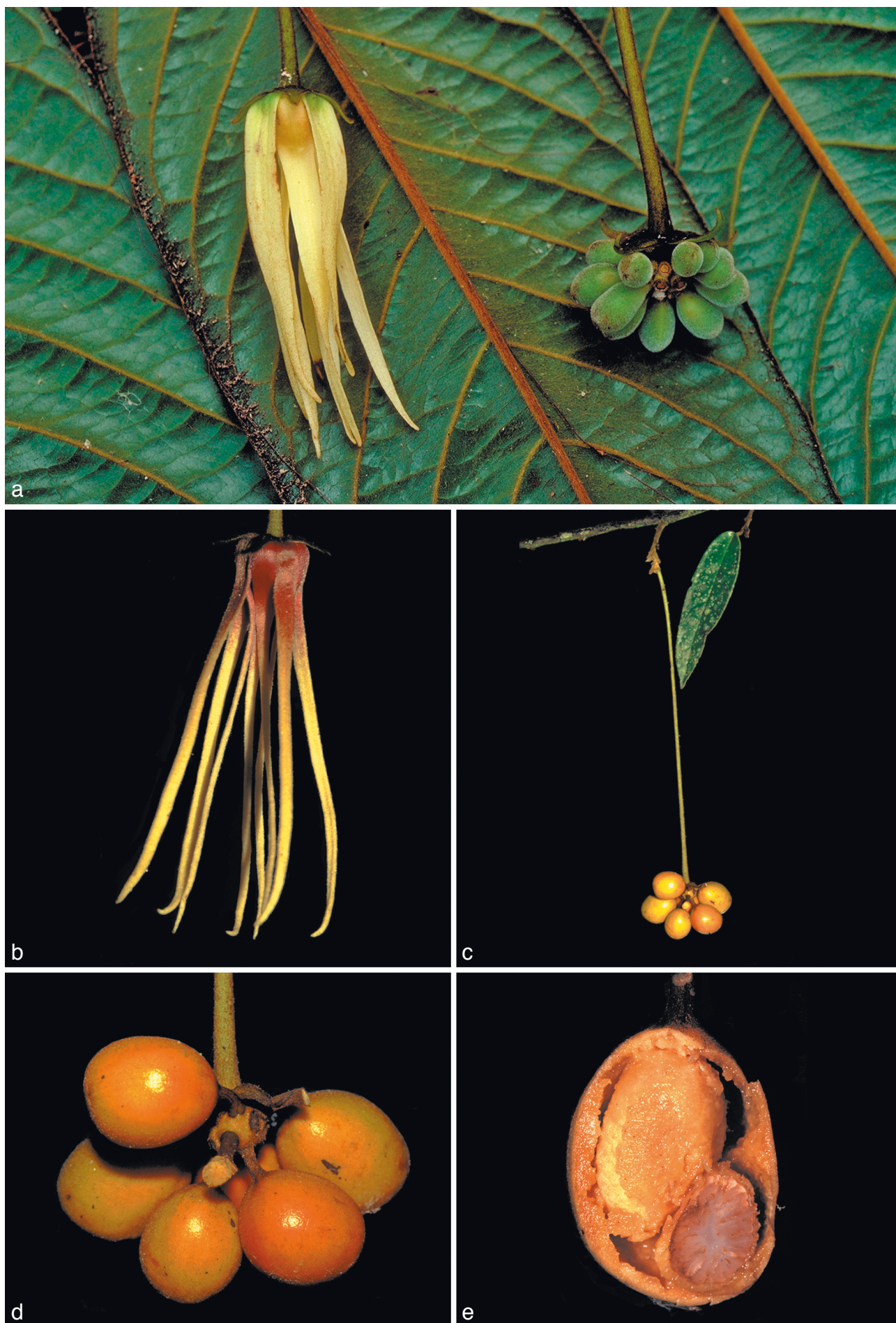
Note — *Stenanona costaricensis* is very similar in gross floral morphology to *S. panamensis*. However, the bracts are smaller than those of *S. panamensis*, and occur opposite one other, rather than separated by at least 1 mm. In addition, *S. costaricensis* possesses 8 ovules arranged in two rows, vs 2–4 ovules in a single row in *S. panamensis*. The most striking difference between *S. costaricensis* and *S. panamensis* is the surface of the monocarps: in *S. panamensis* the monocarps are smooth, whereas those of *S. costaricensis* are covered by lamellar, lacerate excrescences, irregularly fused together to form wing-like plates, which at first glance might be considered to be the result of disease. Distinct from the tuberculate monocarps of *S. tuberculata*, this unusual type of monocarp surface sculpturing is rare within *Annonaceae*, occurring in one species of *Sapranthus* from Mexico, *Monocarpia borneensis*, several species of Southeast Asian *Uvaria* and several *Piptostigma* species in West Africa.

### 5. *Stenanona flagelliflora* T.Wendt & G.E.Schatz — Map 2

*Stenanona flagelliflora* T.Wendt & G.E.Schatz (Schatz & Wendt 2004) 30, f. 1–3. — Type: *Wendt et al.* 3851 (holo MEXU; iso CHAPA, MO, WIS), Mexico, Veracruz, Municipio Hidalgotitlán [now Municipio Uxpanapa], W affluent of Río Las Cuevas, c. 5 hours by foot S of La Laguna, 350 m, 16 Apr. 1982.

Distribution — Mexico (very locally common in the southern part of the Uxpanapa region of extreme southern Veracruz and the adjacent part of the Chimalapa region of eastern Oaxaca).

Habitat & Ecology — In evergreen moist forest on hills with deep soils. At elevations of 200–350 m.



**Plate 1** a. *Stenanona carrillensis* G.E.Schatz & Maas. Flower, fruit, and leaf (Schatz & Young 986). — b–e. *Stenanona hondurensis* G.E.Schatz, F.Coe & Maas. b. Flower; c. pendant fruit; d. detail of fruit; e. seeds (a: Schatz & Young 986; b–e: Maas et al. 8476). — Photos: a. G. Schatz; b–e. P. Maas.

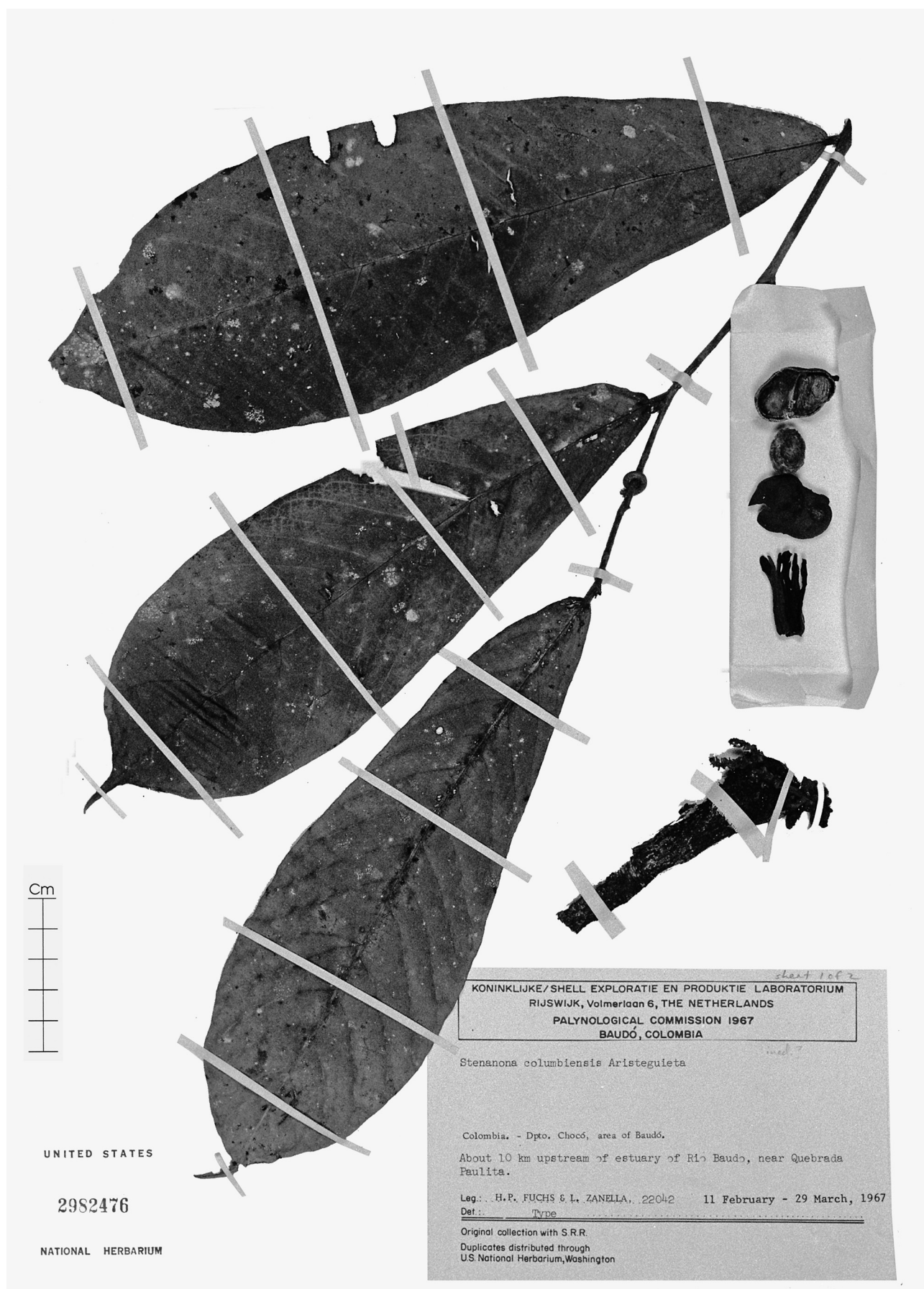


Fig. 1 *Stenanona columbiensis* Arist. ex G.E.Schatz & Maas. Leafy twig and dissected flower and fruit (Fuchs et al. 22042, holotype specimen, US).



**Map 2** Distribution of *Stenanona cauliflora* (J.W. Walker) G.E. Schatz (★), *S. flagelliflora* T. Wendt & G.E. Schatz (●), *S. monticola* Maas & G.E. Schatz (■) and *S. tuberculata* G.E. Schatz & Maas (▲).

**Conservation status** — The known Extent of Occurrence of *S. flagelliflora* is 60 km<sup>2</sup>; total potential EO is probably no more than double that figure, with 100 km<sup>2</sup> a reasonable estimate, based on topographical, climatological and substrate considerations. The Area of Occupancy within the EO is probably no more than 5 %, given the restricted nature of the habitat on the floors and lowers slopes of certain steep-sided valleys of small creeks; AO is thus rather generously estimated at 5 km<sup>2</sup>. There are 4 known subpopulations (3 of which are vouchered by collections). The area is under intense settlement pressure, especially on the Veracruz side of the state line, and, in addition, escaped fires in dry years such as 1998 have burned significant areas with potentially appropriate habitat. Thus, *S. flagelliflora* can be assessed as Critically Endangered (CR A3c+4ac; B1ab(i,ii)+2ab(i,ii)).

**Note** — From all other *Stenanona* species, *S. flagelliflora* differs markedly in being flagelliflorous, and by its ovate petals with a short, acute to acuminate apex. The lack of a long, drawn-out apex would seem at first glance out of place in the genus. However, basic petal shape (minus the apex), size, venation and texture, all match nearly perfectly the inner petal whorl of the sympatric *S. humilis*. Leaves also resemble closely those of *S. humilis*. The loss of the caudate petal apex would seem to have accompanied the evolution of the highly specialized flagelliflorous habit, in which flowers are borne only centimetres above the ground.

**6. *Stenanona hondurensis*** G.E. Schatz, F. Coe & Maas, *sp. nov.* — Plate 1; Map 3

Arbor 3–15-metralis, floribus tetrameris, pedicellis pendulis gracilibus (75–) 135–200 mm longis, petalis liberis distincta; a *Stenanona carrillensis* cui similis nervis lateralibus utrinque 9–13 (nec 13–20), petalis basi 2–4 mm (nec 5–8 mm) latis, petalis in tertia parte basali vinaceis ceterum cremeis (nec petalis unicoloribus) differt. — Typus: *Brant & Zúñiga 2840* (holo MO; iso CR, EAP, INB, K, PMA, STRI, WAG), Honduras, Atlántida, Municipio Esparta, 4.25 km S of Jilamito Nuevo, on steep slopes on the E side of Río Jilamito, 140–200 m, 14 Apr. 1994.

Tree 3–15 m tall; young twigs and petiole densely covered with golden brown, erect hairs (velutinous). *Leaves*: petiole 5–12 mm long, terete; lamina narrowly elliptic to elliptic, occasionally broadest slightly above the middle, 9–25 by 3–9 cm, membranous, glabrous above, densely covered with golden brown, erect hairs (velutinous) below, particularly towards the margins, base rounded to subcordate and slightly oblique, apex acute to acuminate (acumen to 15 mm long), rarely retuse through aborted development, primary vein flat to slightly impressed

above, secondary veins 9–13 on either side of primary vein, flat to slightly impressed above. *Inflorescence* together with leaves, pseudolateral (supra-axillary, infra-axillary or leaf-opposed) to less often terminal, rarely an aggregate of 2 superposed inflorescences, rhipidium 1–3-flowered, to c. 10 flowers in succession, sympodial rachis to 12 mm long. *Indument*: peduncle, pedicels, and outer side of sepals, densely covered with golden brown appressed and erect hairs (velutinous), outer side of petals to rather densely to sparsely so. Flowers pendulous; peduncle (0–)2–7 mm long; pedicels slender, (75–)135–200 mm long, bearing a minute bract of c. 2 mm long at 5–25 mm from the base; sepals 4, basally connate, green, slightly recurved at anthesis, ovate to triangular, 5–8 by 2–5 mm, apex caudate; petals 8, free, in 2 subequal whorls, dark purple to wine red for the basal 1/3 and cream to ochre yellow in upper 2/3, linear-triangular, 50–80 by 2–4 mm at the base, evenly tapering to a point at the apex, the inner petals narrower; stamens white, c. 120, 1.5–2 mm long, apical part of connective discoid; carpels 25–35, ovary densely covered with golden brown, appressed and erect hairs, ovules 2, stigma pyriform, 0.8–1.2 mm long, coherent and abscising en masse. *Monocarps* green, turning ochre yellow in vivo (fide Maas et al. 8500), ellipsoid to globose, c. 15 by 12 mm, rather densely to sparsely covered with golden brown, appressed and erect hairs, stipes 4–7 mm long, attached somewhat obliquely to the monocarp. *Seeds* 1 or 2, ellipsoid, flattened, c. 10 by 7 mm.

**Distribution** — Honduras (Atlántida and Yoro), where it is sympatric with *S. tuberculata*.

**Habitat & Ecology** — In tropical, evergreen, moist forest on hills with deep soils. At elevations of 140–330 m.

**Conservation status** — Known from only three localities, *S. hondurensis* has an Extent of Occurrence and Area of Occupancy of less than 100 km<sup>2</sup> in a region of Honduras where forest remnants are extremely fragmented and are currently lacking any protection. It thus qualifies as Endangered (EN B1ab(iii)+2ab(iii)).

**Note** — With its pendulous flowers borne on long slender pedicels, *S. hondurensis* most closely resembles *S. carrillensis*, from which it can be distinguished by its leaves with fewer secondary veins, and its narrower petals that are wine red at their base.

*Other specimens examined.* HONDURAS, **Atlántida**, 6 km SE of Mataras, 300 m, *Coe 2020* (HEH); Jilamito Viejo, 4.5 km S of Jilamito Nuevo, 330 m, *Maas et al. 8500* (B, EAP, F, INB, K, MO, NY, P, U, US). **Yoro**, Río Guán Guán, 1 km al sur de la carretera principal que va a San José Texiguat, 200–250 m, *Aguilar 4088* (EAP, INB, K, MO, PMA); 4 km SE de Mataras, junto al río Texiguat, y aprox. 1.5 km al sur de San José de Texiguat, 200–250 m, *Aguilar & Evans 4062* (CR, F, MO, NY, US).

**7. *Stenanona humilis*** (Miranda) G.E. Schatz — Plate 2, 3; Map 3

*Stenanona humilis* (Miranda) G.E. Schatz in Maas et al. (1994) 465. — *Sapranthus humilis* Miranda (1954) 126. — Type: *Miranda 6583* (holo MEXU; iso F, GH), Mexico, Chiapas, El Carbón, W of Pichucalco, 21 Aug. 1950.

**Distribution** — Mexico (Chiapas, the type locality and the Zona Uxpanapa region of southern Veracruz).

**Habitat & Ecology** — In tropical moist forest, on sandy soils and soil pockets within karstic limestone. At elevations of 100–140 m.

**Conservation status** — With an Extent of Occurrence of less than 400 km<sup>2</sup>, an Area of Occupancy only a small fraction of the Extent of Occurrence due to the fragmented nature of soil pockets within the karstic limestone, and less than 5 localities (perhaps only 2 subpopulations), *S. humilis* can be assessed as Endangered (EN B1ab(iii)+2ab(iii)).

**Note** — Although Miranda recognized the similarity of this curious species to *Stenanona*, he chose to describe it in *Sapranthus* on the basis of what appeared to him to be a discoid



Plate 2 a. *Stenanona humilis* (Miranda) G.E.Schatz. Habit. — b. *Stenanona narinensis* G.E.Schatz & Maas. Fruit borne from the main trunk (a. Ishiki, Maas et al. 2233; b. Maas et al. 6513). — Photos: P. Maas.



**Plate 3** a, b. *Stenanona humilis* (Miranda) G.E.Schatz. a. Flower; b. young fruit. — c, d, f. *Stenanona panamensis* Standl. c. Flower and fruit; d. pendant flower; f. flower seen from below. — e. *Stenanona stenopetala* (Donn.Sm.) G.E.Schatz. Fruiting branch (a, b: *Ishiki, Maas et al.* 2233; c, d, f: *Schatz & Grayum* 1110; e: *Schatz* 1179). — Photos: a, b. P. Maas; c–e. G. Schatz.

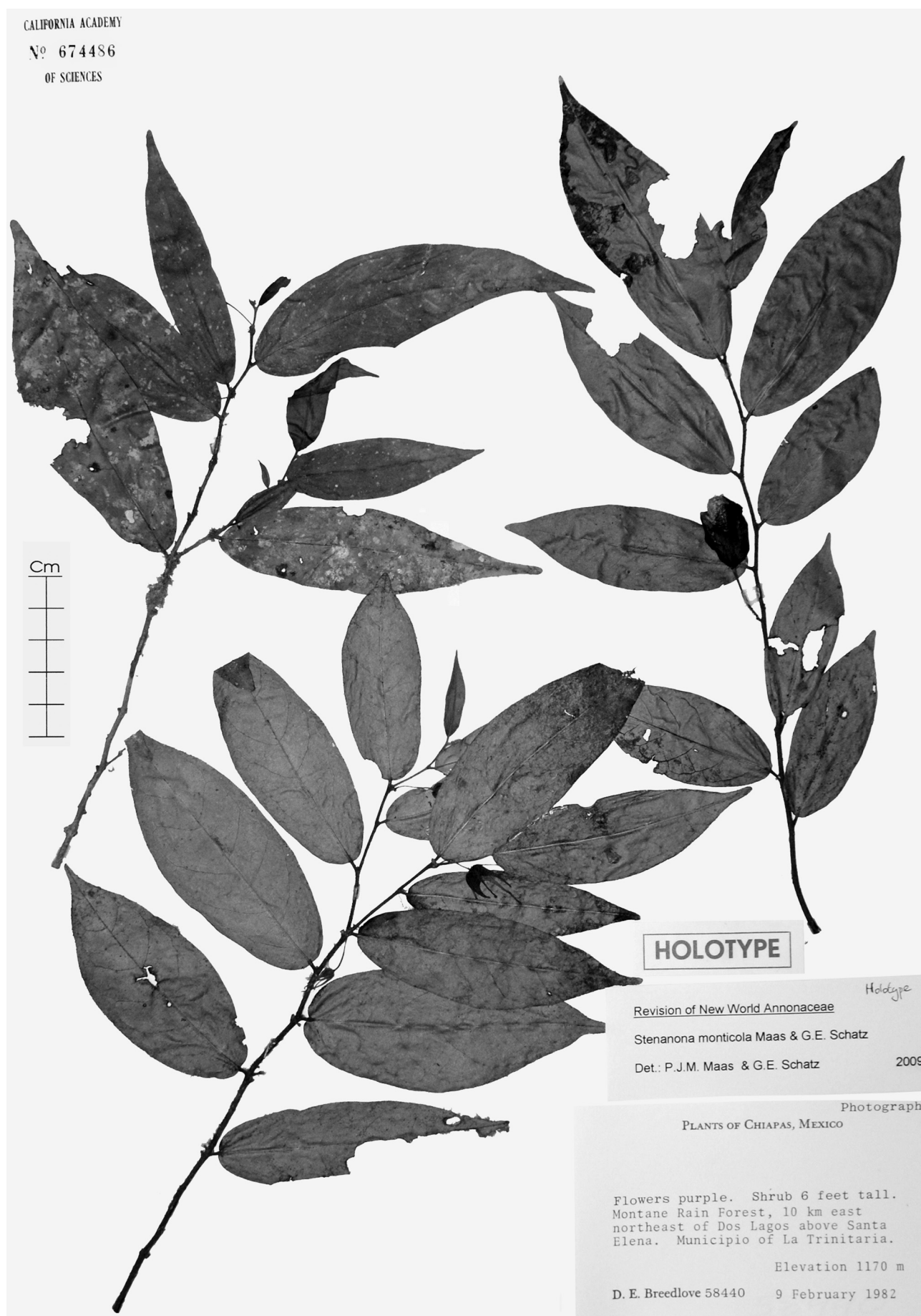
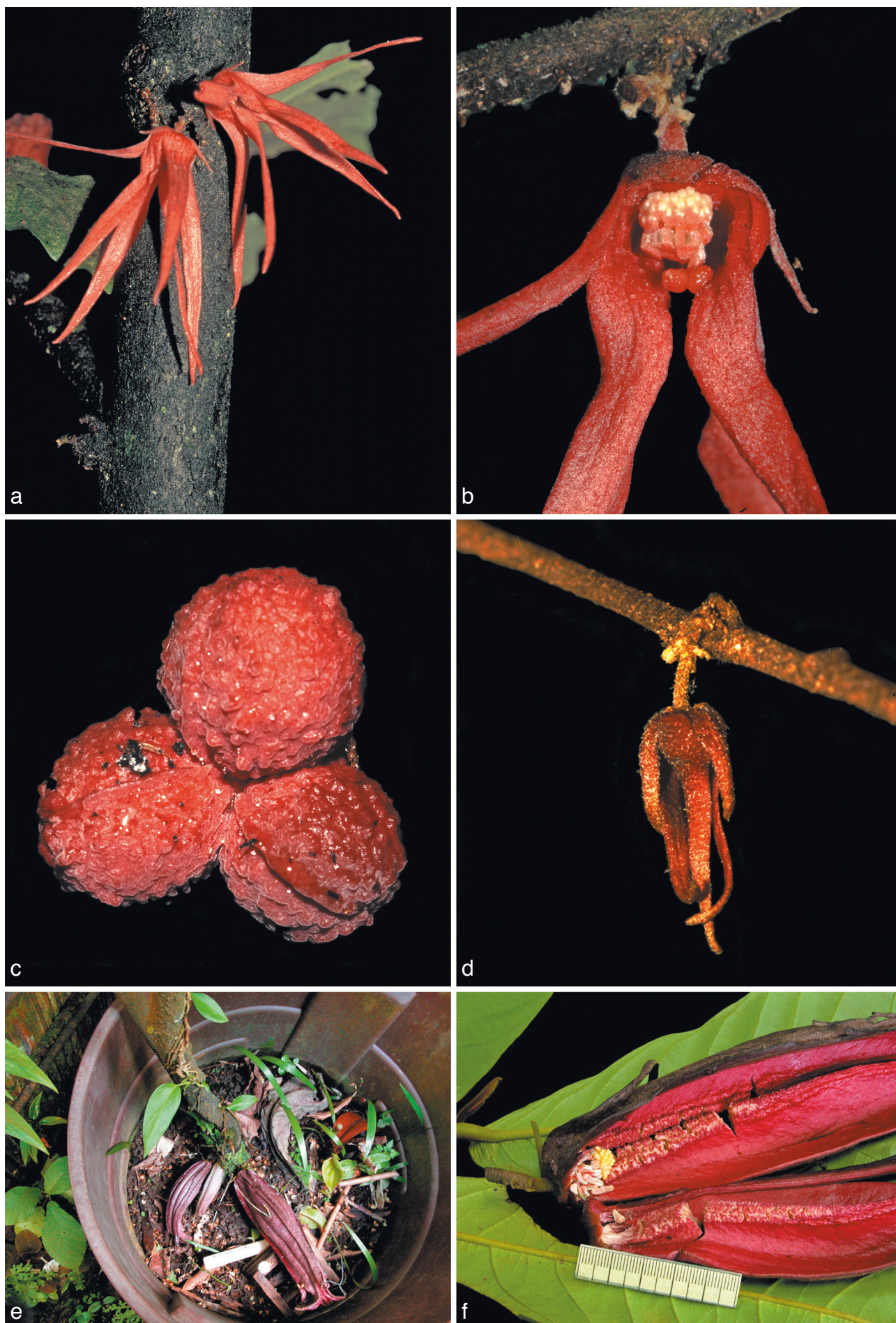


Fig. 2 *Stenanona monticola* Maas & G.E.Schatz. Flowering and fruiting twig (Breedlove 58440, holotype specimen, CAS).



Fig. 3 *Stenanona monticola* Maas & G.E.Schatz. Flowering and fruiting twig. (Breedlove & Almeda 57524, CAS).



**Plate 4** a–c. *Stenanona tuberculata* G.E.Schatz & Maas. a. Cauliflorous tree; b. basal part of flower with some petals removed; c. tuberculate fruit. — d. *Stenanona wendtii* G.E.Schatz & Maas. Flower. — e, f. *Stenanona tubiflora* G.E.Schatz & Maas. e. Stem with basal flowers; f. basal part of flower with some petals removed (a–c. Maas et al. 8476; d. Ishiki & Rainer 2315; e, f. De Nevers 7715). — Photos: a–d. P. Maas; e, f. C. Galdames.

connective apex. However, dissections of rehydrated flowers reveal a short, deltoid, ligulate apex directed horizontally toward the gynoecium. Overall floral morphology, especially the aristate apex and rose/wine red colour of the petals, point to *Stenanona* rather than *Sapranthus*. Moreover, the globose, inaperturate pollen with coarse verrucate exine sculpturing differs markedly from the disulculate pollen of *Sapranthus*, and instead agrees with other *Stenanona* species (Schatz 1987). Among the *Stenanona* species with free petals, *S. humilis* is most similar to *S. wendtii*, with which it shares unequal petal whorls and the clonal habit; *S. humilis* can be distinguished from *S. wendtii* by its longer pedicels, sparsely instead of densely hairy, and larger sepals and petals.

**8. *Stenanona monticola* Maas & G.E. Schatz, sp. nov. —**  
Fig. 2, 3; Map 2

Frutex vel arbor 1–10 metralis, montium incola, foliis verruculis lentiformibus, basi cordatis vel obtusis distincta. — Typus: *Breedlove 58440* (holo CAS; iso B, F, K, MEXU, MO, WAG), Mexico, Chiapas, Municipio La Trinitaria, 10 km E of Dos Lagos above Santa Elena, 1170 m, 9 Feb. 1982.

Shrub or tree, 1–10 m tall; young twigs and petioles densely covered with erect to half-appressed hairs. *Leaves*: petiole 2–4 mm long; lamina narrowly elliptic, membranous, strongly punctate with minute lens-like warts, 8–13 by 1.5–4 cm, glabrous above, but primary vein covered with erect hairs to glabrous, lower side sparsely covered with appressed hairs, base cordate to obtuse, apex acute to acuminate (acumen 5–10 mm long), primary vein impressed above, secondary veins 6–8 on either side of primary vein, slightly prominent above. *Inflorescence*: leaf-opposed or slightly lower than leaf (supra-axillary), 1- or less often 2-flowered. Indument: peduncle, pedicels, bracts and outer side of sepals and petals densely to rather densely covered with erect to appressed hairs. Flowers pendulous; peduncle 0.5–2 mm long; pedicels slender, 10–20 mm long, bract 1, close to base, narrowly triangular, 1–2 mm long; sepals 3, free, narrowly triangular, 1.5–2 by 0.5–1 mm, apex acute; petals 6, free, in 2 unequal whorls, purple, outer petals linear, 10–16 by 0.5–1 mm, with a caudate apex 7–8 mm long; inner petals narrowly ovate-triangular, 10–20 by 1–5 mm, with a caudate apex 5–10 mm long; stamens 25–50, 1–1.5 mm long, apical part of connective depressed ovate-triangular, densely covered with orange dots, glabrous, projecting toward the gynoecium; carpels 3, ovary densely covered with appressed hairs; stigma transversely ellipsoid, 0.8–1 by 0.4–0.5 mm, densely papillate, ovule 1. *Monocarps* brownish in sicco, 1–4, ellipsoid, 10–20 by 6–10 mm, strongly punctate with minute lens-like warts, sparsely covered with appressed hairs to glabrous, stipes 1–2 mm long. *Seed* 1, ellipsoid, 9–12 by 6–7 by 4–5 mm.

Distribution — Mexico (Chiapas).

Habitat & Ecology — In montane rain forest. At elevations of 1000–1250 m.

Conservation status — Known from only three localities constituting two locations, *S. monticola* has an Extent of Occurrence and Area of Occupancy of less than 30 km<sup>2</sup> in a region of Chiapas where forest remnants are extremely fragmented and are currently lacking any protection. It thus qualifies as Endangered (EN B1ab(iii)+2ab(iii)).

Note — During a recent visit to the CAS-Herbarium in San Francisco the second author noticed four collections by Dennis Breedlove, more or less resembling *S. humilis* at first sight. Unlike that species, though, all four Breedlove collections are noteworthy because of minute lens-like warts all over the plant. Otherwise they share the unequal and very narrow petals with both *S. humilis* and *S. wendtii*. *Stenanona humilis* seems to come closest but differs by petals almost twice as long as compared to the Breedlove collections (23–44 mm vs 10–20 mm). It is clear that the latter represent an undescribed species

for which the name *S. monticola* is proposed because it grows at a much higher elevation than *S. humilis*.

*Other specimens examined.* MEXICO, Chiapas, Municipio La Independencia, 12 km from Laguna Tsiskaw on road to Ixcán, 1250 m, 19 Oct. 1974, *Breedlove 38968* (CAS); Municipio La Trinitaria, 15 km E of Dos Lagos above Santa Elena, 1000 m, 29 Dec. 1981, *Breedlove 56549* (CAS, K, MEXU, NY, US, WAG); Municipio La Trinitaria, 10 km E of Dos Lagos above Santa Elena, 1170 m, 19 Jan. 1982, *Breedlove & Almeda 57524* (CAS, MO, WAG).

**9. *Stenanona narinensis* G.E. Schatz & Maas, sp. nov. —**  
Fig. 4; Plate 2; Map 1

Arbor 2–3-metralis, inter illas species *Stenanonae* floribus trimeris petalis liberis distincta petalis linearibus vel lineari-triangularibus cremeis et stipitibus monocarpiorum gracilibus et pro ratione longis. — Typus: *Romero Castañeda 5578* (holo COL), Colombia, Nariño, right margin of Río Rosario, 3 km above mouth of Río Caunapí, 5 Mar. 1956.

Tree 2–3 m tall; young twigs and petiole densely covered with golden brown, erect hairs (velutinous), finally becoming glabrous. *Leaves*: petiole 3.5–5 mm long, somewhat swollen; lamina narrowly elliptic to narrowly obovate, 11–16 by 3–6 cm, chartaceous, glabrous above, except for some erect hairs along primary and secondary veins, rather densely to sparsely covered with white, mainly erect hairs below, base obtuse to rounded, slightly oblique, apex long-acuminate (acumen 10–35 mm long), primary vein impressed above, secondary veins 7–9 on either side of primary vein, slightly raised above. *Inflorescence* together with leaves, supra-axillary, or produced from the trunk, a condensed rhipidium bearing a single flower at a time. Indument: pedicels and outer side of bracts, sepals and petals densely covered with golden brown, erect hairs (velutinous). Flowers pendulous; peduncle 3–4 mm long; pedicels c. 3 cm long, fruiting pedicels to c. 10 mm long, bearing several bracts 1–2 mm long; sepals 3, free, broadly ovate to broadly triangular, 3–4 by 2.5 mm, with 3 longitudinal veins, apex acute; petals 6, free, in 2 equal whorls, cream, linear-triangular to linear, 50–60 mm long, c. 3 mm broad at the truncate base, tapering evenly to < 1 mm broad just below the acute apex, the petals concave proximally, pressed tightly against the androecium, with fine reticulations inside marking the impressions of the stamens; stamens c. 80, c. 1 mm long, apical part of connective broadly discoid or with a horizontal, deltoid, minutely papillate-tuberculate, projecting toward the gynoecium; carpels c. 15, ovary densely covered with golden brown, erect hairs, ovules 2, uniseriate, stigma globose to napiform, c. 0.1 mm diam, minutely papillate-tuberculate. *Monocarps* orange in vivo, depressed globose, c. 11 mm diam, sparsely covered with erect hairs, stipes slender, 10–13 mm long. *Seeds* 1 or 2, depressed globose, 10–11 by 10–11 by 7–8 mm, bullate to rugose, with a shallow encircling equatorial furrow.

Distribution — Colombia (Nariño).

Habitat & Ecology — In tropical moist forest. At sea level.

Conservation status — *Stenanona narinensis* is known from only two collections, one of which was made at a CONIF field station. Given the proximity of the known collections to the Ecuador border, *S. narinensis* could occur in either the Cayapas Mataje Ecological Reserve or the Awa Indigenous Forest Reserve in Ecuador. Until additional information is gathered, it should be considered potentially threatened as at least Vulnerable (VU D2).

Note — On the basis of the texture of the petals, the golden brown indument on young twigs and on the primary vein abaxially, the globose, inaperturate pollen with coarse exine sculpturing, and a bullate to rugose seed coat, *S. narinensis* agrees well with other *Stenanona* species. Although petal venation is obscured in dried material, rehydrated petals clearly show longitudinal veins. The position of the inflorescence is still somewhat in doubt, as it is together with leaves and supra-axillary



Fig. 4 *Stenanona narinensis* G.E.Schatz & Maas. Flowering twig (Romero Castañeda 5578, holotype specimen, COL).

in the flowering collection, and produced from the trunk in the fruiting collection. Among the *Stenanona* species with 3-merous flowers and free, equal petals, *S. narinensis* is distinguished by its linear-triangular to linear petals, and relatively long and slender stipes of the monocarps.

*Other specimens examined.* COLOMBIA, **Nariño**, CONIF field station 'La Espriella', c. 50 km SE of Tumaco, sea level, *Maas et al.* 6513 (COL, U).

#### 10. *Stenanona panamensis* Standl. — Plate 3; Map 1

*Stenanona panamensis* Standl. (1929) 205. — Type: *Cooper 427* (holo F (2 sheets); iso B, FHO, GH, K, MAD, US), Panama, Bocas del Toro, region of Almirante, Daytonia Farm, Jan.–Mar. 1928.

**Distribution** — Panama (the type locality in Bocas del Toro) and from just across the border in Costa Rica (Limón).

**Habitat & Ecology** — In tropical moist forest. At sea level.

**Conservation status** — *Stenanona panamensis* has an extremely restricted range, with an Extent of Occurrence of less than 100 km<sup>2</sup>, and Area of Occupancy of no more than 10 km<sup>2</sup>, and has never been recollected in Panama. The protected coastal wetlands areas of Gandoca-Manzanillo in Costa Rica and San San Pond Sak in Panama may not harbour *S. panamensis*, which, in Costa Rica occurs inland 4–5 km on hummocks within a mosaic of inundated, swampy areas. With only a single currently verified population, *S. panamensis* should be considered Critically Endangered (CR B1ab(iii)+2ab(iii)).

**Note** — *Stenanona panamensis* is most strikingly distinguished from its apparent closest relative, *S. costaricensis*, by its smooth monocarps, which contrast markedly with the lamellar, lacerate excrescences covering the monocarps of the latter. In flower, *S. panamensis* can be distinguished from *S. costaricensis* by its larger bracts that are alternate and separated from one another by at least 1 mm. In addition, as far as is known, flowers of *S. panamensis* are never borne along the main trunk as in *S. costaricensis* (trunciflory), but rather are borne primarily along older horizontal branches (ramiflory).

#### 11. *Stenanona stenopetala* (Donn.Sm.) G.E.Schatz — Plate 3; Map 3

*Stenanona stenopetala* (Donn.Sm.) G.E.Schatz in Maas et al. (1994) 465. — *Porcelia stenopetala* Donn.Sm. (1905) 1. — *Sapranthus stenopetalus* (Donn.Sm.) Saff. ex Standl. (1929) 206. — *Desmopsis stenopetala* (Donn.Sm.) R.E.Fr. (1930) 26. — Type: *Von Türckheim 11868* (= *Donnell Smith 8496*) (holo US; iso B, F, GH, K, NY), Guatemala, Alta Verapaz, Cubilguitz, 350 m, Mar. 1904.

**Distribution** — Belize (Toledo), Guatemala (Alta Verapaz, Huehuetenango, Petén) to Mexico (Chiapas, Tabasco).

**Habitat & Ecology** — In tropical moist forest, often on limestone. At elevations of 200–800 m.

**Vernacular names** — Belize: Cacao, Mountain Cacao. Guatemala: Cacao Ute, Cacao Te.

**Conservation status** — With an Extent of Occurrence of over 50 000 km<sup>2</sup>, and more than 10 known locations, *S. stenopetala* can be assessed as Least Concern (LC).

**Note** — *Stenanona stenopetala* epitomizes the confusion surrounding generic delimitation among *Desmopsis*, *Sapranthus*, and *Stenanona* in Central America. Neither Fries's (1930) claim that the petals lack prominent venation, nor that they exhibit a thickness characteristic of *Desmopsis* are justified. Longitudinal venation is clearly evident in rehydrated petals, and the degree of fleshiness and thickness (and hence stiffness) fall well short of that characteristic of *Desmopsis* species, but rather agrees well with other *Stenanona* species. Further, pollen shows no evidence of aperture formation, unlike all *Desmopsis* species thus far examined (Schatz 1987). In vegetative aspects, the dark, glossy green lamina above that dries matte greyish



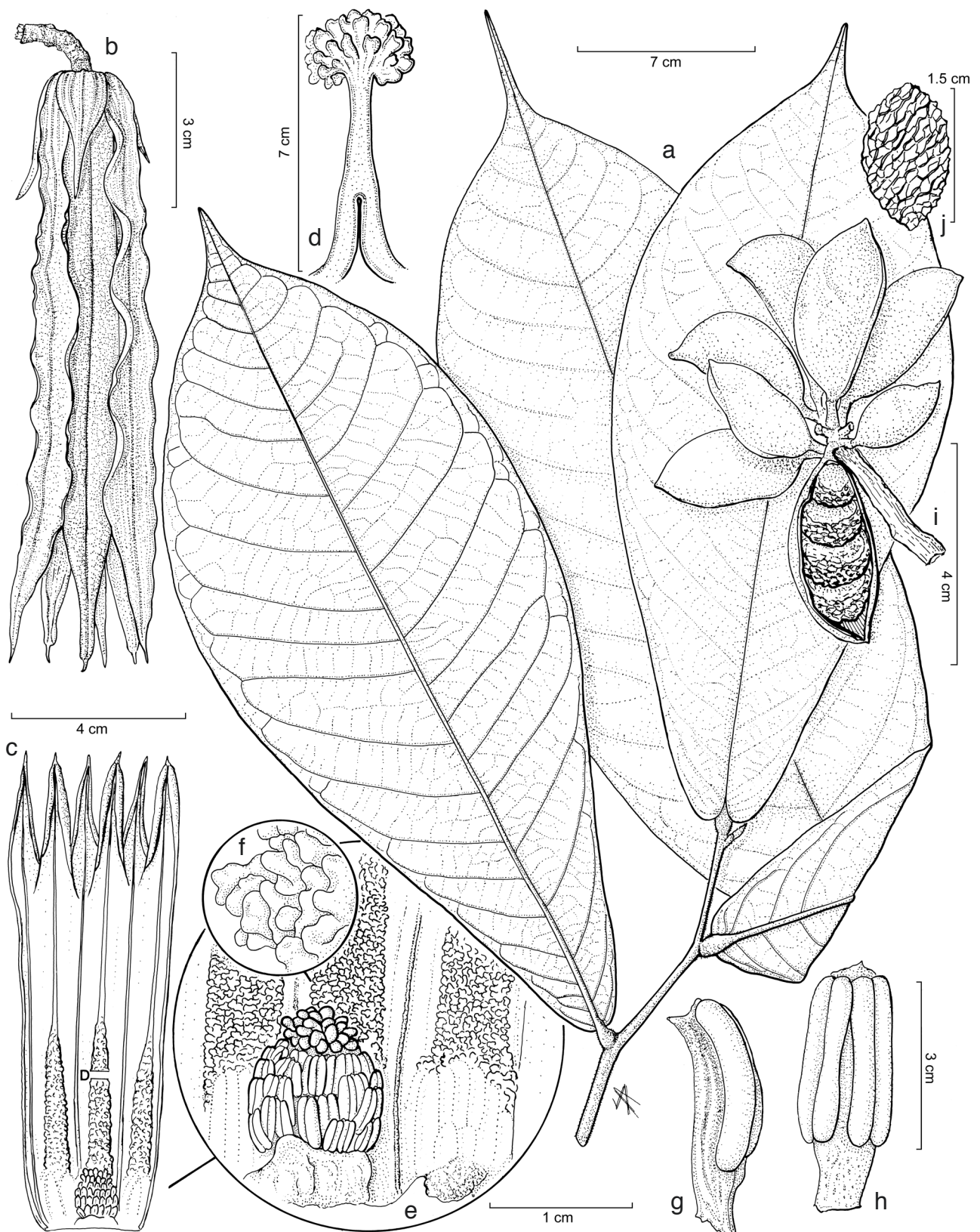
**Map 3** Distribution of *Stenanona hondurensis* G.E.Schatz, F.Coe & Maas (▲), *S. humilis* (Miranda) G.E.Schatz (★), *S. stenopetala* (Donn.Sm.) G.E.Schatz (●) and *S. wendtii* G.E.Schatz & Maas (■).

green, as well as the dense golden brown indument of secondary veins and primary vein below, and ciliate leaf margin, are very reminiscent of *S. carrillensis* and *S. hondurensis*. Among the *Stenanona* species with free petals, *S. stenopetala* is distinguished by its mostly pinkish and relatively shortly pedicellate flowers, which are produced from the main trunk, by a usually 3-merous perianth, and by small sepals relative to the petals.

#### 12. *Stenanona tuberculata* G.E.Schatz & Maas, *sp. nov.* — Plate 4; Map 2

Arbor 3–10-metralis, inter illas species *Stenanonae* floribus trimeris petalis liberis subaequalibus bene distincta sepalis longioribus et monocarpis tuberculatis. — Typus: *Hawkins & Merello 743* (holo MO; iso EAP, F, US, WAG), Honduras, Yoro, Quebrada el Aguacatal, West tributary of Río Guán, 30 m above the stream on west-facing slope, 300 m, 8 Apr. 1995.

Tree 3–10 m tall; young twigs and petiole densely covered with golden brown, appressed and some erect, hairs, soon glabrous. **Leaves:** petiole 2–3 mm long; lamina narrowly obovate to narrowly elliptic, 5–24 by 2–8.5 cm, membranous, sparsely covered with some scattered, erect and appressed hairs along primary (and secondary) veins above, sparsely covered with appressed hairs, mainly along primary and secondary veins and margins below, base obtuse to subcordate, slightly asymmetrical, apex acute to acuminate (acumen to 30 mm long), primary vein impressed above, secondary veins (7–)11–14 on either side of primary vein, flat to slightly raised above. **Inflorescences** on older leafless branches or produced from the trunk, rhipidium sessile, often becoming branched, 1- or 2-flowered, to c. 8 flowers in succession, sympodial axis to 10 mm long. Indument: pedicels and outer side of sepals densely covered with golden brown, erect and appressed hairs, outer side of petals sparsely so; pedicels 2–5 mm long, to 10 mm long in fruit, borne in the axis of minute bract, bearing a second minute bract just above the base of the pedicel, soon falling off; sepals 3, dark red, free, triangular to narrowly triangular, 6–15 by 2–5 mm, with evident venation, apex acuminate to acute; petals 6, free, in 2 subequal whorls, dark red, linear-triangular, 30–45 by 2–5 mm; stamens pink, c. 75, 1.5–2 mm long, apical part of connective directed towards the centre; carpels 2–4, ovary densely covered with golden brown, appressed hairs, ovules 4, biseriate, stigma subglobose, c. 1 mm diam, subglabrous. **Monocarps** pinkish red in vivo, subglobose, 20–30 mm diam, rather densely covered with golden brown, erect hairs, sessile, irregularly tuberculate (tubercles to 2 mm long). **Seeds** 4 or 5, wedge-shaped, c. 13 by 7–9 mm.



**Fig. 5** *Stenanona tubiflora* G.E.Schatz & Maas. a. Leafy branch; b. flower; c. opened flower showing inner surface of petals and androecium/gynoecium; d. cross section of keel on inner petals; e. detail of base of petals and androecium/gynoecium; f. detail of papillate-verrucose surface on keel of inner petals; g. stamen in side view; h. stamen in face view; i. fruit; j. seed (Folsom & Dressler 5789, MO).

**Distribution** — Northern Honduras (Atlántida), where it is sympatric with *S. hondurensis*.

**Habitat & Ecology** — In tropical moist forest. At elevations of 140–500 m.

**Conservation status** — *Stenanona tuberculata* is known from only 4 collections within 25 km of one another, an Extent of Occurrence of less than 30 km<sup>2</sup> in a region of Honduras

where forest remnants are extremely fragmented and are currently lacking any protection. Based on projected continuing decline in forest cover in the region, *S. tuberculata* should be considered Critically Endangered (CR B1ab(iii)).

**Note** — Although *S. tuberculata* superficially resembles *S. costaricensis* at first glance, and shares ovaries with biseriate ovules with the latter species, the petals of *S. tuberculata*

are completely free from one another. Among the *Stenanona* species with trimerous flowers with free, equal to subequal petals, *S. tuberculata* can be distinguished by its large sepals, and sessile, globose monocarps with irregularly tuberculate surface sculpturing.

*Other specimens examined.* HONDURAS, **Atlántida**, Municipio Esparta, 4.25 km S of Jilamito Nuevo, slightly disturbed primary forest on steep slopes on the E side of Río Jilamito, 140–200 m, *Brant & Zúñiga 2832* (EAP, F, MO, U), **Yoro**, ravines E of Texiguat River, 1–2 km SW of aldea La Aurora, 200–500 m, *Hazlett et al. 8030* (EAP, MO); 3 km SW of San José de Texiguat along Quebrada El Aguacatal, 285–310 m, *Maas et al. 8476* (B, EAP, INB, K, MO, NY, U, US, WU).

**13. *Stenanona tubiflora*** G.E.Schatz & Maas, *sp. nov.* —  
Fig. 5; Plate 4; Map 1

Arbor 2–4-metralis inflorescentis e basi trunci orientibus, a speciebus ceteris *Stenanonae* petalis exterioribus cum interioribus ad 3/4 coalitis atque petalis interioribus carina adaxiali basin praecipue versus rugosa et verrucosa munitis differt. — Typus: *De Nevers 7715* (holo MO) [grown from seed collected by R.L. Dressler, Comarca de San Blas, El Llano-Cartí Road, km 12, 350 m (possibly vouchered by *Folsom & Dressler et al. 5789*)], Panama, Prov. Panama, from cultivation at Smithsonian Tropical Research Institution, 13 Apr. 1986 (fl).

Tree 2–4 m tall; young twigs and petiole densely covered with golden brown, erect and appressed hairs (velutinous). *Leaves*: petiole 5–10 mm long, conspicuously swollen; lamina narrowly obovate, 25–44 by 10–16 cm, chartaceous, sparsely covered with white, appressed and erect hairs above and below, base rounded to cordate, apex long-acuminate (acumen 15–40 mm long), primary vein impressed above, secondary veins 16–21 on either side of primary vein, slightly prominent above. *Inflorescence* produced from the main trunk near the base (basiflory), the flower actually lying on the ground, a single flower at a time, to an unknown number of flowers in succession, sympodial rachis 10–25 mm long. Indument: pedicels and outer side of sepals and petals densely covered with white to brown, erect and appressed hairs; pedicels c. 4 mm long, fruiting pedicels to 10 mm long, bearing several minute ovate to narrowly triangular bracts 1–2 mm long; sepals 3, free, green, ovate, 24–26 by 10–11 mm, with 5 slightly elevated longitudinal veins outside, apex caudate, slightly reflexed, margins involute; petals 6, purple outside, maroon inside, in 2 subequal, connate whorls, the margins of the inner petals fused to a medial keel on the inside of the outer petals to within 25–28 mm of their apex, i.e., for approximately 3/4 of their length, therefore forming a long tube, the margins of the outer petals free, the margins of all petals involute distally beyond the point of fusion, the petals fleshy, narrowly oblong, 115–130 by 11–15 mm, apex acute to acuminate, the medial keel along the inside of the inner petals to 0.7 cm tall, becoming highly rugose papillate-verrucate 55 mm from the base and broadening toward the base to 5 mm broad, the keel on the outer petals also papillate-verrucate at the base, all petals with a deep furrow on the outside corresponding to the keel on the inside; stamens purple to maroon, c. 35, 3–4 mm long, apical part of connective very small, deltoid, projecting toward the gynoecium; carpels c. 30, ovary densely covered with white, appressed hairs, ovules 4, uniseriate, stigma ellipsoid, c. 1.5 mm long, minutely tuberculate, glabrous, attached to the ovary obliquely by a very short style, connate into a head abscising as a unit. *Monocarps* green, with red mesocarp in vivo, ellipsoid to oblong-ellipsoid, 20–40 by 10–20 mm, densely verrucose, sparsely covered with appressed hairs, apex acute, with a distinct point to 2 mm long, stipes 2–5 mm long. *Seeds* 4–6, globose to discoid, 10–15 by 8–10 by 4–5 mm.

*Distribution* — Panama (the Atlantic slope of San Blas, Prov. Panama).

*Habitat & Ecology* — In tropical moist forest. At elevations of 85–350 m.

*Conservation status* — The original locality of *S. tubiflora* along the El Llano-Cartí road has since been cleared of forest, and thus, the second locality c. 75 km to the east along the Cordillera de San Blas is the only known possibly extant locality. Pending further information, it should be considered Critically Endangered (CR B1ab(iii)+2ab(iii)).

*Note* — *Stenanona tubiflora* is probably most closely related to *S. columbiensis*, with which it shares leaf morphology, the cauliflorous habit, and the substantial fusion of the inner and outer petals. However, the degree of petal fusion (3/4 of the length) is unequalled in the genus, and results in a tubular flower. This flower is borne at the base of the trunk (basiflory), and lies horizontally on the ground. Within the tube, the inner petals are markedly keeled, with the keel becoming highly rugose and verrucose toward the base.

*Other specimens examined.* PANAMA, **San Blas**, El Llano-Cartí Road, 13.8 km N of the Panamerican Highway, *Folsom & Dressler et al. 5789* (MO); Río Playón Chico, walking by the Río towards the trail that crosses la Cordillera de San Blas, 85–200 m, *H. Herrera 1775* (MO).

**14. *Stenanona wendtii*** G.E.Schatz & Maas, *sp. nov.* —  
Fig. 6; Plate 4; Map 3

Frutex 0.3–1.5 metralis stolones clones formantes emittens, a *Stenanona humili* cui manifeste affinis pedicellis brevioribus, sepalis petalisque minoribus bene differt. — Typus: *Wendt et al. 6841* (holo MO), Mexico, Oaxaca, Municipio Sta. María Chimalapa, Sierra de Tres Picos, central part, N side, lower part of ridge that rises from 5-ha inventory site (along a branch of Arroyo Garrobo) southward toward the main E-W ridge and Cerro Piicotzuc, c. 15 straight-line km SSE of La Laguna, Veracruz, 500 m, 6 Apr. 1996.

Clonal shrub 0.3–1.5 m tall, spreading vegetatively by stolons in the leaf litter and duff just beneath the surface; young twigs somewhat zigzagging, with petiole densely covered with golden brown, erect hairs (velutinous), becoming less densely so with age. *Leaves*: petiole 1.5–3 mm long; lamina narrowly elliptic to occasionally narrowly ovate, 4–11 by 1–4 cm, membranous, occasionally somewhat falcate, glabrous above, but primary vein rather densely covered with erect hairs, secondary veins sparsely so to glabrous, sparsely to rather densely covered with erect hairs, particularly along primary vein and margins, below, base obtuse to acute, apex acute to acuminate (acumen to 15 mm long), primary vein impressed above, secondary veins 9–12 on either side of primary vein, indistinct and slightly prominent above. *Inflorescences* together with leaves, 1- or 2-flowered, terminal but appearing leaf-opposed or supra-axillary by overtopping of renewal shoot. Indument: pedicels and outer side of sepals and petals densely to rather densely covered with white, mainly erect hairs. Flowers pendent; pedicels 3–7 mm long, very slender, dull rose to dark red; sepals 3, free, red, triangular, 1–1.5 by 0.5–1 mm; petals 6, free, in 2 unequal whorls, green, maturing dark red, outer petals narrowly triangular, 5–8 by 0.8–1.2 mm, with a caudate apex to 5 mm long; inner petals narrowly ovate-triangular, 9–11 by 2 mm, with a caudate apex to 7 mm long; stamens red, < 1 mm long, apical part of connective discoid; carpels not studied. *Fruit* not seen.

*Distribution* — Mexico (the type locality, the Sierra de Tres Picos, in the Chimalapa region of eastern Oaxaca, and the adjacent Uxpanapa region of southern Veracruz, where it is sympatric with *S. flagelliflora*).

*Habitat & Ecology* — In tropical moist forest, on hills with deep soils. At elevations of 230–700 m.

*Conservation status* — The conservation status of *S. wendtii* mirrors that of *S. flagelliflora*, with which it is sympatric. With an Extent of Occurrence of less than 100 km<sup>2</sup>, and projected continuing decline in the area and extent of habitat, *S. wendtii* should be considered Critically Endangered (CR B1ab(iii)).

*Note* — With its free, unequal petal whorls and clonal habit, *S. wendtii* is clearly most closely related to *S. humilis*. However,

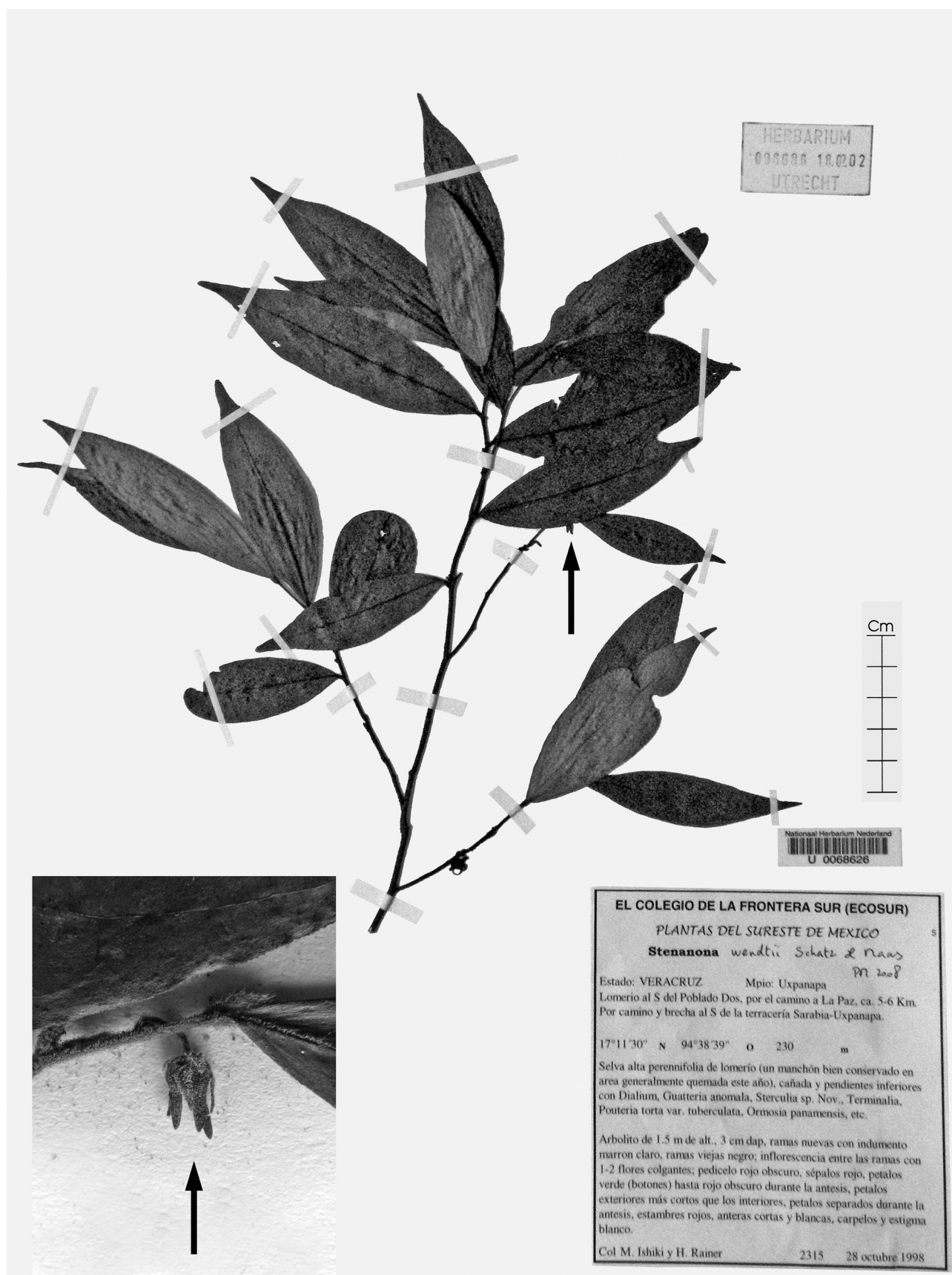


Fig. 6 *Stenanona wendtii* G.E.Schatz & Maas. a. Flowering twig, note arrow; b. detail of flower (Ishiki & Rainer 2315, U).

*S. wendtii* differs from *S. humilis* by its shorter pedicels, and smaller sepals and petals.

*Other specimens examined.* MEXICO, **Veracruz**, Municipio Uxpanapa, Lomerio al S del Pueblo Dos, by the road to La Paz, 5–6 km by road and enhanced path to the S of the dirt road Sarabia-Uxpanapa, 230 m, *Ishiki & Rainer 2315* (U, WU).

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## IDENTIFICATION LIST

The abbreviations behind the collector numbers refer to the following taxa:

### *Stenanona*

|                             |                           |
|-----------------------------|---------------------------|
| carr = <i>carrillensis</i>  | mont = <i>monticola</i>   |
| caul = <i>cauliflora</i>    | nari = <i>narinensis</i>  |
| colu = <i>columbiensis</i>  | pana = <i>panamensis</i>  |
| cost = <i>costaricensis</i> | sten = <i>stenopetala</i> |
| flag = <i>flagelliflora</i> | tube = <i>tuberculata</i> |
| hond = <i>hondurensis</i>   | tubi = <i>tubiflora</i>   |
| humi = <i>humilis</i>       | wend = <i>wendtii</i>     |

- Aguilar et al. 4062, 4088: hond; 5221: cost.
- Bello 1625, 1872, 2229: cost – Brant & Zúñiga 2832: tube; 2840: hond – Breedlove et al. 38968, 56549, 57524, 58440: mont – Brewer & Fine 1016: sten.
- Chacón 741: cost – Chatrou et al. 67: cost; 100: pana – Chinchilla 74: cost – Coe 2020: hond – Conrad 2875: caul – Contreras 6729, 6929, 9373: sten – Cooper 427: pana.
- Davidse et al. 35703: sten – Davidson et al. 7029, 8886: cost – De Nevers 7715: tubi; 7807: cost – Donnell Smith 8496: sten.
- Espinoza et al. 861: cost.
- Folsom & Dressler 5789: tubi – Fuchs et al. 22042: colu.
- Gentle 7220: sten – Gentry 8165: sten – Gomez Pompa 322: sten – Gonzalez et al. 1604: pana – Grayum et al. 4451, 4504: pana.
- Haber et al. 1859, 11790, 11808: cost – Hammel & Merello 15515: caul – Hawkins et al. 743: tube; 1342: sten – Hazlett et al. 8030: tube – G. Herrera et al. 825, 1051, 7713: cost – H. Herrera 1775: tubi.
- INBio 67: cost – Ishiki et al. 2233: humi; 2313, 2314: flag; 2315: wend.
- Kupper 569: cost.
- Lent 2531: cost – Lundell & Contreras 19861, 20672, 20679: sten.
- Maas et al. 6513: nari; 8011: cost; 8476: tube; 8500: hond; 9458: cost – Miller & Sandino 1149, 1152: cost – Miranda 6583: humi – Mora et al. 829, 1043: cost.
- Pennington & Sarukhan 9169: sten.
- Ramírez 69: cost – Ríos 93: cost – Romero Castañeda 5578: nari – Rueda & Coronado 7339, 7385: cost.
- Saul 102: sten – Schatz et al. 615, 711, 712, 962: carr; 986: humi; 1045: carr; 1110: pana; 1129: carr; 1179: sten – Schipp S-698: sten – Short & Stafford 18: cost – Stevenson 105: sten – Steyermark 44406, 44510, 44573, 45573, 49413: sten.
- Vásquez 1125: caul – Von Türckheim 8496, 11868: sten.
- Walker 357: caul – Wendt et al. 2617: humi; 3851: flag; 4871: humi; 6841: wend; 6686, 6842, 6882: flag – Wilbur & Stone 9786, 10215, 10698, 10706: cost.
- Zamora et al. 1882: cost – Zuñiga 477: cost.

## INDEX TO SCIENTIFIC NAMES

Accepted taxa are in roman type, new taxa in **bold**, and synonyms in *italics*. Numbers refer to the species number as used in the revision.

### *Desmopsis*

*stenopetala* (Donn.Sm.) R.E.Fr. 11

### *Porcelia*

*stenopetala* Donn.Sm. 11

### *Reedrollinsia* J.W.Walker [p. 206]

*cauliflora* J.W.Walker 2

### *Sapranthus*

*humilis* Miranda 7

*stenopetalus* (Donn.Sm.) Saff. ex Standl. 11

### *Stenanona* Standl. [p. 206]

**carrillensis** G.E.Schatz & Maas 1

*cauliflora* (J.W.Walker) G.E.Schatz 2

**columbiensis** Aristeg. ex G.E.Schatz & Maas 3

*costaricensis* R.E.Fr. 4

*flagelliflora* T.Wendt & G.E.Schatz 5

**hondurensis** G.E.Schatz, F.Coe & Maas 6

*humilis* (Miranda) G.E.Schatz 7

**monticola** Maas & G.E.Schatz 8

### *Stenanona* (cont.)

**narinensis** G.E.Schatz & Maas 9

*panamensis* Standl. 10

*stenopetala* (Donn.Sm.) G.E.Schatz 11

**tuberculata** G.E.Schatz & Maas 12

**tubiflora** G.E.Schatz & Maas 13

**wendtii** G.E.Schatz & Maas 14