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Thelypteris indusiata (Thelypteridaceae), a new fern species from Amazonian Brazil

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Abstract

Thelypteris indusiata is described as a new species from Amazonian Brazil. This species with 1-pinnate laminae and terminal pinnae that resemble lateral ones belongs to *Thelypteris* subgenus *Goniopteris* and resembles several other species, mainly *T. poiteana*, *T. ghiesbreghtii*, *T. vivipara* and *T. platypes*, but differs from these species mainly by the venation pattern and the indusiate sori.

Key words: Ferns, *Goniopteris*, Pará state, Brazil, Carajás Range

Introduction

During a pteridophyte floristic survey at Carajás National Forest in Pará State, northern Brazil, five new species were discovered. Three of them have been described elsewhere (Dittrich *et al.* 2012, Salino *et al.* 2011), one species of *Isoetes* will be further described, and one species of *Thelypteris* is described here. This species belongs to subg. *Goniopteris* (Presl 1836: 181) Duek (1971:720), which has long been recognized as a natural group (Christensen 1913, Mickel & Smith 2004, Smith 1983, 1990, 1992, 1993, 1995 a, b, Tryon & Tryon 1982). Recent molecular phylogenetic analyses supported *Goniopteris* as a monophyletic group (Smith & Cranfill 2002, Schuettpelz & Pryer 2007, Alvarez-Fuentes 2010, He & Zhang 2012). However, sampling of *Goniopteris* to date has been sparse, and infrageneric treatments of *Thelypteris sensu lato* are in flux (Smith *et al.* 2006). The presence of furcate or stellate hairs is a useful diagnostic for *Goniopteris* (Salino 2002); however, some species lack these hairs (Smith 1992). *Goniopteris* is a Neotropical group of about 115–120 species, of which 36 occur in Brazil (A. Salino, unpublished data). In addition to the new species described here, nine other species of subg. *Goniopteris* occur in Amazonian Brazil: *Thelypteris abrupta* (Desvaux 1827: 239) Proctor (1959 [1960]: 306), *T. amazonica* Salino & Fernandes (2011: 611), *T. biformata* (Rosenstock 1909: 300) Tryon (1967: 5), *T. biolleyi* (Christ 1901: 31) Proctor (1953: 58), *T. juruensis* (Christensen 1913: 256) Tryon & Conant (1975: 33), *T. pennata* (Poiret 1804: 535) Morton (1967: 64), *T. poiteana* (Bory 1826: 233) Proctor (1953: 63), *T. tetragona* (Swartz 1788: 132) Small (1938: 256) and *T. tristis* (Kunze 1834: 47) Tryon (1967: 8).

Materials & Methods

Specimens of all mentioned species of *Thelypteris* subg. *Goniopteris* including the type specimens and additional material from the following herbaria were studied: B, BM, COAH, COL, F, FI, GH, HB, HUA, IAN, JAUM, K, MEDEL, MG, MO, NY, P, PI, PMA, Q, QCA, QCNE, QPLS, RB, S, STRI, UC, and US. The morphological terminology used in the description follows Lellinger (2002). For SEM images, samples of spores and leaves were transferred from herbarium specimens to aluminum SEM stubs coated with double-sided carbon tape. The stubs were then coated with gold in a sputter-coater, and were imaged digitally using a FEI Quanta 200 SEM at an accelerating voltage of 30 kV.

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Taxonomy

Thelypteris indusiata Salino, *sp. nov.* (Figs. 1, 2, 3)

Thelypteris indusiata is most similar to *T. poiteana*, *T. ghiesbreghtii* (Hooker 1846: 3) Morton (1967: 45), *Thelypteris vivipara* (Raddi 1825: 32) Reed (1968: 324), and *T. platypes* (Fée 1869: 106) Ponce (2007: 319) with which it shares the 1-pinnate lamina with terminal pinna that resembles that lateral ones and pinnae entire or very shallowly lobed. It differs from these species mainly by the indusiate sori and free venation.

Type:—BRAZIL. Pará: Canaã dos Carajás, Floresta Nacional de Carajás, Serra do Tarzan, 6°18'47" S, 50° 10'40"W, 10 February 2012, *A. Salino 15156, L.C.S. Vianna, A.J. Arruda, L.F.A. de Paula, T. Alves & M. Gontijo* (holotype BHCB, isotypes BM, MG, UC).

Plants terrestrial. Stems decumbent to erect, scales lanceolate, castaneous, with furcate and stellate hairs. Leaves clustered, 21–88 cm long, monomorphic; petioles sulcate adaxially, 11–56 cm long, 0.8–2.8 mm diameter, scaly at base, scales like those of stems, pilose with stellate and furcate hairs. Laminae 10–32 cm long, triangular to oblong, herbaceous to papyraceous, not verrucose, 1-pinnate or rarely 1-pinnate-pinnatifid, with conform (pinna-like) apex; buds or plantlets absent; aerophores absent; rachises pilose with a mixture of long simple hairs (0.4–0.8 mm) and short simple, furcate and stellate hairs (0.09–0.26 mm); pinnae 1–4(–5) pairs, 4–17 × 1.8–4.0 cm, perpendicular to ascending, the proximal pair usually deflexed, oblong to ovate, sessile to short-stalked to 2.7 mm, apex acute to acuminate, base obtuse, excavate or cuneate; pinnae with entire to crenate margins or rarely incised to 1/3 of their width; costae, costules and veins adaxially, pilose with simple hairs 0.09–0.30(–0.80) mm long, laminar surface adaxially glabrous; costae, costules and veins abaxially with a mixture of simple unicellular to multicellular long hairs 0.4–0.6 mm and simple unicellular short hairs 0.09–0.20 mm, laminar surface abaxially with simple unicellular hairs 0.10–0.25(–0.80) mm; segments, if present, 3.3–5.2 mm wide, entire, rounded apically; veins 3–8 pairs per segment, unbranched, all veins ending below the margins or sinuses, free, rarely one proximal or medial pair united below the sinus, distal vein of proximal pair arising from costule. Sori round, medial; indusia conspicuous, round or round-reniform, castaneous, entire, margins pilose with long simple hairs (0.25–0.40 mm long); sporangia glabrous; spores monolete, elipsoidal, perispore with prominent, fimbriate wings (Fig. 3).

Distribution and habitat:—*Thelypteris indusiata* is know only from Pará state, northern Brazil, where grows in Amazonian rainforests usually on hillsides or along trails at 300–520 m, mainly in the Serra dos Carajás National Forest with only two collections outside this region.

Etymology:—The epithet refers to the conspicuous indusia.

Additional specimens examined (paratypes):—BRAZIL. Pará: Alenquer, Estação Ecológica do Grão-Pará, 12 June 2008, *J.M. Costa 684* (BHCB); Belterra, 30 July 1947, *G. Black 47-1130* (IAN); Canaã dos Carajás, Floresta Nacional de Carajás, Corpo S11D, 6°24'24"S, 50°14'57"W, 391 m, 27 April 2012, *T.E. Almeida et al. 2337* (BHCB); estrada para a Serra Sul, 6°16'19"S, 50°18'40"W, 380 m, 28 August 2012, *A. Salino et al. 15501* (BHCB, MG, VALE), 6°18'57"S, 50°10'39"W, 580 m, 16 Dec 2012, *A. Salino et al. 15579* (BHCB); Parauapebas, Floresta Nacional de Carajás, Corpo N1, 6°02'14" S, 50°15'55"W, 520 m, 14 February 2012, *A. Salino et al. 15195* (BHCB).

Notes:—*Thelypteris indusiata* is most similar to *T. poiteana* (Mexico, Central America, Antilles and South America to Brazil), *T. ghiesbreghtii* (Mexico and Central America), *Thelypteris vivipara* (Southeastern Brazil), and *T. platypes* (Southeastern Brazil) in having 1-pinnate laminae with conform, pinnule-like apices and entire to shallowly lobed pinnae. However, it differs from these species mainly by the indusiate sori and free venation. *Thelypteris poiteana* has exindusiate sori, usually setose sporangia and anastomosing venation with 3–9 areoles between the costa and pinnae margins. The exindusiate *Thelypteris ghiesbreghtii* has similarly anastomosing veins but lacks branched or stellate trichomes on the sporangia. *Thelypteris vivipara* and *T. platypes* also differs from *T. indusiata* by having creeping stems, veins and lamina surface glabrous abaxially, buds present on adaxial side of distal pinnae, anastomosing veins with 1–3 vein-pairs united before margins (always forming a costal areolae), and exindusiate sori. Some specimens of *T. indusiata* are slightly similar to *T. juruensis* (French Guiana, Ecuador, Peru, Bolivia, and Amazonian Brazil), however *T. juruensis* differs by having both surfaces of the veins glabrous, the distal vein of proximal pair arising from the costa and absent or minute indusia. *Thelypteris rolandii* (Christensen 1913: 258) Tryon (1967: 8) from Nicaragua, Haiti, Jamaica, Lesser Antilles, Venezuela and Ecuador is also slightly similar to *T. indusiata,* however, *T. rolandii* has 2–3 anastomosing vein pairs, exindusiate sori and sporangial capsules with acicular hairs. *Thelypteris indusiata* occurs sympatrically with eight *Goniopteris* species, *T. abrupta*, *T. amazonica*, *T. biolleyi*, *T. lugubriformis*, *T. pennata, T. poiteana, T. tetragona* and *T. tristis.*

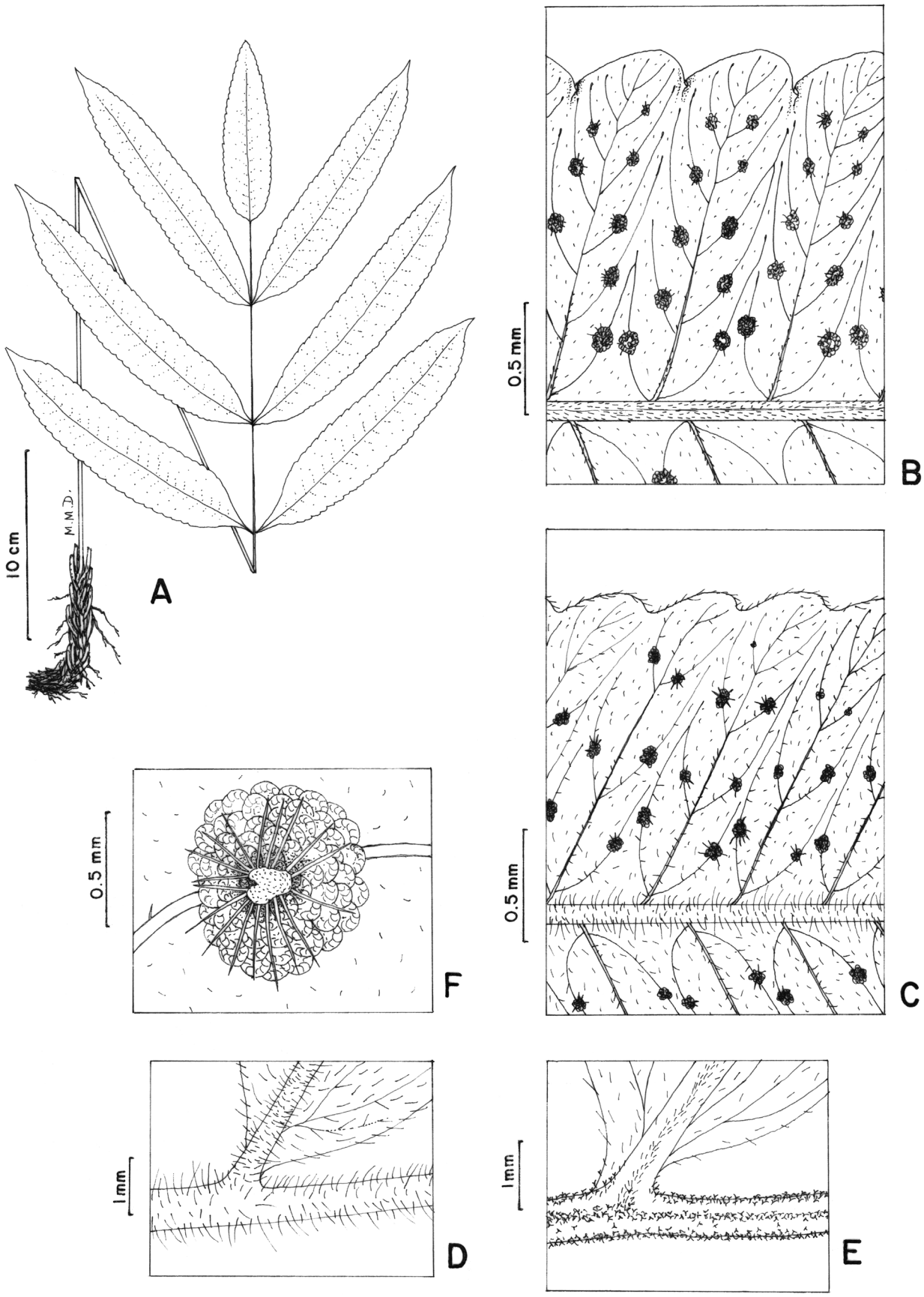

FIGURE 1. *Thelypteris indusiata.* A. Habit. B. Detail of the abaxial side of pinna from a specimen with short hairs. C. Detail of the abaxial side of pinna from a specimen with long hairs. D. Abaxial side of the rachis and pinna base from collection with long hairs. E. Abaxial side of the rachis and pinna base from collection with long hairs. F. Detail of the sorus with pilose indusia. (A–B, F from *Salino et al. 15156*, BHCB; C–E. from *Salino et al. 15195*, BHCB).

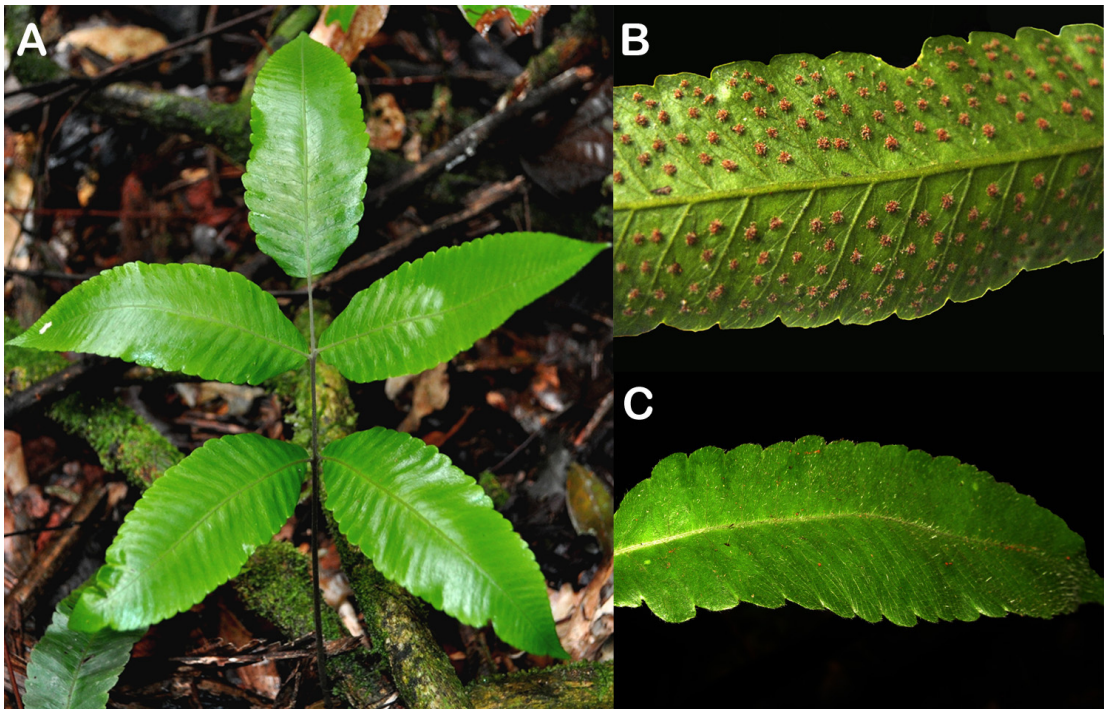

FIGURE 2. *Thelypteris indusiata*. **A.** Plant growing inside forest at Carajás National Park. **B.** Abaxial side of a medial pinna. **C.** Adaxial side of a distal pinna.

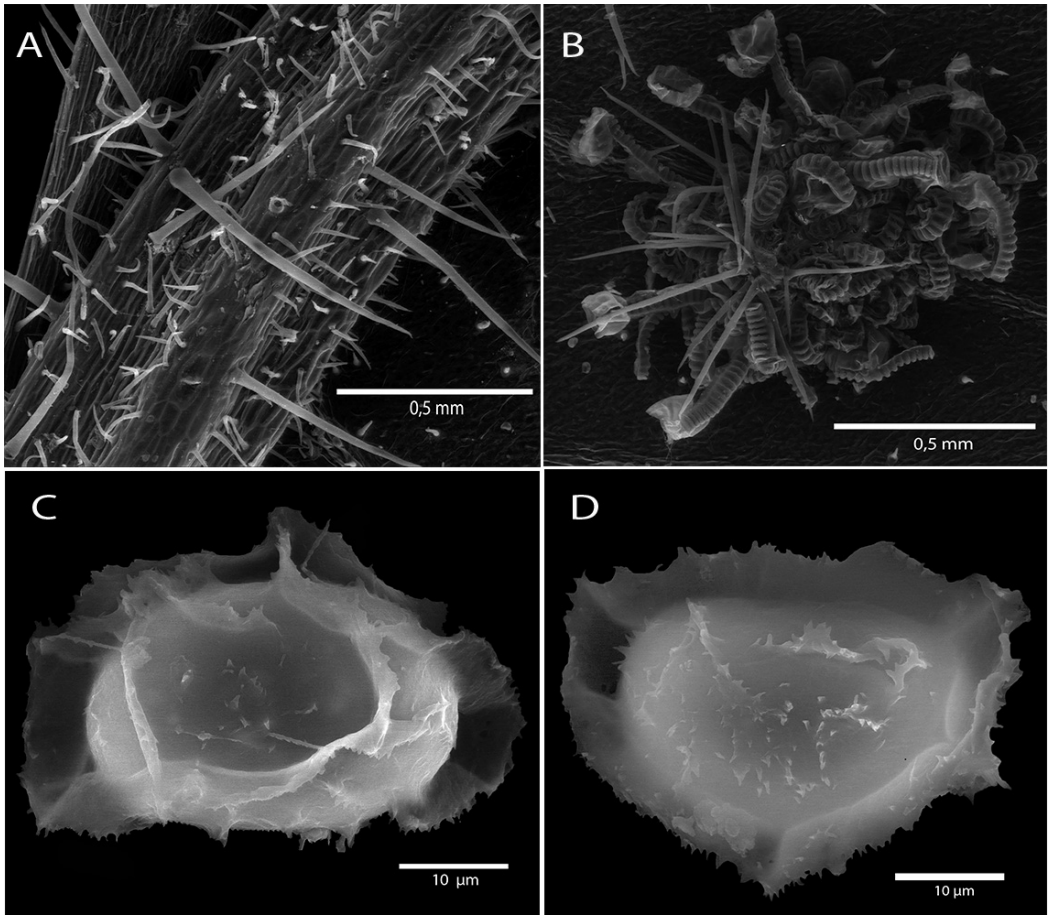

FIGURE 3. *Thelypteris indusiata*. Scanning electron micrographs of hairs, sorus and spores. **A.** Hairs of the abaxial side of rachis. **B**. Sorus with pilose indusium. **C**. Spore. **D**. Spore. (All from *Black 47-1130*, IAN).

Key to species of *Thelypteris* subg. *Goniopteris* from Amazonian Brazil

1. Costules and veins on abaxial side with sessile stellate hairs 2
–. Costules and veins on abaxial side glabrous or with acicular hairs 3
2. Lamina gradually reduced into a pinnatifid apex; proximal pair of veins from adjacent segments uniting below the sinus to an excurrent vein and the next pair running at or above the sinus ..... *T. biolleyi*
–. Lamina with terminal pinna that resembles a lateral one (conform apex); proximal pair of veins from adjacent segments uniting below the sinus to an excurrent vein, with the next 1–2 pairs either joining the excurrent vein below the sinus or running directly to sinus ..... *T. pennata*
3. Veins anastomosing, forming 3–9 series of areoles between costa and margin or sinus; pinnae crenate or very shallowly lobed less than 1/5 the distance to costae; sori exindusiate ..... *T. poiteana*
–. Veins free or rarely anastomosing, forming 1–2 areoles series between costa and margin or sinus; pinnae shallowly to deeply lobed, 1/3 or more (if rarely shallowly lobed less than 1/5 then sori indusiate); sori indusiate or exindusiate 4
4. Proximal pairs of veins from adjacent segments uniting below the sinus to an excurrent vein to sinus; sori exindusiate; sporangia with simple acicular hairs on the capsules and stalks ..... *T. tetragona*
–. Proximal pairs of veins from adjacent segments uniting at the sinus or ending blindly below the sinus, without excurrent vein; sori indusiate, rarely exindusiate; sporangia glabrous or with hairs only on sporangial stalks (in *T. abrupta*) 5
5. Lamina gradually narrowed distally into a pinnatifid apex ..... *T. abrupta*
–. Lamina with terminal pinna resembling a lateral one (conform apex), rarely subconform apex 6
6. Veins glabrous on both surfaces; distal vein of proximal pair arising from costa; indusia absent or minute ..... *T. juruensis*
–. Veins with hairs on both surfaces, rarely glabrous; distal vein of proximal pair arising from costule; indusia conspicuous 7
7. Pinnae 2–4(–5) pairs; pinnae usually entire with crenate margins, rarely incised to 1/3 their width; buds or plantlets absent ..... *T. indusiata*
–. Pinnae 7–18 pairs; pinnae incised 1/3–3/4 of their width; buds or plantlets usually present in axils of distal pinnae 8
8. Proximal pinnae with short- to long-cuneate bases; abaxial surface of costae glabrous or with sparsely acicular hairs, and a few furcate hairs ..... *T. tristis*
–. Proximal pinnae with truncate or oblique bases; abaxial surface of costae moderately to densely pilose with a mixture of acicular, furcate and stellate hairs 9
9. Segments with 6–9 vein pairs, proximal 1–2 pairs from adjacent segments ending well below the sinus; veins usually with clavate apices ..... *T. amazonica*
–. Segments with 10–20 vein pairs, proximal 1–2 pairs from adjacent segments connivent to sinus; veins without clavate apices ..... *T. biformata*

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