The genus Touroulia Aubl. (Quiinaceae)

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The genus *Touroulia* Aubl. *(Quiinaceae)*

Abstract

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Morphology, distribution, and leaf venation of the two species of *Touroulia* Aubl. *(T. amazonica, T. guianensis)* are described, and a key to the species is provided.

Introduction

The neotropical genus *Touroulia (Quiinaceae)* comprises two species, *T. amazonica* and *T. guianensis. T. guianensis*, described in 1775 by F. Aublet, is widespread in northern South America and comparatively well documented in herbarium collections.

Touroulia amazonica was described in 1950 by J. M. Pires and even today only a few collections of this species exist. Within the family *Quiinaceae*, the genus *Touroulia* is easily distinguished from the other genera *(Froesia, Lacunaria, Quiina)* by the combination of the following characters: leaves pinnate, flowers androdioecious, gynoecium syncarpous and seeds villous. The leaf and stem anatomy provide additional characters (Gottwald & Parameswaran 1967, Roth 1973).

Delimitation of the genus

The very characteristic and unique leaf venation of *Touroulia guianensis* and various other *Quiinaceae* has been investigated and described by Hallier (1912), Foster (1950a, 1950b, 1951) and Roth (1996). *T. amazonica* has principally the same craspedodromous leaf venation as *T. guianensis* with numerous densely spaced and ± parallel running tertiary veins. Size and branching pattern of the tertiary veins (of the leaflets) are similar in these species too and differ from those observed in the other genera of *Quiinaceae*. This fact supports a closer relationship of the two species. A noteworthy difference between them is that in *T. amazonica* the tertiary veins form a slightly s-shaped curve (sometimes ± geniculately bent close to the secondary veins), while in *T. guianensis* they are conspicuously geniculately bent in about the middle of the intercostal fields (Fig. 1).

Pires (1950) has discussed the delimitation of the genus *Touroulia*, proposing generic rank for *T. amazonica* (in schedis). Although this view is supported by the anatomical studies of

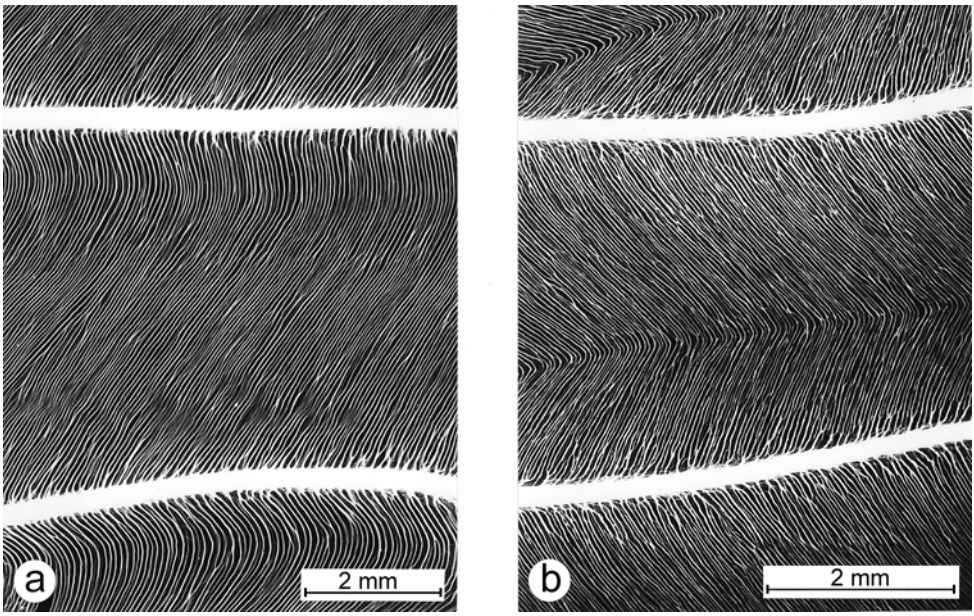

Fig. 1. Venation of intercostal field of leaflet blade – a: *Touroulia amazonica,* b: *T. guianensis.*

Gottwald & Parameswaran (1967), the similarities in habit, morphology of inflorescence, flower and fruit and especially in the extraordinary leaf venation justify the maintenance of both species in a single genus.

Touroulia

Touroulia Aubl., Hist. Pl. Guiane 1: 492. 1775 ≡ *Robinsonia* Scop., Intr. Hist. Nat.: 218. 1777, nom. superfl.

– *Quiina* sensu Benth. in Bentham & Hooker, Gen. Pl. 1: 176. 1862 p.p., non Aubl.

Type: *T. guianensis* Aubl.

Trees to 15(-30?) m tall, trunk up to 20 cm in diameter. Leaves opposite (in young plants ± alternate and tending to be larger than in adult species), imparipinnate, petiolate; rachis sometimes (especially in young plants) alate in apical part. Stipules interpetiolar, 2 or 4 per node, lanceolate, acute, glabrous or shortly hairy, 0.4-1.5 × 0.05-0.2 cm. Leaflets sessile, opposite to alternate, ovate or oblong, acute, base ± asymmetrically obtuse, margin ± serrate-crenate, the teeth spinose, the secondary veins projecting beyond margin (rarely inconspicuously crenulate, not spinose, veins not projecting beyond margin); intersecondary veins absent; tertiary veins densely spaced, ± parallel. Terminal leaflet usually slightly longer and wider than the lateral ones. Inflorescence a terminal, slender thyrsoid. Axis of inflorescence ± pilose. Bracts ± broadly triangular, rounded to acute, 0.1-0.9 × 0.08-0.3 cm, densely pilose abaxially, minutely pilose adaxially. Flower bracts similar in shape but smaller than primary bracts. Flowers androdioecious (in *T. amazonica*?), globose in bud, pedicellate, the pedicel pilose, articulating in about the middle *(T. guianensis)* or at base *(T. amazonica).* Sepals 5, unequal, imbricate, broadly triangular, coriaceous, free or basally connate. Petals (4-)5, contort, obovate, broadly rounded, glabrous. Stamens 50 to over 100 in male, less in hermaphrodite flowers, filaments filiform, anthers basifixed, subglobose, bithecate, opening by longitudinal slits. Ovary superior, syncarpous, (4-)5-11-locular, with (4-)5-11(?) styles; 2 ovules per locule. Fruit baccate, ± globose, longitudi-

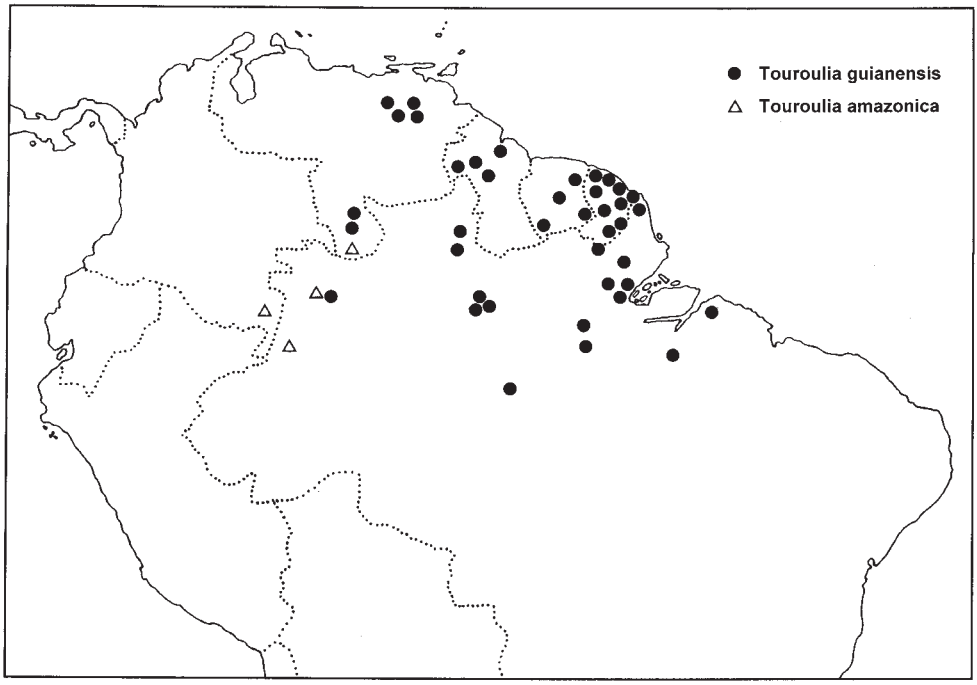

Fig. 2. Distribution of *Touroulia*.

nally striate, glabrous, 4-8(-11?)-celled, 1.5-2.5 cm in diameter. Seed(s) 1 (very rarely 2) per cell, densely pilose, ± ovate in outline.

Two species in northern South America, *T. guianensis* being widespread and well collected, *T. amazonica* much rarer.

Further references: Jussieu, Gen. Pl.: 434. 1789; Endlicher, Gen. Pl. 2: 796. 1836; Walpers, Repert. Bot. Syst. 2: 434. 1843; Planchon & Triana in Ann. Sci. Nat. Bot., ser. 4, 15: 315. 1861; Baillon, Hist. Pl. 6: 409. 1877; Engler in Martius (ed.), Fl. Bras. 12, 1: 485. 1888; Engler in Engler & Prantl (ed.), Nat. Pflanzenfam. 3, 6: 167. 1893; Engler in Engler (ed.), Nat. Pflanzenfam. ed. 2, 21: 108. 1925 p.p.; Lanjouw & van Heerdt in Recueil Trav. Bot. Néerl. 37: 282. 1940; Lanjouw & van Heerdt in Meded. Kolon. Inst. Amsterdam, Afd. Handelsmus. 30, 11: 364. 1941; Lemée, Flore Guyane Franç. 3: 26. 1953; Macbride in Publ. Field Mus. Nat. Hist., Bot. Ser. 13: 717. 1956.

Key to the species of *Touroulia*

1. Inflorescence (7-)10-15(-25) cm long. Flowers up to 1 cm in diameter. Tertiary veins in about middle of intercostal areas geniculately bent (Fig. 1b) . . . . *Touroulia guianensis*
– Inflorescence 24-37 cm long. Flowers 1.3-2.5 cm in diameter. Tertiary veins not geniculately bent in middle of intercostal areas (Fig. 1a) . . . . . *Touroulia amazonica*

1. *Touroulia amazonica* – Fig. 1a, 3, 5b.
Touroulia amazonica Pires & A. S. Foster in Bol. Técn. Inst. Agron. N. 20: 49. 1950. – Holotype: Brazil, Amazonas, municipality São Paulo de Olivença, basin of creek Belém, 10.-12.1936, *B. A. Krukoff 9012 (*A; isotypes: BM!, BR!, G!, NY!, P).

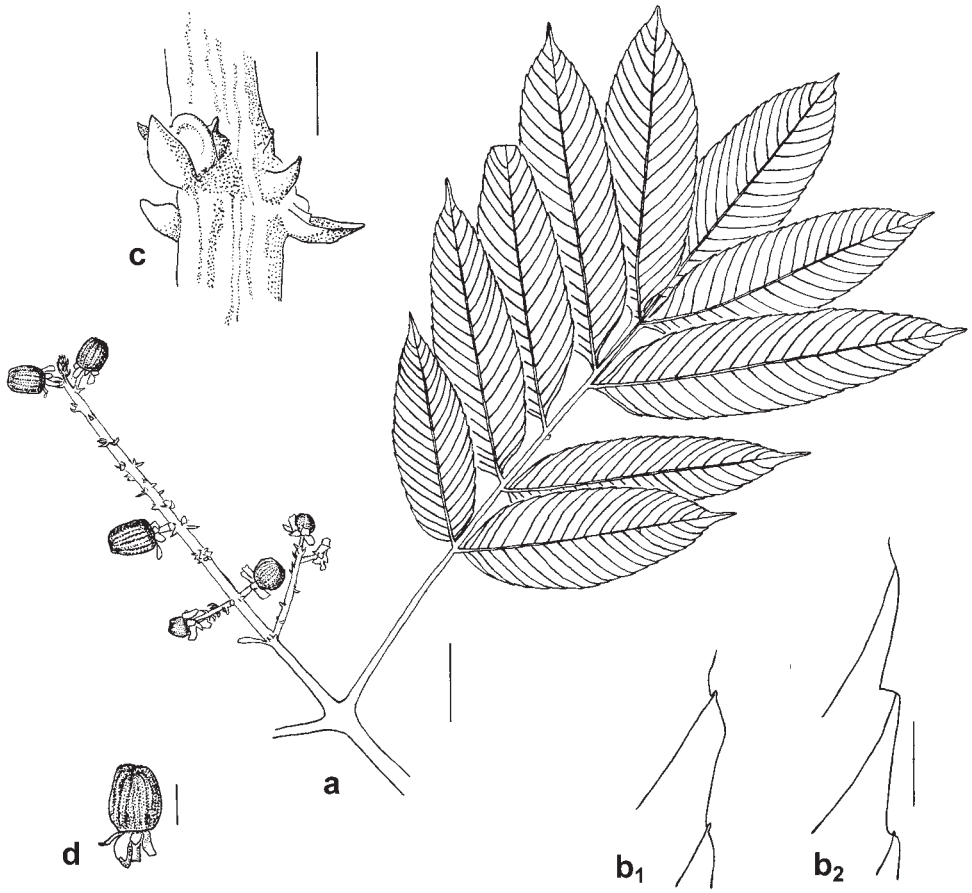

Fig. 3. *Touroulia amazonica* – a: terminal inflorescence and leaf, b: leaf margin, c: part of inflorescence with bracts and scar of pedicel, d: fruit. – Scale: a = 4 cm, b-c = 4 mm, d = 1 cm; a, b_1, c-d after *Silva & Brazão 60817*, b_2 after *La Rotta & Miraña 555*; drawing by J. V. Schneider.

Trees to about 15 m tall, diameter of trunk to 5 cm. Leaves 31-89 × 24-35 cm, with 7-25 leaflets, petiole 6-14 cm; leaflets 12-33 × 3.5-5(-7) cm, ± coriaceous, with 14-25 pairs of secondary veins. Margin of leaflets ± serrate-crenate (rarely inconspicuously crenulate), flat, the secondary veins ± straight near margin, usually projecting 0.2-0.5 mm beyond margin. Tertiary veins forming an s-shaped curve, if ± geniculately bent, then not in about the middle of intercostal fields but close to the secondary veins. Stipules 4 per node, narrowly triangular, shortly hairy, 0.4-0.5 × 0.06-0.08 cm. Inflorescence 24-37 × c. 25 cm. Flowers 1.3-2.5 cm in diameter, the pedicel articulating at base; sepals 0.3-0.5 cm long, broadly triangular, persisting in fruit; petals 0.6-1.0 cm long, ± obovate. Fruit 1.6-2.1 × 1.4-2.0 cm. Seed c. 1.1 × 0.4 cm.

Vernacular name: Nimekogoree (Miraña, Colombia).

Habitat: Primary or secondary evergreen lowland forest, 150-350 m.

Distribution: Colombia, Venezuela, Brazil (Fig. 2).

Ic.: Pires & Foster in Bol. Técn. Inst. Agron. N. 20: 49. 1950.

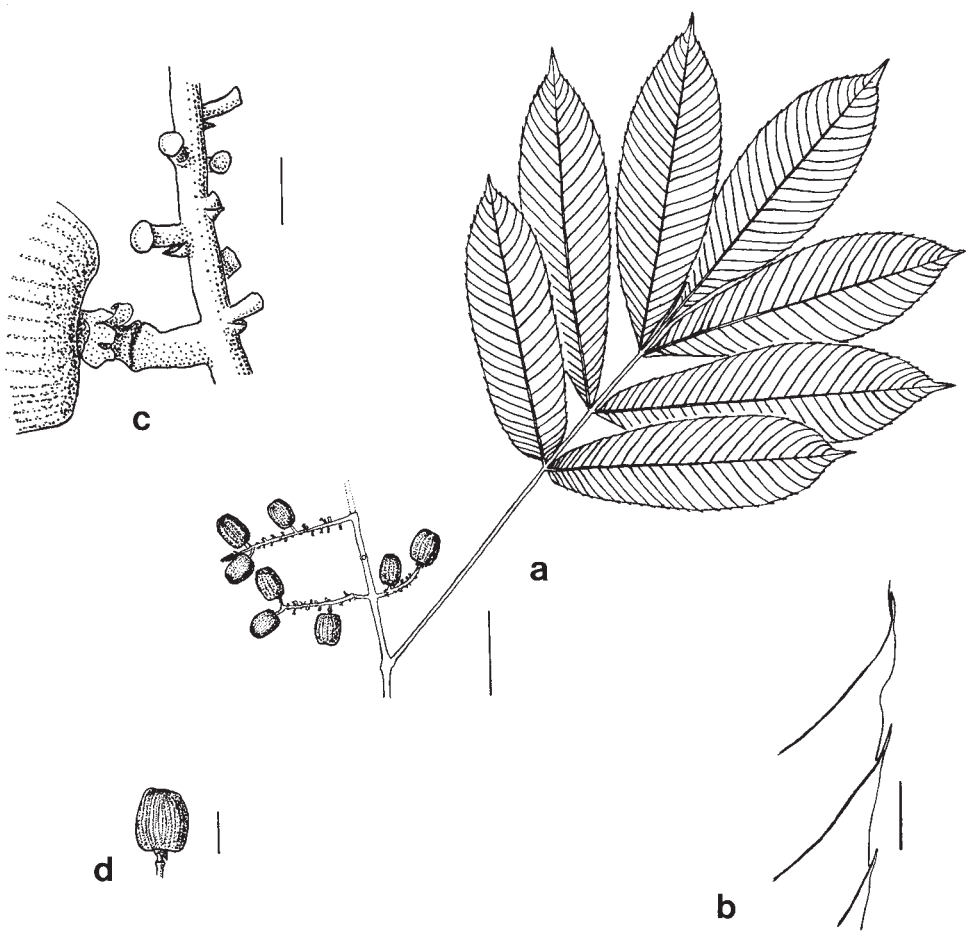

Fig. 4. *Touroulia guianensis* – a: leaf and base of terminal inflorescence, b: leaf margin, c: base of fruit and pedicel, articulating at about the middle, d: fruit. – Scale: a = 4 cm, b-c = 3 mm, d = 1 cm; after *Santos 75*; drawing by J. V. Schneider.

Notes: The species is probably androdioecious (as *T. guianensis*) but up to now no male inflorescences have been observed by us.

Flowers of hermaphrodite plants at hand display strong similarities with *T. guianensis*. Conspicuous are the differences in size of inflorescence and flowers as well as in the articulation of the fruit pedicel (basally in *T. amazonica*, at about the middle in *T. guianensis*).

The course of the secondary veins near the leaf margin and the way they protrude beyond it usually is a good character to distinguish both *Touroulia* species (see Fig. 3 and 4). Rarely (slightly aberrant specimen *La Rotta & Miraña 555*) the leaflets are ± crenulate in *T. amazonica* and the secondary veins do not protrude beyond the margin.

2. *Touroulia guianensis* – Fig. 1b, 4, 5a.

Touroulia guianensis Aubl., Hist. Pl. Guiane 1: 492, t. 194. 1775 ≡ *Robinsonia guianensis* J. F. Gmel., Syst. Nat. 2(1): 796. 1791, nom. superfl. ≡ *Robinsonia melianthifolia* Willd., Sp. Pl. 2: 999. 1799, nom. superfl. ≡ *Touroulia solitaria* Stokes, Bot. Mat. Med. 3: 105. 1812, nom. superfl.

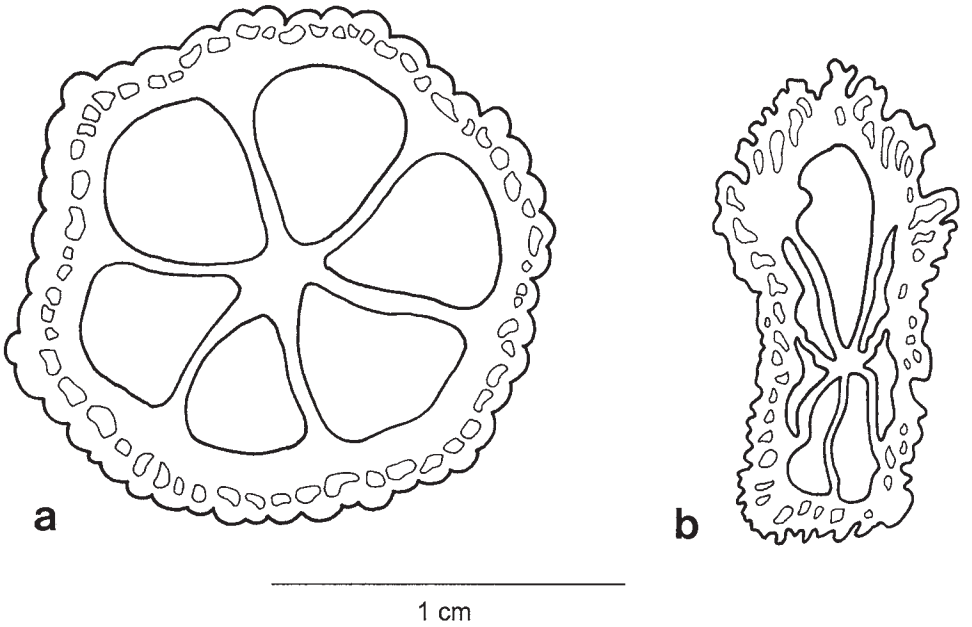

Fig. 5. Transsection of fruits of *Touroulia* – a: *T. guianensis (French Guiana Forest Service 301 M)*, b: *T. amazonica* (*Silva & Brazão 60817*; flattened shape of fruit due to pressing during preservation process). – Drawing by M. Middeke.

Type: French Guiana, *Aublet s.n.* (P!, lectotype, hic designatus; BM!, probably isolectotype; S!, possibly isolectotype [see Notes, below]).

Tree 4-10(-30?) m tall, diameter of trunk to 20 cm. Leaves 13-55 × 10-40 cm, with 7-13 leaflets; petiole 2.5-10 cm; leaflets 5-22 × 2-5(-6) cm, chartaceous, with 15-26 pairs of secondary veins. Margin of leaflets ± serrate, crisp, the secondary veins bent towards apex near margin and projecting 0.5-1.5(-2) mm beyond. Tertiary veins strongly geniculately bent in about the middle of intercostal fields (Fig. 1b). Stipules 2 per node, triangular to subulate, 0.4-1.3 × 0.2-0.3 cm, acute (Fig. 4), glabrous. Inflorescence (7-)10-15(-25) × (4-)6-13(-16) cm. Flowers up to 1 cm in diameter, the male usually smaller than the hermaphrodite, the pedicel articulating in about the middle; sepals united at base, the calyx 5-lobed, the lobes unequal, broadly triangular, 0.03-0.15 cm long, persisting in fruit; petals yellowish, 0.25-0.3 cm long, obovate. Fruit 1.5-2.5 × 1.3-2 cm. Seed 1.0-1.3 × 0.5-0.6 cm.

Vernacular name: Yoyo mosi, Palmito, Mongui oudou [monki-oedoe, mangui-oedoe] (French Guiana), Oulatalheua (French Guiana), Redi-oedoe (Suriname).

Habitat: Primary and secondary rainforest; preferably on sandy soil; 400-700 m.

Distribution: Venezuela, Brazil, French Guiana, Guyana, Suriname (Fig. 2).

Ic.: Aublet, Hist. Pl. Guiane 1: t. 194. 1775; Lamarck, Tabl. Encycl. 3(1): pl. 424. 1794; Hallier in Arch. Néerl. Sci. Exact. Nat., ser. 3, 1: 182. 1912; Roosmalen, Fruits Guianan Flora: 369, pl. 136, fig. 9. 1985.

Further references: Walpers, Repert. Bot. Syst. 2: 434. 1843; Planchon & Triana in Ann. Sci. Nat. Bot., ser. 4, 15: 316. 1861; Sagot in Ann. Sci. Nat. Bot., ser. 6, 11: 170. 1881; Engler in Martius

(ed.), Fl. Bras. 12, 1: 486. 1888; Ducke in Arch. Jard. Bot. Rio de Janeiro 4: 143. 1925; Lanjouw & van Heerdt in Pulle, Flora of Suriname 3(1): 364. 1941; Pires in Bol. Técn. Inst. Agron. 15: 29. 1948; Lemée, Flore Guyane Franç. 3: 26. 1953; Lindeman & Mennega in Meded. Bot. Mus. Herb. Rijks Univ. Utrecht 200: 255. 1963; Boggan & al., Checklist Plants Guianas: 179. 1997.

Notes: Aublet did not cite any collecting number or herbarium in the protologue. Therefore, a specimen (sterile) from P annotated in Aublet's handwriting has been designated as the lectotype. A specimen (with inflorescence) from BM is annotated "Guiana. F. Aublet." on the reverse of the herbarium sheet but not by Aublet himself. Possibly another Aublet specimen is kept in the Herbarium Swartzii at S. It is known that Swartz had some exchange with Aublet (Salter, pers. comm.).

Flower buds were often observed to be covered by a yellowish, resinous substance, becoming dry and hard in herbarium specimens.

In hermaphrodite plants the lateral branches of the inflorescence usually appear botryoid, only at their base 3-flowered cymose partial-inflorescences could occasionally be observed. The pedicel is thickening as the fruit ripens, reaching a diameter of 1.0-3.0 mm.

In male plants, the primary branches of the inflorescence bear 3-5(-7)-flowered cymose partial inflorescences. The pedicel does not thicken after flowering, reaching a diameter of 0.2-0.3 mm.

The fruits are reported to be edible.

Nomina excludenda

1. *Touroulia decastyla* Radlk. in Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 19: 218. 1889 [1890]. – Holotype: Brasilia, Minas Gerais, in montibus ad São Jose do Chopotó, 700 m, *Schwacke 4818* (M!; isotype: RB!) ≡ ***Lacunaria decastyla*** (Radlk.) Ducke in Arch. Jard. Bot. Rio de Janeiro 5: 169. 1930.

L. decastyla is easily recognized as member of *Lacunaria* by undivided, whorled leaves (4 per node) and unisexual flowers.

2. *Touroulia jenmanii* Oliv. in Hooker's Icon. Pl. 20: t. 1998. 1891 ≡ ***Lacunaria jenmanii*** (Oliv.) Ducke in Arch. Jard. Bot. Rio de Janeiro 5: 171. 1930. – Holotype: British Guiana, Issorooroo River, 2.1889, *Jenman 5178* (K, FR [photo]!).

3. *Touroulia pteridophylla* Radlk. in Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 19: 218. 1889 [1890] ≡ ***Quiina pteridophylla*** (Radlk.) Pires in Bol. Técn. Inst. Agron. N. 20: 48. 1950. – Holotype: Brasilia, Alto Amazonas, Prov. Rio Negro, habitat in sylvis ad flumen Japurá, *Martius s.n.* (M!).

Only juvenile plants of *Touroulia* spp. might be confused with seedlings of *Quiina pteridophylla.* The latter exhibits pinnatipartite leaves in juvenile individuals resembling the leaves of *Touroulia guianensis (T. amazonica* is not known as seedling). Leaves in whorls of (3-)4-5 and the conspicuously furrowed shoot apex distinguish *Q. pteridophylla* from *T. guianensis* (leaves opposite, shoot apex not conspicuously furrowed).

Specimens seen

The list of investigated specimens is available at http://www.bgbm.fu-berlin.de/bgbm/library/publikat/willd29zizka&schneider.htm.

Acknowledgements

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