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TAXONOMIC NOVELTIES IN *HETEROPTERYS* GROUP *APTYCHIA* (MALPIGHIACEAE) FROM THE BRAZILIAN ATLANTIC FOREST

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We describe two new species of *Heteropterys* (Malpighiaceae) endemic to the Atlantic Forest of Espírito Santo State, Brazil. *Heteropterys eucalyptifolia* and *H. follianum* belong to the *Aptychia* informal group, due to their petioles with a pair of glands at the base, sessile pedicels, petals exposed in the enlarging bud, and strongly heteromorphic filaments. Morphological descriptions, illustrations, a distribution map and information on the conservation status of the species are provided.

Keywords. Atlantic Forest, Espírito Santo, Malpighiales, new species, taxonomy.

Descrevemos duas novas espécies de *Heteropterys* (Malpighiaceae) endêmicas da Floresta Atlântica do estado do Espírito Santo, Brasil. *Heteropterys eucalyptifolia* e *H. follianum* pertencem ao grupo informal *Aptychia*, por apresentar pecíolo com um par de glândulas na base, pedicelos sésseis, pétalas expostas no botão floral, e filetes fortemente heteromórficos. São fornecidas descrições morfológicas, ilustrações, mapa de distribuição e estado de conservação das espécies.

Palavras chave. Espírito Santo, Floresta Atlântica, Malpighiales, novas espécies, taxonomia.

Introduction

The family Malpighiaceae is pantropical and, although not obvious at first, has great floral variability, especially in the inflorescence morphology and arrangement of oil glands. Despite the intense work of taxonomists to recognise species and phylogenetic relationships in the family (Davis & W. R. Anderson, 2010), South American Malpighiaceae remain surprising, as evidenced by the large number of species described in recent years (e.g. Almeida & Amorim, 2014; C. Anderson, 2014; Almeida & Amorim, 2015; Amorim & Almeida, 2015; Almeida, 2016; W. R. Anderson & C. Anderson, 2017; Francener *et al.*, 2017; C. Anderson & W. R. Anderson, 2018; C. Anderson, 2019). Among the taxa in the family, *Heteropterys* Kunth has been intensely studied through reviews of informal groups (Amorim, 2003a; Sebastiani & Mamede, 2010), local floras (Pessoa *et al.*, 2014), descriptions of new species (e.g. Sebastiani & Mamede, 2010; Pessoa & Amorim, 2016;

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Amorim *et al.*, 2017; Pessoa *et al.*, 2019) and wood anatomy studies (Amorim *et al.*, 2017; Pace *et al.*, 2019).

Heteropterys is the largest genus of Malpighiaceae and comprises c.152 species (W. R. Anderson, 2013; Amorim *et al.*, 2017; Pessoa *et al.*, 2019) distributed throughout the Neotropics, with one species reaching western Africa (C. Anderson, 2001). The genus is monophyletic with fairly strong bootstrap support (Davis & W. R. Anderson, 2010; Charles C. Davis, Harvard University, personal communication, 2019), and phylogenies include several infrageneric groups (with modest support) proposed by Niedenzu (1903, 1928). One of these informal groups corresponds to *Heteropterys* subsect. *Aptychia* Niedenzu (1903), an assemblage of species with sessile pedicels that occurs predominantly on the eastern coast of South America (Amorim, 2003a).

Taxonomic novelties in *Heteropterys* group *Aptychia* have been reported from different forest types from Pernambuco to Rio de Janeiro State, with at least nine species having been described in recent years (Amorim, 2001, 2002, 2003b, 2005). Here, we present two further taxonomic novelties in the group, *Heteropterys eucalyptifolia* and *H. follianum*, both endemic to the Brazilian Atlantic Forest of Espírito Santo State.

New Taxa

Heteropterys eucalyptifolia Amorim, **sp. nov.**

Heteropterys eucalyptifolia differs from *Heteropterys lindleyana* A.Juss. in its lamina (9.7–)13.6–17 × (3.2–)5.2–5.6(–6.2) cm (versus 11.6–29 × 7.8–16.3 cm in *H. lindleyana*) with margins entire (versus entire to crenate–sinuate), abaxial surface bearing several small impressed glands on the margin (versus abaxial surface bearing a marginal or inframarginal row of 14–16 impressed glands distally but not on margin), inflorescence (4–)5.5–11.5(–14) cm long (versus 9.5–25.5 cm long), petals vivid yellow, the posterior with white in centre of limb (versus all petals pale yellow), and samara (38–)42–47 mm long (versus 48–65 mm long) – Type: Brazil. Espírito Santo: Mun. Castelo, Parque Estadual do Forno Grande, trilha para as piscinas, 20°30′58′′S, 41°05′01′′W, 1100–1400 m, 2 v 2008 (bud, fl), *C. N. Fraga, R. Goldenberg, M. M. Saavedra & C. Mynssen* 1958 (holo CEPEC; iso MBM, MBML, RB, UPCB). **Figs 1A–D, 2.**

Liana, climbing to 4–6 m. *Stems* cylindrical, striate, initially sparsely sericeous to early glabrate, developing scattered lenticels. *Leaves* opposite; petiole (14–)20–30 mm long, sparsely sericeous to early glabrate, bearing a pair of glands at base, each gland 2–4 mm in diameter; stipules as minute protuberances, c.0.5 mm long, early caducous; lamina of larger leaves (9.7–)13.6–17 × (3.2–)5.2–5.6(–6.2) cm, membranous, ovate, elliptic, lanceolate to ovate–lanceolate, the base obtuse to rounded, the apex acute to acute–acuminate, the margins entire; glabrous or bearing a few sessile early caducous hairs; abaxial surface bearing several small impressed glands on margin; veins and reticulum more visible below

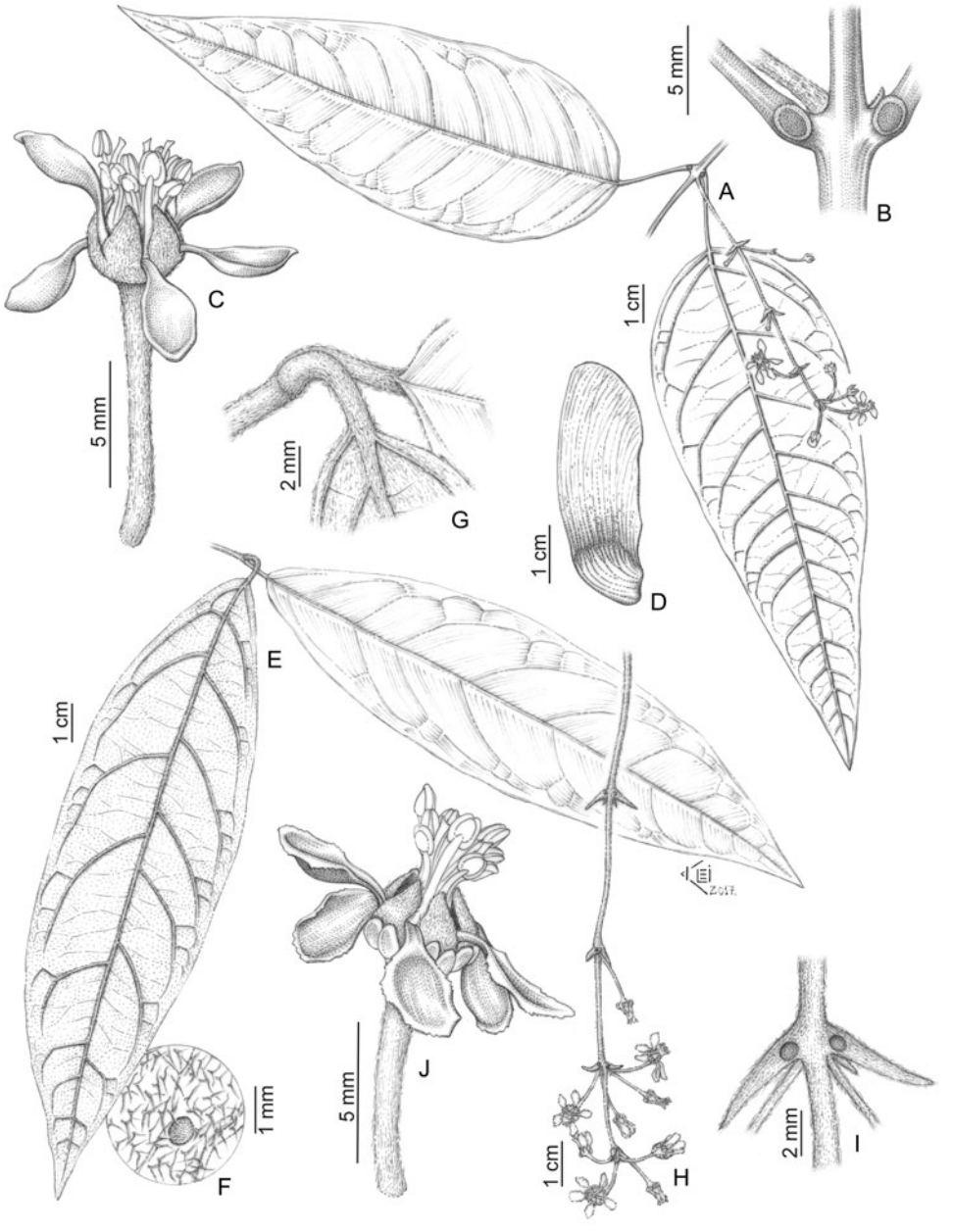

FIG. 1. *Heteropterys eucalyptifolia* Amorim, sp. nov.: A, flowering branch; B, detail of petiole base; C, open flower; D, samara in lateral view. *Heteropterys follianum* Amorim, sp. nov.: E, vegetative branch; F, detail of abaxial surface of leaf, showing the gland; G, detail of petioles; H, inflorescence; I, detail of inflorescence bracts; J, open flower. Based on: A–C, *C. N. Fraga, R. Goldenberg, M. M. Saavedra & C. Mynssen* 1958 (CEPEC); D, *C.N. Fraga* et al. 2109 (CEPEC); E–J, *D.A. Folli* 5464 (CEPEC). Drawn by Klei Sousa.

FIG. 2. General aspect of *Heteropterys eucalyptifolia* Amorim, sp. nov. A, Flowering branch; B, detail of inflorescence; C, open flowers, each arrow indicating the posterior petal; D, floral buds; E, immature samaras. (Photographs: C. N. Fraga.)

than above. *Inflorescence* paniculate, axillary or rarely terminal, pendulous, pale brown, sparsely sericeous to glabrate with age, (4–)5.5–11.5(–14) cm long, primary branches 4–10, (0.5–)2–3 cm long or absent, accessory branches absent, the flowers borne ultimately in 4- to 6-flowered umbels, occasionally with an additional 2–4 flowers borne more proximally; inflorescence bracts abruptly reduced, 2–4 mm long, 1–1.5 mm wide, oblong, the margins entire, the base biglandular, each gland 1–1.5 mm in diameter, green; peduncle absent; bract 1–1.5 mm long, c.0.7 mm wide, ovate, eglandular, abaxial surface sericeous, bracteoles like bracts but smaller; pedicel 9.5–10 × 0.6–2.4 mm, uniformly slender, pale brown, densely sericeous. *Sepals* 3.5–5 × 2–3 mm, pale brown, obtuse at the apex, not appressed against filaments at anthesis, abaxial surface sericeous, all eglandular. *Petals* exposed in the enlarging bud, late caducous, the posterior suberect and the lateral spreading, not carinate, the margins entire; lateral petals vivid yellow, claw 2–2.3 mm

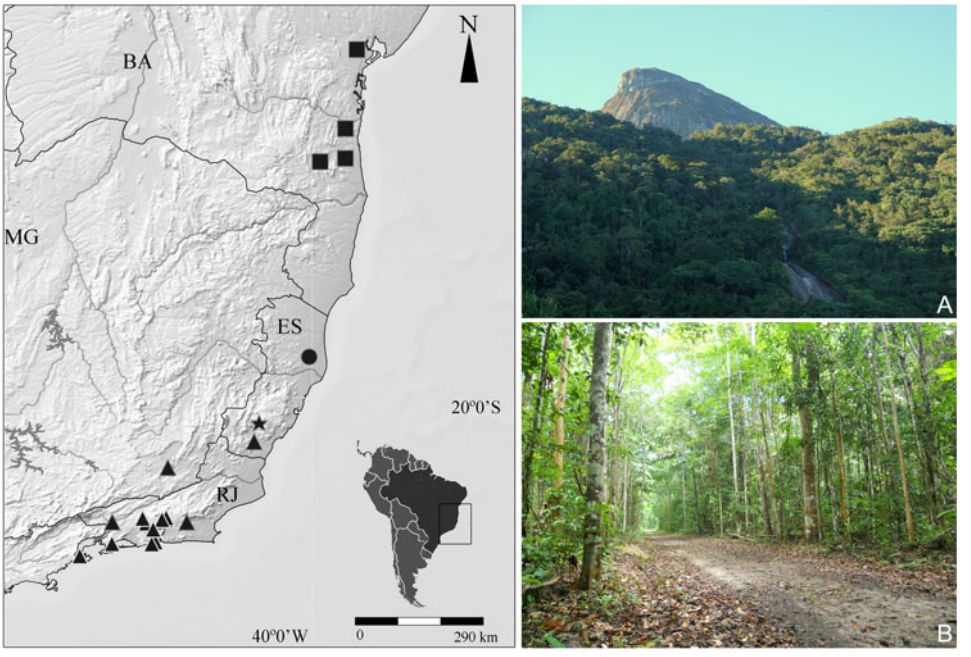

FIG. 3. Left panel, Map showing the geographical distribution of *Heteropterys eucalyptifolia* (star) and the related species *H. lindleyana* (triangles), and of *H. follianum* (circle) and the related species *H. sanctorum* (squares). A, Overview of the moist coastal Atlantic Forest in Forno Grande State Park, Castelo, Espírito Santo, Brazil (the location of the area indicated by the star in the left panel). B, General aspect of the lowland coastal Atlantic Forest in the Vale Natural Reserve, Linhares, Espírito Santo, Brazil (the location of the area indicated by the circle in the left panel). (Photographs: A, C. N. Fraga; B, L. C. Marinho.) Map produced using the SimpleMappr website (Shorthouse, 2010).

long, limb 3–4.5 × 2–2.5 mm; posterior petal vivid yellow with white in centre of limb, claw 2–2.5 mm long, limb 2.5–2.7 × c.1.5 mm. *Stamens* glabrous; filaments strongly heteromorphic, green, 3.8–5 × 1–1.8 mm, basally connate; anthers white, 0.8–1.2 mm long, slightly reflexed at anthesis; the connective uniformly pale gray. *Ovary* 1.5–1.7 mm tall, densely sericeous; styles 1.4–1.5 mm long, the anterior erect and two posterior slightly arcuate outwards from base, glabrous, exceeding or similar in length to the larger stamens, the apex dorsally apiculate; stigmas lateral, all three facing centre of flower. *Samara* pale brown when mature, (38–)42–47 mm long, borne erect when single, suberect when double or triple, proximally sericeous or glabrate; dorsal wing (22–)32–37 × 12–18 mm, inferior margin densely thickened in proximal nut; nut 11–13 mm in diameter, ovate, with inconspicuous veins.

Habitat, distribution and conservation status. Heteropterys eucalyptifolia is known only from the municipality of Castelo, in Espírito Santo State (left panel of Fig. 3). It is a small liana that grows in primary and advanced secondary Atlantic Forest (Fig. 3A), between 1100 and 1600 m a.s.l. All specimens of *Heteropterys eucalyptifolia* were collected in the protected area of Forno Grande State Park (see Fig. 3A), mostly along watercourses, in the canopy or on the borders of forest remnants. Although it occurs in a protected area,

Heteropterys eucalyptifolia is considered Critically Endangered (IUCN, 2012), based on its extent of occurrence of less than 100 km^2 and its single locality (B1 + B2a).

Phenology. The species was collected with floral buds and flowers in May and fruits in July and October.

Etymology. The specific epithet refers to the resemblance of the leaf shape to those of *Eucalyptus* L'Her. species (Myrtaceae).

Additional specimens examined. Brazil. **Espírito Santo**: Mun. Castelo, Parque Estadual do Forno Grande, 20°30′58″S, 41°05′01″W, 1100–1400 m, 30 v 2006 (bud, fl), *L. Kollmann* et al. 9126 (CEPEC, MBML, SP); ibid., localidade do Rio Manso, 1200–1250 m, 3 v 2008 (bud), *C.N. Fraga* et al. 2006 (CEPEC, MBML, RB); ibid., trilha para as piscinas, 1100–1400 m, 17 vii 2008 (fr), *C.N. Fraga* et al. 2109 (CEPEC, MBM, MBML, RB); ibid., 1132–1400 m, 17 vii 2008 (fr), *L. Kollmann* et al. 11108 (CEPEC, MBML, RB); ibid., Forninho, c.1600 m, 27 v 2009 (bud, fl), *A. P. Fontana* et al. 6018 (CEPEC, MBML); ibid., trilha do mirante, 2 x 2015 (fr), *Turma de Taxonomia de Campo s.n.* (VIES 025454).

Heteropterys eucalyptifolia is morphologically similar to *H. lindleyana*, which also occurs in the Atlantic Forest of Espírito Santo State, Brazil (see left panel of Fig. 3). Both species are small lianas with the following characters: well-developed petioles and laminae; glabrous or bearing a few and early caducous hairs; inflorescences generally axillary and pendulous; and flowers with yellow, spreading petals and a strongly heteromorphic androecium. The new species, however, can be differentiated by the leaf lamina margin (entire versus entire to crenate–sinuate in *Heteropterys lindleyana*) and the glands on the abaxial surface of the leaf (several small impressed glands on the margin versus abaxial surface bearing a marginal or inframarginal row of 14–16 impressed glands distally but not on the margin in *H. lindleyana*). *Heteropterys lindleyana* in Espírito Santo State is known from only one collection (*Kollmann* 9738 [MBML]) but is not sympatric. Most collections of *Heteropterys eucalyptifolia* were erroneously determined as *H. eglandulosa* A.Juss., a species related to *Heteropterys* informal group *Parabanisteria*, which generally grows in cerrado, rock outcrops and Amazonian forest in South America.

Heteropterys follianum Amorim, **sp. nov.**

Heteropterys follianum is similar to *Heteropterys sanctorum* W.R.Anderson but can be differentiated by the densely velutinous petiole and abaxial lamina surface (versus petiole and abaxial lamina surface sparsely sericeous when young to early glabrate in *H. sanctorum*), posterior petal slightly suberect or all spreading (versus all petals strongly reflexed), posterior styles slightly arcuate outwards from base and the anterior slender (versus all styles slender and strongly divergent), posterior styles with apex truncate or rounded and the anterior dorsally strongly apiculate (versus all styles with apex truncate) and stigmas lateral (versus apical) – Type: Brazil. Espírito Santo: Mun. Linhares, Reserva Natural Vale, estrada municipal do MME, 19°09′24″S, 40°03′26″W, 19 i 2007 (fl), *D.A. Folli* 5464 (holo CEPEC; iso CVRD, SP). **Fig. 1E–J.**

Liana, climbing to 1–2 m. *Stems* cylindrical to 4- to 6-angled, c.3 mm in diameter, densely velutinous to glabrate with age, developing lenticels. *Leaves* opposite; petiole 8–10.1 mm long, densely velutinous (the hairs V- or Y-shaped to straight and appressed), bearing a pair of glands at base, each gland c.1 mm in diameter; stipules not seen; lamina of larger leaves (7–)15–16.5 × 4–4.8 cm, chartaceous, elliptic, cuneate–oblong to widely lanceolate, the base acute, rarely cuneate, the apex acute, rarely obtuse, the margins entire to sinuate, slightly revolute; hairs V-shaped to straight and appressed, indument appearing velutinous on abaxial surface, especially on midrib, lateral veins and margin proximally; abaxial surface bearing a marginal or inframarginal row of 8–13 small impressed glands distally; veins more visible below than above, reticulum inconspicuous. *Inflorescence* paniculate, borne on older, leafless stems, axillary to fallen leaves (not observed on distal stems), pendulous, velutinous, 10–12 cm long, primary branches strongly reduced or absent, accessory branches absent, flowers borne ultimately in 2- to 4-flowered umbels; inflorescence bracts 3–8 × c.3 mm, oblong, the base biglandular, each gland 1.5–2 mm in diameter; peduncle absent; bract c.1 × c.0.5 mm, ovate, eglandular, abaxial surface sericeous, bracteoles similar to bracts but smaller: pedicel 8–10 × 1–2 mm, uniformly slender, densely sericeous. *Sepals* 4–4.5 × c.2.5 mm, pale brown, obtuse at the apex, not appressed against filaments at anthesis, abaxial surface sericeous, anterior sepal eglandular and the lateral four biglandular, or lateroposterior sepals 1- or 2-glandular, each gland 2–2.5 mm in diameter. *Petals* exposed in the enlarging bud, all pale yellow, easily caducous, the posterior slightly suberect or all spreading at anthesis, not carinate, margin slightly erose; claw of lateral petals c.3 mm long, limb c.5 × c.4 mm; claw of posterior petal c.4 mm long, limb c.6 × c.2.5 mm. *Stamens* glabrous; filaments strongly heteromorphic, 3–5 × 0.5–1 mm, basally connate; anthers 1.5–2 mm long, slightly reflexed at anthesis; the connective uniformly dark. *Ovary* c.2 mm high, densely sericeous; styles not divergent, glabrous, exceeding or similar in size to the larger stamens, posterior styles slightly arcuate outwards from base, c.4 mm long, the apex truncate or rounded, anterior style slender, c.4.5 mm long, the apex strongly apiculate dorsally; stigmas lateral, all three facing centre of flower. *Samara* not seen.

Habitat, distribution and conservation status. Heteropterys follianum is known only from one collection from northern Espírito Santo State (see left panel of Fig. 3). It is a small liana that grows in primary coastal Atlantic Forest (see Fig. 3B), where we suppose it can be found below the canopy in shaded areas. Although *Heteropterys follianum* occurs in a relatively well-known area, where collecting expeditions have taken place since the 1950s, the populations seems to have few individuals, because only one herbarium collection was found. Owing to the low number of known samples, we have assessed the species as Data Deficient (DD) (IUCN, 2012).

Phenology. The species was collected with floral buds and flowers in January.

Etymology. The epithet honors Domingos A. Folli (born 1953), who collected the type of the species and is one of the most important collectors ever to work in Espírito Santo, Brazil, especially in poorly collected areas in the northern part of the state.

Heteropterys follianum resembles *H. sanctorum* by the petiole bearing a pair of glands at base, abaxial lamina surface bearing a marginal or inframarginal row of small impressed glands distally, inflorescences axillary to fallen leaves, and yellow, early caducous petals. *Heteropterys sanctorum* is known from few records in four localities in southern Bahia State, Brazil (see left panel of Fig. 3). Also, both species have a noteworthy inflorescence characteristic: the panicle is pendulous and borne on older, leafless stems. We also highlight the large leaves, with the abaxial leaf surface bearing a marginal or inframarginal row of small impressed glands distally. *Heteropterys follianum* can be is easily distinguished by the velutinous indument on the petiole and abaxial lamina surface. When more and better specimens are available, with representative leaves and fruits, it may be possible to find additional differences between *Heteropterys follianum* and *H. sanctorum*.

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