

The lianescent species of *Grewia* L. (Malvaceae *s.l.*, formerly Tiliaceae) in Madagascar

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ABSTRACT

Three liana species of *Grewia* L. are described from Madagascar, bringing to five the members of the genus on the island to exhibit this habit. *Grewia manomboensis* G.E. Schatz, Randrian. & Lowry, sp. nov., *G. rabehevitrae* Randrian., Lowry & G.E. Schatz, sp. nov. and *G. rufostellata* Randrian., Lowry & G.E. Schatz, sp. nov., all three of which occur in low- to mid-elevation humid eastern forest, can be distinguished from one another by several features, including differences in the leaves (size, margin and prominence of the tertiary venation), pedicels (length, diameter and trichome density), sepal size, indument type and color, and petal shape. Illustrations are provided for each new taxon and photographs for two of them, along with a range map, preliminary assessments of the conservation status of each species, and an identification key in English and French.

KEY WORDS

Malvaceae,
Grewia,
liana,
Madagascar,
conservation
new species.

RÉSUMÉ

Les espèces lianescentes de Grewia L. (Malvaceae s.l., anciennement Tiliaceae) de Madagascar.

Trois espèces lianescentes de *Grewia* L. sont décrites de Madagascar, portant à cinq le nombre de représentants du genre sur l'île caractérisés par ce port. *Grewia manomboensis* G.E. Schatz, Randrian. & Lowry, sp. nov., *G. rabehevitrae* Randrian., Lowry & G.E. Schatz, sp. nov. et *G. rufostellata* Randrian., Lowry & G.E. Schatz, sp. nov., qui croissent toutes les trois dans les forêts orientales de basse à moyenne altitude, peuvent être distinguées les unes des autres par plusieurs caractères, dont des différences foliaires (taille, marge et proéminence de la nervation tertiaire), pédicellaires (longueur, diamètre, densité de trichomes), la taille des sépales, le type et la couleur de l'indument, ainsi que par la forme des pétales. Des illustrations sont fournies pour chacun des nouveaux taxons et des photographies pour deux d'entre eux, ainsi qu'une carte de répartition, une première évaluation du statut de conservation pour chaque espèce et une clé d'identification en anglais et en français.

MOTS CLÉS

Malvaceae,
Grewia,
liane,
Madagascar,
conservation,
espèces nouvelles.

INTRODUCTION

Traditionally the woody tropical genus *Grewia* L. was long placed in the family Tiliaceae, but several recent phylogenetic studies have led to its inclusion in a broadly defined Malvaceae (Alverson *et al.* 1998; Bayer *et al.* 1999; APG III 2009). Within Malvaceae sensu lato, *Grewia* belongs to the widely recognized subfamily Grewioideae, one of nine that make up the family (Bayer *et al.* 1999). Worldwide, *Grewia* comprises about 150 species of trees, shrubs and some lianas, primarily occurring in the Old World tropics. In Madagascar, the genus contains 86 currently recognized species (Schatz 2001), a number that will

increase significantly as material resulting from recent botanical exploration of previously under-explored parts of the island is studied and as several undescribed species recognized over the last few decades are published. Almost all of Madagascar's currently described species are trees or shrubs, although two long recognized species, *G. chalybaea* Baillon and *G. radula* Baker, are lianas, a fact that appears to have been largely overlooked. Representatives of the genus grow in a great variety of habitats and are found in most of Madagascar's vegetation types, although diversity is especially high in humid eastern forest (Capuron 1963, 1964; Capuron & Mabberley 1999; Mabberley & Capuron 1999; Schatz 2001).

Recent field work conducted by botanists from the Missouri Botanical Garden at several sites in east-central and southeastern Madagascar has yielded material of lianescent members of *Grewia* that could not be assigned to any of the currently recognized species. A careful examination of the available specimens at the herbaria of the Muséum national d'Histoire naturelle in Paris and the Missouri Botanical Garden in St. Louis, conducted as part of the *Catalogue of the Vascular*

Plants of Madagascar project (<http://www.efloras.org/madagascar>), confirmed that these collections represented three new species, bringing to five the total number of lianescent *Grewia* endemic to Madagascar. Here we provide a key to these five taxa and describe the three new entities, providing illustrations, color photos (for two of them), and preliminary risk of extinction assessments using the IUCN Red List Categories and Criteria (IUCN 2001).

KEY TO THE LIANESCENT SPECIES OF *GREWIA* L. IN MADAGASCAR

1. Largest leaves with blades > 9 cm long 2
- Largest leaves with blades < 9 cm long 3
2. Stamens 40 to 57; sepals pubescent on entire adaxial surface; pedicels of mature flowers 4.5-6 mm long; trichomes on surface of fully expanded leaves brown, not greatly contrasting with the color of the leaf blade *G. chalybaea* Baillon
- Stamens 16 to 25; sepals pubescent on the distal 2/3 of adaxial surface; pedicels of mature flowers 7-13 mm long; trichomes on surface of fully expanded leaves rust-orange, contrasting with the color of the leaf blade
..... *G. rufostellata* Randrian., Lowry & G.E. Schatz, sp. nov.
3. Both surfaces of leaves glabrescent to sparsely pubescent with stellate trichomes; sepals glabrous on adaxial surface except for a tuft of trichomes at the base; pedicels slender, c. 0.2-0.3 mm in diam., sparsely to moderately stellate pubescent, their epidermis visible *G. manomboensis* G.E. Schatz, Randrian. & Lowry, sp. nov.
- Both surfaces of leaves pubescent to densely pubescent with either stellate trichomes or with both stellate and unbranched trichomes; sepals densely pubescent on adaxial surface; pedicels robust, 0.4-0.8 mm in diam., densely stellate pubescent, largely obscuring their epidermis..... 4
4. Largest leaves with blades 2.3-5.5 cm long; both stellate and unbranched trichomes present on young stems, stipules, petioles, abaxial leaf surfaces, inflorescence axes, bracts and pedicels, the unbranched trichomes scattered to dense, up to 2 mm long, usually oriented perpendicularly to primary and secondary veins on abaxial leaf surface *G. radula* Baker
- Largest leaves with blades 4-8 cm long; only stellate trichomes present on young stems, stipules, petioles, abaxial leaf surfaces, inflorescence axes, bracts and pedicels
..... *G. rabehevitrae* Randrian., Lowry & G.E. Schatz, sp. nov.

CLÉ DES ESPÈCES LIANESCENTES DE *GREWIA* L. À MADAGASCAR

1. Limbe des feuilles les plus grandes > 9 cm de long 2
- Limbe des feuilles les plus grandes < 9 cm de long 3
2. Étamines 40 à 57 ; sépales pubescents sur l'ensemble de leur face adaxiale ; pédicelles des fleurs adultes de 4,5-6 mm de long ; trichomes bruns à la surface des feuilles totalement développées, ne contrastant pas nettement avec la couleur du limbe
..... *G. chalybaea* Baillon

- Étamines 16 à 25 ; sépales pubescents sur les $\frac{2}{3}$ distaux de leur face adaxiale ; pédicelles des fleurs adultes de 7-13 mm de long ; trichomes rouille-orange à la surface des feuilles totalement développées, contrastant nettement avec la couleur du limbe
..... *G. rufostellata* Randrian., Lowry & G.E. Schatz, sp. nov.
- 3. Feuilles glabres à légèrement pubescentes sur les deux faces avec des trichomes étoilés ; sépales glabres sur leur face adaxiale à part une touffe de poils à leur base ; pédicelles fins, *c.* 0,2-0,3 mm de diamètre, à pubescence étoilée épars à modérée, laissant leur épiderme visible *G. manomboensis* G.E. Schatz, Randrian. & Lowry, sp. nov.
- Feuilles pubescentes à densément pubescentes sur les deux faces avec soit uniquement des trichomes étoilés, soit avec des trichomes étoilés et non ramifiés ; sépales densément pubescents sur leur face adaxiale ; pédicelles robustes, *c.* 0,4-0,8 mm de diamètre, à pubescence étoilée dense, masquant fortement leur épiderme 4
- 4. Limbe des feuilles les plus grandes de 2,3-5,5 cm de long ; présence à la fois de trichomes étoilés et non ramifiés sur les jeunes rameaux, stipules, pétioles, surface abaxiale des feuilles, axes d'inflorescence, bractées et pédicelles, les trichomes non ramifiés épars à denses, jusqu'à 2 mm de long, généralement orientés perpendiculairement aux nervations primaire et secondaire sur la face abaxiale des feuilles *G. radula* Baker
- Limbe des feuilles les plus grandes de 4-8 cm de long ; présence de trichomes uniquement étoilés sur les jeunes rameaux, stipules, pétioles, surface abaxiale des feuilles, axes d'inflorescence, bractées et pédicelles
..... *G. rabehevitrae* Randrian., Lowry & G.E. Schatz, sp. nov.

SYSTEMATICS

1. *Grewia manomboensis*

G.E. Schatz, Randrian. & Lowry, sp. nov.
(Fig. 1)

Haec species inter congeneros madagascarienses quoad habitum lianescentem Grewiae foliis venatione aspectu penninervis, inflorescentibus quatuor floribus pedunculo et pedicellis gracilissimis distinguitur.

TYPUS. — Madagascar. Prov. Fianarantsoa, Région Atsimo-Antsinana, Fivondronana Farafangana, Fokontany Manombo, Réserve Spéciale de Manombo, forêt dense humide de basse altitude sur latérite, 23°00'47"S, 47°43'34"E, 30 m, 14.XI.2001, fl., *Rabenantoandro, McPherson & Gervais 779* (holo-, MO!; iso- P!, TAN!, TEF!).

PARATYPES. — Madagascar. Prov. Fianarantsoa, forêt littorale sur latérite à labomary, 40 km au SW de Farafangana, Mananivo, 23°03'34"S, 47°40'23"E, 0-50 m, 6.II.2001, *Rabenantoandro et al. 413* (MO, P, TEF). — Région Atsimo-Antsinanana, Fivondronana Farafangana, Réserve Spéciale de Manombo, parcelle 1, forêt d'Anaviavy, forêt dense humide de basse altitude sur latérite, 23°00'39"S, 47°44'08"E, 12 m, 16.IX.2005, y.fr., *Rakotonirina et al. 301* (MO, TAN). — Reste de forêt sur latérite de basalte au S de Farafangana (route de Mahabo) au PK 13-17, [22°55'S, 47°47'E], 11.X.1964, fl., *Service Forestier (Capuron) 23583* (P).

DESCRIPTION

Lianas, stems brown, densely covered with beige stellate trichomes, eventually wearing off to reveal circular to elliptic lenticels. Stipules narrowly triangular to needle-like, densely covered with both simple and stellate trichomes. Leaves alternate, subcoriaceous, 1.5-5.2 × 0.9-2.2 cm, elliptic to ovate, adaxially initially with very scattered stellate trichomes varying in the number of arms from 2 to 6 and the length of arms from 0.01-0.5 mm, glabrescent, abaxially initially with very scattered trichomes along the midvein, secondary and tertiary veins, varying in the number of arms from 2 to 6 and the length of arms from 0.01-0.5 mm, glabrescent, finely verrucose, base acute to obtuse, margins serrate, each tooth terminating with a single simple trichome, apex acute to acuminate, blade sub-palmatinerved but appearing penninerved, craspedodromous, with 6 or 7 pairs of secondary veins, the basal two secondary veins subopposite and extending upwards *c.* $\frac{1}{4}$ the length of the blade at a slightly steeper angle (50-55°) than the remaining secondaries (35-40°), midvein slightly raised abaxially, raised adaxially, secondary and tertiary venation slightly raised abaxially, lacking domatia, flat adaxially, not evident. Petiole 2.5-4 mm, den-

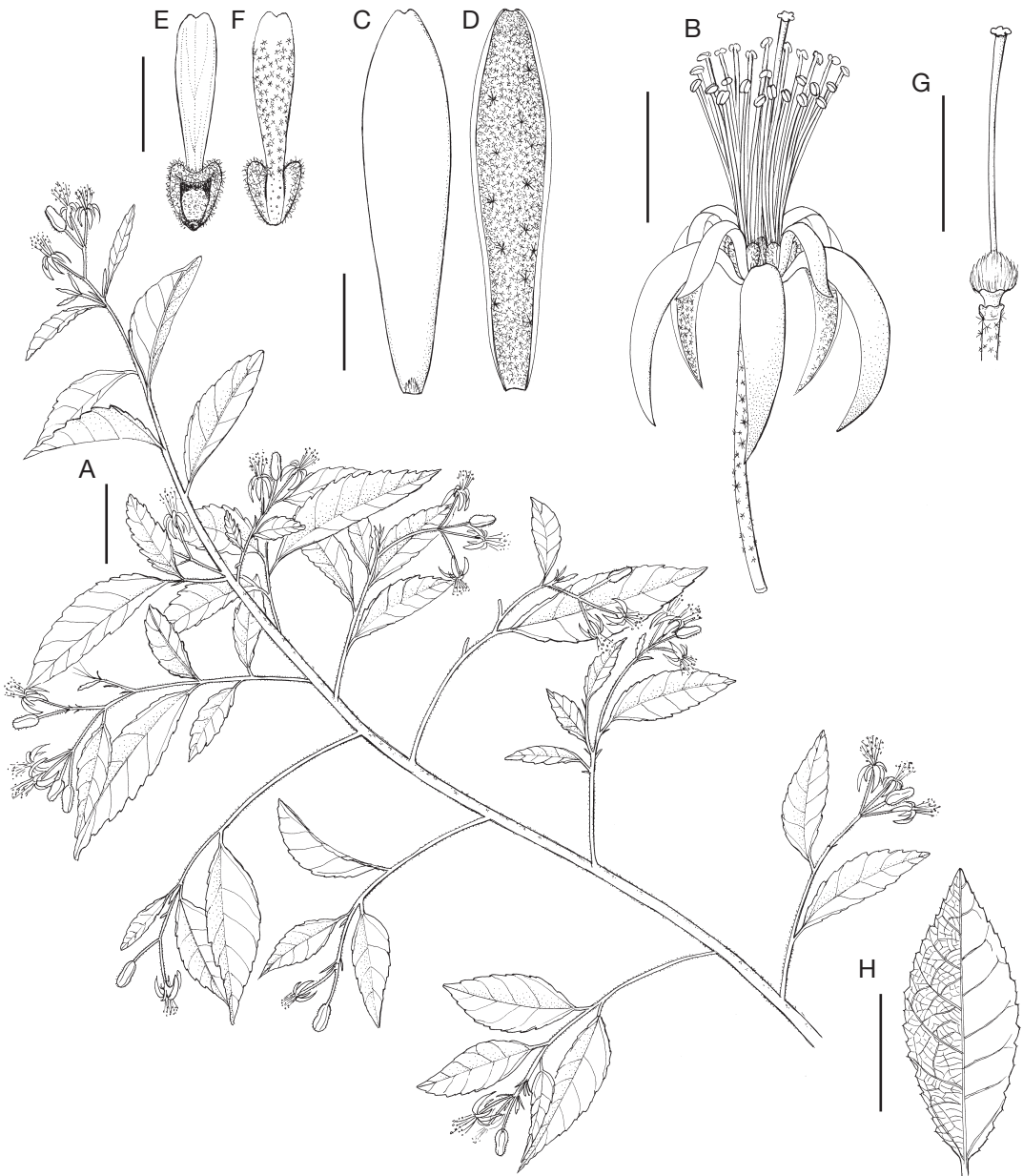


FIG. 1. — *Grewia manomboensis* G.E. Schatz, Randrian. & Lowry, sp. nov.: **A**, flowering branch; **B**, flower at anthesis; **C**, sepal (adaxial surface); **D**, sepal (abaxial surface); **E**, petal (adaxial surface with basal gland); **F**, petal (abaxial surface); **G**, detail of gynoecium; **H**, detail of leaf with venation. **A-H**, *Rabenantoandro, McPherson & Gervais 779* (holotype, MO). Scale bars: A, 2 cm; B, 5 mm; C, D, E, 2 mm; F, 5 mm; G, 2 cm. Illustration by Barbara Alongi.

sely covered with both simple and stellate trichomes bearing 2 to 4 arms. Inflorescences pseudoterminal, umbellate, 2- to usually 4-flowered, peduncle slender,

5-6 mm long, to 10 mm in young fruit, 0.2 mm in diam., covered with stellate trichomes. Flowers bisexual, pentamerous, pedicel very slender, 10-12 mm

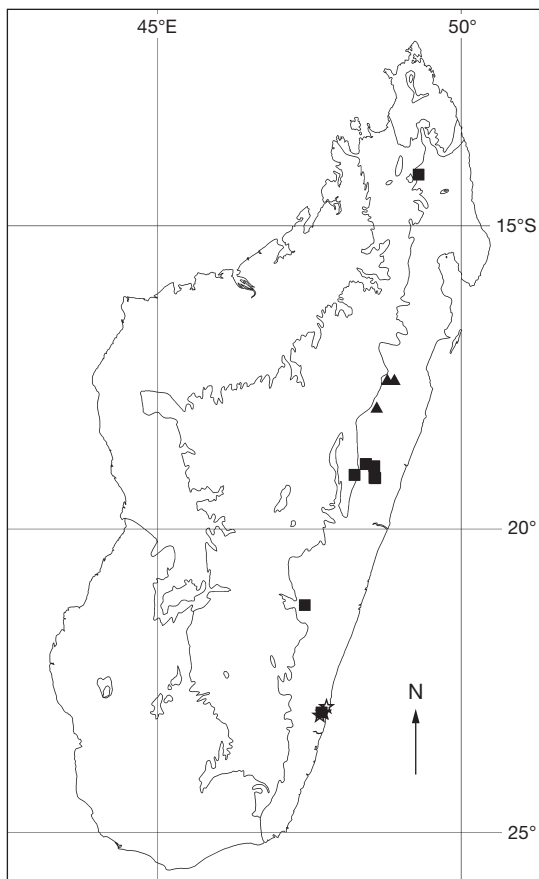


FIG. 2. — Distribution of new lianescent species of *Grewia* L., mapped on the bioclimatic zones of Madagascar (after Cornet 1974; see Schatz 2000): *G. manomboensis* G.E. Schatz, Randrian. & Lowry, sp. nov.; (☆), *G. rufostellata* Randrian., Lowry & G.E. Schatz, sp. nov. (■) and *G. rabehevitrae* Randrian., Lowry & G.E. Schatz, sp. nov. (▲).

long, to 15 mm in young fruit, 0.2-0.3 mm in diam., with sparse to moderately dense stellate trichomes, the epidermis visible, bearing caducous bracts 1-2 mm long at base; sepals valvate, erect in bud, strongly reflexed at anthesis, 8-10 × 1.3-3 mm, narrowly oblong, abaxially densely covered with whitish grey stellate trichomes, adaxially glabrous except with a tuft of trichomes at the base, yellow in vivo; petals 4-5 × 0.7-1 mm, narrowly oblong, densely covered with stellate trichomes on both surfaces, yellow in vivo, the basal 1 mm slightly broader and glandular, the gland densely ringed by tufts of beige simple

and stellate trichomes, adaxially the pad of the gland densely papillose, androgynophore 0.7 mm, glabrous, receptacle shallowly 5-lobed, densely covered with simple and stellate trichomes; stamens 20 to 30 in 5 groups, filament 8 mm long, filiform, anther 0.3 mm in diam; ovary densely covered with whitish beige simple trichomes, style 9 mm long, stigma shallowly 5-lobed, papillose. Young fruit drupaceous, depressed globose, 5 mm tall, 6-7 mm in diam., glabrescent.

REMARKS

Grewia manomboensis sp. nov. is restricted to the Réserve Spéciale de Manombo and two nearby sites (Fig. 2). It can be easily distinguished from the other lianescent members of the genus in Madagascar by its small leaves and usually 4-flowered umbellate inflorescences borne on very slender peduncles, with the flowers borne on very slender pedicels 0.2-0.3 mm in diam. whose epidermis is only partially obscured by stellate pubescence.

CONSERVATION STATUS

Grewia manomboensis sp. nov. is known only from four collections, two from within the Réserve Spéciale de Manombo, one from a forest remnant c. 6 km to the north, and one from the forested area S of Parcelle 1 of the reserve. With an EOO of 77 km² and an AOO of 54 km², at no more than five locations, and given that the subpopulation in Parcelle 1 of the Manombo Reserve, on basaltic laterite, has suffered significant degradation during the last several decades, coupled with the fact that the unprotected subpopulations situated outside Manombo have/will undergo decline, and with a projected reduction of greater than 50% in the overall population in the next three generations (c. 45 years), the species is assigned a provisional conservation status of Endangered: EN A3c; B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v).

2. *Grewia rufostellata*

Randrian., Lowry & G.E. Schatz, sp. nov.
(Figs 3; 4)

Haec species a ceteris 4 congeneris madagascariensibus lianescentibus foliis grandibus [4-12.5(-13.5) × 2.5-6.6 cm],

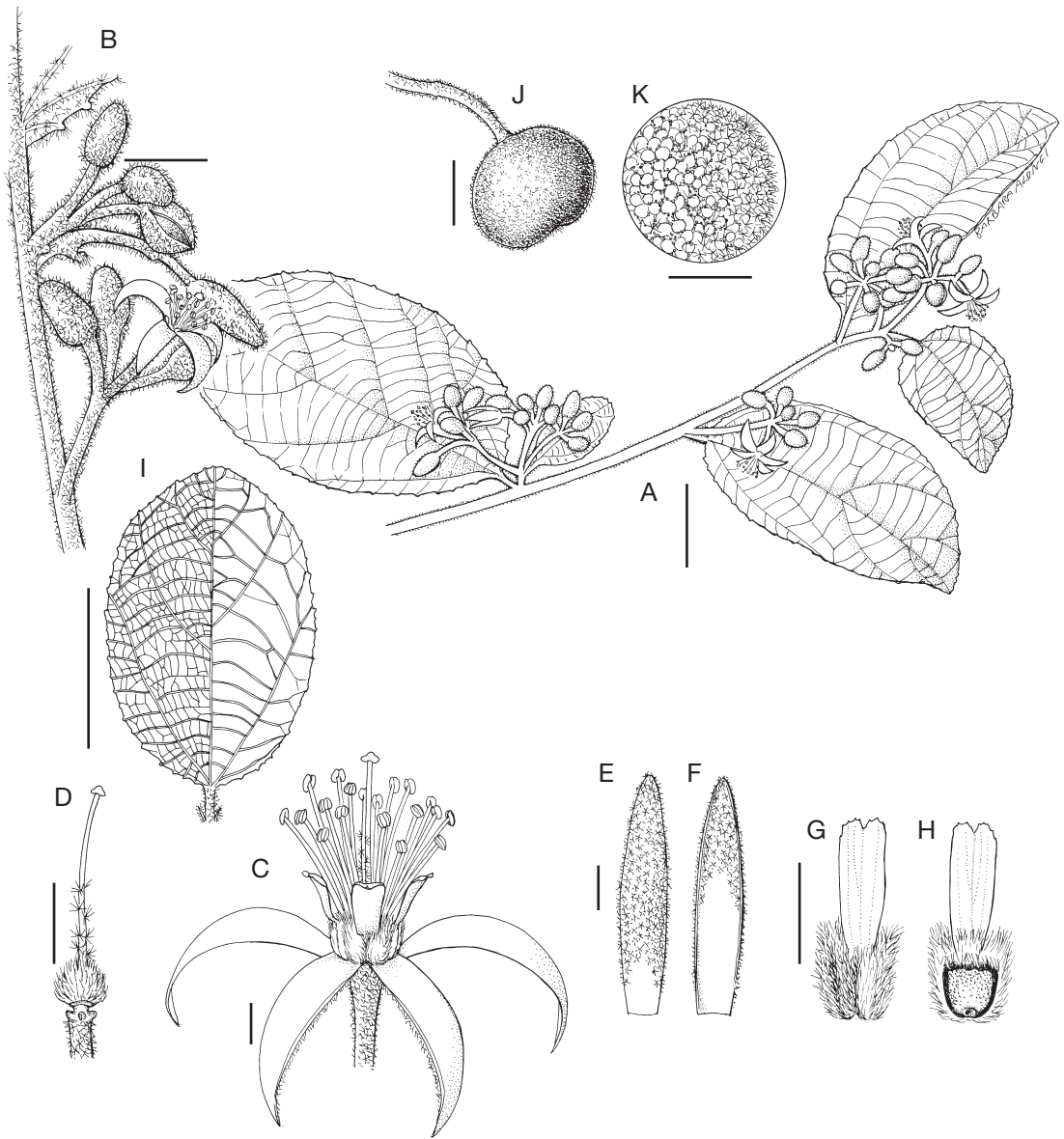


FIG. 3. — *Grewia rufostellata* Randrian., Lowry & G.E. Schatz, sp. nov.: **A**, flowering branch; **B**, portion of inflorescence with open flower; **C**, flower at anthesis; **D**, detail of gynoecium; **E**, sepal (abaxial surface); **F**, sepal (adaxial surface); **G**, petal (abaxial surface); **H**, petal (adaxial surface) with basal gland; **I**, detail of leaf venation; **J**, fruit; **K**, detail of fruit surface. **A-H**, *Razanatsima & Honoré 65* (holotype, MO); **J-K**, *Razanatsima & R. Ranaivojoana 37* (paratype, MO). Scale bars: A, B, 2 cm; C-H, K, 2 mm; I, 1, 3 cm; J, 5 mm. Illustration by Barbara Alongi.

sepalis adaxialiter per 2/3 partes distales indumento vestitis atque staminibus paucis (20 ad 25) distinguitur.

Grewia chalybaea Baill. var. *orientalis* R. Vig. & Humbert, *Revue Générale de Botanique* 29: 199 (1917), non *Grewia*

orientalis L. (1753). — Type: Madagascar, Prov. Toamasina, District de Moramanga, forêt d'Analamazaotra, près du Col d'Amboasary, [18°55'48"S, 48°25'48"E], 905-1000 m, 23.IX.1912, buds, *Viguiér & Humbert 963* (holo-, P[P00156925]); iso-, P!).

TYPUS. — **Madagascar.** Prov. Toamasina, Vatomandry, Ambalabe, Ambinaninandro II, à l'Est de Toby Foara, 19°09'46"S, 48°34'59"E, 506 m, 19.I.2006, fl., *Razanatsima & Honoré 65* (holo-, MO!; iso-, G!, K!, MO!, NY!, P!, TAN!, US!, WAG!).

PARATYPES. — **Madagascar.** Prov. Antsiranana, district de Sambava, commune rurale de Bevontro, Fokontany de Tsaratanana, village d'Ambodidivaina, vallée d'Antsahandroboka, suivant la ligne de crête sur la rive gauche de la rivière Antsahandroboka, 14°09'50"S, 49°17'58"E, 1159 m, 9.II.2007, y. buds, *Ravelonarivo et al. 2110* (G, MO, P, TAN). — Prov. Fianarantsoa, Ranomafana National Park, 21°15'25"S, 47°25'29.6"E, 27.IX.2005, fr., *Acevedo-Rodriguez et al. 14496* (MO). — Farafangana, Ankarana, Manombo, Betanatana Forest Reserve, highly disturbed forest along a logging road on an old lava flow, 23°01'34"S, 47°42'05"E, 26 m, 28.VIII.2008, fr., *Bussmann et al. 15250* (MO, P, TAN, TEF). — Prov. Toamasina, Moramanga, Parc National de Mantady, à partir du PK 14, sur le chantier du graphite, [18°56'S, 48°26'E], 930 m, 29.X.1993, fr., *Andrianarisata et al. 17* (MO, P, TAN). — Forêt de Sandrangato, au sud de Moramanga, [19°06'30"S, 48°14'30"E], 6.III.1942, *Decary 17772* (BR, G, K, MO, NY, P [2 sheets], TAN, WAG). — Forêt de Sandrangato, au sud de Moramanga, bord de ruisseau, [19°06'30"S, 48°14'30"E], 8.III.1942, *Decary 17842* (MO, P, TAN). — Beforona (forêt orientale), [18°58'S, 48°34'E], 10.VII.1942, *Decary 18060* (P). — Forêt d'Analamazaotra, [18°56'S, 48°26'E], 800 m, VII.1913, fr., *Perrier de la Bâthie 4646* (P). — Forêt d'Analamazaotra, [18°55'48"S, 48°25'48"E], 800 m, fl., *Perrier de la Bâthie 5500* (K, MO, P [2 sheets]). — Forestry Station of Analamazaotra, SE of the old road between Moramanga and Andasibe, top of the hill between the new and old roads, [18°56'S, 48°26'E], 900 m, 17.VII.1996, fr., *A. Randrianasolo 426* (MO, P, TAN). — Vatomandry, Ambalabe, Ambinaninandro II, Nord Est du Tobin'i Foara, 19°09'26"S, 48°34'47"E, 601 m, 7.X.2005, fr., *Razanatsima & Ranaivojaona 37* (G, K, MO, P, TAN). — Vatomandry, Ambalabe, Ambinaninandro II, à l'Ouest de Toby Foara, 19°09'25"S, 48°34'20"E, 617 m, 15.V.2006, y.fr., *Razanatsima 125* (K, MO, P, TAN). — Environs de Sandrangato, au sud de Moramanga, [19°06'30"S, 48°14'30"E], 27.III.1969, *Service Forestier (Capuron) 28788* (P). — District de Moramanga, forêt d'Analamazaotra, près du col d'Amboasary, [18°55'48"S, 48°25'48"E], 950-1000 m, 23.X.1912, *Viguiet & Humbert 963* (P [2 sheets]).

DESCRIPTION

Liana, stems and branches dark brown, with dense, dark ferruginous stellate indument, wearing off to reveal scattered small circular lenticels. Stipules simple, needle-like, *c.* 1.5-2 mm, with scattered

stellate trichomes, caducous. Leaves alternate, subcoriaceous, 4-12.5(-13.5) × 2.5-6.6 cm, sometimes smaller on young branches, usually obovate, rarely elliptic or ovate, adaxially with moderately dense, evenly spaced, sessile stellate trichomes, each with 5 to 7 (to 11) straight to slightly wavy branches *c.* 0.05 mm long, abaxially with sessile stellate ferruginous trichomes, very dense on primary and secondary veins, progressively more scattered on smaller gauge order veins, each trichome with 5 to 11 straight to slightly wavy branches *c.* 0.25-0.5 mm long, base usually rounded, sometimes weakly cordate, margins obscurely serrate-dentate, the teeth often somewhat bulbous, apex rounded or very shortly acuminate, blade sub-palmatinerved but appearing penninerved, craspedodromous, with three monopodial primary veins, the central one slightly thicker, major secondary veins 3 or 4 per side, sub-opposite to alternate, the basal-most borne *c.* half way along the central primary, interior and inter-secondaries approximately perpendicular to primaries and major secondaries, minor secondaries at 45-60° angle to lateral primaries, arcuate to margin, primary and secondary veins raised abaxially, impressed adaxially (in dry material), tertiary veins reticulate, domatia present abaxially along the central primary in the axils of the lateral primaries and the proximal major secondaries, and also along the lateral secondaries in the axils of the minor secondaries. Petiole 4-8 mm long, densely covered with ferruginous stellate trichomes. Inflorescences axillary, comprising 1 to 3 (or 4) pseudumbels usually borne from a single point, occasionally forming a short, simple or compound corymb, each pseudumbel with (3 to) 5 to 15 flowers, axes densely covered with ferruginous stellate trichomes; peduncle (10-)12-15(-24) mm in flower, to 30 mm in fruit. Flowers bisexual, pentamerous; pedicel 7-10 mm long in flower, to 16 mm fruit, 0.4-0.6 mm in diam.; sepals erect in bud, valvate, enclosing the other floral parts, reflexed at anthesis, narrowly lanceolate, 11-13 × 1-2 mm, red, abaxially with dense stellate indument, adaxially glabrous in proximal half, distal half with progressively denser simple, whitish trichomes, petals 4-5 × 1 mm, oblong, enlarged in proximal third, with dense, whitish stellate trichomes abaxially, to *c.* 0.5 mm long,

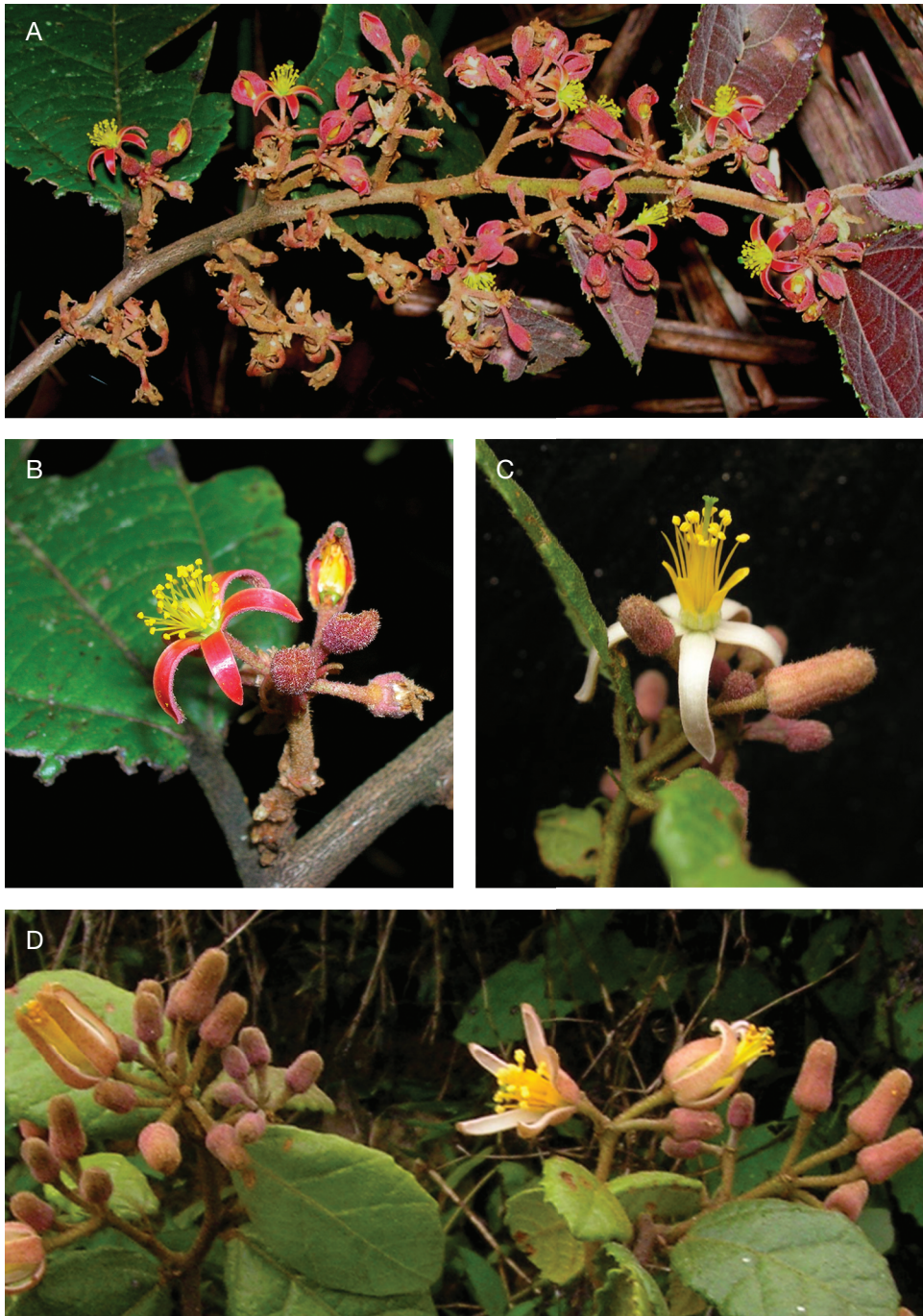


FIG. 4 – Photographs of lianescent species of *Grewia* L.: **A, B**, *G. rufostellata* Randrian., Lowry & G.E. Schatz, sp. nov.; **C, D**, *G. rabehevitrae* Randrian., Lowry & G.E. Schatz, sp. nov. Photos: **A, B**, A. Razanatsima; **C, D**, D. Rabehevitra.

glabrous adaxially, basal gland *c.* 1-1.5 × 1 mm, obtrapezoidal, minutely papillose, apex rounded to shallowly bifid; androgynophore *c.* 1 mm long, glabrous; stamens *c.* 16 to 25, of unequal length, filaments *c.* 5-9 mm, glabrous, filiform; anthers *c.* 0.4-0.5 mm long, ovoid, glabrous; ovary ovoid, *c.* 1 mm high, *c.* 1 mm in diam., densely pubescent with straight, simple, whitish trichomes; style *c.* 8 mm long, densely pubescent in basal third, glabrous elsewhere, stigma capitate. Fruits drupaceous, widely depressed obovoid, apex shallowly concave, 12-14 mm high, 15-17 mm in diam., covered with stellate trichomes, wearing off with age to reveal a verrucose surface, containing four pyrenes.

REMARKS

Grewia rufostellata sp. nov. and the species it most closely resembles, *G. chalybaea*, can be distinguished from the other lianescent species in Madagascar by their larger leaf size (the largest blades > 9 cm long). These two species can be easily separated from each other on the basis of several floral characters: the sepals of *G. rufostellata* sp. nov. have pubescence on the distal $\frac{2}{3}$ of their adaxial surface (vs glabrous in *G. chalybaea*) and *G. rufostellata* sp. nov. has 16 to 25 stamens (vs 40 to 57 in *G. chalybaea*). Moreover, the trichomes on the leaves of *G. rufostellata* sp. nov. are rust orange in color (vs brown in *G. chalybaea*). Material of *G. rufostellata* sp. nov. has been collected in low- to mid-elevation humid forest in eastern Madagascar (Fig. 2), where it occurs from near sea level to 900 m elevation. This species has been recorded in flower in January and February, and fruiting specimens have been gathered from May to October.

We have chosen to describe this entity as a new species rather than proposing a *nomen novum* based on the name *Grewia chalybaea* Baill. var. *orientalis* R. Vig. & Humbert primarily because the latter is typified by only two rather fragmentary collections in bud deposited at the Paris herbarium, with no isotypes known elsewhere.

CONSERVATION STATUS

Grewia rufostellata sp. nov. has a relatively large distribution, with an EOO of *c.* 40 000 km², and is

known to occur in three large protected areas (Mantadia, Ranomafana and Manombo). Assuming that effective conservation programs are maintained in these three protected areas, this species is assigned a provisional conservation status of Least Concern.

3. *Grewia rabehevitrae*

Randrian., Lowry & G.E. Schatz, sp. nov.
(Figs 4, 5)

Haec species a ceteris 4 congeneris madagascariensibus lianescentibus foliis parvis (1-5.2 × 0.9-3 cm) trichomatibus stellatis tantum pubescentibus atque sepalis adaxialiter indumento modico densove vestitis distinguitur.

TYPUS. — Madagascar. Prov. Toamasina, Région Alaotra-Mangoro, Fivondronana et Firaisana Didy, Fokontany Amboarabe, [Ambohilero], forêt de Sahananto, forêt dense humide de moyenne altitude sur latérites, 17°59'21"S, 48°36'34"E, 1165 m, 27.IX.2005, fl., *Rabehevitra*, Lowry, Rakotonasolo & Randriamahatody 1430 (holo-, MO!; iso- G!, MO!, P!, TAN!).

PARATYPES. — Madagascar. Prov. Toamasina, District de Fénérive, Ambodirafia, [17°32'S, 48°47'E], 17.X.1955, fl., y. fr., *Réserves Naturelles 7682* (G, MO, P). — District de Vavatenina, Canton de Sahatavy, Parc national de Zahamena, [17°32'S, 48°54'E], 17.IX.1960, buds, fl., *Réserves Naturelles 11349* (G, MO, P).

DESCRIPTION

Liana, stems dark colored, with dense, ferruginous stellate trichomes, wearing off to reveal scattered elliptic lenticels, small branches sympodial. Stipules simple, needle-like, variable in length, *c.* 1-5 mm, with scattered stellate trichomes. Leaves alternate, subcoriaceous to chartaceous, 1-5.2 × 0.9-3 cm, circular, elliptic to obovate, rarely ovate, abaxially with dense, rather long stellate trichomes, more so on the midvein, each with (6 to) 7 to 10 (to 11) branches of *c.* 0.02-0.03 mm long, adaxially with sparser, evenly spaced, unequally sized sessile stellate trichomes, each with 5 to 10 branches of *c.* 0.01-0.02 mm long, base rounded, sometimes weakly cordate, margins visibly serrate, apex rounded or slightly acuminate, blade sub-palmatinerved but appearing penninerved, craspedodromous, with 3 monopodial primary veins, the central slightly thicker, 3 or 5 (rarely 6) irregularly paired major secondary veins, most of the interior

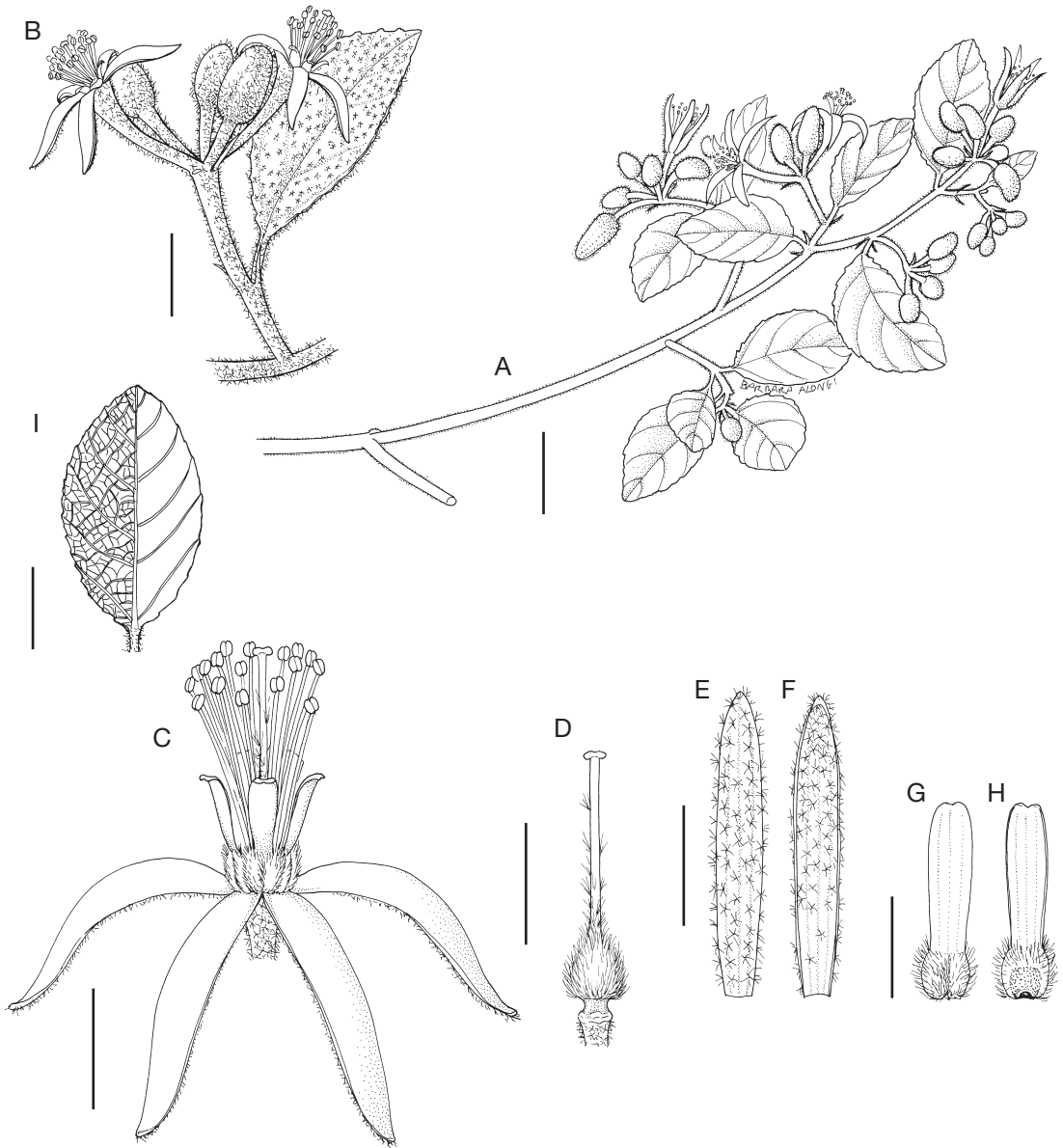


FIG. 5. — *Grewia rabehevitrae* Randrian., Lowry & G.E. Schatz, sp. nov.: **A**, flowering branch; **B**, portion of inflorescence with open flowers; **C**, flower at anthesis; **D**, detail of gynoecium; **E**, sepal (abaxial surface); **F**, sepal (adaxial surface); **G**, petal (abaxial surface); **H**, petal (adaxial surface) with basal gland; **I**, detail of leaf venation. **A-I**, *Rabehevitra et al.* 1430 (holotype, MO). Scale bars: A, 2 cm; B, 2 mm; C-F, 4 mm; G, H, 2 mm; I, 1 cm. Illustration by Barbara Alongi.

and inter-secondaries approximately perpendicular to primaries and major secondaries, minor secondaries at 45-80° to lateral primaries, very often straight to very slightly arcuate, primaries and secondaries

prominent abaxially, impressed adaxially, tertiary veins obscurely visible abaxially and invisible adaxially, domatia usually present along the central primary in the axils of the lateral primaries and the proximal

major secondaries. Petiole short, 2–4 mm, densely covered with stellate trichomes. Inflorescences axillary, usually an umbel of (2 to) 4 to 9 flowers; peduncle *c.* 4–10 mm long, with dense stellate trichomes. Flowers bisexual, pentamerous, pedicel with dense stellate trichomes hiding the epidermis, (3-)4-7(-8) mm long, 0.4–0.6 mm in diam.; sepals *c.* 8–11 × 1.8–2 mm, white, narrowly triangular to narrowly oblong to linear, abaxially with stellate trichomes, adaxially with dense whitish stellate trichomes toward the apex, *c.* 0.2–0.25(-0.5) mm; petals 4–5 × 1 mm, base enlarged and pubescent on the outer surface, basal gland *c.* 0.8 × 0.8 mm, subrectangular to weakly obtuse, minutely papillose, apex retuse; androgynophore *c.* 1 mm, glabrous; stamens *c.* 18 to 20, of unequal length, filament *c.* 5–8 mm long, filiform, glabrous; anthers introrse, *c.* 0.2–0.3 mm long, glabrous; ovary widely ovoid, 1 mm high, 1 mm in diam., densely pubescent, style *c.* 6–9 mm long, pubescent in basal 4/5, glabrous apically, stigma capitate. Fruits not seen.

REMARKS

Grewia rabehevitrae sp. nov. is known from only three collections, two from Zahamena National Park, and one from Sahananto forest (also known as Ambohilero forest) (Fig. 2) in an area of dense, mid-elevation humid forest that was subjected to intensive illegal, mechanized logging in 2004, which severely impacted the local vegetation and led to extensive erosion and siltation of rice paddies located downstream in the vicinity of Antsevabe (Aronson *et al.* 2006). Morphologically *G. rabehevitrae* sp. nov. is very distinct from the other liana species of *Grewia* in Madagascar. While it shares small leaves (the largest blades not exceeding 9 cm in length) with *G. manomboensis* sp. nov. and *G. radula*, it can be easily distinguished from *G. manomboensis* sp. nov. by the moderate to dense pubescence on the adaxial surface of its sepals (vs glabrous except for a tuft of trichomes at the base) and by its robust pedicels *c.* 0.4–0.6 mm in diam. whose epidermis is nearly obscured by the dense stellate trichomes (vs slender pedicels 0.2–0.3 mm in diam. whose epidermis is only partially obscured). *Grewia rabehevitrae* sp. nov. differs from *G. radula* by the presence of only stellate trichomes on its leaf surfaces (vs both stellate and unbranched).

ETYMOLOGY

This species is named in honor of David Rabehevitra, who conducted extensive botanical inventory work between 2003 and 2007 while on the staff of the Missouri Botanical Garden, and participated in the botanical survey and restoration study conducted at the Ambohilero forest in 2006.

CONSERVATION STATUS

While the subpopulation of *Grewia rabehevitrae* sp. nov. occurring within the Zahamena protected area is probably well protected, continuing decline as a result of forest conversion can be expected in the other subpopulation at the Sahananto forest S of the protected area. Therefore, with an EOO of 1940 km² and AOO of 1390 km², and only two locations, we assign this species a provisional conservation status of Endangered: EN B1ab(iii)+2ab(iii).

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