

Taxonomic revision of *Phyllanthus* L. (Phyllanthaceae) in Madagascar and the Comoro Islands II: subgenera *Anisonemoides* (Jean F. Brunel) Ralim. & Petra Hoffm., stat. nov. and *Menarda* (Müll. Arg.) Ralim. & Petra Hoffm., stat. nov.

Hélène RALIMANANA

Kew Madagascar Conservation Centre,
Lot II J 131 B Ambodivoanjo, 101 Antananarivo (Madagascar)
hralimanana.rbgkew@moov.mg
ralimananah@yahoo.fr

Petra HOFFMANN

Herbarium, Royal Botanic Gardens, Kew,
Richmond, TW9 3AB Surrey (Royaume-Uni)
petraswebmail@yahoo.co.uk

Ralimanana H. & Hoffmann P. 2014. — Taxonomic revision of *Phyllanthus* L. (Phyllanthaceae) in Madagascar and the Comoro Islands II: subgenera *Anisonemoides* (Jean F. Brunel) Ralim. & Petra Hoffm., stat. nov. and *Menarda* (Müll. Arg.) Ralim. & Petra Hoffm., stat. nov. *Adansonia*, sér. 3, 36 (2): 265-301. <http://dx.doi.org/10.5252/a2014n2a9>

ABSTRACT

In the second part of the taxonomic revision of *Phyllanthus* L. in Madagascar and the Comoro Islands the subgenera *Anisonemoides* (Jean F. Brunel) Ralim. & Petra Hoffm., stat. nov. and *Menarda* (Müll. Arg.) Ralim. & Petra Hoffm., stat. nov. are described. The subgenera are characterised by pinnatifid or bipinnatifid phyllanthoid branching, stamens are (2-4)5(-6) free or fused in *Anisonemoides* but 5, free stamens in *Menarda*; dehiscent fruits and tricolporate or trisyncolporate pollen with a macro-microreticulate exine, with muri bordering colpi, and one or two pores. They are endemic to Madagascar with most taxa being of limited geographic distribution. The subgenus *Anisonemoides*, stat. nov. comprises fifteen species and two species are belonging to *Menarda*, stat. nov. Four species from the Eastern floristic domain are newly described: *Phyllanthus bemangidiensis* Ralim., sp. nov., *P. coodei* Ralim. & Petra Hoffm., sp. nov., *P. gordonii* Ralim. & Petra Hoffm., sp. nov., and *P. mantadiensis* Ralim. & Petra Hoffm., sp. nov. Distribution maps and IUCN conservation assessment status are provided for each taxon. The circumscription of several species within *Anisonemoides* stat. nov. and *Menarda* stat. nov. has been revised.

KEY WORDS

IUCN conservation
assessment status,
Madagascar,
Phyllanthaceae,
Phyllanthus,
new species,
new subgenera.

RÉSUMÉ

Révision taxonomique de *Phyllanthus* L. (Phyllanthaceae) de Madagascar et des Îles Comores II : sous-genres *Anisonemoides* (Jean F. Brunel) Ralim. & Petra Hoffm. et *Menarda* (Müll. Arg.) Ralim. & Petra Hoffm.

Dans la seconde partie de la révision taxonomique des *Phyllanthus* de Madagascar et des Îles Comores les sous-genres *Anisonemoides* (Jean F. Brunel) Ralim. & Petra Hoffm. et *Menarda* (Müll. Arg.) Ralim. & Petra Hoffm. sont décrits. Les sous-genres sont caractérisés par la ramification pinnatiforme ou bipinnatiforme, les étamines (2-4)5(-6), libres ou soudées chez *Anisonemoides*, 5 étamines toujours libres chez *Menarda* – les fruits déhiscents, et le pollen tricolporé ou trisyncolporé à exine macro-microréticulée, à colpus bordé d'un mur, et un ou deux pores. Il est endémique de Madagascar avec la plupart des taxons à distribution géographique très limitée. Le sous-genre *Anisonemoides* comprend quinze espèces, deux espèces appartiennent au sous-genre *Menarda*. Quatre espèces provenant du domaine floristique de l'Est sont nouvellement décrites : *Phyllanthus bemangidiensis* Ralim., sp. nov., *P. coodei* Ralim. & Petra Hoffm., sp. nov., *P. gordonii* Ralim. & Petra Hoffm., sp. nov., et *P. mantadiensis* Ralim. & Petra Hoffm., sp. nov. Les cartes de distributions et les évaluations du statut de conservation UICN sont fournies pour chaque taxon. L'attribution de plusieurs espèces à *Anisonemoides* et *Menarda* a été révisée.

MOTS CLÉS

Phyllanthaceae,
Phyllanthus,
UICN évaluation du
statut de conservation,
Madagascar,
espèces nouvelles,
sous-genres nouveaux.

INTRODUCTION

This paper is the second in a series that will comprise a systematic revision of *Phyllanthus* L. in Madagascar and the Comoro Islands. The first (Ralimanana & Hoffmann 2011) gave a general synopsis of the genus in the area, and treated in detail four subgenera, *Isocladus* G. L. Webster, *Betsileani* (Jean F. Brunel) Ralim. & Petra Hoffm., *Kirganelia* (A. Juss.) G. L. Webster and *Tenellanthus* Jean F. Brunel. The third part (Ralimanana & Hoffmann 2013) deals with the taxa previously united in subgenus *Phyllanthus* and *Emblica* (Gaertn.) G. L. Webster section *Urinararia* G. L. Webster. In this paper we present a treatment of subgenera *Anisonemoides* (Jean F. Brunel) Ralim. & Petra Hoffm., stat. nov. and *Menarda* (Müll. Arg.) Ralim. & Petra Hoffm., stat. nov. which we recognise as a new infrageneric group within the genus *Phyllanthus*. The fourth (and final) part of our series will contain a revision of subgenus *Gomphidium* (Baill.) G. L. Webster in Madagascar along with a number of unplaced taxa.

The group treated here comprises seventeen species which are all endemic to Madagascar. *Phyllanthus bemangidiensis* Ralim., sp. nov., *P. coodei* Ralim. & Petra Hoffm., sp. nov., *P. gordonii* Ralim. & Petra Hoffm., sp. nov., and *P. mantadiensis* Ralim. & Petra Hoffm., sp. nov. are new to science. The group was shown to be either a separate lineage or sister to subgenus *Betsileani* in molecular phylogenetic analyses (Kathriarachchi *et al.* 2006; for *Betsileani* see Ralimanana & Hoffmann 2011). Morphologically, these taxa are, however, most similar to members of two unrelated groups, subgenera *Tenellanthus* and *Kirganelia*. Except for *P. bernierianus* Baill., *P. mantadiensis*, sp. nov. and *P. multiflorus* Poir., in Lamarck, all species of the group treated here have three, four, five or six free stamens. This is similar to *P. nummulariifolius* Poir. and *P. tenellus* Roxb., which were placed by Webster (1967) in sect. *Pentandra* G.L. Webster (subgen. *Kirganelia*) and likewise have five free stamens and dehiscent fruits. The taxa treated here differ from those in sect. *Pentandra* by their habit, which is never herbaceous, as well as their floral morphology (male disc glands thick and

globose, ovoid or reniform versus thin and broadly cuneate), seed surface (smooth or striate versus verrucose or papillose) and pollen characters (tricolporate or trisyncolporate versus tetracolporate). Brunel (1987) placed the taxa treated here in two sections of subgenus *Kirganelia*, namely sect. *Anisonemoides* and sect. *Menarda*. However, the dehiscent (rather than baccate) fruits of these species, as well as pollen with parallel muri bordering the colpi, a lack of brachyblasts (except in *Phyllanthus gordonii*, sp. nov., *P. mantadiensis*, sp. nov., *P. multiflorus* and *P. ankarana* Leandri), and an androecium which is free, or centrally fused (except in *P. mantadiensis*, sp. nov. with some stamens filaments irregularly fused), differentiate them from members of subgen. *Kirganelia*. Also, species of sect. *Anisonemoides* (clade I) are divergent from those in subgen. *Kirganelia* (clade B) according to the molecular analysis of Kathriarachchi *et al.* (2006). Therefore we have chosen to raise Brunel's sections *Anisonemoides* and *Menarda* into subgeneric level.

In *Phyllanthus*, both vegetative patterns and floral characters are useful in discriminating between taxa. Similar vegetative patterns, however, sometimes obscure phylogenetic relationships that are more accurately reflected in floral or micromorphological characters. The complexity of the infrageneric classification can be well demonstrated when discussing the placement of the four species newly described here.

MATERIALS AND METHODS

The studies include a modification of some species boundaries established by Leandri (1958), description of new species within subg. *Anisonemoides*, stat. nov. and *Menarda*, stat. nov. and lectotypification of necessary names, based on the application of The International Code of Botanical Nomenclature (ICBN). Identification keys, full descriptions, illustrations, distribution maps and

conservation assessments are also provided. The revision presented here is based on studies of herbarium material, collections, and field observations. Herbarium material of Madagascan *Phyllanthus* was consulted in the herbaria BM, K, P, TAN and TEF. For the types, herbarium acronyms are given and followed by an exclamation mark indicating that the specimens were seen.

The measurements, colours and other details given in the descriptions are based mostly on herbarium specimens, and data derived from field notes. The floristic domains here referred to are as defined by Humbert (1965). The conservation status of each species was assessed by calculating its geographic range using a GIS, and then applying the IUCN Red List Category criteria (IUCN 2001).

A list of material examined is given after each taxon. Information about habitat was obtained from our field studies or from the field notes of other botanists.

TAXONOMIC TREATMENT

Phyllanthus subgenus *Anisonemoides*

(Jean F. Brunel) Ralim. & Petra Hoffm.,
stat. nov.

Subgen. *Kirganelia* (A. Juss.) G. L. Webster sect. *Anisonemoides* Jean F. Brunel, *Phyllanthus* Afrique Intertropicale: 276 (1987). — Type: *Phyllanthus bojerianus* (Baill.) Müll. Arg.

DESCRIPTION

Monoecious or dioecious shrubs, subshrubs or small trees with pinnatifid or bipinnatifid phyllanthoid branching. Brachyblasts absent or rarely present. Plagiotropic branches solitary or rarely in fascicles of two to six. Leaves alternate. Stipules entire, fimbriate or erose. Inflorescences on leafy branches, axillary, unisexual rarely bisexual, 1-many-flowered. Tepals

KEY TO THE SUBGENERA *ANISONEMOIDES* (JEAN F. BRUNEL) RALIM. & PETRA HOFFM., STAT. NOV. AND *MENARDA* (MÜLL. ARG.) RALIM. & PETRA HOFFM., STAT. NOV.

1. Leaves alternate, never opposite or sub-opposite subgenus *Anisonemoides*, stat. nov.
- Leaves opposite or sub-opposite, occasionally with some leaves alternate on the same individual subgenus *Menarda*, stat. nov.

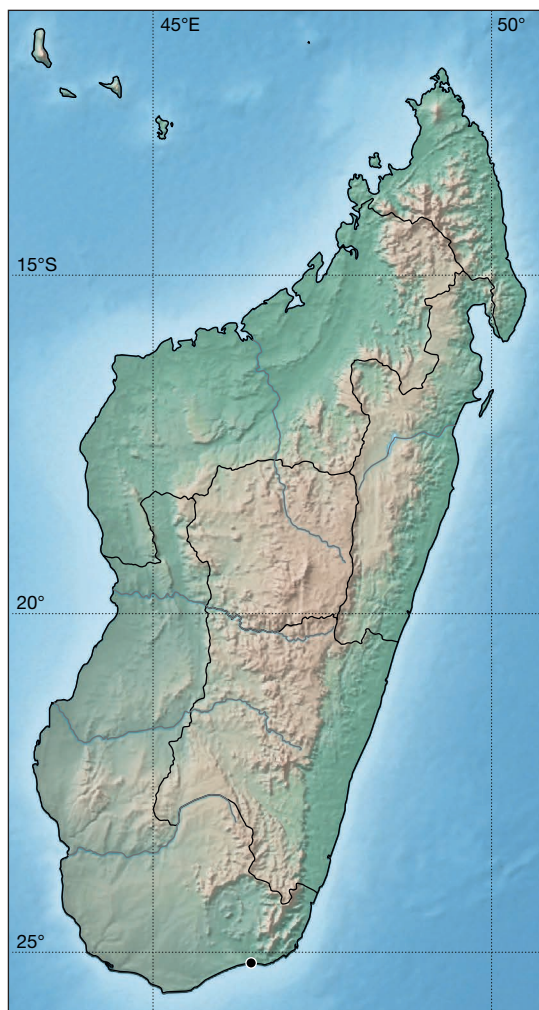


FIG. 1. — Distribution map of *Phyllanthus obdeltophyllus* Leandri.

(4-)5(-6). Disc: free glands in male flowers, annular in female flowers. Stamens (2-4)5 (-6), filaments free or the inner filaments tending to fuse, very rarely entirely fused or irregularly fused; anthers free or rarely fused, basifixed, dehiscent longitudinally, not apiculate; pollen tricolporate or trisyncolporate with muri bordering the mono-orate colpi, exine macro-microreticulate (Brunel 1987). Ovary 3-locular, smooth, sometimes becoming slightly rugose when dry; styles free or fused at the base, bifid. Fruits dehiscent; tepals persistent or caducous, not accrescent in fruit; styles persistent or caducous; seeds 2 per locule, finely striated longitudinally or smooth.

1. *Phyllanthus obdeltophyllus* Leandri

Mémoire de l'Institut scientifique de Madagascar, série B, Biologie végétale 8: 232 (1957). — Type: Madagascar, Toliara, Bassin du Mandrare, versant Ouest de la montagne entre Andohahela et Elakake, alt. 800-900 m, I-II.1934, *Humbert 13815* (holo-, P[P00078250!]; iso-, P[P00078251!, P00078252!, P00078253!, P00078254!]).

DISTRIBUTION AND ECOLOGY. — Endemic to Madagascar; southern floristic domain. Subhumid forest. Altitude 800-900 m (Fig. 1).

CONSERVATION STATUS. — No collection of this species has been made since the type collection in 1957, even though botanists have frequently carried out collecting trips in the area. In addition, the type was collected in the South of Madagascar where the vegetation is fragmented and under rapid degradation. We therefore assign to it the category Vulnerable (VU (D2)).

KEY TO THE *PHYLLANTHUS* SUBGEN. *ANISONEMOIDES* (JEAN F. BRUNEL)
RALIM. & PETRA HOFFM., STAT. NOV. SPECIES

- 1. Leaf blades obdeltate *P. obdeltophyllus* Leandri
- Leaf blades different from above 2

- 2. Orthotropic branches terete basally and becoming flattened distally 3
- Orthotropic branches terete or angular throughout, never flattened distally 4

- 3. Orthotropic branches brown, aciculate. Internodes 0.5-1 mm; petiole 0.2-0.3 mm; leaf blades pubescent on both sides; midvein flattened adaxially
 *P. isomonensis* Leandri
- Orthotropic branches grey, smooth to rugose. Internodes 2-4 mm; petiole 0.5-0.7 mm; leaf blades pubescent abaxially; midvein prominent adaxially
 *P. humberianus* Leandri

4. Brachyblasts present, 1-10 mm long 5
 — Brachyblasts absent 8
5. Brachyblasts with a tuft of 5-10 scales at the apex. Leaf blades truncate or slightly cordate at base. Pedicel of male flower 7-14 mm long. Exocarp ligneous *P. multiflorus* Poir.
 — Brachyblasts without tuft of scales at the apex. Leaf blades attenuate, obtuse or rounded at base. Pedicel of male flower 1-10 mm long. Exocarp not ligneous 6
6. Leaf blades trullate. Bracts not grouped in tuft of sterile bracts in male inflorescences. Stamens 3, entirely free. Littoral species *P. gordonii* Ralim. & Petra Hoffm., sp. nov.
 — Leaf blades elliptic, ovate, obovate or suborbicular. Bracts grouped in tuft of 5-20 sterile bracts in male inflorescences. Stamens 5, free or fused. Inland species 7
7. Male inflorescences with 1-2 flowers. Disc always present. Pedicels 4-6 mm in female flowers. Tepals 5. Styles bifid for $c. \frac{4}{5}$ of their length, 0.3-0.5 mm long. Seeds $2.8-3 \times 2.6$ mm, smooth *P. mantadiensis* Ralim. & Petra Hoffm., sp. nov.
 — Male inflorescences with 3-50 flowers. Disc absent or minute. Pedicels 8-30 mm in female flowers. Tepals 5-6. Styles bifid for $\frac{2}{3}-\frac{3}{4}$ of their length, 2-3 mm long. Seeds $1.6-2 \times 1.4-2$ mm, with 20-25 longitudinal striae *P. ankarana* Leandri
8. Plagiotropic branches grouped at the distal part of the orthotropic branches. Stamens 2(-3), filaments entirely fused, anthers oblong. Rheophytic plant *P. bernieranus* Baill. ex Müll. Arg.
 — Plagiotropic branches spread regularly along the orthotropic branches. Stamens (4-) 5(-6), filaments entirely free, anthers ovoid. Not a rheophytic plant 9
9. Internodes 12-15 mm. Leaf blades caudate at apex. Fruiting pedicel 15-30 mm long
 *P. bemangidiensis* Ralim., sp. nov.
 — Internodes 0.5-9 mm. Leaf blades not caudate at apex. Fruiting pedicel 3-12 mm long 10
10. Leaf blades $30-80 \times 15-40$ mm, acuminate or cuspidate at apex
 *P. goudotianus* (Baill.) Müll. Arg.
 — Leaf blades $2-16 \times 0.9-10$ mm; not acuminate nor cuspidate at apex 11
11. Female flowers tepals $5-7 \times 4-6$ mm, without hyaline margin. Tepals accrescent in fruit, $10-13 \times 5-6$ mm *P. ambatovolana* Leandri
 — Female flowers tepals $0.8-2 \times 0.7-1.7$ mm, with hyaline margin. Tepals not accrescent in fruit, $1-2 \times 0.7-1.8$ mm 12
12. Internodes 0.5-1 mm. Leaf blades slightly arched, mucronulate at apex. Number of leaves 6-59 per branch *P. bojerianus* (Baill.) Müll. Arg.
 — Internodes 2-6 mm. Leaf blades not arched, obtuse or rounded at apex. Number of leaves 4-20 per branch 13
13. Leaf blades elliptic or oblong. Bracts in tufts of 10-15 mainly sterile bracts in male inflorescences *P. mananarensis* Leandri
 — Leaf blades obovate to suborbicular. Bracts not in tufts 14
14. Leaf blades obtuse to rounded at base, subcoriaceous or chartaceous, revolute. Pedicels 8-15 mm in male flowers and 6-18 mm in female flowers. Species of *Uapaca bojeri* Baill. forest *P. vakinankaratrae* Leandri
 — Leaf blades attenuate at base, membranous, not revolute. Pedicels 1-1.8 mm in male flowers and $c. 2.5$ mm in female flowers. Species of open humid forest
 *P. iratsiensis* Leandri



FIG. 2. — *Phyllanthus isomonensis* Leandri: **A**, habit, showing the flattened orthotropic branch; **B**, detail of orthotropic branch, cataphylls; **C**, detail of plagiotropic branch with inflorescence; **D**, male flower. Drawn from *Phillipson 2841* by Roger Lala Andriamiarisoa. Scale bars: A, 1 cm; B, 2 mm; C, 2 mm; D, 1 mm.

REMARK

Apparently dioecious subshrubs, 1 m high. Branching pinnatifid; orthotropic branches terete or elliptic in cross section, striate, glabrous. Brachyblasts absent. Cataphylls triangular, *c.* 1.3 × 0.6 mm, coriaceous, entire, glabrous. Cataphyllary stipules triangular, *c.* 0.7–1 × *c.* 0.4 mm, coriaceous, entire, glabrous. Plagiotropic branches solitary or fasciculate in twos or in threes, flattened, 1.5–7 cm long, 0.5–0.8 mm in diameter, striate, glabrous. Stipules caducous or persistent, triangular, *c.* 0.4 × 0.3 mm, subcoriaceous, entire. Leaves 4–15 per branch. Internodes 2–6 mm long. Petiole terete, slightly flattened at base of leaf blade, 0.4–0.6 × 0.2–0.3 mm, glabrous. Leaf blades obovate, 3–7 × 4–9 mm, *c.* 0.7 times longer than wide, attenuate at the base, truncate, sometimes obtuse-mucronulate at the apex, coriaceous, revolute, glabrous on both sides; midvein prominent on both sides; secondary veins 2–3 pairs, slightly prominent adaxially, generally indistinct or flattened abaxially. Inflorescences unisexual, consisting of 1–3 male flowers. Bracts triangular, 0.1–0.2 × 0.1–0.2 mm, entire, glabrous. Male flowers 1–1.2 × 0.8–1 mm. Pedicels 3–10 × *c.* 0.2 mm, glabrous. Tepals 5, equal, obovate or suborbicular, 1–1.2 × 0.8–1 mm, rounded, membranous, glabrous on both sides, margin entire, hyaline for *c.* 1/5 of total tepal width on each side, veins unbranched. Disc glands 5, globose or lenticular, *c.* 0.3 × 0.2 mm, smooth. Stamens 5; filaments free, terete, *c.* 1 × 0.2 mm; anthers free, globose, *c.* 0.3 mm in diameter. Female flowers and fruits unknown.

2. *Phyllanthus isomonensis* Leandri (Figs 2; 3)

Mémoire de l'Institut scientifique de Madagascar, série B, Biologie végétale 8: 229 (1957). — Type: Madagascar, Toliara, Vallée de la Manambolo, Bassin du Mandrare, alt. 400–900 m, XII.1933, *Humbert 13043* (holo-, P[P00482882!]; iso-, P[P00482883!]).

ADDITIONAL SPECIMENS EXAMINED. — Madagascar, Toliara: Cap Ste Marie, III.1964, *Bosser 19370* (P); Amboasary, 26.XI.1973, *Cremers 2939* (P).

DISTRIBUTION AND ECOLOGY. — Endemic to Madagascar; southern floristic domain. Bush. Altitude sea level: 300 m (Fig. 3).

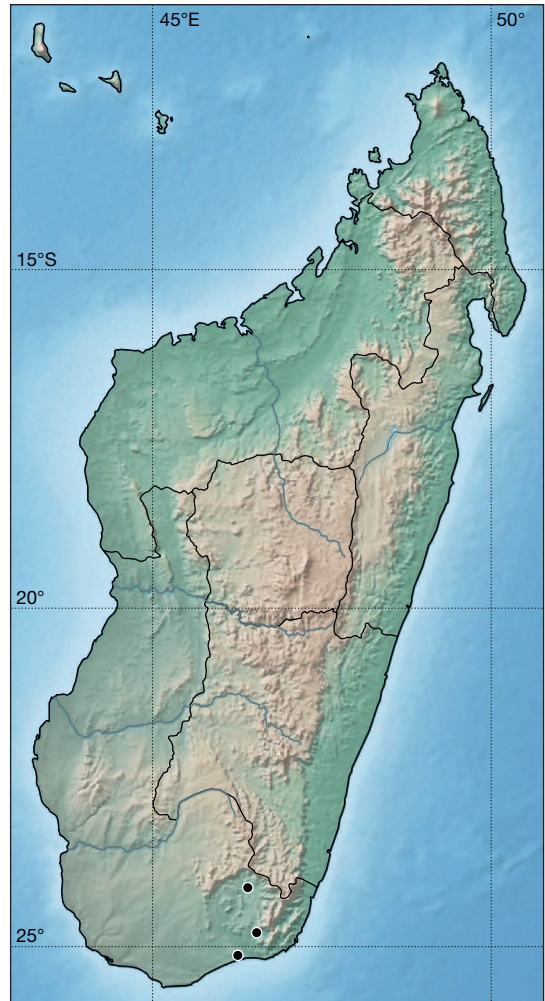


FIG. 3. — Distribution map of *Phyllanthus isomonensis* Leandri.

CONSERVATION STATUS. — This species has disjunct distribution, and is threatened by habitat loss. With an area of occupancy (AOO) of 310.45 km² and an extent of occurrence (EOO) of 1300.63 km², it is rated as Endangered (EN B1ab(i,ii,iii,iv) + B2ab(i,ii,iii,iv)).

REMARKS

Monoecious subshrubs or shrubs, 60–100 cm high. Branching pinnatifid; orthotropic branches terete at the base then becoming flattened toward the apex, brown, aciculate, pubescent or glabrous. Brachyblasts absent. Cataphylls triangular, 0.5–0.8 × 0.3–0.5 mm, coriaceous, entire, glabrous. Cataphyllary stipules,

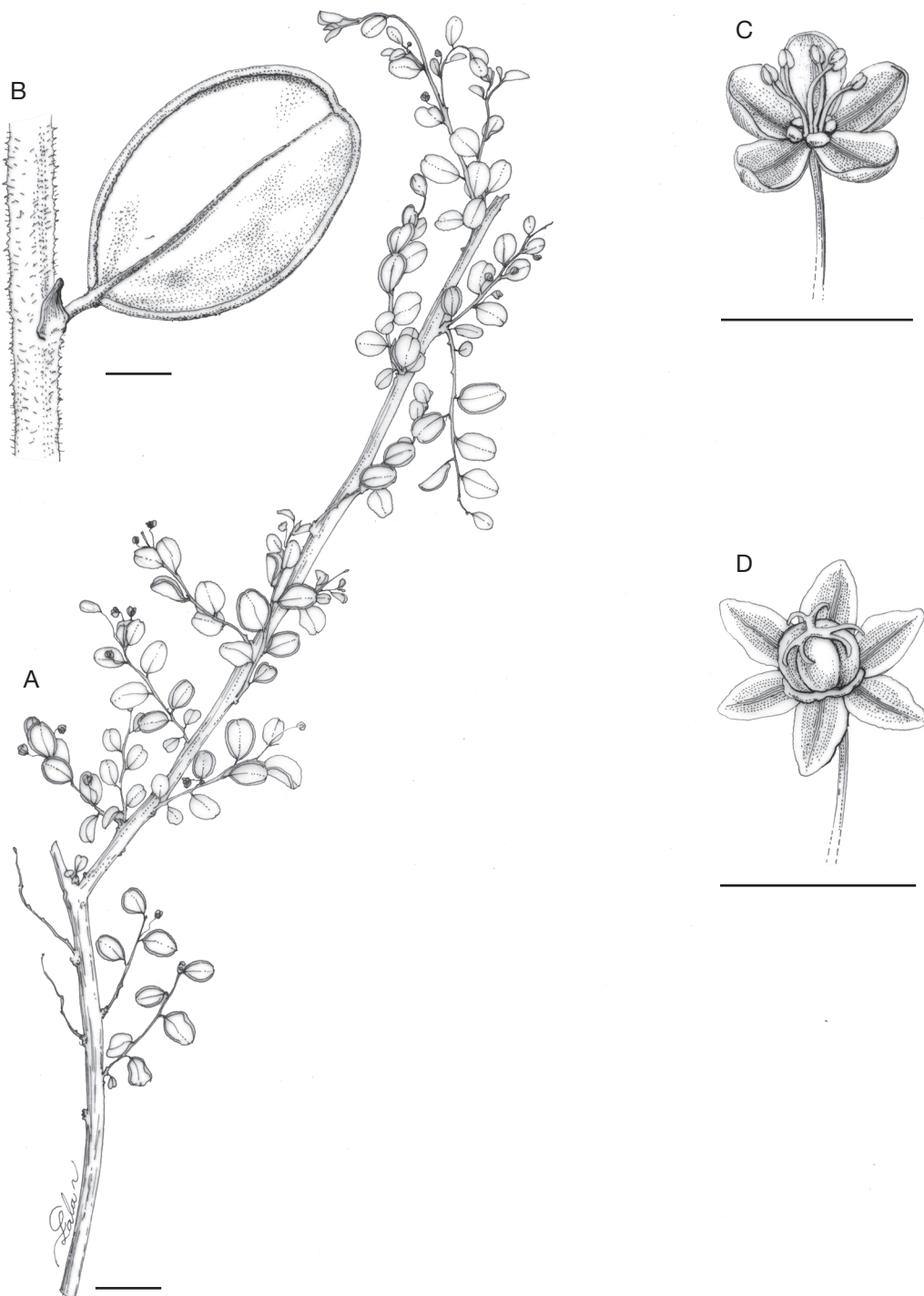


FIG. 4. — *Phyllanthus humbertianus* Leandri: **A**, habit; **B**, plagiotropic branch and lower leaf surfaces; **C**, male flower; **D**, female flower. Drawn from *Phillipson 3002* by Roger Lala Andriamiarisoa. Scale bars: A, 1 cm; B, 1 mm; C, D, 3 mm.

triangular 0.5–0.8 × 0.3–0.5 mm, coriaceous, entire, glabrous. Plagiotropic branches solitary or fasciculate in twos or threes, terete, 1.5–2.5 cm long, 0.2–0.4 mm in diameter, striate, pubescent. Stipules persistent, triangular, 0.3–0.8 × 0.2–0.3 mm, membranous, entire or slightly erose, glabrous. Leaves 3–6 per branch. Internodes 0.5–1 mm long. Petioles terete, 0.2–0.3 × 0.1–0.2 mm, pubescent. Leaf blades obovate, 1.5–2.5 × 1–1.5 mm, 1–1.6 times longer than wide, slightly attenuate or obtuse at the base, rounded at the apex, coriaceous, slightly revolute, pubescent on both sides; midvein flattened adaxially, slightly prominent abaxially; secondary veins indistinct on both sides. Inflorescences unisexual, consisting of 2–3 male flowers or only 1 female flower, male inflorescences and female inflorescences on different branches. Bracts triangular or elliptic, 0.4–0.6 × 0.2–0.3 mm, slightly erose, glabrous. Male flowers 1–1.5 × 1–2 mm. Pedicels 2–4 × 0.1–0.2 mm, pubescent. Tepals 5, unequal, elliptic or obovate, 1–1.5 × 0.6–1 mm, rounded or obtuse, membranous, glabrous on both sides or pubescent outside and glabrous inside, margin entire, hyaline for ¼–⅓ of total tepal width on each side, veins unbranched. Disc glands lenticular, *c.* 0.2 × 0.2 mm, smooth. Stamens 5, free; filaments terete, 0.5–1 × 0.1–0.2 mm; anthers free, ovoid, 0.3–0.4 × 0.1–0.2 mm. Female flowers 0.8–2 × 1–1.3 mm. Pedicels 8–10 × 0.1–0.2 mm, pubescent. Tepals 5, equal, spreading, ovate, 0.8–2 × 0.4–0.6 mm, obtuse, membranous, glabrous on both sides, margin entire, hyaline for ⅙–⅕ of total tepal width on each side, veins unbranched. Disc lobed, smooth. Ovary 3-locular, globose, 0.8–1 mm in diameter, smooth, glabrous; styles fused at the base, flattened, bifid for ½–⅔ of their length, 0.3–0.5 mm long; stigmas obtuse or acute. Fruits subglobose, 2–2.2 × 1.5–2 mm, glabrous; fruiting pedicels 9–10 × 0.2–4 mm; tepals 0.8–2 × 0.4–0.6 mm; styles persistent or caducous; columella *c.* 1 mm. Seeds 0.8–1 × 1–1.2 mm, smooth (Fig. 2).

3. *Phyllanthus humberianus* Leandri (Figs 4; 5)

Notulae Systematicae 6: 194 (1938). — Type: Madagascar, Toliara, du Lac Manampetsa au delta de la Linta

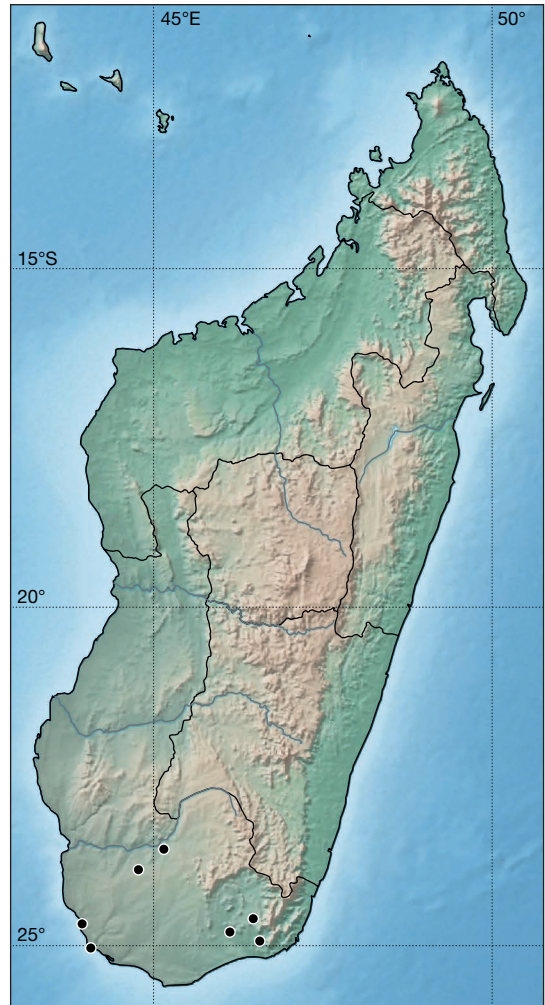


FIG. 5. — Distribution map of *Phyllanthus humberianus* Leandri.

près de Itampolo, alt. 1–10 m, s. dat., *Humbert & Swingle 5410* (lecto-, P[P00078199]!, designated here; iso-, P[P00078200]!, TAN!).

ADDITIONAL SPECIMENS EXAMINED. — Madagascar, Toliara: Ifotaka, Morafeno, Mandrare, XI.1952, *Bosser 4032* (P). — Cap Ste Marie, III.1964, *Bosser 19370* (P). — Andranovory, III.1989, *Brunel 12563* (P). — Cap Ste Marie, 27.I.1963, *Capuron 22562 SF* (TEF). — Cap Ste Marie, alt. 1–150 m, V–VII.1955, *Humbert & Capuron 19280* (P). — Delta de Linta, *Decary 9010* (P). — Cap Ste Marie, 27.XII.1988, *Phillipson 3002* (MO, P). — Parcel 2, near Hazofotsy, 24°50'S, 46°32'E, alt. 100 m, 7.XII.1988, *Phillipson 2441* (MO, TAN). — Ando-

hahela, parcel 2, near Tsimelahy, 24°56'S, 46°38'E, alt. 200 m, 19.II.1990, *Phillipson & Milijaona 3555* (MO, TAN). — Cap Ste Marie, 25°35'23"S, 45°08'41", alt. 188 m, 1.II.2005, *Ranaivojaona 1156 & 1157* (TAN).

DISTRIBUTION AND ECOLOGY. — Endemic to Madagascar; southern floristic domain. Bush. Altitude sea level: 200 m (Fig. 5).

CONSERVATION STATUS. — Species known from seven localities, one of which is in a protected area (Andohahela). This species is threatened by habitat fragmentation, annual bush fire and grazing. It has an AOO of 5895 km² and an EOO of 24 953 km² and is here rated as Nearly Threatened (NT).

REMARKS

Monoecious shrubs or subshrubs, 30-60 cm high. Branching pinnatifid; orthotropic branches terete, becoming flattened toward the apex, grey, smooth to rugose; young branches pubescent becoming glabrous. Brachyblasts absent. Cataphylls triangular, 0.8-1 × 0.5-0.7 mm, coriaceous, entire, glabrous. Cataphyllary stipules triangular, 0.4-1 × 0.3-0.7 mm, coriaceous, entire, glabrous. Plagiotropic branches solitary, terete or flattened, 1-6 cm long, 0.3-0.4 mm in diameter, rugose, pubescent or glabrous. Stipules persistent or caducous, triangular, 0.5-0.8 × 0.4-0.5 mm, membranous, entire, glabrous. Leaves 3-12 per branch. Internodes 2-4 mm long. Petioles semi-terete, 0.5-0.7 × c. 0.3 mm, glabrous. Leaf blades obovate or suborbicular, 2-8 × 1.3-6 mm, 1.3-1.4 times longer than wide, slightly attenuate or obtuse at the base, rounded at the apex, coriaceous, slightly revolute, glabrous adaxially, pubescent abaxially, green adaxially and greyish green abaxially when fresh; midvein prominent adaxially, prominent or indistinct abaxially; secondary veins 3-4 pairs, flattened or indistinct adaxially, indistinct abaxially. Inflorescences unisexual, consisting of 1 male flower or 1 female flower, male and female inflorescences on different branches. Bracts triangular, 0.3-0.4 × 0.2-0.3 mm, slightly erose, glabrous. Male flowers 1-1.2 × 1.2-1.5 mm, white-green when fresh. Pedicels c. 5 × 0.2 mm (diameter increasing slightly toward receptacle), glabrous or pubescent. Tepals 5(-6), unequal (outer smaller), elliptic or suborbicular, 0.8-1 × 0.6-1 mm, rounded or obtuse, membranous, glabrous on both sides (sometimes pubescent outside), margin entire or erose, hyaline for c. ¼ of total tepal width on each side, veins un-

branched or branched. Disc glands 5(-6), reniform, c. 0.2 × 0.1 mm, smooth. Stamens 5(-6); filaments free, sometimes the 2 inner tending to fuse at their base, terete, 0.5-0.7 × c. 0.2 mm; anthers free, ovoid or globose, 0.3-0.4 × 0.2-0.4 mm. Female flowers 1.5-3 × 3-4 mm, white green when fresh. Pedicels 6-9 × 0.1-0.2 mm (wider toward receptacle), glabrous or pubescent. Tepals 5(-6), equal or unequal, elliptic, 1.5-2 × 0.7-1 mm, obtuse, membranous, glabrous on both sides (sometimes pubescent outside), margin entire, hyaline for c. ¼ of total tepal width, veins unbranched. Disc lobed, smooth. Ovary 3-locular, depressed globose or globose, 0.9-1.2 × 0.9-1.3 mm, smooth, pubescent; styles fused at the base, bifid for c. ¾ of their length, terete or flattened, 1.2-1.4 mm long; stigmas obtuse or acute. Fruits depressed globose or globose, 2-2.2 × 3-3.2 mm, pubescent; fruiting pedicels 6.5-10 × 0.3-0.5 mm; tepals 1.8-2.2 × 0.8-1 mm; columella 0.7-1 mm. Seeds 1.3-1.5 × 1.6-1.8 mm, smooth (Fig. 4).

4. *Phyllanthus multiflorus* Poir., in Lamarck (Figs 6; 7)

Encyclopédie méthodique, Botanique 5: 299 (1804); Müller Argoviensis, in De Candolle, *Prodromus systematis naturalis regni vegetabilis* 15(2): 335 (1866). — Type: Madagascar, s. loc., *Lamarck s.n.* (holo-, P-LA[P00381859]!).

ADDITIONAL SPECIMENS EXAMINED. — Madagascar, s. loc., *Commerson s.n.* (P[P00078239], P[P00078240]). — Herb. *Willdenow fol.* 17792 (P). — Mahajanga: Ampandra, Antsalova, 18°39'S, 44°45'E, alt. 100-200 m, 28.XI.1992, *Labat et al.* 2208 (P). — Sambirano, Analalava, aux environs de Bezofa, rocailles (gneiss) des bords de l'Andraombeza, 1909, *Perrier de la Bâthie 9911* (P). — Antsalova, Ampandra, 18°39'10"S, 44°45'03"E, alt. 165 m, 20.X.2006, *Ralimanana et al.* 809 (K, TAN, TEF).

DISTRIBUTION AND ECOLOGY. — Endemic to Madagascar; western floristic domain. Dry forests. Altitude 100-200 m (Fig. 7).

CONSERVATION STATUS. — Known from few collections. This species has a disjunct distribution. One location is within a protected area (Bemaraha). The subpopulation not in a protected area is threatened by habitat loss by human activities such as fire. This species has an EOO of 47 897.2 km² and an AOO of 144 km². It is assessed as Endangered (EN B2ab(i,ii,iii,iv)).



FIG. 6. — *Phyllanthus multiflorus* Poir.: **A**, habit; **B**, detail of orthotropic surface; **C**, male flower; **D**, dry fruit. Drawn from *Ralimanana* 809 by Roger Lala Andriamiarisoa. Scale bars: A, 1 cm; B, 3 mm; C, 2 mm; D, 7 mm.

REMARKS

Monoecious shrubs or treelets, 1-2.5 m high. Branching pinnatifid; orthotropic branches terete, striate,

glabrous. Brachyblasts 6-10 mm long, with a tuft of 5-10 scales at the apex. Cataphylls triangular, 2.5-3.5 × 2-2.5 mm, coriaceous, erose, glabrous. Cataphyllary

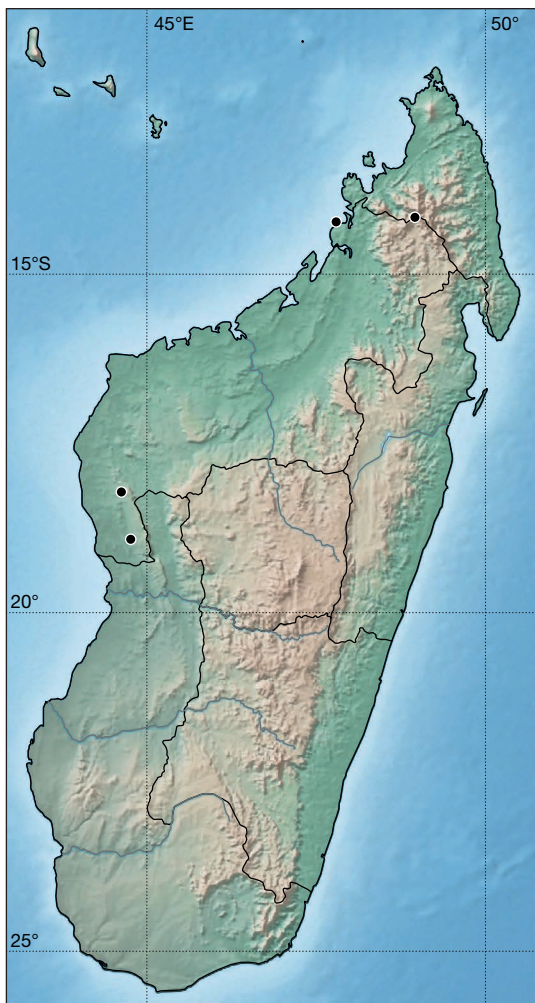


FIG. 7. — Distribution map of *Phyllanthus multiflorus* Poir.

stipules triangular, 1-2 × 0.7-1 mm, coriaceous, erose, glabrous. Plagiotropic branches solitary, compressed, 1.5-11.5 cm long, 0.5-1 mm in diameter, striate, glabrous. Stipules persistent, linear, 3-4 × 0.3-0.4 mm, membranous, entire or erose, glabrous. Leaves 4-9 per branch. Internodes 2-20 mm long. Petioles terete, 1-2 × 0.3-0.5 mm, glabrous. Leafblades ovate, 12-50 × 10-30 mm, 1.3-1.6 times longer than wide, truncate or slightly cordate at the base, acuminate at the apex, chartaceous, glabrous on both sides; midvein prominent on both sides; secondary veins 3-7 pairs, prominent on both sides. Inflorescences unisexual,

consisting of 2-7 male flowers or only 1 female flower. Bracts triangular, 0.1-0.2 × 0.1-0.2 mm, slightly erose, glabrous, grouped in a tuft of 5-10 mainly sterile bracts in male inflorescences. Male flowers 2-3.5 × 4-7 mm. Pedicels terete, 7-14 × 0.1 mm, glabrous. Tepals 5, equal or subequal, elliptic or ovate, 2.2-3.5 × 1.8-2.5 mm, rounded or obtuse, membranous, glabrous on both sides, margin erose, hyaline for c. 1/3 of total tepal width in each side, veins unbranched. Disc glands 5, reniform, 0.6-0.8 × 0.4-0.5 mm, smooth. Stamens 5; filaments fused into a very short column for c. 1/5 of their length, free parts slightly flattened, 0.8-1 × 0.1-0.3 mm; anthers free, ovoid, 0.2-0.3 × 0.1-0.2 mm. Female flowers unknown (information only from fruits). Pedicels glabrous. Tepals 5, ovate or obovate, obtuse or rounded, membranous, glabrous on both sides, margin entire. Ovary 3-locular, globose or depressed globose, smooth becoming slightly rugose when dry, glabrous; styles free, terete, bifid for c. 2/3 of their length; stigmas obtuse or acute. Fruits globose or depressed globose, 3-5 × 3-7 mm, exocarp ligneous and thick, 0.6-1.6 mm thick; fruiting pedicels 12-20 mm long; tepals persistent or caducous, 2.2-4 × 1.8-2.5 mm; columella 2-3 mm. Seeds 2-2.8 × 1.5-2 mm, finely striate longitudinally (Fig. 6).

5. *Phyllanthus gordonii*

Ralim. & Petra Hoffm., sp. nov.

(Figs 8; 9)

Sp. nov. P. multifloro praesentia brachyblastorum et fructibus capsularibus similis sed absentia squamarum apice brachyblastorum, laminis foliorum basin attenuatis vel obtusis apice obtusis, bracteis sterilibus in inflorescentia mascula carentibus et staminibus 3 liberis (vice 5 connatis) differt.

TYPUS. — Madagascar, Toamasina, Ste Marie, littoral forest of Ambohidena, 16°51'09"S, 49°57'13"E, alt. 19 m, 9.X.2003, *Andrianarivelo* 76 (holo-, TEF!; iso-, MO).

DISTRIBUTION AND ECOLOGY. — Endemic to Madagascar; eastern floristic domain. Littoral forests. Altitude near sea level: 20 m (Fig. 9).

CONSERVATION STATUS. — The AOO of this species is 418 km², the EOO is 676 km², and its habitat is severely threatened by cut and slash methods (tavy). We therefore rate it as Endangered (EN B1ab(i,ii,iii,iv) + B2ab(i,ii,iii,iv)).



FIG. 8. — *Phyllanthus gordonii* Ralim. & Petra Hoffm., sp. nov.: **A**, habit; **B**, plagiotropic branch with inflorescence; **C**, brachyblast; **D**, lower surface of a leaf; **E**, upper surface of a leaf; **F**, female flower; **G**, male flower. Drawn from *Andrianarivelo* 76 (female flower) and *McPherson 18887* by Roger Lala Andriamiarisoa. Scale bars: A, D, E, 1 cm; B, F, 1 mm; C, 4 mm; G, 2 mm.

ETYMOLOGY. — The species epithet honors Dr. Gordon McPherson, our colleague, collaborator and friend at the herbarium of Missouri Botanical Garden in St. Louis who made the first collection of this species.

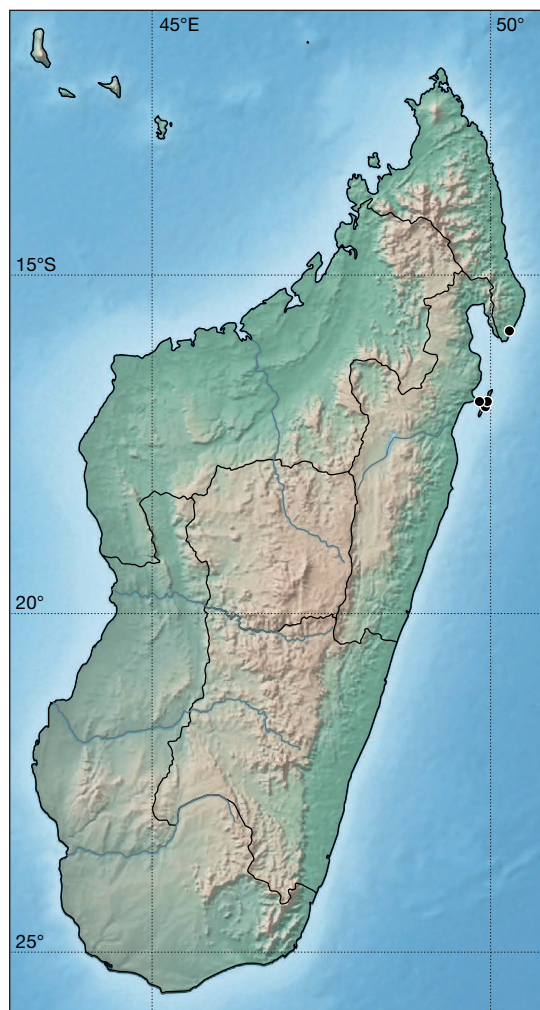


FIG. 9. — Distribution map of *Phyllanthus gordonii* Ralim. & Petra Hoffm., sp. nov.

PARATYPES. — **Madagascar**, Toamasina: Île Sainte Marie, Lokintsy, forest of Ambohidena, 16°51'11"S, 49°57'10"E, alt. 10 m, 13.V.2003, *McPherson et al. 18887* (MO, TEF); Ambohidena, Sainte Marie, 16°51'11"S, 49°57'18"E, alt. 9 m, 18.II.2004, *Rabevohitra et al. 9007* (MO, TEF).

REMARKS

Monoecious subshrubs or shrubs, 1-3 m high. Branching pinnatifid; orthotropic branches terete, glabrous. Brachyblasts 2-4 mm long. Cataphylls triangular, 1-2 × 0.5-0.8 mm, coriaceous, entire, glabrous. Cataphyllary stipules triangular, 1-2 ×

0.5-0.8 mm, coriaceous, entire, glabrous. Plagiotropic branches solitary or fasciculate in twos, terete, 3-10 cm long, 0.4-0.8 mm in diameter, smooth, glabrous. Stipules caducous, not seen. Leaves 3-12 per branch. Internodes 5-15 mm long. Petioles terete, 1-2 × 0.3-0.6 mm, glabrous. Leaf blades trullate, 8-18 × 6-14 mm, attenuate or obtuse at the base, obtuse at the apex, membranous, revolute, glabrous on both sides; midvein flattened adaxially, prominent abaxially; secondary veins 2-4 pairs, indistinct adaxially, slightly prominent or flattened abaxially. Inflorescences unisexual or bisexual, consisting of 2-4 male flowers or 2-4 male flowers and 1 female flower, the sexes variously arranged. Bracts triangular, 0.7-1 × 0.3-0.4 mm, entire, glabrous. Male flowers 1-2 × 1-2 mm. Pedicels 5-10 × 0.1-0.3 mm, glabrous. Tepals 5, equal, ovate, 1-2 × 0.8-1.5 mm, obtuse, membranous, glabrous on both sides, margin entire, hyaline for ¼ of total tepal width on each side, veins unbranched. Disc glands 5, reniform, c. 0.2 × 0.1 mm, smooth. Stamens 3, free; filaments 0.3-0.5 × c. 0.1 mm, terete; anthers free, globose, 0.1-0.2 mm in diameter. Female flowers 1.5-3 × 3-4 mm. Pedicels 5-13 × 0.3-0.4 mm, glabrous. Tepals 5, equal, ovate, 1.5-3 × 0.8-1 mm, obtuse, subcoriaceous, glabrous on both sides, margin entire, hyaline for c. ¼ of total tepal width on each side, veins unbranched. Disc lobed, smooth. Ovary 3-locular, globose, 0.8-1 mm in diameter, smooth, glabrous; styles fused at the base, terete, bifid for c. ¾ of their length, 0.4-0.5 mm long; stigmas obtuse. Fruits depressed globose (only young fruits seen), c. 3 × 5 mm, glabrous; fruiting pedicels terete, c. 9 × 0.2 mm, glabrous; tepals 1.5-3 × 0.8-1 mm (Fig. 8).

At first glance, *P. gordonii*, sp. nov. may be mistaken for a species belonging to subgenus *Kirganelia* similar to *P. casticum* P.Willemet with which it shares short brachyblasts. However, *P. gordonii*, sp. nov. is distinguished by its three completely free stamens that are not arranged in two sets or even further fused as those of *Kirganelia*. In addition, the fruits in *P. gordonii*, sp. nov. are dehiscent whereas all *Kirganelia* species have baccate fruits. Three free stamens as found in *P. gordonii*, sp. nov. are also characteristic of subgenus *Betsileani* but here branching is not phyllanthoid and brachyblasts are absent. Two or three stamens and dehiscent fruits

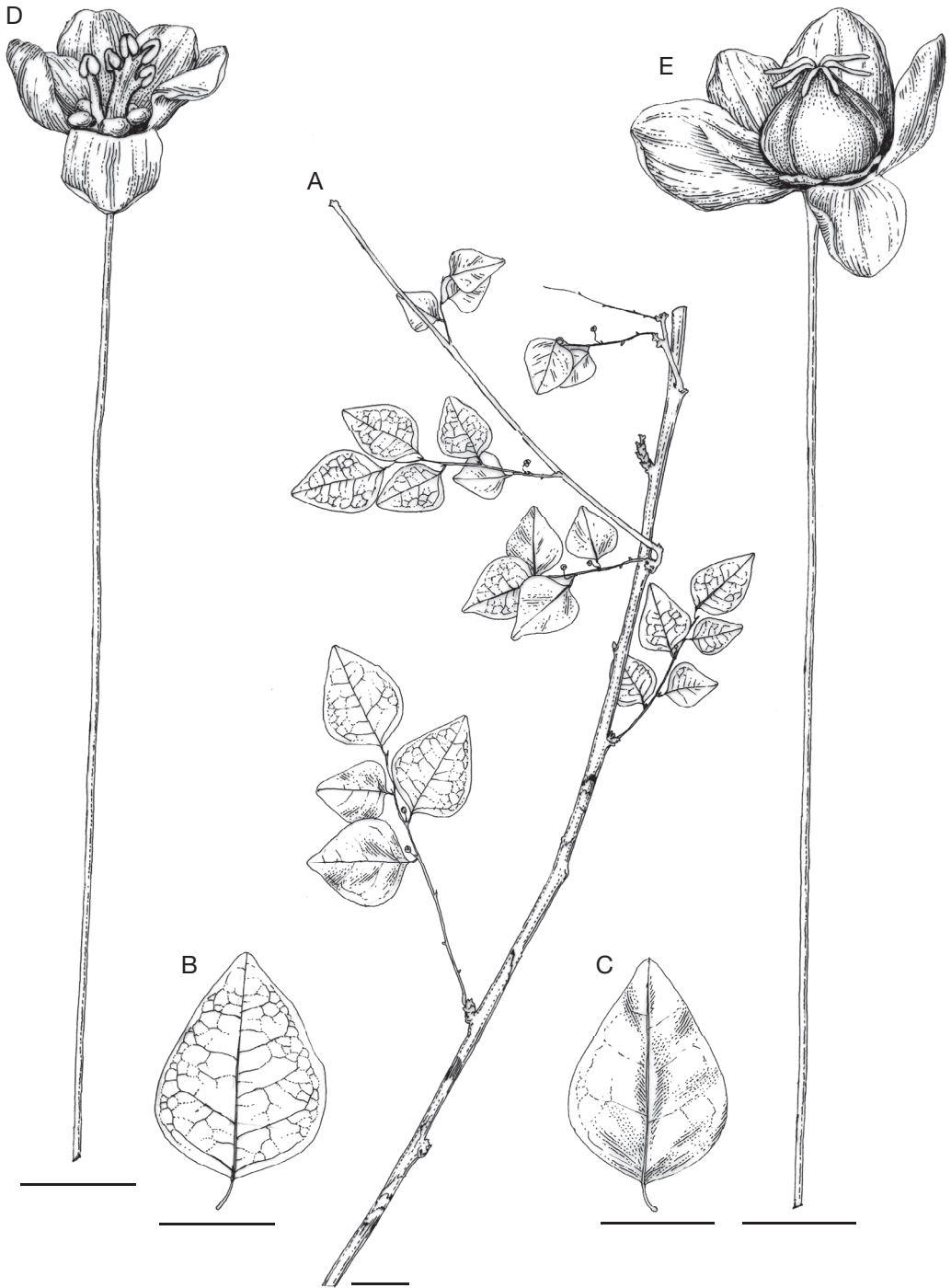


FIG. 10. — *Phyllanthus mantadiensis* Ralim. & Petra Hoffm., sp. nov.: **A**, habit; **B**, upper surface of a leaf; **C**, lower surface of a leaf; **D**, male flower; **E**, young fruit. Drawn from *Ralimanana* 533 by Roger Lala Andriamiarisoa. Scale bars: A-C, 1 cm; D, E, 1 mm.

are also characteristic of subgenus *Afroswartziani* Ralim. & Petra Hoffm. but in this group stamens are entirely or partially fused. On balance, we decided to place *P. gordonii*, sp. nov. in subgenus *Anisnemoides*, stat. nov.

6. *Phyllanthus mantadiensis*

Ralim. & Petra Hoffm., sp. nov.

(Figs 10; 11)

Sp. nov. *P. multifloro praesentia brachyblastorum et laminis foliorum ovatis similis sed bracteis apice brachyblasti carentibus, laminis foliorum basin obtusis vel rotundatis (vice truncatis vel leviter cordatis), apice obtusis (vice acuminatis), pedicello floris staminatis 1-5 mm longo (vice 7-14 mm).*

TYPUS. — Madagascar, Toamasina, Mantadia National Park, 18°47'46"S, 48°25'43"E, alt. 1171 m, 6.IV.2004, *Ralimanana 533 et al.* (holo-, TAN!; iso-, K!).

DISTRIBUTION AND ECOLOGY. — Endemic to Madagascar; eastern floristic domain. Humid forests. Altitude 1000-1300 m (Fig. 11).

CONSERVATION STATUS. — This species is only known from two locations and has an EOO of 8 km². It is rated as Critically Endangered (CR B1b(i,ii,iii,iv)).

ETYMOLOGY. — The species epithet is derived from the name of the protected area where the type was collected.

PARATYPES. — Madagascar, Toamasina: Parc National Mantadia, 18°52'33"S, 48°31'52"E, alt. 1282 m, 14.XI.2004, *Ralimanana 584* (K, TAN); Moramanga, Andasibe, corridor forestier Analamay Mantadia, 18°47'07"S, 48°24'38"E, alt. 1006 m, 24.XI.2012, *Rasoazanany & Ratolojanahary 110* (MO, P, TAN); Alaotra-Mangoro, Andasibe, Andasifahatelo, Ambatoaranana, corridor forestier Analamay Mantadia, 18°47'12"S, 48°24'42"E, alt. 1034 m, 22.III.2013, *Rasoazanany et al. 514* (MO, P, TAN).

REMARKS

Monoecious shrub, 80-200 cm high. Branching pinnatifid; orthotropic branches terete, striate, glabrous. Brachyblasts 2-3 mm. Cataphylls triangular, 0.3-0.5 × 0.3-0.5 mm, subcoriaceous or coriaceous, entire, glabrous. Cataphyllary stipules triangular, 0.2-0.4 × 0.2-0.4 mm, subcoriaceous, entire, glabrous. Plagiotropic branches solitary or fasciculate in twos, terete, 1.5-6 cm long, 0.3-0.5 mm in diameter, smooth, glabrous. Stipules persistent or caducous, triangular, 0.3-0.5 × 0.3-0.5 mm, membranous,

entire, glabrous. Leaves 3-7 per branch. Internodes 3-7 mm long. Petioles terete, 0.7-1 × 0.2-0.4 mm, glabrous. Leaf blades ovate, 8-20 × 8-15 mm, obtuse or rounded at the base, obtuse at the apex, membranous, glabrous on both sides, green adaxially, light green or greyish green abaxially when fresh; midvein flattened or impressed adaxially, prominent abaxially; secondary veins 2-4 pairs, flattened adaxially and abaxially. Inflorescences unisexual, consisting of 1-2 male flowers or 1 female flower; male inflorescences and female inflorescences on different or same branches. Bracts triangular, c. 0.2 × 0.2 mm, entire, glabrous, grouped in a tuft of 3-5 mainly sterile bracts in male inflorescences. Male flowers 0.9-1.2 × 1.2-1.4 mm, cream when fresh. Pedicels 1-5 × 0.1-0.3 mm, glabrous. Tepals 5, equal, obovate, 0.9-1.2 × 0.8-1 mm, rounded, membranous, glabrous on both sides, margin entire, hyaline for c. 1/6 of total tepal width on each side, glabrous on both sides, veins unbranched. Disc glands 5, reniform, 0.1-0.2 × 0.1-0.2 mm, smooth. Stamens 5, free, the 2 inner tending to fuse at their base or sometimes irregularly fused; filaments 0.4-0.7 × c. 0.1 mm, terete; anthers free, ovoid, 0.1-0.2 × c. 0.1 mm. Female flowers 1.2-2 × 1.5-2 mm, cream when fresh. Pedicels 4-6 × 0.2-0.3 mm, glabrous. Tepals 5, equal, elliptic or obovate, 1.2-2 × 0.7-1 mm, obtuse, membranous, glabrous on both sides, margin entire, hyaline for 1/6-1/5 of total tepal width on each side, veins unbranched. Disc lobed, smooth. Ovary 3-locular, globose to sub-ovoid, 1-1.2 × 1-1.2 mm, smooth, glabrous; styles free, bifid for c. 4/5 of their length, spread horizontally, 0.3-0.5 mm long; stigmas obtuse or acute. Fruits depressed globose c. 6 × 5 mm, glabrous; fruiting pedicels terete, c. 7 × 0.2-0.3 mm, glabrous; tepals c. 2 × 1 mm. Seeds 2.8-3 × 2.6 mm, smooth (Fig. 10).

Phyllanthus mantadiensis, sp. nov. has five free stamens or the 2 inner tending to fuse at their base. Some flowers also have stamens irregularly fused which are typical of subgenus *Kirganelia* but its dehiscent fruits do not support such an assigning. We have studied some recent collections where we found variation in filament fusion. The specimens demonstrate that some flowers have completely free stamens, while the others tend to have fused or irregularly fused stamens. We would like to note that species placed in *incertae sedis* are the ones where

only dehiscent fruits are known and no male flowers are available. Further molecular studies are needed to confirm the placement of such morphologically aberrant Madagascan *Phyllanthus* species.

7. *Phyllanthus ankarana* Leandri
(Fig. 12)

Bulletin de la Société Botanique de France 81: 452 (1934). — Type: Madagascar, Mahajanga, Causse d'Ankara, male, X.1924, *Perrier de la Bâthie* 1174 (lecto-, chosen by Brunel 1987, P[P00482892!]; iso-, P[P00482891!, P00482894!, and P00482895!]).

Phyllanthus trichopodus Leandri, *Bulletin de la Société Botanique de France* 81: 452 (1934), nom. illegit. *Phyllanthus trichopodus* Guillaumin is an accepted name and a New Caledonian *Phyllanthus* species.

Phyllanthus tulearicus Leandri, *Notulae Systematicae* 6: 199 (1938). — Type: Madagascar, Toliara, Fiherenana, *Perrier de la Bâthie* 16622 (holo-, P[P00078284!]; iso-, P[P00078285!]).

ADDITIONAL SPECIMENS EXAMINED. — Madagascar, s. loc., 28.III.1974, *Abraham* 449916 (P). — Antsiranana: Réserve spéciale Ankarana, Mahamasina, 12°55'1"S, 49°8'12"E, alt. 125 m, 4.XI.1997, *Vaucoulon* 911 (K, MO, TAN). — Mahajanga: Namoroka, *Decary* 15819 (P). — Bongo-Lava entre la Mahajamba et le Bemarivo, XI.1906, *Perrier de la Bâthie* 4556 (P). — Bevazaha, Tsaramandroso, Ambato-Boeni, I.X.1948, *Ramamonjisoa* 1657 RV (P). — Toliara: Basibasy, XII.1961, *Apert* 44 (K, P). — Route Toliara-Sakaraha, 13.XI.1974, *Capuron* 27949 SF (P). — Morondava, *Grevé* 226, 228 (P). — Environs de Morondava, route de Belo, 3.XII.1970, *Keraudren-Aymonin & Aymonin* 25874 (P). — Morondava, between Morondava and Beroboka, 20°03'S, 44°37'E, alt. 30 m, 7-8.XII.1990, *Gillespie* 4116 (K, MO). — Beza Mahafaly, Betioky, parcel 2, 23°41'S, 44°35'E, alt. 190 m, 28.X.1987, *Phillipson* 2472 (K, MO, TAN). — Morondava, *Raharimalala* s.n. (P). — Forêt du PK 32 Ifaty, 23°4'4"S, 43°3'E, alt. 44 m, 11.XII.2004, *Ralimanana et al.* 663 (K, MO, TAN).

DISTRIBUTION AND ECOLOGY. — Endemic to Madagascar; western floristic domain. Dry forest, sandy forest, bush. Altitude 30-130 m (Fig. 12).

CONSERVATION STATUS. — Although not common, this species has a large distribution area (AOO of 106776 km², EOO of 220887 km²) and is therefore assigned the IUCN category Least Concern (LC). One location is in a protected area (Ankarana).

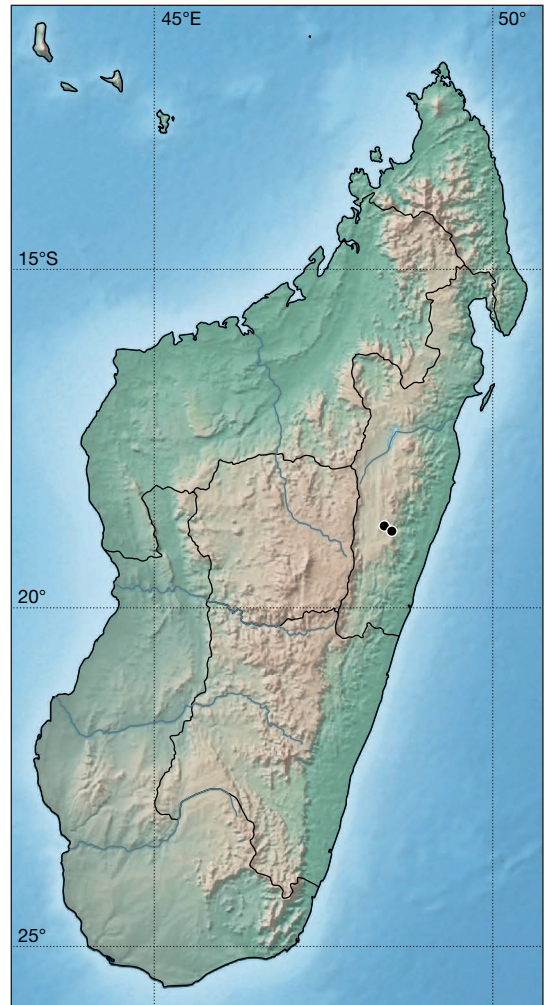


FIG. 11. — Distribution map of *Phyllanthus mantadiensis* Ralimanana & Petra Hoffm., sp. nov.

REMARKS

Diocious shrubs, 1-5 m high. Branching pinatifid; orthotropic branches terete, glabrous. Brachyblasts 1-2 mm long. Cataphylls triangular, 0.6-1 × 0.5-0.8 mm, coriaceous, entire, fimbriate or erose, glabrous. Cataphyllary stipules 0.6-1 × 0.3-0.8 mm, coriaceous, entire, fimbriate or erose, glabrous. Plagiotropic branches solitary or fascicled in twos, terete or slightly flattened, 1.4-5 cm long, 0.2-0.4 mm in diameter, smooth or striate, glabrous or pubescent. Stipules persistent, triangu-

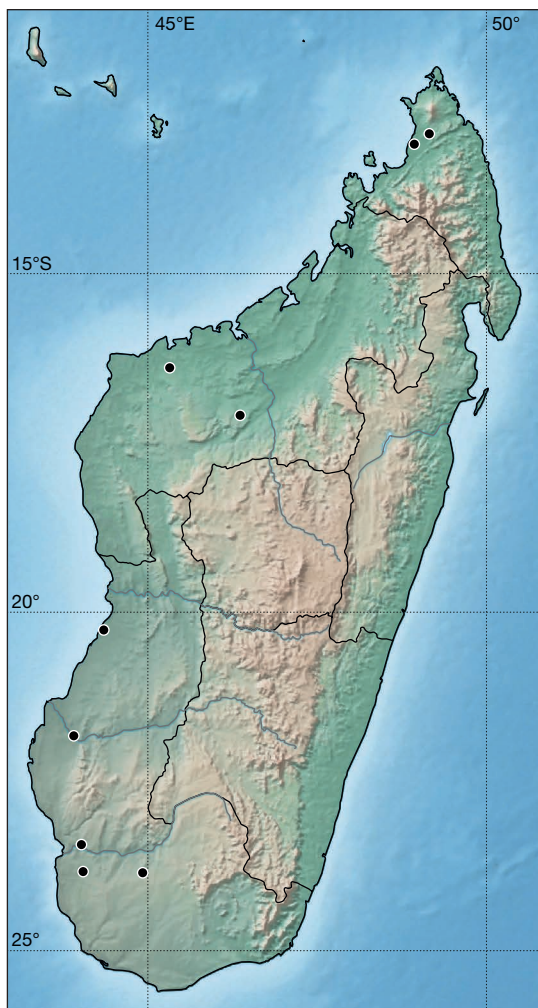


FIG. 12. — Distribution map of *Phyllanthus ankarana* Leandri.

lar or oblong, 0.5-2 × 0.3-0.5 mm, membranous, entire, fimbriate or erose, glabrous. Leaves 4-9 per branch. Internodes 1-6 mm long. Petioles terete or adaxially flattened, 0.5-1.2 × 0.1-0.3 mm, glabrous or pubescent. Leaf blades ovate, obovate, suborbicular or elliptic, 2-15 × 1-13 mm, 1.25-2 times longer than wide, rounded, obtuse or attenuate at the base, rounded, obtuse or sometimes obtuse-mucronulate at the apex, membranous (young leaves) or chartaceous, glabrous or pubescent on both sides; midvein flattened or slightly prominent

adaxially, slightly prominent abaxially; secondary veins 2-3 pairs, slightly prominent adaxially, flattened abaxially or indistinct on both sides. Inflorescences unisexual, consisting of 3-50 male flowers or only 1 female flower. Bracts triangular grouped in tuft of sterile bracts in male inflorescences, 0.5-1.5 × 0.4-1.5 mm, entire, fimbriate or erose, glabrous. Male flowers 1-2.5 × 1-1.7 mm. Pedicels 5-10 × c. 0.1 mm, glabrous. Tepals (4-) 5, subequal, obovate or spatulate, 0.7-0.9 × 0.5-0.7 mm, obtuse-mucronulate, membranous, glabrous on both sides, margin entire, hyaline for c. 1/8 of total tepal width on each side, veins unbranched. Disc glands absent or present, if present minute, (4-) 5, globose, smooth becoming slightly rugose when dry, c. 0.1 × 0.1 mm. Stamens 5; filaments free or fused into a short column for c. 1/6 of their length, terete, 0.5-1.2 × c. 0.1 mm; anthers free, globose, ovoid or ellipsoid, 0.4-0.5 mm long. Female flowers 4-5 × 2-4 mm. Pedicels 8-30 × c. 0.2 mm, glabrous. Tepals 5-6, equal, elliptic, obovate or oblong, 1.3-2 × 0.6-1 mm, rounded or obtuse, membranous, glabrous on both sides, margin entire, hyaline for 1/12-1/10 of total tepal width on each side, veins branched or unbranched. Disc various or absent, if present lobed or consisting of free glands, glands globose, 0.1-0.2 mm in diameter. Ovary 3-locular, globose or depressed globose, 1-2 × 1-2 mm, smooth becoming slightly rugose when dry, glabrous; styles free or fused at the base, erect, bifid for 2/3-3/4 of their length, 2-3 mm long; stigmas acute. Fruits globose or depressed globose, 2-4 × 2-5 mm; fruiting pedicels 8-30 × 0.2-0.3 mm; tepals 1.5-2 × 0.6-1 mm; columella 1.4-2.5 mm long. Seeds 1.6-2 × 1.4-2 mm, with 20-25 longitudinal striae.

8. *Phyllanthus bernieranus*

Baill. ex Müll. Arg., in De Candolle
(Figs 13; 14)

Prodromus systematis naturalis regni vegetabilis 15(2): 361 (1866). — Type: Madagascar, s.loc., Bernier 245 (holo-, P[P00535919]!; iso-, P[P00535921]).

Phyllanthus andalangiensis Leandri, *Mémoire de l'Institut Scientifique de Madagascar*, série B, Biologie végé-



FIG. 13. — *Phyllanthus bernieranus* Baill. ex Müll. Arg.: **A**, habit; **B**, detail of orthotropic branch with cataphylls; **C**, upper surface of a leaf; **D**, lower surface of a leaf; **E**, fruit. Drawn from *Ralimanana* 413 by Roger Lala Andriamiarisoa. Scale bar: A, 1 cm; B, 2 mm; C, D, 5 mm; E, 1 mm.

tale 8: 226 (1957). — Type: Madagascar, Antsiranana, Vallée de l'Andalany, 1950–1951, *Humbert & Capuron* 24199 (lecto- chosen by Brunel 1987, P!).

ADDITIONAL SPECIMENS EXAMINED. — Madagascar, Antsiranana: Vallée d'Andalany, bassin de Bemarivo, alt. 200–300 m, 12–14.XI.1950–1951, *Humbert &*

Capuron 24200 (P). — Ankaizina, alt. 800 m, 1905, *Perrier de la Bâthie 9910* (P). — Toamasina: Antalavia, Masoala, 15°47'S, 50°01'E, alt. 50–20 m, 19.IV.1988, *Gentry & Schatz 62173* (MO, P). — Maroantsetra, Ambanizana, on boulders in Androka river, 15°77'57"S, 49°58'36"E, 19.XI.2001, *Phillipson 5373* (K, MO, P). — Mananara avaratra, 16°27'S, 49°47'E, alt. 270 m, 23.X.1994, *Prance & Andriantiana 30727* (P). — Mahavoho, 12.II.1990, *Raharimalala 409* (P). — Soanierana Ivongo, river between Ambatobe and Amberomanitra, 16°53'28"S, 49°21'25"E, alt. 197 m, 18.XII.2003, *Ralimanana & Rakotonasolo 413* (BR, G, K, MO, P, TAN). — Soanierana Ivongo, 27.XII.1949, coll. inc. 2348 SF (P). — Mananara avaratra, Ambinanin'Ambalaviaviana, Ambohimanakana Varary, Sandrahaty, 17.IV.1988, *coll. inc. 3144 SF* (TEF).

DISTRIBUTION AND ECOLOGY. — Endemic to Madagascar; eastern and Sambirano floristic domains. Rheophytic species growing on boulders in river beds. Altitude 50–800 m (Fig. 14).

CONSERVATION STATUS. — Population fragmented. This species is threatened by habitat loss which leads to a decline of extent of occurrence, area of occupancy, quality of habitat and number of locations or subpopulations. It has an EOO of 26,684.4 km² and an AOO of 600 km². We therefore assign to it the category Vulnerable (VU B2ab(i, ii, iii, iv)).

VERNACULAR NAME. — Valanirambato.

REMARKS

Monoecious subshrubs, 30–80 cm high. Branching pinnatifid; orthotropic branches terete or subangular, rugose or striate, glabrous. Brachyblasts absent. Cataphylls triangular, 0.6–1 × c. 0.5 mm, coriaceous, entire, glabrous. Cataphyllary stipules triangular, 0.4–0.8 × 0.3–0.4 mm, coriaceous, entire, glabrous. Plagiotropic branches solitary, grouped at the distal part of orthotropic branches, terete or subangular, 8.3–18 cm long, 0.8–1 mm in diameter, striate, glabrous. Stipules persistent, triangular, 1–2 × 0.5–0.7 mm, membranous, entire, glabrous. Leaves 8–20 per branch. Internodes 6–15 mm long. Petioles terete, 1–1.5 × 0.3–0.5 mm, glabrous. Leaf blades elliptic, ovate to lanceolate, 6–21 × 4–10 mm, 2.5–3 times longer than wide, attenuate, obtuse or rounded at the base, acute or rounded at the apex, subcoriaceous or chartaceous, glabrous on both sides, green or reddish green adaxially and greyish green abaxially when fresh; midvein prominent

on both sides; secondary veins 6–9 pairs, prominent or flattened adaxially, flattened or indistinct abaxially. Inflorescences unisexual or bisexual, consisting of 2–3 male flowers, or only 1 female flower, or 2–3 male flowers and 1 female flower, bisexual or male inflorescences on proximal part, female inflorescences on distal part of plagiotropic branches. Bracts triangular, 1–1.5 × 0.3–0.5 mm, entire, glabrous. Male flowers 2–2.5 × 1.5–2 mm. Pedicels 1.5–2 × 0.2–0.3 mm (slightly wider distally), glabrous. Tepals 5(–6), equal, ovate, 1–2.5 × 0.8–1 mm, rounded, membranous, glabrous on both sides, margin entire, hyaline for c. ¼ of total tepal width on each side, veins branched. Disc glands 5, obovoid, c. 0.3 × 0.2 mm, smooth. Stamens 2(–3); filaments entirely fused into a column; column terete, 1–1.2 × 0.3–0.5 mm; anthers fused or free by the apex, oblong, 0.6–0.7 × 0.2–0.3 mm. Female flowers 1.5–2.5 × 1.2–1.5 mm, white green when fresh. Pedicels 2–3.5 × 0.1–0.2 mm (slightly wider distally), glabrous. Tepals 5(–6), equal, ovate or obovate, 1–1.2 × 0.4–0.7 mm, rounded or obtuse, subcoriaceous or membranous, glabrous on both sides, margin entire, hyaline for c. ¼ of total tepal width on each side, veins branched. Disc lobed, smooth. Ovary 3-locular, ovoid or depressed globose, 1–1.4 × 1–1.6 mm, smooth becoming slightly rugose when dry, glabrous; styles entirely free, terete, bifid for ½–⅔ of their length, 0.5–1.2 mm long; stigmas obtuse. Fruits ovoid or depressed globose, 1.1–1.7 × 1.3–2 mm, glabrous, green becoming yellow when ripe; fruiting pedicels 3–5 × c. 0.1 mm; tepals 1–1.5 × 0.8–1.2 mm; columella 1–1.2 × 0.2 mm. Seeds c. 1 × 0.8 mm, smooth, reddish or light brown when fresh (Fig. 13).

We found no character to distinguish between *P. andalangiensis* and *P. bernieranus*. Both have 2(–3) stamens with filaments entirely fused into a column, and with elongate anthers that can be fused or free by the apex. They also share the same ecology; both are rheophytic species and grow on boulders in river beds. In his descriptions Leandri (1957, 1958) did not report the stamen number of *P. andalangiensis*. He distinguished *P. bernieranus* from *P. andalangiensis* only by the leaf size (narrower in *P. bernieranus*). In our opinion this character is not enough to discriminate two species. There

is overlap of all other morphological characters in both species. *P. bernieranus*, as the older name, has priority so *P. andalangiensis* is here referred into synonymy. The fused stamens of *P. bernieranus* are somewhat atypical of subgenus *Anisonemoides*, stat. nov. but according to the molecular results (Kathriarachchi *et al.* 2006), *P. vakinankaratrae* Leandri and *P. andalangiensis* Leandri form a strongly supported (BP 99) clade.

9. *Phyllanthus bemangidiensis*

Ralim., sp. nov.

(Figs 15; 16)

Sp. nov. *P. cryptophilo lamini foliorum lanceolatis et staminibus 5 liberis similis sed foliis semper alternatis (vice plerumque oppositis), lamini apice caudatis (vice acuminatis vel acutis), pedicello floris staminati 10-12 mm (vice 1-4 mm), floris pistillati 15-30 mm (vice -11 mm) differt.*

TYPUS. — Madagascar, Toliara, Anosy, Tsitongambarika, Ampasina, 24° 34' 17"S 047° 08' 37"E, alt. 30 m, 3.IV.2008, Razakamalala *et al.* 4170. (holo-, TAN!, iso-, MO, P).

DISTRIBUTION AND ECOLOGY. — Endemic to Madagascar; eastern floristic domain. Low elevation humid forest. Altitude 30 m (Fig. 16).

CONSERVATION STATUS. — This species is only known from the type. No collections were made before, even though botanists have frequently carried out collecting trips in Tsitongambarika and Bemangidy areas. It seems that it is very rare. Therefore we rated it as Vulnerable (VU(D2)).

REMARKS

Monoecious shrub, 3 m high. Branching pinatifid; orthotropic branches terete, glabrous. Brachyblasts absent. Cataphylls triangular, 0.5-1 × 0.7-1 mm, coriaceous, erose or entire, glabrous. Cataphyllary stipules triangular, 0.3-0.6 × 0.3-0.8 mm, coriaceous, entire or erose, glabrous. Plagiotropic branches solitary, terete, 6-21 cm long, 0.4 mm in diameter, smooth or striate, glabrous. Stipules persistent, triangular, 0.5-1 × 0.3-0.5 mm, membranous to subcoriaceous, entire, glabrous. Leaves 4-13 per branch. Internodes 12-15 mm long. Petioles terete, 1-2 × 0.4-0.7 mm, glabrous. Leaf blades ovate to lanceolate, 14-45 × 11-20 mm,

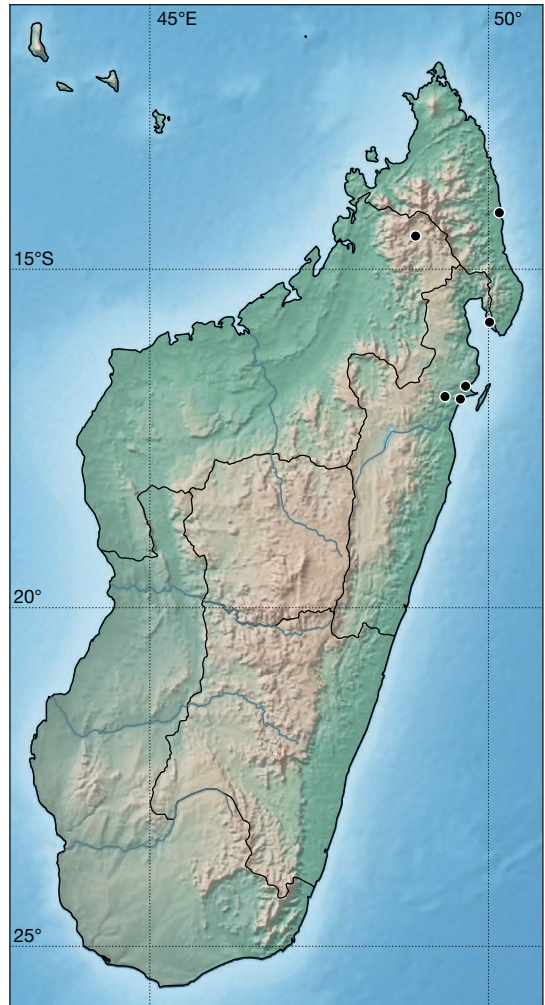


FIG. 14. — Distribution map of *Phyllanthus bernieranus* Baill. ex Müll. Arg.

c. 1.2-2.2 times longer than wide, cuneate to obtuse at the base, caudate at the apex, membranous to chartaceous, glabrous on both sides; midvein prominent adaxially, flattened abaxially; secondary veins 3-7 pairs, prominent adaxially, flattened abaxially; marginal veins more or less obvious. Inflorescences unisexual, 1 male flower or 1 female flower, male and female inflorescences on different branches. Bracts triangular, grouped in tufts of 8-15 mainly sterile bracts in male inflorescences, 0.3-0.7 × 0.3-0.5 mm, entire, glabrous.

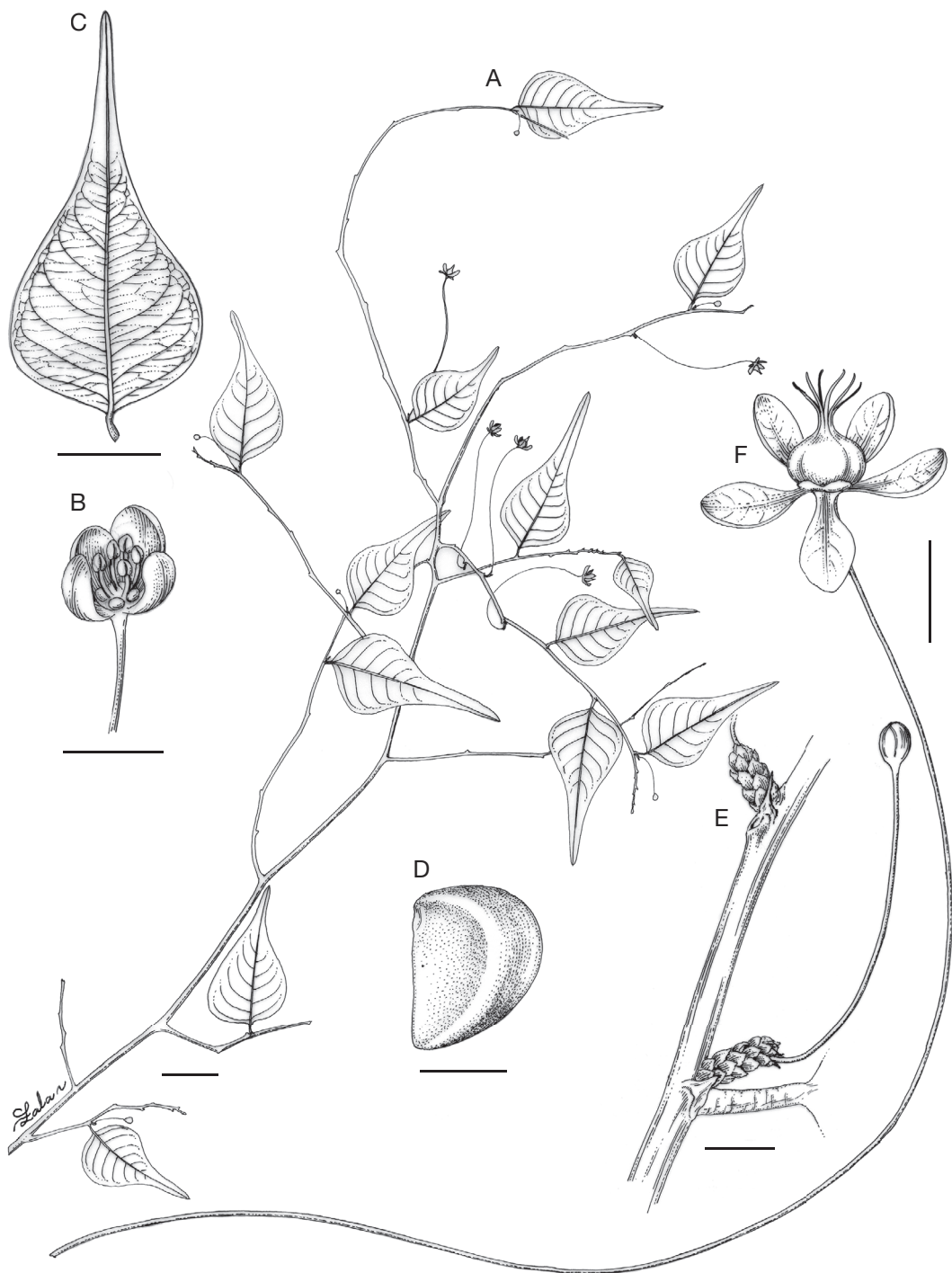


FIG. 15. — *Phyllanthus bemangidiensis* Ralim., sp. nov.: **A**, habit; **B**, male flower; **C**, upper surface of a leaf; **D**, seed; **E**, plagiotropic branch with inflorescence; **F**, young fruit. Drawn from Razakamalala et al. 4170 by Roger Lala Andriamiarisoa. Scale bars: A, C, 1 cm; B, F, 2 mm; D, E, 1 mm.

Male flowers 1.7-2 × 2-2.2 mm. Pedicels 10-12 × c. 0.2 mm, glabrous. Tepals 5, equal, obovate, 1.5-2 × 1-1.5 mm, rounded, membranous, glabrous on both sides, margin entire, hyaline for c. 1/8 of total tepal width on each side, veins unbranched. Disc glands 5, globose to reniform, c. 0.2 × 0.2 mm, slightly rugose. Stamens 5, free; filaments terete, 1-1.4 × c. 0.2 mm; anthers ovoid, c. 0.5 mm long. Female flowers 3-4 × 3-5 mm. Pedicels 15-30 × c. 0.2 mm, glabrous. Tepals 5, equal or subequal, elliptic to obovate, 1.5-2 × 1-1.5 mm, rounded, subcoriaceous, glabrous on both sides, margin entire, hyaline for 1/8-1/10 of total tepal width on each side, veins branched or unbranched. Disc lobed, smooth. Ovary 3-locular, depressed globose, c. 1 × 1.5 mm, smooth, pubescent; styles free or fused at the base, terete, bifid for 2/3-3/4 of their length, 1.5-2 mm long; stigmas obtuse. Open fruits seen; fruiting pedicels 15-30 × c. 0.2 mm; tepals 1.5-2 × 1-1.5 mm; columella c. 1 mm long. Seeds 1.7-2 × 1-1.5 mm, finely striated longitudinally (Fig. 15).

Phyllanthus bemangidiensis, sp. nov. was only recently collected in Anosy region. Because of the alternate leaves, 5 free stamens and the dehiscent fruits we place it in subgenus *Anisonemoides* stat. nov.

10. *Phyllanthus goudotianus*
(Baill.) Müll. Arg.
(Fig. 17)

Linnaea 32: 8 (1863). Basionym: *Menarda goudotiana* Baill., *Adansonia* 2: 62 (1861). — Type: Madagascar, Ambanivola, 1836, *Goudot s.n.* (holo-, P[P00078198]!).

ADDITIONAL SPECIMEN EXAMINED. — Madagascar, Toamasina, Betampona, 17°55'S, 49°13'E, alt. 210-410 m, 25.IV.1994, *Andrianarisata et al.* 130 (MO, P).

DISTRIBUTION AND ECOLOGY. — Endemic to Madagascar; eastern floristic domain. Humid forests. Altitude 200-500 m (Fig. 17).

CONSERVATION STATUS. — This species is only known from two collections but one without precise locality. It is a shrub or treelet. It grows in a well-studied area and therefore we think that it is a very rare species. One of the collections is from a protected area (Betampona) which is under no threat but given the few locations we rated this species as Vulnerable (VU(D2)).

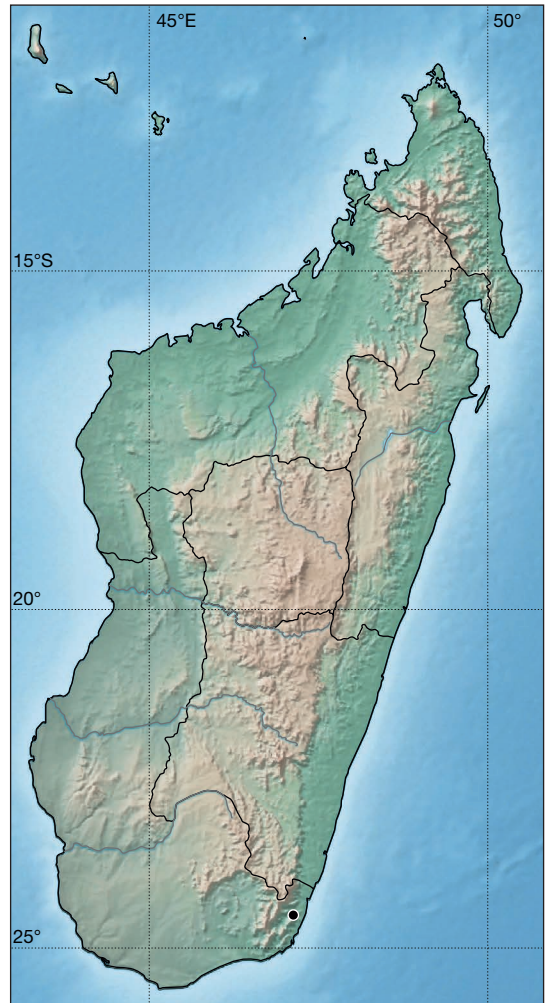


FIG. 16. — Distribution map of *Phyllanthus bemangidiensis* Ralim., sp. nov.

REMARKS

Monoecious shrubs, 1-1.5 m high. Branching pin-natiform; orthotropic branches terete, rugose or striate, glabrous. Brachyblasts absent. Cataphylls triangular, 0.5-0.8 × 0.3-0.4 mm, coriaceous, entire, glabrous. Cataphyllary stipules triangular, 0.5-0.8 × 0.3-0.4 mm, coriaceous, entire, glabrous. Plagiotropic branches solitary, terete, 5-15 cm long, 0.8-1 mm in diameter, striate, glabrous. Stipules persistent or caducous, triangular, 1-1.2 × 1.3-1.5 mm, membranous, erose, glabrous. Leaves 4-8 per branch. Internodes 6-9 mm

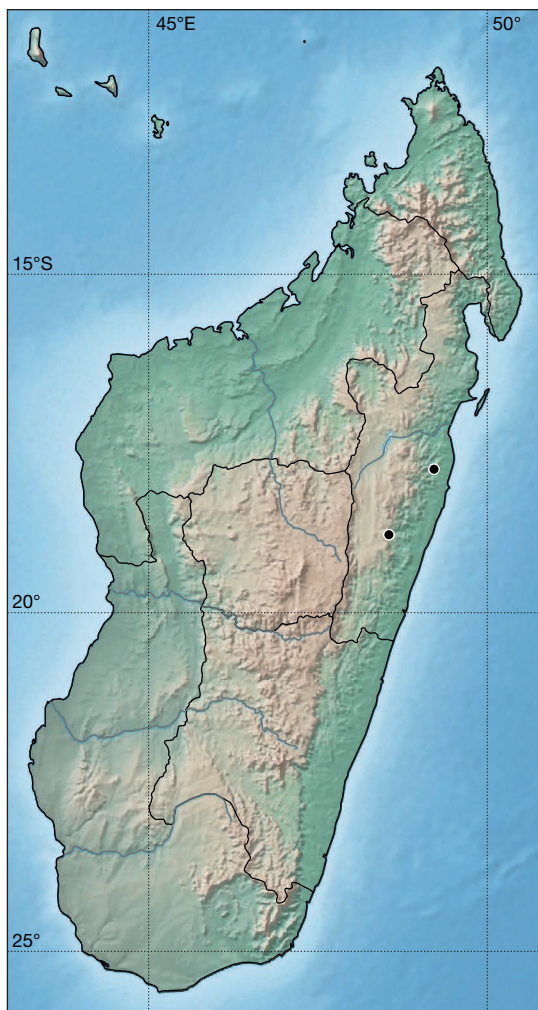


FIG. 17. — Distribution map of *Phyllanthus goudotianus* (Baill.) Müll. Arg.

long. Petioles terete or semiterete, 0.5-3 × 0.8-1 mm, glabrous. Leaf blades ovate, 30-80 × 15-40 mm, 2-3 times longer than wide, attenuate at the base, acuminate or cuspidate at the apex, chartaceous, glabrous on both sides; midvein impressed adaxially, prominent abaxially; secondary veins 3-7 pairs, slightly prominent adaxially, prominent abaxially. Inflorescences bisexual, consisting of 3-4 male flowers and 1 female flower. Bracts triangular, 0.5-0.7 × 0.3-0.4 mm, entire or slightly erose, glabrous. Male flowers 1.2-1.4 × 2-2.2 mm. Pedicels 4-8 × 0.2-0.3 mm, glabrous. Te-

pals 5(-6), subequal, obovate or suborbicular, 1-1.3 × 0.9-1.2 mm, rounded, membranous, glabrous on both sides, margin slightly erose, hyaline for $c. \frac{1}{4}$ of total tepal width on each side, veins unbranched. Disc glands 5, reniform, 0.3-0.4 × 0.2-0.3 mm, smooth. Stamens 5, entirely free; filaments terete or angular, 0.5-0.7 × 0.2-0.4 mm (diameter slightly increasing at the base of anthers); anthers ovoid, 0.2-0.3 × 0.2 mm, connective enlarged between the thecae. Female flowers unknown (information only from fruits). Pedicels glabrous. Tepals 5, ovate or obovate, obtuse or rounded, membranous, glabrous on both sides, margin entire. Ovary 3-locular, depressed globose or ovoid, smooth, glabrous; styles fused at the base, bifid for $c. \frac{1}{2}$ of their length, terete or flattened, 0.3-0.5 mm long; stigmas obtuse or acute. Fruits depressed globose or ovoid, 3-3.5 × $c. 3$ mm, 1-1.5 times longer than wide, glabrous; fruiting pedicels 6-12 × 0.2-0.3 mm, glabrous; tepals 1-2 × 0.8-1.5 mm; columella 1-2 mm long. Seeds $c. 2 \times 2$ mm, smooth.

11. *Phyllanthus ambatovolana* Leandri (Fig. 18)

Notulae Systematicae 6: 191 (1938). — Type: Madagascar, Toamasina, Ambatovola, *Perrier de la Bâthie 18398* (holo-, P[P00535934, P00535936]; iso-, P[P00535935]).

ADDITIONAL MATERIAL EXAMINED. — Madagascar, s.loc, 1952-1955, *Dequaire 27472* (P). — Antsiranana: Andapa, Ambalamanasy II, Antanimbaribe, way to Ambodivintanona forest, 13°30'00.28"S, 49°34'03"E, alt. 639 m, 29.I.2013, *Ralimanana et al. 1737* (K, MO, P, TAN). — Toamasina: Moramanga, Andasibe, Menalamba, Sahaviana, 18°51'37"S, 48°16'05"E, alt. 977 m, 15.XII.2005, *Antilabimena et al. 4418* (MO, P, TAN). — Moramanga, Ambohibary, Sahaviana, 18°51'15"S, 48°16'28"E, alt. 1001 m, 12.II.2007, *Antilabimena et al. 5285* (MO, P, TAN, TEF). — Moramanga, Ambatovy, 5 km from Ampitambe, 18°51'51"S, 48°16'23"E, 12.III.2004, *Rakotonasolo 765* (TAN, K). — Moramanga, Ambatovy, commune rurale d'Ambohibary, 18°50'43"S, 48°17'22"E, alt. 1044 m, 24.II.2005, *Razanatoa et al. 333* (MO, P). — Toliara: Bassin de la Mananara, affluent du Mandrare, entre Andohahela et Elakaka, alt. 900 m, I-II.1934, *Humbert 13927* (P). — Andohahela, parcel I, north-east of Eminiminy, near Itrotroky river, 24°38'S, 46°46'E, alt. 500-1000 m, II.1993, *Malcomber 2169* (K, MO, P). — Andohahela, parcel I, vicinity of Eminiminy, 24°40'S, 46°48'E, alt. 200-700 m, 13-27.I.1993, *B. Randidriamampionona 51* (K, MO, P).

DISTRIBUTION AND ECOLOGY. — Endemic to Madagascar; central floristic domain. Humid forests or humid forest boundaries. Altitude 600–1100 m (Fig. 18).

CONSERVATION STATUS. — *Phyllanthus ambatovolana* has a disjunct distribution and is threatened by habitat loss. It has an AOO of 28 km² and is here rated as Endangered (EN B2ab(i,ii,iii,iv)).

REMARKS

Dioecious shrubs or treelets 1–3 m high. Branching pinnatifid; orthotropic branches terete, 0.6–2 mm in diameter, smooth, glabrous. Cataphylls triangular, 0.5–1 × 0.3–0.5 mm, coriaceous, entire, glabrous. Cataphyllary stipules, 0.5–1 × 0.3–0.5 mm, coriaceous, entire, glabrous. Plagiotropic branches solitary, terete or compressed near the apex, 1.5–6 cm long, 0.1–0.3 mm in diameter, pubescent or scabrous. Stipules persistent, triangular, 0.5–0.8 × 0.2–0.4 mm, membranous, entire, glabrous. Internodes 4–5 mm long. Leaves 4–14 per branch. Petioles terete, 0.8–1 × 0.2–0.3 mm, glabrous. Leaf blades elliptic to suborbicular, 6–16 × 4–10 mm, 1.5–1.6 times longer than wide, attenuate sometimes slightly asymmetric at the base, obtuse to rounded at the apex, membranous to chartaceous, entire, glabrous on both sides; midveins flattened adaxially, prominent abaxially; secondary veins 3–4 pairs, flattened adaxially, prominent abaxially. Inflorescences unisexual, consisting of 2–3 male flowers or only 1 female flower. Bracts subulate or triangular, 0.2–0.5 × c. 0.3 mm, entire, glabrous. Male flowers 2–3 × 1.6–2 mm. Pedicels 6–13 × 0.2–0.3 mm, glabrous. Tepals (5–)6, equal or subequal, ovate to obovate, 1–3 × 1–2 mm, rounded, membranous, glabrous on both sides, margin entire, hyaline for c. 1/4 of total tepal width on each side, veins unbranched. Disc glands 5, reniform, c. 0.2 × 0.5 mm, smooth. Stamens (5–)6, free; filaments terete, 0.6–1.2 × c. 0.2 mm; anthers ovoid, 0.2–0.3 mm in diameter. Female flowers 8–12 × 10–12 mm. Pedicels 5–10 × c. 0.2 mm, glabrous or pubescent. Tepals (5–)6, subequal, elliptic to ovate, 5–7 × 4–6 mm, rounded, chartaceous to subcoriaceous, glabrous on both sides, margin entire, not hyaline, veins branched. Disc lobed, smooth. Ovary 3-locular, globose, 3–4 × 3–4 mm, glabrous to pubescent; styles free, bifid for c. 1/4 of their length, 0.3–0.5 mm long; stigmas obtuse. Fruit globose, 4–5 × c. 5 mm, glabrous to pubescent; fruiting pedicels 8–10 × c. 0.2 mm,

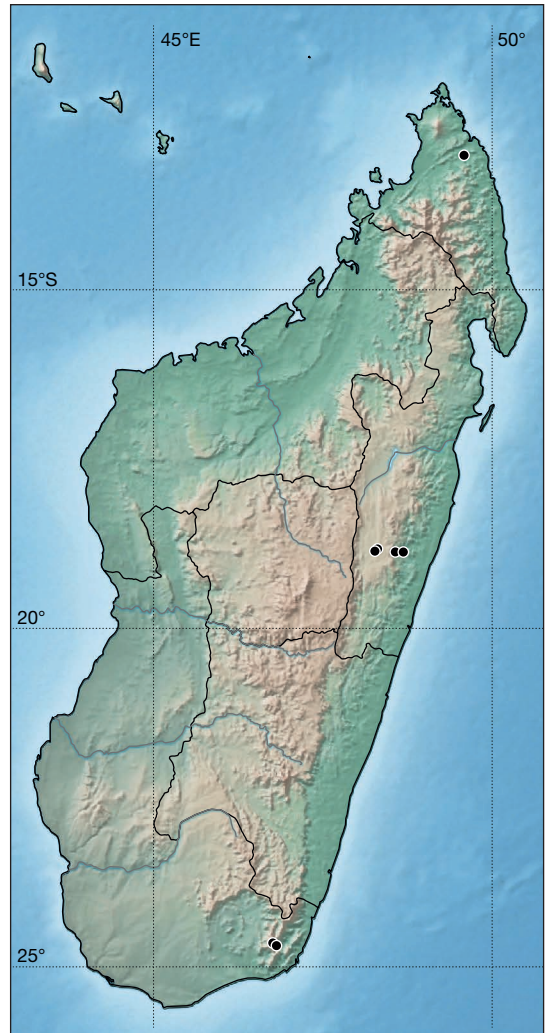


FIG. 18. — Distribution map of *Phyllanthus ambatovolana* Leandri.

glabrous; tepals accrescent to 10–13 × 5–6 mm; styles caducous or sometimes persistent; columella 2–3 mm. Seeds 1.8–2 × 1.6–2 mm, smooth.

12. *Phyllanthus bojerianus* (Baill.) Müll. Arg., in De Candolle (Figs 19; 20)

Prodromus systematis naturalis regni vegetabilis 15 (2): 343 (1866). — Basionym: *Kirganelia bojeriana* Baill.,



FIG. 19. — *Phyllanthus bojerianus* (Baill.) Müll. Arg.: **A**, habit; **B**, detail of orthotropic surface; **C**, plagiotropic branch surface with leaves and fruits; **D**, male flower; **E**, stamen; **F**, female flower; **G**, fruit. Drawn from Bosser 18860 by Roger Lala Andriamiarisoa. Scale bars: A, 1 cm; C, 4 mm; D-F, 2 mm; G, 3 mm.

Adansonia 2: 47 (1861). — Type: Madagascar, Antananarivo, Imerina, *Bojer s.n.* (holo-, P[P00535912]!).

ADDITIONAL SPECIMENS EXAMINED. — Madagascar, s. loc., 1867, Admiral Bowles, s. n. (K); *Baron 190* (P); *Baron 2052* (P); *Baron 4667* (P). — Central Madagascar, *Baron 1130* (K); *Baron 2058* (K); *Baron 4082* (K); *Baron 4084* (K); *Hook 337* (K); *Parker s.n.* (K); *Peltier & Peltier 1173* (P); *Peltier & Peltier 1626* (P). — Antananarivo: entre Betsitra et Analabe, X.1966, *Alleizette 1288* (P). — Km 20 route de Toamasina, 1950, *Benoist 194* (P). — Antananarivo, *Bojer s.n.* (P). — Forêt de la rivière Kizato Tsiroamandidy, 24.III.1974, *Boiteau 3033* (P). — PK 20 route de Toamasina, II.1964, *Bosser 19172* (P, TAN). — Talus à l'Est de la ville d'Antananarivo, *Decary 6138* (K, P, TAN). — Ilafy, 13.V.1935, *Maitre 154* (P). — Rocher dans le Parc zoologique de Tsimbazaza, *Herbier du jardin Botanique de Tananarive 1265* (P). — *Herbier du jardin Botanique de Tananarive 4951* (P). — Andramasina, 18.XII.1959, *Peltier 1626* (P). — Talatavolonondry, 22.I.1960, *Peltier & Peltier 1773* (P, TAN). — Mont Onibe, RN 1, XII.1963, *Peltier & Peltier 4388* (P). — Environs d'Antananarivo, *Perrier de la Bâthie 18315* (P). — Vakinakaratra, Betafo, nord du pic de Vohimalaza, 18.XI.1912, alt. 1600 m, *Viguiier & Humbert 1363* (P). — Andalamahitsy, *coll. inc. 199* (P). — Andalamahitsy, *coll. inc. 684* (TAN). — Environs du village d'Ambatomanoïna, 11.XII.1950, *coll. inc. 700 SF* (P, TEF). — Imerina, *coll. inc. H536/57* (K). — Fianarantsoa: Betsileo, *Baron 39* (K). — Environs de Ranotsara, XII.1963, *Bosser 18860* (P, TAN). — Ambalavao PK 475, II.1975, *Croat 30237* (TAN). — Antambohobe, Ivohibe, 20.X.1956, *Rakoto 8939 RV* (P). — Toamasina: Morarano Lac Alaotra, XII.1954, *Bosser 7524* (TAN). — Lac Alaotra, *Cours 4001* (P). — Toliara: PK 20 route de Ianakafy Betroka, *Bosser 17430* (TAN). — Vallée de la Manambolo, *Decary 9378* (P). — Delta du Fiherenana, alt. 2-10 m, *Humbert & Perrier de la Bâthie 2436* (P). — Massif du Ivakoany, alt. 1300-1640 m, *Humbert 7013* (P). — Massif d'Ivakoany, *Humbert 12158 bis* (P). — Entre Bekily et Tsivory, *Seyrig 285, 285bis* (P).

DISTRIBUTION AND ECOLOGY. — Endemic to Madagascar; central, western and southern floristic domains. Secondary forests, margin of humid forests, rocky areas, bush, dry forests. Altitude near sea level: 1640 m (Fig. 20).

CONSERVATION STATUS. — This widespread species has an AOO of 110 000 km² and an EOO of 168 051 km². It is therefore rated as Least Concern (LC).

REMARKS

Dioecious subshrubs. Branching pinnatifid or bipinnatifid; orthotropic branches terete, striate, glabrous. Brachyblasts absent. Cataphylls triangular,

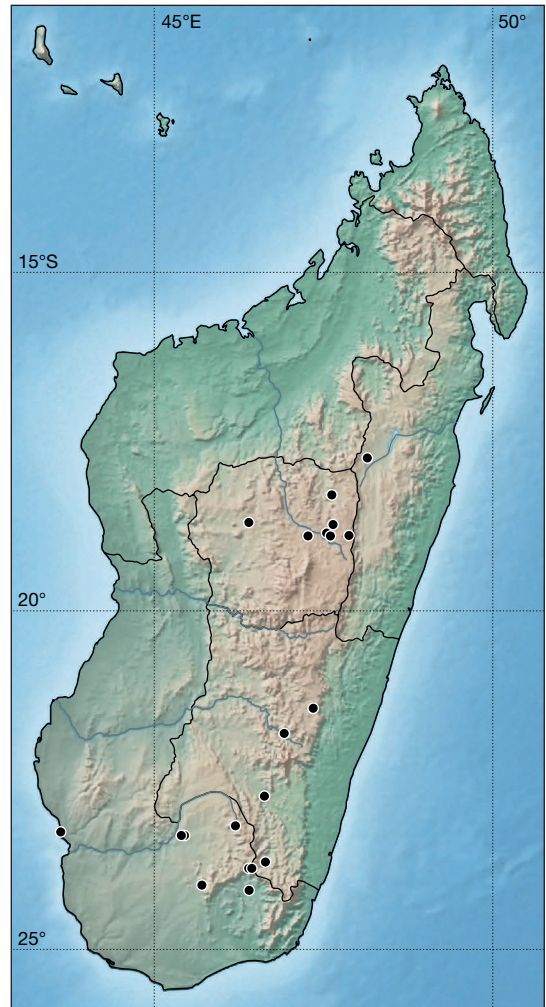


FIG. 20. — Distribution map of *Phyllanthus bojerianus* (Baill.) Müll. Arg.

1-1.5 × c. 0.4 mm, coriaceous, erose, glabrous. Cataphyllary stipules triangular, 0.6-1.5 × 0.3-0.5 mm, coriaceous, entire, glabrous. Plagiotropic branches solitary or fasciculate in twos, terete, 1-11 cm long, c. 0.2 mm in diameter, striate, pubescent or puberulous. Stipules persistent, triangular, 0.5-1.5 × c. 0.3 mm, membranous, erose or entire, glabrous. Leaves 6-59 per branch. Internodes 0.5-1 mm long. Petioles terete, 0.5-1 × 0.2-0.3 mm, glabrous. Leaf blades elliptic, ovate or lanceolate, slightly arched, 2-4 × 1-2 mm, c. 2 times longer than wide, rounded

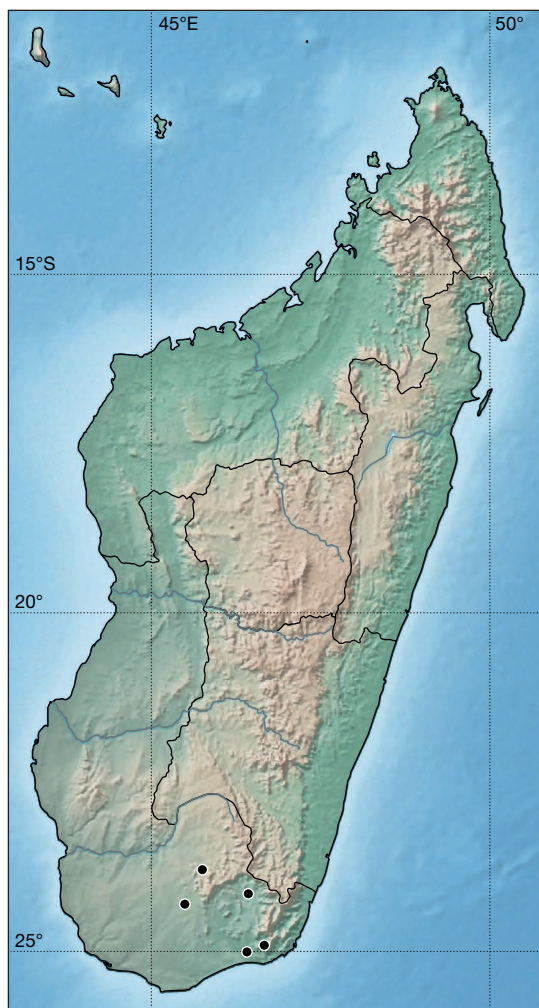


FIG. 21. — Distribution map of *Phyllanthus mananarensis* Leandri.

or obtuse at the base, mucronulate at the apex, membranous, glabrous on both sides; midvein prominent or sometimes impressed to $c. \frac{1}{3}$ leaf blade length proximally adaxially, impressed or flattened abaxially; secondary veins 2-5 pairs, indistinct adaxially, impressed or indistinct abaxially. Inflorescences unisexual, consisting of 2-4 male flowers or 1 female flower. Bracts triangular, $c. 0.5 \times 0.3$ mm, entire or erose, glabrous. Male flowers $c. 1 \times 2$ mm. Pedicels $c. 5 \times 0.1$ mm, glabrous. Tepals 5(-6), subequal, ovate, $c. 1.5 \times 0.8$ mm,

rounded or obtuse, membranous, glabrous on both sides, margin entire, hyaline for $c. \frac{1}{4}$ of total tepal width on each side, veins unbranched. Disc glands 5 (-6), reniform, $c. 0.3 \times 0.3$ mm, smooth. Stamens 5(-6), free; filaments terete, $0.5-0.7 \times c. 0.2$ mm; anthers globose, $c. 0.5$ mm in diameter. Female flowers $1.3-2 \times 2-2.3$ mm. Pedicels $2.5-5 \times 0.2-0.4$ mm, glabrous. Tepals 5(-6), equal or subequal, ovate or obovate, $1-1.3 \times 0.7-1$ mm, rounded, membranous, glabrous on both sides, margin entire, hyaline for $c. \frac{1}{6}$ of total tepal width on each side, veins branched. Disc lobed, smooth. Ovary 3-locular, depressed globose, $c. 0.7 \times 0.9$ mm, smooth becoming slightly rugose when dry, glabrous; styles fused at the base, flattened, bifid for $c. \frac{3}{4}$ of their length, $c. 1.2$ mm long; stigmas acute. Fruits depressed globose, $c. 2 \times 4$ mm; fruiting pedicels $4-10 \times c. 0.2$ mm; tepals $c. 1.4 \times 0.8$ mm; columella $c. 1$ mm long. Seeds $c. 2 \times 0.9$ mm, finely striated longitudinally (Fig. 19).

13. *Phyllanthus mananarensis* Leandri (Fig. 21)

Mémoire de l'Institut Scientifique de Madagascar, série B, Biologie végétale 8: 230 (1957). — Type: Madagascar, Toliara, Bassin de la Mananara, affluent du Mandrare, alt. 400-700 m, I-II. 1934, *Humbert 13781* (holo-, P[P00078231]!; iso-, P[P00078247]!).

ADDITIONAL SPECIMENS EXAMINED. — Madagascar, Toliara: vallée de la Manambolo, 24.IX.1931, *Decary 9373, 9378* (P). — Vallée du Mandrare près d'Andabolava, mont Vohibara, alt. 500-810 m, XII.1933, *Humbert 12631, 12632* (P). — Près de Betroka, Isoanala et Antanimora, III.1934, *Humbert 14185* (P). — Vallée de la Manambolo, environs d'Isomonono, alt. 600-900 m, XII.1933, *Humbert s.n.* (P). — Andohahela, parcel 3, near of Tsimelahy, $24^{\circ}56'S, 46^{\circ}38'E$, alt. 200 m, 16.II.1990 *Phillipson & Milijaona 3555* (MO, P).

DISTRIBUTION AND ECOLOGY. — Endemic to Madagascar; southern floristic domain. Bush. Altitude 200-900 m (Fig. 21).

CONSERVATION STATUS. — This species is distributed in the South of Madagascar. It is threatened by habitat loss by grazing and fire. With an AOO of 840.93 km² and an EOO of 8173.52 km² it is rated as Vulnerable (VU B1ab(i,ii,iii,iv) + B2ab(i,ii,iii,iv)).

REMARKS

Apparently dioecious subshrubs. Branching pinnatifid; orthotropic branches terete, striate, glabrous. Brachyblasts absent. Cataphylls triangular, 0.7-1 × 0.4-0.6 mm, coriaceous, entire, glabrous. Cataphyllary stipules triangular, 0.7-1 × 0.4-0.6 mm, coriaceous, entire, glabrous. Plagiotropic branches solitary or fascicled in 4-6, terete, 2-5.5 cm long, *c.* 0.4 mm in diameter, striate, glabrous. Stipules persistent, linear or triangular, *c.* 1.3 × 0.3 mm, membranous, entire, glabrous. Leaves 7-14 per branch. Internodes 2-5 mm long. Petioles terete, 0.5-1 × 0.2-0.3 mm, glabrous. Leaf blades elliptic or oblong, 4-10 × 2-4 mm, 1.7-2 times longer than wide, attenuate or rounded at the base, obtuse or rounded at the apex, subcoriaceous or chartaceous, revolute, glabrous on both sides; midvein prominent on both sides; secondary veins 3-5 pairs, flattened on both sides. Inflorescences unisexual, consisting of 2-5 male flowers. Bracts linear, *c.* 0.2 × 0.1 mm, entire, glabrous, grouped in a tuft of 10-15 mainly sterile bracts. Male flowers 1-1.5 × *c.* 2 mm. Pedicels 4-7 × *c.* 0.1 mm, glabrous. Tepals 5, unequal (outer bigger), obovate or oblong, 1-1.5 × 0.5-0.9 mm, rounded, membranous, glabrous on both sides, margin erose, hyaline for $\frac{1}{6}$ - $\frac{1}{4}$ of total tepal width on each side, veins unbranched. Disc glands 5, globose, 0.1-0.2 mm in diameter. Stamens (4-)5, free; filaments terete, 0.7-0.9 × 0.1-0.2 mm; anthers globose, *c.* 0.3 mm in diameter. Only columella seen. Female flowers and fruits unknown.

14. *Phyllanthus vakinankaratrae* Leandri
(Figs 21; 22)

Mémoire de l'Institut Scientifique de Madagascar, série B, Biologie végétale 8: 233 (1957). — Type: Madagascar, Antananarivo, Vakinankaratra, entre Ambatolampy et Tsinjoarivo, 29.XI.1912, [Viguiier & Humbert 1742 (holo-, P[00078286]!; iso-, P[P000482897])].

ADDITIONAL SPECIMENS EXAMINED. — Madagascar, Antananarivo: PK 28 route du Sud, XII.1956, *Bosser 10649* (P, TAN). — Environ d'Ambatofinandrahana, 16.II.1938, *Decary 12950* (P). — Massif d'Ankaratra, alt. 1700-2000 m, 27.IV.1955, *Humbert & Capuron 30303* (P). — Environs d'Andramasina, II.1958, *Descoings 3118, 3206* (TAN). — Amboasary, Behenjy,

22.XII.1963, *Peltier & Peltier 4488* (P). — Between Antsirabe and Ambositra, col de Tapia, 20°14'38"S, 47°05'8.1"E, alt. 1470 m, 27.I.2004, *Ralimanana et al. 435* (G, K, MO, P, TAN). — Tsinjoarivo Ambatolampy, 19°38'82"S, 47°41'52"E, alt. 1549 m, 17.XI.2004, *Ralimanana & Rajaonarison 624* (K, MO, P, TAN). — Tsinjoarivo Ambatolampy, 19°37'95"S, 47°41'20"E, alt. 1557 m, 18.XI.2004, *Ralimanana & Rajaonarison 650* (K, MO, P, TAN). — Ambatolampy, 19°37'95"S, 47°41'20"E, alt. 1557 m, 18.XI.2004, *Ralimanana & Rajaonarison 651* (K, MO, P, TAN). — Between Antsirabe and Ambositra, col de Tapia, 20°14'38"S, 47°05'8.1"E, alt. 1470 m, 19.XII.2004, *Ralimanana & Hoffmann 655* (TAN). — Massif of Ibity, 20°04'10"S, 47°00'16"E, alt. 1700 m, 17.II.2003, *Schatz et al. 4105* (MO, P, TAN). — Antsirabe, Vakinankaratra, versant Est de mont Ibity, alt. vers 1700 m, 21.XI.1912, *Viguiier & Humbert 1482* (P). — Fianarantsoa: Itremo, Apr. 1964, *Bosser 19578* (P, TAN). — Col de Tapia, alt. 1300-1410 m, 24.I.1975, *Croat 29365* (MO, P). — Massif of Itremo, vicinity of Itremo, alt. 1500-1685 m, 27.I.1975, *Croat 29819* (MO, TAN). — Massif of Itremo, alt. 1500-1685 m, 27.I.1975, *Croat 29843* (TAN). — Environs d'Ambatofinandrahana, alt. 1600-1800 m, 15.II.1938, *Decary 12925* (P). — Montagnes à l'Ouest d'Itremo, alt. 1500-1700 m, 17-22.IV.1955, *Humbert 28316* (P). — Ambositra, col de Tapia, II.1960, *Keraudren 114* (P). — Antapia Manadriana, 20°43'23"S, 47°05'24"E, alt. 1503 m, 9.XII.2004, *Ralimanana & Hoffmann 658* (K, MO, P, TAN). — Itremo massif, 20°34'35.7"S, 46°35'06"E, alt. 1556 m, 3.V.2010, *Ralimanana et al. 1434* (K, MO, P, TAN).

REMARKS

Dioecious subshrubs, 20-50 cm high. Branching pinnatifid or bipinnatifid; orthotropic branches terete, 1-2 mm in diameter, rugose or striate, glabrous. Brachyblasts absent. Cataphylls triangular, 0.3-0.5 × 0.3-0.4 mm, coriaceous, entire, glabrous. Cataphyllary stipules triangular, 0.2-0.5 × 0.2-0.4 mm, coriaceous, entire, glabrous. Plagiotropic branches solitary, terete, 1-9 cm long, 0.4 mm in diameter, striate, glabrous. Stipules persistent, linear, 1-1.5 × *c.* 0.2 mm, membranous, entire, glabrous. Leaves 4-20 per branch. Internodes 2-5 mm long. Petioles terete, 0.5-0.7 × 0.2 mm, glabrous. Leaf blades obovate to suborbicular, 3-6 × 2-5 mm, 1.2-1.5 times longer than wide, obtuse or rounded at the base, rounded at the apex, subcoriaceous or chartaceous, revolute, glabrous on both sides, reddish green adaxially, light green or reddish abaxially when fresh; midvein slightly prominent

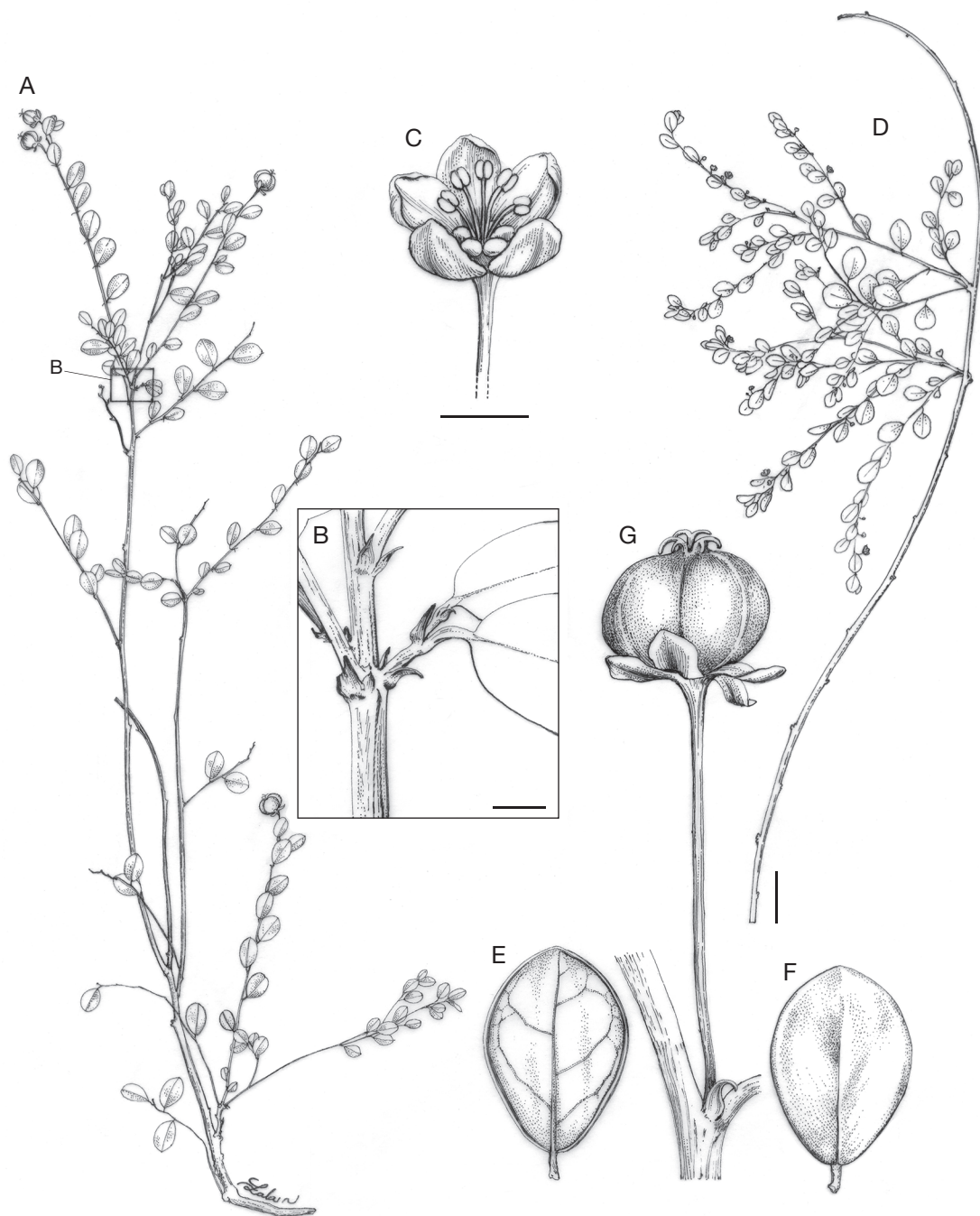


FIG. 22. — *Phyllanthus vakinankaratrae* Leandri: **A**, habit, male individual; **B**, detail of orthotropic surface and cataphylls; **C**, male flower; **D**, female individual habit; **E**, lower surface of a leaf; **F**, upper surface of a leaf; **G**, fruit. Drawn from *Ralimanana* 650 (female individual) and 651 (male individual) by Roger Lala Andriamiarisoa. Scale bars: A, D, 1 cm; B, C, G, 1 mm; E, F, 2 mm.

to $c. \frac{1}{2}$ from the base adaxially, flattened abaxially; secondary veins 3-4 pairs, indistinct or flattened on both sides. Inflorescences unisexual, consisting of 1-3 male flowers or 1 female flower. Bracts linear or triangular, $c. 0.3 \times 0.2$ mm, entire, glabrous. Male flowers 1-1.4 \times 2-2.4 mm, white green when fresh. Pedicels 8-15 \times 0.1-0.2 mm, glabrous. Tepals 5(-6), subequal, ovate or obovate, 1-1.4 \times 0.7-1 mm, rounded, membranous, glabrous on both sides, margin entire, hyaline for $c. \frac{1}{4}$ of total tepal width on each side, veins unbranched. Disc glands 5 or 6, reniform, $c. 0.3 \times 0.2$ mm, smooth. Stamens 5 (-6), free; filaments terete, 0.5-0.6 \times $c. 0.2$ mm; anthers free, ovoid, $c. 0.3 \times 0.2$ mm. Female flowers 1-2 \times 1.5-2 mm, white green when fresh. Pedicels 6-18 \times 0.1-0.2 mm, glabrous. Tepals 5(-6), equal or subequal, ovate or obovate, 0.8-2 \times 0.7-1.7 mm, rounded, membranous, glabrous on both sides, margin entire, hyaline for $c. \frac{1}{4}$ of total tepal width on each side, veins unbranched. Disc lobed, smooth. Ovary 3-locular, globose, 1-2 mm in diameter, smooth, glabrous; styles fused at the base, flattened, bifid for $c. \frac{1}{2}$ of their length, 0.3-1 mm long; stigmas acute. Fruits globose, 1.5-2 \times 1.5-2.5 mm, glabrous, green when fresh, light brown when dry; fruiting pedicels 6-18 \times 0.1-0.2 mm; tepals 1-2 \times 0.7-1.8 mm; columella $c. 1$ mm long. Seeds 0.9-1.4 \times 0.8-1 mm, smooth (Fig. 22).

DISTRIBUTION AND ECOLOGY. — Endemic to Madagascar; central floristic domain. This species particularly grows in the understorey of *Tapia* (*Uapaca bojeri* Baill.) forest, in the Ibity and Itremo massifs. Altitude 1400-2000 m (Fig. 23).

CONSERVATION STATUS. — This species is found in a particular habitat (*Uapaca bojeri* forest) which is threatened by annual fire. With an AOO of 972 km², an EOO of 9083 km² and all known locations outside of protected areas this species is rated as Vulnerable (VU B1ab(i,ii,iii,iv)+ B2ab(i,ii,iii,iv)).

15. *Phyllanthus iratsiensis* Leandri (Fig. 24)

Notulae Systematicae 6: 193 (1938). — Type: Madagascar, Fianarantsoa, Andringitra, massif de l'Iratsy, alt. 2000-2500 m, 25.XI. – 5.XII.1926, *Humbert 3798* (holo-, P[P00078205]); iso-, P[P00078206]).

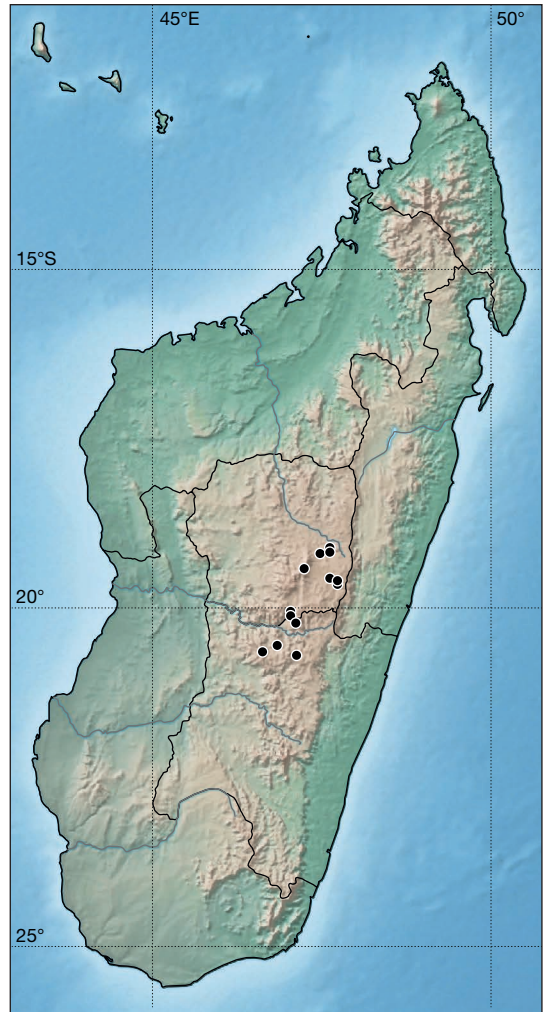


FIG. 23. — Distribution map of *Phyllanthus vakinankaratrae* Leandri.

ADDITIONAL SPECIMEN EXAMINED. — Madagascar, Fianarantsoa: Andringitra, au bord de la rivière Sahavato, 22°11'39"S, 46°58'16"E, alt. 1800-2000 m, 9-16. XII.1993, Lewis *et al.* 1056 (MO, P).

DISTRIBUTION AND ECOLOGY. — Endemic to Madagascar; central floristic domain. Open humid forests. Altitude 1800-2000 m (Fig. 24).

CONSERVATION STATUS. — This species has a very narrow distribution. It is only known from two collections whereas Andringitra a protected area is well visited by botanists. Therefore we think that this species is very rare. With an AOO of 68 km² it is rated as Endangered (EN B2b(i,ii,iii,iv)).

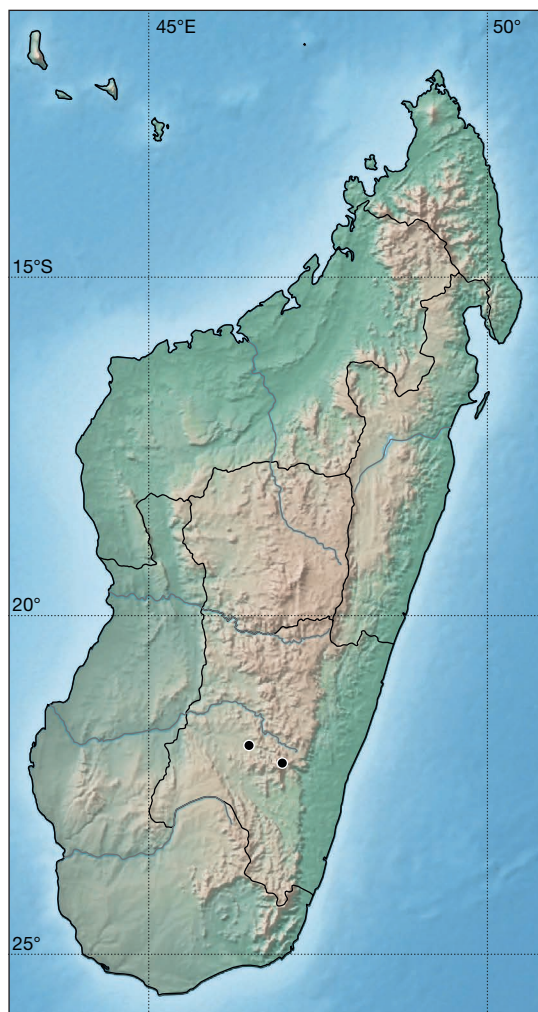


FIG. 24. — Distribution map of *Phyllanthus iratsiensis* Leandri.

REMARKS

Monoecious subshrubs. Branching pinnatifid; orthotropic branches terete or angular, striate, glabrous. Brachyblasts absent. Cataphylls triangular, 0.6-1.5 × 0.3-0.5 mm, coriaceous, entire, glabrous. Plagiotropic branches solitary or fascicled in twos, terete, slightly angular or flattened toward the apex, 2.5-7 cm long, 0.2-0.4 mm in diameter, striate, glabrous. Stipules persistent, subulate or triangular, 0.8-1.5 × 0.1-0.2 mm, membranous, entire, glabrous. Leaves 6-15 per branch. Internodes

3-6 mm long. Petioles terete, 0.5-2 × c. 0.2 mm, glabrous. Leaf blades obovate, 5-10 × 3-9 mm, 1.1-1.6 times longer than wide, attenuate at the base, rounded at the apex, membranous, glabrous on both sides; midvein slightly prominent or flattened adaxially, prominent abaxially; secondary veins 3-6 pairs, flattened on both sides. Inflorescences unisexual, consisting of 2-3 male flowers or only 1 female flower, male inflorescences on proximal part, female inflorescences on distal part of plagiotropic branches. Bracts subulate or triangular, 0.1-0.2 × c. 0.1 mm, entire, glabrous. Male flowers 1.2-1.4 × 1.8-2.2 mm. Pedicels 1-1.8 × c. 0.1 mm, glabrous. Tepals 5(-6), equal or subequal, obovate or oblong, 1.2-1.4 × 0.8-1 mm, rounded, membranous, glabrous on both sides, margin entire, hyaline for c. 1/4 of total tepal width on each side, veins unbranched. Disc glands 5, reniform, c. 0.4 × 0.2 mm, smooth. Stamens (4-)5, free; filaments terete, 0.8-1 × c. 0.15 mm; anthers globose, c. 0.3 mm in diameter. Female flowers 1-1.3 × c. 2.3 mm. Pedicels c. 2.5 × 0.2 mm, glabrous. Tepals 5(-6), unequal (outer smaller), obovate or oblong, 1-1.3 × 0.8-1 mm, rounded, membranous, glabrous on both sides, margin entire, hyaline for c. 1/4 of total tepal width, veins branched. Disc lobed, smooth. Ovary 3-locular, globose, c. 1 × 1 mm, smooth, glabrous; styles free, flattened, bifid for c. 1/2 of their length, c. 0.7 mm long; stigmas acute. Fruits (only young fruits seen) globose; fruiting pedicels c. 3 × 0.2 mm; tepals 1-1.3 × 0.8-1 mm.

Phyllanthus subgenus *Menarda*
(Müll. Arg.) Ralim. & Petra Hoffm.,
stat. nov.

Section *Menarda* (Juss.) Müll. Arg., *Linnaea* 32: 2 (1863). Basionym: *Menarda* Comm. ex A. Juss., *De Euphorbiacearum generibus medicisque earundem viribus tentamen*: 109 (1824). — Type: *Phyllanthus cryptophilus* (Comm. ex A. Juss.) Müll. Arg. Basionym: *Menarda cryptophila* Comm. ex A. Juss.

DESCRIPTION

Monoecious shrubs or subshrubs. Brachyblasts absent. Leaves opposite, sometimes sub-opposite or

KEY TO THE SPECIES OF SUBGEN. *MENARDA* (MÜLL. ARG.) RALIM. & PETRA HOFFM., STAT. NOV.

1. Leaf blades elliptic or lanceolate, 6-10 mm wide, attenuate at the base. Plagiotropic branches 4-14 cm long, glabrous or pubescent *P. cryptophilus* (A. Juss.) Müll. Arg.
 — Leaf blades ovate, 14-25 mm wide, cordate at the base. Plagiotropic branches 2-30 cm long, glabrous *P. coodei* Ralim. & Petra Hoffm., sp. nov.

alternate. Inflorescences bi or unisexual, consisting of 1-3 flowers. Tepals 5. Stamens 5, entirely free; anthers free; pollen tricolporate with bi-orate colpi (Brunel 1987).

15. *Phyllanthus cryptophilus*
 (A. Juss.) Müll. Arg.
 (Fig. 25)

Linnaea 32: 8 (1863). *Menarda cryptophila* A. Juss., De Euphorbiacearum generibus medicisque earumdem viribus tentamen: 109 (1824). — Type: Madagascar, *Commerson s.n.* (holo-, P[[P00535903](#)]!).

Phyllanthus geayi Leandri, *Notulae Systematicae* 6: 193 (1938). — Type: Madagascar, Fianarantsoa, Mananjary, 1909, *Geay 7004* (lectotype chosen by Brunel 1987, P!).

ADDITIONAL SPECIMENS EXAMINED. — Madagascar, s. loc., 6.III.1953, *Rakotoniaina 5156* (P). — Fianarantsoa: route de Farafangana-Vangaindrano, XII.1962, *Bosser 18581* (P, TAN). — Mananjary, 1909, *Geay 7003* ([P00535901](#), original syntype P). — Mananjary, 1909, *Geay 7940* (original syntype P). — Mananjary, 1909, *Geay 7946* (original syntype P). — Manakara, 11.X.1881, *Lantz s.n.* (P). — Farafangana, Mahabo, 23°10'36"S, 47°42'01"E, 3.XI.2001, *McPherson & Rabenantoandro 18312* (MO, TEF). — Farafangana, Mahabo, Mananivo, 23°10'37"S, 47°43'E, alt. 20 m, 25.IX.2002, *Rabenantoandro 988* (MO, TEF). — Farafangana, Mahabo, Mananjary, 23°10'37"S, 47°43'E, alt. 20 m, 25.IX.2002, *Rabenantoandro 992* (MO, TEF). — Farafangana, Mahabo, 23°10'54.7"S, 47°41'48.20"E, alt. 19 m, 6.VI.2012, *Ralimanana et al. 1703* (K, MO, P, TAN). — Toliara: Tolagnaro, au nord de Tolagnaro, à l'Est de la forêt Ilandy, 9.XII.1961, *Capuron 20555 SF* (P, TEF). — Tolagnaro, *Commerson s.n.* (P). — Tolagnaro, forest of Manantantely, 9.XI.1990, *Dumetz 1396* (MO, P). — Tolagnaro, forêt de Manantantely, *Humbert & Swingle 5739* (P). — Tolagnaro, forêt de Manantantely, *Humbert 20365* (P). — Ankazovandamena, près de la baie de Galois, Ranofotsy, alt. 100-450 m, 24.II.1955, *Humbert & Capuron 29040 bis* (P). — Ankazovandamena, *Humbert & Capuron 29085* (P). — North of Tolagnaro,

near Ste Luce, 24°47'S, 47°16'E, 22.X.1989, *McPherson et al. 14219* (MO, TAN). — Tolagnaro, Enaniliha, 2.III.1953, *Jaonarivelo 5156 RN* (TAN, TEF). — Tolagnaro, Enaniliha, 20.VII.1956, *Jaonarivelo 8391* (P, TAN, TEF). — Tolagnaro, Enaniliha, 6.XI.1956, *Jaonarivelo 8591 RN* (P, TAN, TEF). — Tolagnaro, Andohahela, Réserve Intégrale, parcel 1, N of Isakaivondro, 24°45'S, 41°51'E, 17.XII.1993, *Malcomber 2638* (MO, TAN). — Tolagnaro, Ambatorongorongo, 25°9'43"S, 46°46'41"E, alt. 289 m, 7.VI.1999, *Rabenantoandro et al. 86* (K, MO, P).

DISTRIBUTION AND ECOLOGY. — Endemic to Madagascar; eastern floristic domain. Littoral forests, margin of low humid forests, open low humid forests. Altitude 20-300 m (Fig. 25).

CONSERVATION STATUS. — This species is found in littoral forests (from Farafangana to Tolagnaro), all of which are under pressure of human activities. With an AOO of 700 km², and an EOO of 9897.83 km², this species is rated as Vulnerable (VU B1ab(i,ii,iii,iv) + B2ab(i,ii,iii,iv)).

REMARKS

Monoecious shrubs or subshrubs, 40-100 cm high. Branching pinnatifid; orthotropic branches terete, striate, glabrous. Brachyblasts absent. Cataphylls triangular, 0.6-1 × 0.4-0.7 mm, coriaceous, entire, glabrous. Cataphyllary stipules triangular, 0.6-1 × 0.4-0.7 mm, coriaceous, entire, glabrous. Plagiotropic branches solitary or fasciculate in twos, terete or flattened (apex and internodes flattened), 4-14 cm long, 0.5-0.7 mm in diameter (diameter wider at internodes), striate, glabrous or pubescent. Stipules persistent, triangular, c. 0.7 × 0.4 mm, membranous or subcoriaceous, entire, glabrous. Leaves generally opposite or sometimes alternate, 6-18 leaves per branch. Internodes 5-13 mm long. Petioles terete, 0.5-1 × c. 0.4 mm, glabrous. Leaf blades elliptic or lanceolate, 12-35 × 6-10 mm, 2-3.5 times longer than wide, attenuate at the base, acuminate or acute at the apex, membranous or chartaceous, revolute, glabrous on both sides;

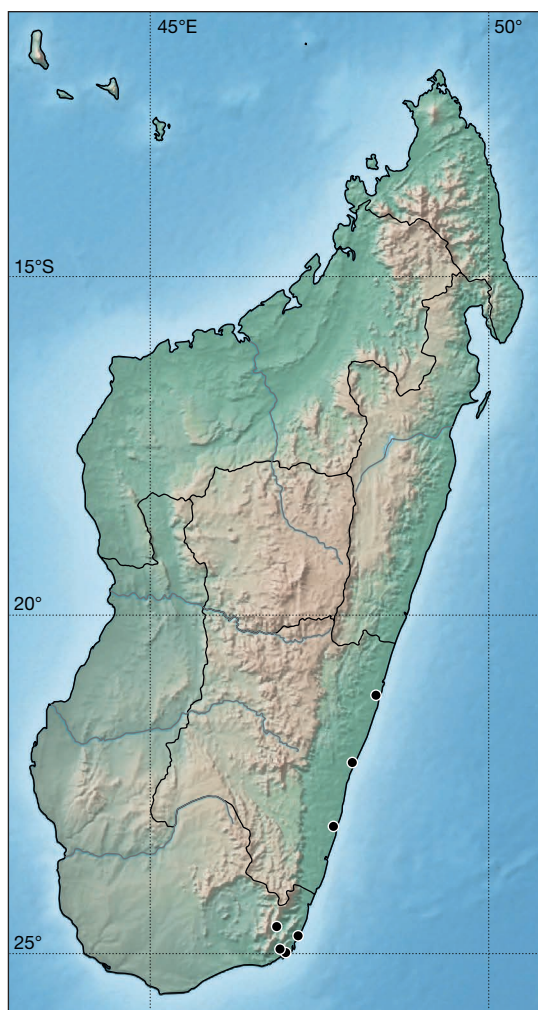


FIG. 25. — Distribution map of *Phyllanthus cryptophilus* (A. Juss.) Müll. Arg.

midvein prominent on both sides; secondary veins 3-4 pairs, slightly prominent adaxially, flattened or prominent abaxially. Inflorescences unisexual, consisting of 1-2 male flowers or only 1 female flower, male inflorescences on proximal part, female inflorescences on distal part of plagiotropic branches. Bracts triangular, *c.* 0.8 × 0.5 mm, entire, glabrous, grouped in a tuft of 5-8 mainly sterile bracts in male inflorescences. Male flowers *c.* 2.5 × 3 mm, white green when fresh. Pedicels 1-4 × *c.* 0.2 mm, glabrous. Tepals 5, subequal, ovate, *c.* 2.5 × 1.5 mm,

rounded, membranous, glabrous on both sides, margin entire, hyaline for *c.* 1/6 of total tepal width on each side, veins unbranched. Disc glands 5, reniform, *c.* 0.4 × 0.2 mm, smooth. Stamens 5, free; filaments terete, *c.* 0.7 × 0.2 mm; anthers ovoid, *c.* 0.4 × 0.2 mm. Female flowers 2-3 × *c.* 3 mm, white green when fresh. Pedicels 6-11 × *c.* 0.1 mm, glabrous. Tepals 5(-6), equal or subequal, elliptic or ovate, 2-3 × *c.* 2 mm, rounded, membranous, glabrous on both sides, margin entire or erose, hyaline for *c.* 1/10 of total tepal width on each side, veins unbranched. Disc lobed, smooth. Ovary 3-locular, globose or depressed globose, 1-1.2 × *c.* 1.2 mm, smooth, glabrous; styles free or fused at the base, bifid for *c.* 2/3 of their length, terete or flattened, 0.6-0.8 mm long; stigmas obtuse or acute. Fruits subglobose or depressed globose, 2-3 × 2-3 mm; fruiting pedicels 7-12 × *c.* 0.2 mm; tepals 2-3.5 × *c.* 2 mm; columella 1-1.5 mm long. Seeds 1.5-2 × 1.4-1.6 mm, finely striated longitudinally.

16. *Phyllanthus coodei*

Ralim. & Petra Hoffm., sp. nov.
(Figs 26; 27)

Sp. nov. *P. cryptophilo foliis alternatis vel oppositis et staminibus 5 liberis similis sed laminis foliorum ovatis (vice ellipticis vel lanceolatis) basin cordatis (vice attenuatis) differt.*

TYPUS. — Madagascar, Toliara, Tolagnaro, Pic de Saint Louis, 24°58'98"S, 46°57'28"E, alt. 395 m, 16.XII.2004, Ralimanana et al. 731 (holo-, TAN!; iso-, K!).

ADDITIONAL SPECIMENS EXAMINED. — Madagascar, Toliara. — Tolagnaro, tracks to Pic St Louis, III.1960, Bosser 14037 (P, TAN). — Pic St. Louis, IV.1960, Bosser 14407 (P). — Pic St. Louis, IV.1960, Keraudren 1060 (P). — Tolagnaro, V.1890, Scott-Elliott 2671 (BM, P).

DISTRIBUTION AND ECOLOGY. — Endemic to Madagascar; eastern floristic domain. Species only known from St Louis mountain. Humid forests. Altitude 300-500 m (Fig. 27).

CONSERVATION STATUS. — This species is only found in one site in the vicinity of Tolagnaro. This site is seriously threatened by human activities. The AOO is estimated less than 10 km² and EOO 100 km². We suggest to rate it as Critically endangered (CR B1ab(i,ii,iii,iv) + B2ab(i,ii,iii,iv)).

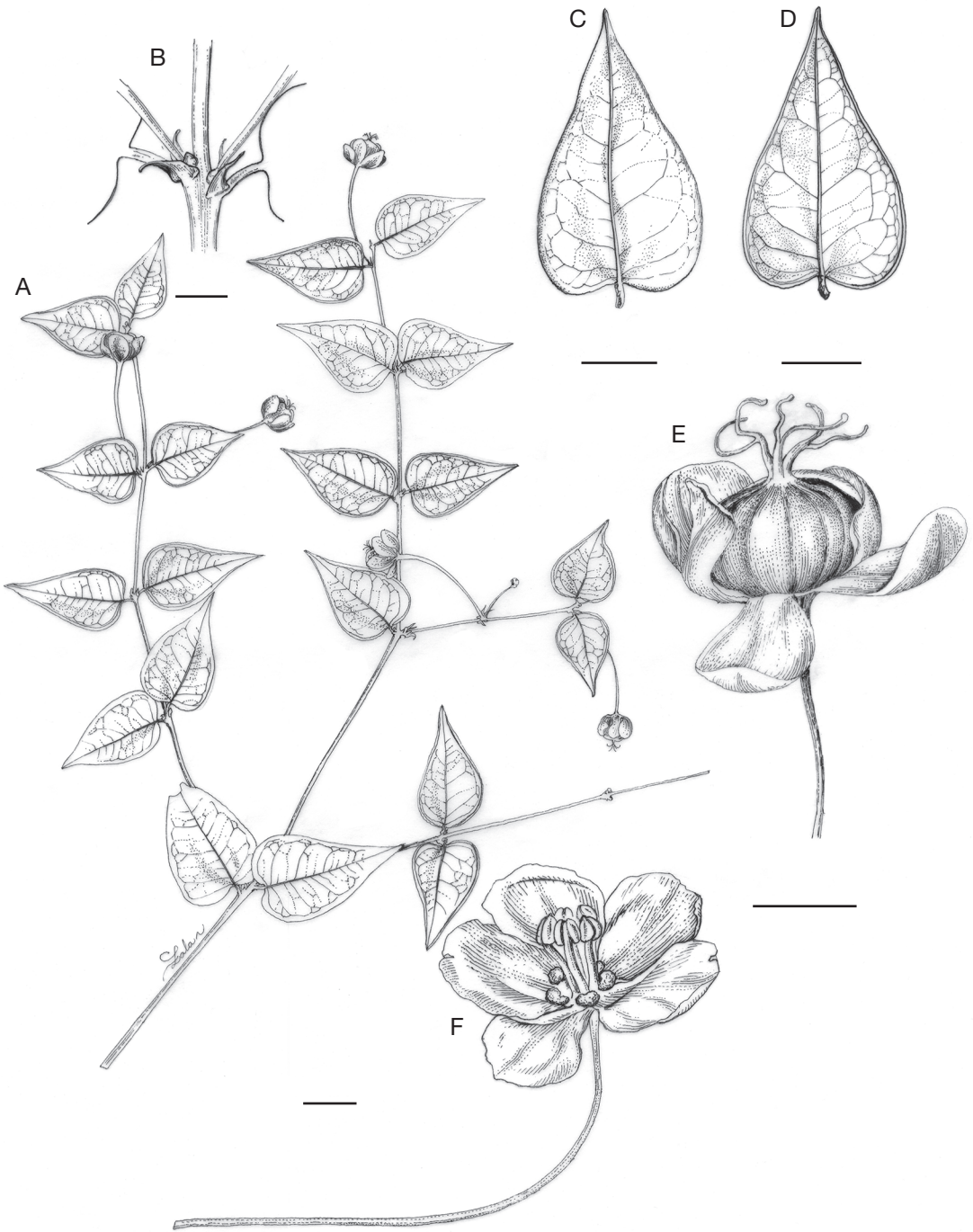


FIG. 26. — *Phyllanthus coodei* Ralim. & Petra Hoffm., sp. nov.: **A**, habit; **B**, detail of cataphylls; **C**, upper surface of a leaf; **D**, lower surface of a leaf; **E**, fruit; **F**, male flower. Drawn from Ralimanana 731 by Roger Lala Andriamiarisoa. Scale bars: A, C, D, 1 cm; B, 3 mm; E, 5 mm; F, 1 mm.

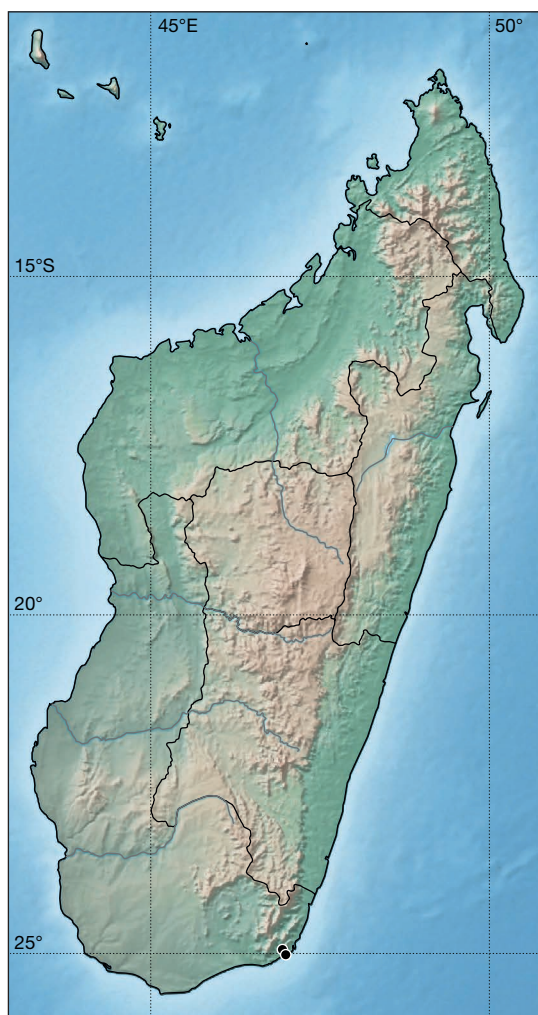


FIG. 27. — Distribution map of *Phyllanthus coodei* Ralim. & Petra Hoffm., sp. nov.

ETYMOLOGY. — The species epithet honours our colleague M. J. E. Coode at the Herbarium of The Royal Botanic Gardens, Kew, who contributed much to the study of *Phyllanthus* in the Mascarene Islands.

VERNACULAR NAMES. — Masindranono, Hazontoho.

REMARKS

Monoecious subshrubs, 30-80 cm high; bark brown reddish in young branches, becoming green when older. Brachyblasts absent. Branching pinnatifid; orthotropic branches terete or flattened toward the

apex, rugose or striate, glabrous. Cataphylls triangular, 0.8-2 × 0.5-0.9 mm, reddish brown when fresh, coriaceous, entire or erose, glabrous. Cataphyllary stipules triangular, 0.5-2 × 0.3-0.9 mm, coriaceous, entire, glabrous. Plagiotropic branches solitary, flattened, 2-30 cm long, 0.8-1 mm wide, striate, glabrous. Stipules persistent or caducous, triangular, 1.8-2 × 0.5-0.6 mm, subcoriaceous, entire, glabrous. Leaves alternate or opposite, 3-17 per branch. Internodes 1-16 mm long. Petioles terete, 0.7-1 × 0.5-0.7 mm, glabrous. Leaf blades ovate, 14-30 × 14-25 mm, 1-1.4 times longer than wide, cordate at the base, acuminate at the apex, chartaceous or membranous, glabrous on both sides, green adaxially and light green abaxially when fresh; midvein prominent on both sides; secondary veins 3-5 pairs, prominent on both sides, with marginal vein. Inflorescences unisexual or bisexual, consisting of 1-3 male flowers and/or 1-2 female flowers, bisexual or male inflorescences on proximal part, female inflorescences on distal part of plagiotropic branches. Bracts subulate or triangular, 0.3-0.4 × 0.1-0.3 mm, erose, glabrous. Male flowers 2-2.6 × 3-3.7 mm, white when fresh. Pedicels 3-6 × 0.3-0.5 mm, glabrous. Tepals 5, unequal, obovate, 2-2.6 × 1-1.9 mm, rounded, membranous, glabrous on both sides, margin entire, hyaline for $c. \frac{1}{8}$ of total tepal width on each side, veins branched. Disc glands 5, globose, $c. 0.3 \times 0.3$ mm, smooth, cream when fresh. Stamens 5, free; filaments terete, 1-1.2 × 0.2-0.3 mm; anthers ovoid, 0.3 × 0.2 mm. Female flowers 3-4 × 5-5.5 mm, white green when fresh. Pedicels 10-20 × 0.3 mm, glabrous, brown reddish when fresh. Tepals 5(-6), unequal, obovate or suborbicular, 3-4 × 2-2.8 mm, rounded, subcoriaceous or chartaceous, glabrous on both sides, margin entire, hyaline for $\frac{1}{12}$ - $\frac{1}{10}$ of total tepal width on each side, veins branched. Disc lobed, smooth. Ovary 3-locular, globose or depressed globose, 1-2 × 1-2 mm, smooth, light yellow when fresh, glabrous; styles fused at the base, bifid for $c. \frac{3}{4}$ their length, terete or flattened, 1-1.5 mm long; stigmas obtuse or acute. Fruits globose or depressed globose, 2.5-3 × 2.8-3.5 mm, glabrous; fruiting pedicels 12-20 × $c. 0.3$ mm; tepals 3.5-5 × 2-3 mm; columella 1-1.5 mm. Fruits (only young fruits seen) globose or depressed globose (Fig. 26).

Leandri (1958) reported the presence of *Phyllanthus oppositifolius* Baill. ex Müll. Arg. in Madagascar,

citing *Scott Elliot 2671* from Tolagnaro, because of its truncate or cordate leaf base. *Phyllanthus oppositifolius* has three stamens that are entirely fused into a column (including the anthers). According to Coode *et al.* (1982), this species is endemic to Mauritius and it seems to be already extinct. The Madagascar plants have opposite leaves with cordate leaf bases and thereby superficially strongly resembles *P. oppositifolius*, but they have five stamens which are entirely free. This clearly was a case of a misidentification by Leandri (1958). The Madagascar plant is here newly described as *P. coodei*, sp. nov. It may also be confused with *P. phillyreifolius* Poir., another endemic from the Mascarenes, but the latter has three fused stamens. Its free androecium differentiates *P. coodei*, sp. nov. from both *P. phillyreifolius* and *P. oppositifolius*, and places it instead in close relationship with *P. cryptophilus*, another species from the east coast of Madagascar, in subgenus *Menarda*, stat. nov.

Acknowledgements

We would like to thank the Friends of Kew, the Bentham Moxon Trust and the Royal Botanic Gardens, Kew, who generously supported this study. Our special thanks to the curators and staff of K, P, TAN, TEF for facilitating our study. Field work was conducted under collaborative agreements between The Royal Botanic Gardens, Kew, Madagascar National Parks (MNP), Université d'Antananarivo-Département de Biologie et Ecologie Végétale (DBEV) and Parc Botanique et Zoologique de Tsimbazaza (PBZT). We gratefully acknowledge these partners for their help with collection and research permit preparation and for their assistance during fieldwork. We also would like to thank Roger Lala Andriamiarisoa (MO) for the drawings and John Dransfield (K) for the Latin diagnoses.

REFERENCES

- BAILLON H. 1861. — Recueil périodique d'observations botaniques. *Adansonia* 2: 47-62.
- BRUNEL J. F. 1987. — Sur le genre *Phyllanthus* L. et quelques genres voisins de la tribu des *Phyllanthae* Dumort. (*Euphorbiaceae*, *Phyllanthae*) en Afrique intertropicale et à Madagascar. Thèse de doctorat, Université Louis Pasteur, Strasbourg, France.
- COODE M. J. E., RADCLIFFE-SMITH A. & SCOTT A. J. 1982. — Euphorbiaceae, in ANTOINE R., BRENNAN J. P. M. & MANGENOT G. (eds), *Flore des Mascareignes*, famille 160: 1-117.
- HUMBERT H. 1965. — Description des types de végétation, in HUMBERT H. & COURS-DARNE G. (eds), Notice de la carte de Madagascar. *Travaux de la Section Scientifique et Technique de l'Institut Français de Pondichery*, hors série 6: 46-78.
- JUSSIEU A. DE 1824. — *De Euphorbiacearum generibus medicisque earundem viribus tentamen*. Didot, Paris, France, 118 p.
- IUCN 2001. — *IUCN Red List Categories: Version 3.1*. IUCN Species Survival Commission, IUCN, Gland, Switzerland and Cambridge, U.K.
- KATHRIARACHCHI H., SAMUEL R., HOFFMANN P., MLINAREC J., WURDACK K. J., RALIMANANA H., STUESSY T. F. & CHASE M. W. 2006. — Phylogenetics of tribe *Phyllanthae* (*Phyllanthaceae*; *Euphorbiaceae sensu lato*) based on nrITS and plastid *matK* DNA sequence data. *American Journal of Botany* 93 (4): 637-655.
- LAMARCK J. B. A. M. 1804. — *Encyclopédie méthodique, Botanique* 5. H. Agasse, Paris, 758 p.
- LEANDRI J. 1934. — Espèces et localités nouvelles d'Euphorbiacées d'Afrique et Madagascar. *Bulletin de la Société botanique de France* 81: 452.
- LEANDRI J. 1938. — Contribution à l'étude des Euphorbiacées de Madagascar (suite). *Notulae Systematicae* 6: 191-199.
- LEANDRI J. 1957. — Notes systématiques sur les Euphorbiacées, *Phyllanthus* de Madagascar. *Mémoire de l'Institut Scientifique de Madagascar* 8: 229-233.
- LEANDRI J. 1958. — *Euphorbiaceae* I (*Phyllanthoideae*), in HUMBERT H. (ed.), *Flore de Madagascar et des Comores*, famille 111: 1-199.
- MÜLLER J. 1863. — Euphorbiaceae, Vorläufige Mitteilungen aus dem für De Candolle's Prodrömus bestimmten Manuscript über diese Familie. *Linnaea* 32: 2, 8.
- MÜLLER J. 1866. — Euphorbiaceae, in DE CANDOLLE (ed.), *Prodrömus systematis naturalis regni vegetabilis* 15, part 2. Victor Masson, Paris, France: 189-1286.
- RALIMANANA H. & HOFFMANN P. 2011. — Taxonomic revision of *Phyllanthus* (*Phyllanthaceae*) in Madagascar and the Comoro Islands I: synopsis and subgenera *Isocladus*, *Betsileani*, *Kirganelia* and *Tenellanthus*. *Kew Bulletin* 66: 331-365.
- WEBSTER G. L. 1967. — The genera of *Euphorbiaceae* in the Southeastern United States. *Journal of the Arnold Arboretum* 48: 303-361, 363-431.

Submitted on 25 June 2012;
accepted on 17 April 2013;
published on 26 December 2014.

