

# A new edible yam (*Dioscorea* L.) species endemic to Mayotte, new data on *D. comorensis* R.Knuth and a key to the yams of the Comoro Archipelago

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## ABSTRACT

The yam (*Dioscorea* L.) flora of the Comoro Archipelago comprises seven cultivated, introduced or widespread species and a single endemic, *D. comorensis* R.Knuth, previously known only from the male type specimen but very recently rediscovered with both male and female plants. Specimens from Mayotte are shown to belong to a distinct species, which is described and illustrated. *Dioscorea mayottensis* Wilkin differs from *D. comorensis* in its less persistent pubescence, male inflorescence morphology, pedicel length, torus shape and filament morphology. *Dioscorea comorensis* is described from the type, two newly identified specimens and specimens and photographs from the very recently rediscovered populations. Both species have edible tubers. Preliminary conservation status assessments are given; *D. comorensis* may face the greater threat. The inflorescence morphology and relationships of both species to those from Madagascar are discussed. A key based on vegetative characters is provided to facilitate the identification of the yams of the Comoro Archipelago.

## KEY WORDS

Yams,  
*Dioscorea* L.,  
Comoro Archipelago,  
Mayotte,  
conservation,  
edible tubers,  
yam identification,  
new species.

## RÉSUMÉ

Une nouvelle espèce d'igname (*Dioscorea* L.) comestible endémique de Mayotte, données nouvelles sur *D. comorensis* R.Knuth et clé des ignames de l'archipel des Comores. Aux Comores, la flore des ignames (*Dioscorea* L.) est constituée de sept espèces cultivées, introduites ou à large distribution et d'une seule espèce endémique, *D. comorensis* R.Knuth, seulement connue par le spécimen type mâle avant sa redécouverte récente avec les plantes mâle et femelle. Des spécimens récoltés à Mayotte appartiennent à une espèce indigène distincte qui est décrite et illustrée. *Dioscorea mayottensis* Wilkin diffère de *D. comorensis* par sa pubescence moins persistante, la morphologie de l'inflorescence mâle, la longueur du pédicelle, la forme du « torus » et la morphologie des filaments. *Dioscorea comorensis* est décrite à partir du spécimen type, des deux nouveaux spécimens et des spécimens et photos des populations redécouvertes très récemment. Les deux espèces ont des tubercules comestibles. Les statuts provisoires de conservation sont donnés, *D. comorensis* s'avère la plus en danger. La morphologie de l'inflorescence et les relations de ces deux espèces avec celles présentes à Madagascar sont discutées. Une clé basée sur les caractères végétatifs est présentée afin de faciliter l'identification des ignames des îles des Comores.

## MOTS CLÉS

Ignames,  
*Dioscorea* L.,  
Archipel des Comores,  
Mayotte,  
conservation,  
tubercules comestibles,  
identification des  
ignames,  
espèce nouvelle.

## INTRODUCTION

Seven species of *Dioscorea* L. were recorded from the Comoro Archipelago (comprising Njazidja [Grande Comore], Mwali [Mohéli], Nzwani [Anjouan] and Mayotte) in the *Flore de Madagascar et des Comores* treatment (Burkill & Perrier de la Bâthie 1950). They are listed in Table 1 with the vegetative characters by which they can be identified. The first two species are cultigens (*D. esculenta* (Lour.) Burkill and *D. alata* L.), and the next two are relatively common and widespread in both Madagascar and Africa (*D. sainsibarensis* Pax and *D. martiniana* A.Rich.). *Dioscorea bulbifera* L. is the only species of *Dioscorea* native to both Africa and Asia. It produces edible bulbils, and thus it may have been introduced from one continent to the other through trade or migration. The specimens from Madagascar and the Comoro Archipelago placed under *D. minutiflora* Engl. by Burkill & Perrier de la Bâthie (1950) are called *Ovihazoz* in Madagascar and appear to belong to a different African species in the cultivated Guinea yam complex (*D. cayenensis* Lam. and its allies). However, there are taxonomic and nomenclatural problems in the Guinea yam complex that need to

be addressed through extensive pan-African research before a new name can be postulated. Thus the name used by Burkill & Perrier de la Bâthie is retained in Table 1. The herbarium specimens of *Ovihazoz* suggest that it was an occasional, small-scale cultigen in Madagascar and the Comoro Archipelago that has fallen from favour. In contrast to these six species with broad anthropogenic distributions, *D. comorensis* R.Knuth was only known in the *Flora* treatment from the male type specimen collected by Kirk and Meller on Mwali in 1861. Two other *Dioscorea* species names associated with the Comorian flora are "cf. *D. trichantha* Baker", from a sterile specimen collected by Boivin in Mayotte determined by Burkill in 1948, and *D. maciba* Jum. & H.Perrier. The latter is based on Perrier de la Bâthie's identification in 1944 of a fruiting specimen also collected by Boivin, (only locality data "Îles Comores"). This specimen was reidentified as *D. bulbifera* by Burkill in 1948. Neither of these Malagasy endemic species occur in the Comoro Archipelago (Wilkin *et al.* unpubl. data). In contrast, *D. bemarivensis* Jum. & H.Perrier (Table 1) is not recorded from the Comoro Archipelago but has been found on Aldabra, Assumption and Astove atolls according to Burkill & Perrier de

TABLE 1. — The *Dioscorea* L. species from the Comoro Archipelago in Burkill & Perrier de la Bâthie (1950) and *D. bemarivensis*, their vegetative distinguishing characters and distributions.

Species	Tubers	Stems	Leaves	Indumentum	Bulbils	Distribution
<b><i>D. esculenta</i> (Lour.) Burkill</b>	Usually digitate, ovate or globose, sometimes with rigid thorny roots	Left twining, spiny, especially at base	Alternate, entire, with 2 lateral spines at nodes	T-shaped hairs, usually dense and greyish	Absent	Tropical Asia but more widely cultivated
<b><i>D. alata</i> L.</b>	Variable, usually globose to subglobose or clavate to digitate	Right twining, 4-winged, square in cross-section, unarmed	Opposite, entire, nodes unarmed	Absent	Occasionally present	Tropical Asia, pantropically cultivated
<b><i>D. sansibarensis</i> Pax</b>	Globose with a flattened base and depressed apex	Left twining, unarmed or with lax to dense, blunt or flattened spines	Usually opposite, apices acuminate, thickened and with inrolled margins; immature with 3-9 deep to shallow lobes, nodes unarmed	Absent	Usually present, 0.6-5.5 cm in diameter, globose to ovoid, colour and texture variable	Africa and Madagascar
<b><i>D. quartiniana</i> A.Rich.</b>	Ovoid to fusiform, several in a dense cluster	Left twining, unarmed	Alternate, digitately 3-7(-9) foliolate, often densely so, never glossy, nodes unarmed	Hairs quite coarse, often dense, especially on leaf lower surface	Sometimes present, small, brown, tuberculate	Africa and Madagascar
<b><i>D. bulbifera</i> L.</b>	Solitary, usually globose to cylindrical, sometimes absent	Left twining, unarmed	Alternate, entire, two membranous semicircular projections at unarmed petiole base/node	Absent	Usually abundant, globose to ovoid or angled.	Africa and Asia
<b><i>D. minutiflora</i> Engl. (sensu Burkill &amp; Perrier de la Bâthie 1950)</b>	Borne below a woody crown, sometimes at the apices of finger-like projections	Right twining, stems terete, prickly or not	Opposite, entire, thickly chartaceous, nodes with small prickles	Small, straight or curly, often black hairs at nodes	Absent	Cultivated in Madagascar and the Comoro Archipelago, from West/Central Africa
<b><i>D. comorensis</i> R.Knuth</b>	Unknown	Left twining, unarmed but base unknown	Alternate, entire, often 2 fleshy recurved projections at petiole base/node	Caducous hairs on buds and young shoots	Absent	Endemic to the Comoro Archipelago
<b><i>D. bemarivensis</i> Jum. &amp; H.Perrier</b>	Long, terete, spreading horizontally, with swollen apices	Left twining, unarmed	Alternate, digitately 3-5 foliolate, glossy green, nodes unarmed	Sparsely pubescent also with flattened, deltoid hairs mainly on the leaflet margins	Sometimes present, small, grey ovoid to cylindrical, tuberculate.	Western Madagascar, Aldabra, Assumption

la Bâthie (1950) and Fosberg & Renvoize (1980). It has an edible tuber and is therefore included in this study because it is likely to have been carried by migrants from Madagascar, where it is encountered frequently in seasonally dry western forests, to the Comoro Archipelago as well as to the Indian Ocean Islands above, although no specimens have been seen

to date. Thus seven species of *Dioscorea* have been recorded in the Comoro Archipelago, and one more is likely to occur there, although it is possible that some, especially *D. minutiflora* (sensu Burkill & Perrier de la Bâthie 1950), may no longer be extant there.

However, during research on the systematics of *Dioscorea* for the yams of Madagascar project by the

first author, a number of specimens of a very distinctive taxon from Mayotte were seen in Paris in 2003. The first were recent collections made by Hladik, Labat, Pignal and Barthelat and their colleagues from 1996, 1999, 2001 and 2002. Soon older specimens came to light, both from 1975 and the pioneering expedition of Boivin between 1847 and 1852. They were all tentatively placed under *D. comorensis* but it soon became clear that they differed from that species by bearing male flowers on long, slender pedicels in symmetrically oriented cymes. Thus this new species from Mayotte is described and illustrated. Two specimens referable to *D. comorensis* have also been discovered, and a population has very recently been found on Mwali (the first collection there since the type) so *D. comorensis* is also described in full to show range of variation of both species and the differences between them. Their inflorescence morphology and relationships to species from Madagascar are discussed. Finally, a key based on vegetative characters is provided to facilitate the identification of both the native and introduced yams of the Comoro Archipelago.

## MATERIALS AND METHODS

The “Yams of Madagascar” project has involved comparative morphological study and databasing of 1021 specimens from the following herbaria: B, BM, G, K, MO, P, TAN, TCD, TEF, WAG, UPS and the Département de Biologie et Écologie végétales, University of Antananarivo, Madagascar. The specimens used in the study of *D. comorensis* and the new species from Mayotte are cited below. Floral dissections were carried out where appropriate and measurements made using a Leica MZ95 microscope with a measuring eyepiece. Vegetative and inflorescence characters were measured with a dial caliper.

## SYSTEMATICS

### *Dioscorea comorensis* R.Knuth

(Fig. 1)

*Repertorium Specierum Novarum Regni Vegetabilis* 22: 347 (1926). — Type: Comoro Isles [Comoros], Mohilla

[Mwali], hills and coast by Fumboni [Foumboni] Town, ♂ fl., 8.IV.1861, *Kirk & Meller s.n.* (holo-, S; iso-, B, [digital image!], K!).

SPECIMENS EXAMINED. — **Comoros.** Grande Comore [Njazidja], Grand Comore-Sud, Ouroveni, ♂ fl., 4.II.1975, *Floret 737* (P!). — Moheli [Mwali], Itsamia Ngouni, ♀ fr., 28.V.2006, *Labat, Yahaya & Abdou 3717* (CNDRS, K!, MO, P!). — Itsamia Ngouni, ♂ fl., 28.V.2006, *Labat, Yahaya & Abdou 3717bis* (CNDRS, K!, MO, P!).

**Mauritius.** Île de France [Mauritius], no further locality data, ♂ fl., unknown date, *Jussieu s.n.* (P!).

## DESCRIPTION

Twining vine, upper stems appearing annual, lower stems and tuber unknown but reported to be edible. Indumentum of colourless, caducous (but persistent for longer and in greater density than those of *D. mayottensis*) multicellular hairs to 0.7 mm long, usually dense on young vegetative buds and shoots and sparsely persistent around the axil and on the leaf blade lower surface, especially on the veins near the point of petiole insertion, usually appressed but sometimes erect on buds. Stems left-twining, to 3 mm in diameter (base unknown), terete, with shallow longitudinal ridges and grooves on main stems, weakly so or absent in fertile shoots, unarmed, drying mid-brown to grey. Leaves alternate, blade (2.7-)4.6-8.1 × (2.0-)3.5-6.8 cm, ovate to narrowly so or deltoid-ovate, chartaceous to thinly so, margins entire, base deeply cordate, sinus 3.5-22 mm deep, broad to narrow or subhippocrepiform, apex 6-19 mm long, acuminate to short-acuminate with a 1.5-6 mm long, deltoid to narrowly so, brown forerunner tip, veins 5 to the apex, with a smaller, bifid pair of veins to the base, primary venation prominent on lower leaf blade surfaces; petiole 2.2-6.1 cm long, terete but channelled on upper surface; lateral nodal organs (“stipules” of Burkill 1960) sometimes present as two fleshy, recurved, acute projections to c. 2 mm long on each side of amplexicaul petiole base, some collapsing on drying; bulbils and cataphylls absent (but stem base unknown). Male inflorescences 1-3 per axil, simple, racemose, pendent, primary axis 4.8-21.7 cm long (including 0.7-1.9 cm long peduncle), axis flattened and narrowly winged, axis width 0.5-1.4 mm, nodes quite irregularly spaced and 0.7-5.0(-7.3) mm apart, alternate to subopposite, each possessing 2-3(-4)



FIG. 1. — *Dioscorea comorensis* R.Knuth: **A**, female inflorescences with basal ovaries reflexed and enlarging; **B**, female inflorescence with more ovaries reflexed and enlarging; **C**, immature infructescence; **D**, part of male inflorescence showing the flowers in cymules; **E**, male inflorescences; **F**, male flowers. Photos Nicole Crestey (A, B, D, E) and Jean-Noël Labat (C, F).

flowers in a cymule or a solitary flower plus a cymule where the primary branch of the cymule is very short and concealed by the cymule bract, cymule bracts one per node, 1.3-1.9 mm long, ovate to lanceolate, long-acuminate, membranous, midrib scarcely thickened, cymule primary branch to 1.1 mm long. Female inflorescences to *c.* 24 cm long in fruit, with a 20-28 mm long peduncle, simple, spicate, pendent, one per axil, flowers *c.* 20-25 per inflorescence, unevenly spaced 2.4-6.2 mm apart, on all sides of axis. Male flowers pedicellate, pale yellow-green, scent not recorded, pedicels 0.9-3.1 × 0.15-0.6 mm, weakly clavate, ridged and angled; floral bracts at pedicel bases, 0.7-1.3 × 0.2-0.6 mm, narrowly ovate or elliptic to lanceolate, acuminate to obtuse, decreasing acropetally in size and especially width at each node of the cymule, membranous but thinner than cymule bracts; tepals differentiated into 2 whorls of 3 (inner broader), inserted on a shallow, open, bowl-shaped torus 0.2-0.5 × 0.8-1.5 mm, membranous and semi-translucent like tepals except towards centre where filaments are inserted; tepals erect in bud, more or less patent to torus margin at anthesis, membranous, midrib visible but scarcely thickened, apices obtuse to acute, spreading to reflexed; outer tepals 0.9-1.5 × 0.4-1.1 mm, lanceolate to elliptic, elliptic-oblong or narrowly so; inner tepals 0.7-1.6 × 0.8-1.3 mm, elliptic-oblong to ovate or broadly so, stamens 6, inserted in a ring on a thickened area in the torus centre, filaments 0.4-0.8 mm long, erect at base and free or contingent to form a column to 0.3 mm long, above free and apically reflexed in an arching manner such that the anthers are held downwards in dense to lax ring (depending on the age of the flower), not contorted or coiled, anthers 0.15-0.3 × 0.1-0.25 mm, elliptic-oblong, basifixed, pistillode a tiny, fleshy projection in the centre of the ring of filament bases. Female flowers pale yellow-green, scent not recorded, (sub)sessile until capsule development begins; floral bracts 1.6-2.2 × 0.7-1.1 mm, ovate, long-acuminate, membranous, with a thicker midrib, sheathing base of ovary during early development, bracteoles similar but smaller, inserted at 90° to bract, apex less sharply acuminate; ovary 2.6-3.8 mm long, narrowly elliptic to narrowly oblong in outline, 3-angled, pale green when immature, drying more or less black; floral stipe 0.4-0.8 mm

long; tepals differentiated into 2 whorls of 3 (inner broader), spreading at anthesis, later reflexed (especially inner whorl), thickly membranous with a thicker midrib, inserted on the rim of a 0.3-0.7 × 1.0-1.6 mm torus, shallow, open, bowl-shaped, texture like tepals but thickening gradually towards style bases; outer tepals 1.1-1.7 × 0.5-0.8 mm, elliptic to elliptic-oblong or lanceolate, apex acute or acuminate; inner tepals 1.2-1.8 × (0.6-)0.8-1.1 mm, broadly elliptic to elliptic-oblong or broadly so, apex obtuse to rounded; staminodia 6, 0.1-0.3 mm long, inserted around the style base, erect, filiform with a capitate, erect apex; styles 0.7-1.0 mm long, fused to form an erect column for 0.2-0.5 mm, apices free, recurved, bifid, stigma branches deltoid, spreading, horn-like, 0.3-0.5 mm long. Capsules 18-23 × 11-14 mm, ascending at *c.* 60-45° to infructescence axis on a 2-4 mm long, terete to narrowly conical, 3-angled pedicel, oblong to oblong-elliptic or oblong-obovate in outline, drying glossy light brown with darker matt flecking, margin and axis darker, capsule base rounded to retuse, apex obtuse to acute, with torus and tepals persisting on a short floral stipe until at least submature. Seeds (material examined possibly submature) 5.4-6.2 × 4.2-4.7 mm, lenticular-reniform to lenticular-ovoid, dull brown, wing 7.6-9.6 × 4.8-5.8 mm, orientated towards pedicel, oblong, membranous, golden-brown, translucent, apex rounded to acute.

#### REMARKS

The isotype at B consists of two detached leaves and three mounted male inflorescences, with presumably other loose inflorescences in the capsule. Verifying the collection locality given for the *Jussieu s.n.* specimen at P is critical in determining whether this species is disjunct in its distribution (or one part of its distribution is anthropogenic) or endemic to Ndjaziidja and Mwali. There is unfortunately no duplicate specimen in Jussieu's herbarium, which might have yielded more label data. Thus this species should be sought urgently in both the Comoro Archipelago and Mauritius. Only the widespread *D. alata*, *D. bulbifera* and *D. sansibarensis* are in the treatment of Dioscoreaceae in the *Flore des Mascareignes* (Marais 1978). The *Labat et al.* collections of *D. comorensis* in 2006 have allowed the female

plant to be described and confirmed that the species is still extant. Unfortunately the female flowers on *Labat et al. 3717* are mainly past the period of stigma receptivity.

#### DISTRIBUTION AND ECOLOGY

This species occurs in the Comoro Archipelago (Ndjazidja and Mwali) and possibly Mauritius in coastal scrub and low forest. It is said to favour dry, bare soils (Msoili pers. comm.). The collections made by *Labat et al.* were made at *c.* 90 m in elevation. A second Mwali population was discovered in littoral vegetation on the island of Wenefou (Ouénefou) South of Nioumachoua in Mwali in March 2007 (Crestey pers. comm.); male and female plants were photographed (Fig. 1) but unfortunately no specimens made.

#### VERNACULAR NAMES

*Chiyazi msirou* in Njazidja ("forest yam" according to the label of *Floret 737*) and *M'trou* or *M'tru* (Msoili pers. comm.) in Mwali.

#### USES

Tuber edible (according to the labels of *Floret 737* and *Labat et al. 3717*).

#### CONSERVATION STATUS

IUCN Red List category DD (IUCN 2001). The specimen apparently from Mauritius makes its distribution uncertain (see above) and hence its area of occupancy and extent of occurrence cannot be determined without more information. If it is endemic to Njazidja and Mwali, then it is likely that it should be assessed as EN, given that just one recent collection has been made on either island. Both deforestation and over-utilisation are probable threats.

### *Dioscorea mayottensis* Wilkin, sp. nov. (Figs 2-4)

*Dioscorea comorensis affinis sed pubescentia fugaci atque in gemmis juvenilibus tantum inventa (nec magis persistenti in surculis juvenilibus atque axillis inventa), inflorescentia mascula e cymulis alternis ordinatim dispositis 4.5-14 mm distantibus constanti (nec cymulis irregulariter dispositis nec*

*suboppositis 0.7-5.0[-7.3] mm distantibus), ramis cymulae pedicellisque tenuioribus, pedicello in floris primi cymulae 6 mm vel plus longo, pedicello florum sequentium 4.3 mm vel plus longo (nec 3.1 mm longo vel minus), tepalis omnibus similibus (nec interiore latiore quam exteriori), filamentis spiralibus vel contortis (nec reflexibus) differt.*

**TYPUS.** — **Mayotte.** Grande Terre, Bandrélé, ♀ fl. & young fr., 9.II.2001, *Barthelat, M'Changama & Sifary 296* (holo-, P!; iso-, G, K!, MAYOTTE, MO).

**PARATYPES.** — **Mayotte.** Grande Terre, Saziley, Réserve forestière de Saziley, ♀ fl., 23.I.2001, *Barthelat, M'Changama & Sifary 258* (G, K!, MAYOTTE, MO, P!). — Sazilé Bé, pied de falaise, 12°58'39"S, 45°12'01"E, ♀ fl. & young fr., 11.IV.1999, *Pignal, Pibot & Soumille 1125* (K!, MO, P!). — Sazilé Bé, pied de falaise, 12°58'39"S, 45°12'01"E, ♂ fl., 11.IV.1999, *Pignal, Pibot & Soumille 1126* (B, NY, P!). — Pointe Handrema, ♀ fr., 22.IV.1999, *Mas 40* (P!). — Pointe Handrema, ♂ fl., 22.IV.1999, *Mas 64* (P!). — Îlot de Baudilé [Îlot de Bandrélé], ♀ young fr., 30.III.1975, *Coulon 28* (P!). — Îlot de Baudilé [Îlot de Bandrélé], ♂ fl., 30.III.1975, *Coulon 31* (P!). — Grande Terre, Combani, Mont Combani, Réserve forestière, ♀ fl. and young fr., 10.I.2002, *Barthelat, M'Changama & Ali Sifary 670* (G, K!, MAYOTTE, MO, P!). — Grande Terre, Mtsamboro, Îlot Mtsamboro, chemin de crête, ♀ fr., 26.III.2002, *Barthelat, Labarthe, Voynet-Fuasset, Dufour, M'Changama & Ali Sifary 796* (MAYOTTE, P!). — Bouzi [Îlot Bouzy], ster., IX.1850, *Boivin s.n.* (P!). — Îlot Bouzy, ♂ fl., 10.IV.2001, *Hladik 6494* (K!, P!). — Îlot Bouzy, ♀ fr., 10.IV.2001, *Hladik 6494bis* (P!). — Îlot Bouzi, Mamoudzou, ♀ fl., 4.III.2002, *Barthelat, Gomel & Ali Sifary 727* (G, K!, MAYOTTE, MO, P!). — Îlots Choazil, Malandzamiyatsini, sur la crête, 12°40'37"S, 45°03'28"E, ♂ fl., 29.IV.1999, *Pignal, Pibot & Mas 1389* (P!). — Mont Hachiroungou, 12°42'43"S, 45°03'46"E, ♀ fl. and young fr., 16.IV.1996, *Labat & Pascal 2744* (K!, MAYOTTE, MO, P!). — Plateau de Sohoa, ster., 5.IV.2001, *Hladik, Barthelat, M'Changama & Sifary 6455* (P). — Sohoa, bord de plage de Mtsanga Nyamba, ♀ fl. & young fr., 5.IV.2001, *Hladik, Barthelat, M'Changama & Sifary 6469* (K!, P!). — Sud, Mangrove d'Ironi, dans la pente en arrière de la mangrove, ♂ fl., 22.II.1975, *Floret 1145* (P!). — Îles Comores, without further locality, ♀ fr., 1847-1852, *Boivin s.n.* (P!).

#### DESCRIPTION

Twining vine to *c.* 10 m, stems annual from a fleshy tuber. Tubers annually replaced, those of current and previous rainy seasons usually present, divergent, buried 30-60 cm deep, to *c.* 50 × 3 cm, cylindrical to cylindrical-clavate, narrowing to crown, epidermis pale tan, parenchyma white, crown small, *c.* 0.5 cm in diameter, ovoid to dome-shaped, bearing thick



FIG. 2. — Vegetative and male reproductive morphology in *Dioscorea mayottensis* Wilkin: **A**, habit, showing the leaves and male inflorescences with alternate, regularly distributed cymules; **B**, a node, showing the stem, petiole and inflorescence base, an axillary bud, and the lateral nodal spines; **C**, a cymule of the male inflorescence, showing the two cymule bracts, floral bracts, three flowers at anthesis with long pedicels and the anthers at the torus mouth, and three in bud where the pedicels are still developing. The first flower of the cymule appears solitary because the first branch of the cymule is too short to see; **D**, a half-flower showing the torus shape, three tepals, the pistillode and the stamens with contorted to coiled filaments. Drawn from *Mas 64* by Lucy Smith. Scale bar: A, 2.5 cm; B, C, 3 mm; D, 1 mm.



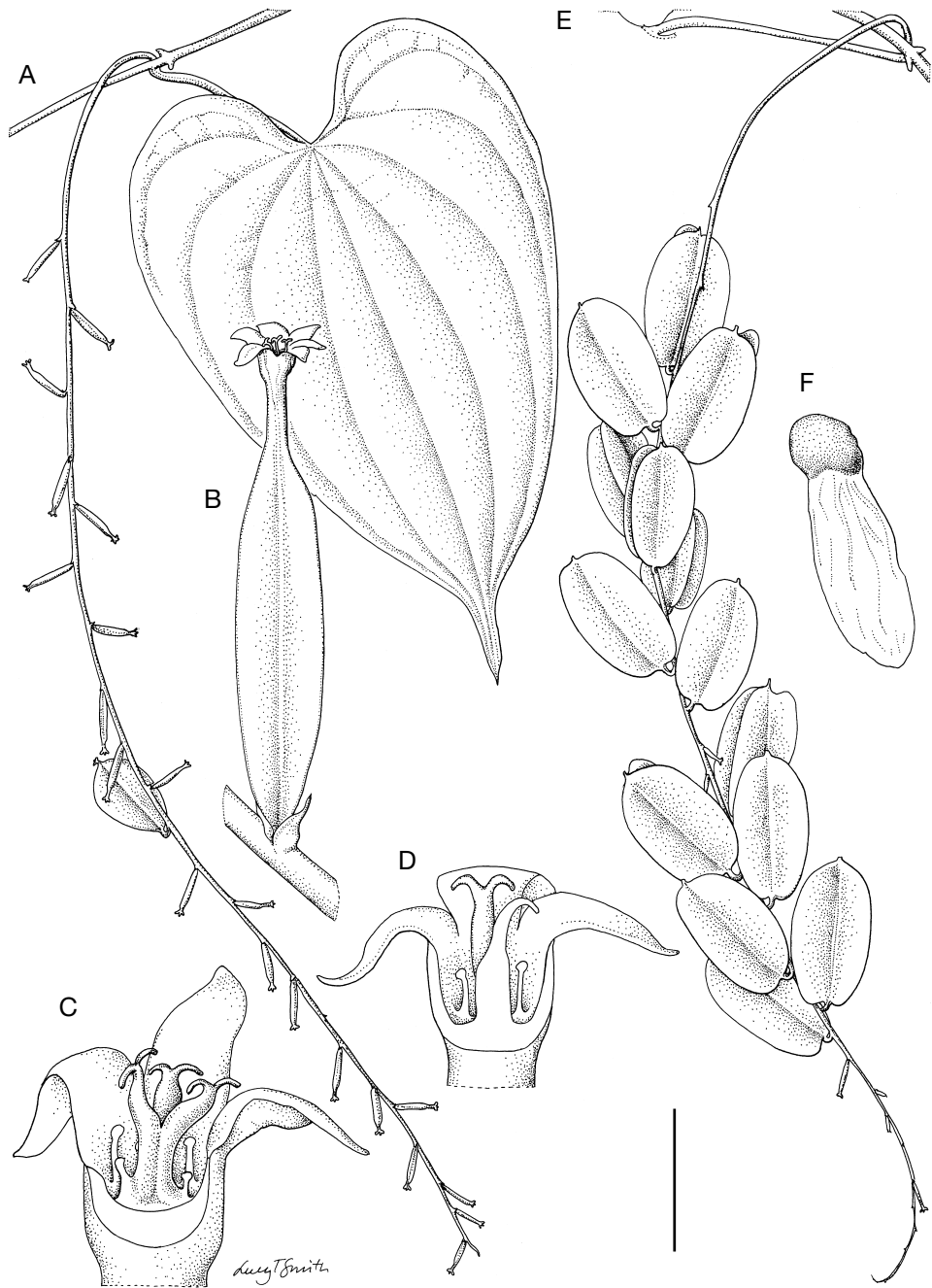


FIG. 3. — Female flowering and fruiting morphology in *Dioscorea mayottensis* Wilkin: **A**, leaf and female inflorescence, showing the lateral nodal spines; **B**, flower showing its insertion onto the inflorescence axis, the floral bract and bracteole, ovary and the floral stipe at its apex; **C**, flower with three tepals removed to show four of the staminodia, the styles and stigmas; **D**, half-flower showing the torus shape; **E**, inflorescence with immature capsules, showing the persistent floral stipe forming an apical apiculus; **F**, a basally winged seed. Drawn from Hladik et al. 6469 (A-D), Barthelat et al. 796 (E) and Hladik 6494 (F) by Lucy Smith. Scale bar: A, 3 cm; B, 4 mm; C, D, 0.9 mm; E, 3 cm; F, 1 cm.

white roots like stem nodes, tuber roots thinner, pale brown. Indumentum absent except on very young axillary vegetative buds and shoots, which have lax to dense, appressed, colourless, very rapidly caducous unicellular hairs to 0.2 mm long. Stems left-twining, to at least 5 mm in diameter, emerging from crown, white below ground with thick white roots at nodes, vertically oriented, above ground terete with weak longitudinal ridges, unarmed, cataphylls to 5 mm long present towards stem base. Leaves (Fig. 2A) alternate, blade 4.6-13.0 × 3.8-12.2 cm, ovate to broadly so or rarely orbicular, chartaceous, mid-green above, paler and grey-green below, veins 5 to the apex, with 1-2(-3) veins towards the base on both sides, margins entire, base deeply cordate, not lobed or auriculate, sinus 4.5-23 mm deep; apex 9-23 mm long, obtuse to rounded and acuminate with a 1-7 mm long, narrowly deltoid, brown to concolorous forerunner tip, primary venation prominent on lower leaf blade surface; petiole (1.5-)-2.4-7.3 cm long, strongly channeled on upper surface, lateral nodal spines ("stipules" of Burkill 1960) usually present (Fig. 2B), two fleshy, recurved, acute projections to *c.* 2 mm long on each side of amplexicaul petiole base, some collapsing on drying. Inflorescences one per axil, simple, racemose, pendent, sometimes with irregular warty galls. Male inflorescences (Fig. 2A) with a primary axis of (5-)15-50 cm long or more (including 1.1-1.7 cm long peduncle), 0.5-1.5 mm wide (including wings), flattened and winged on both sides, nodes 4.5-14 mm apart, spacing greater towards inflorescence base, cymules (Fig. 2C) usually distichous, cymules of up to 7 flowers (first one or two branches of cymule very short), axis narrowed on the apical side of each node through the absence of its wings, cymule bracts two per node, 1-2 mm long, more or less equal in size, inserted at *c.* 90° to each other, ovate to elliptic, membranous with a slightly thickened midrib, apex acute to acuminate, first visible cymule branch to 0.8 mm long, all branches very slender. Female inflorescences (Fig. 3A) to at least 40 cm long, simple, spicate, flowers solitary, *c.* 10-30 per inflorescence, 5-20 mm apart, spacing greater towards base of axis as capsules develop but even and flowers on alternate sides of axis, axis flattened and winged like male

inflorescence, width 1-2.3 mm, axis narrowed on the apical side of each node through the absence of its wings. Male flowers (Fig. 2D) pedicellate, scent not recorded, pedicels 1.4-9.2 mm long, longest in first flower of cymule (always at least 6 mm long when flower open), then decreasing in successive flowers of cymule, but never less than 4.3 mm and usually more than 5 mm long when the flower is open, very slender, only slightly thickened at apex, 0.2-0.5 mm wide; floral bract 0.5-1.3 × 0.2-0.5 mm, at pedicel base, elliptic to lanceolate, membranous, midrib scarcely thickened, base clasping cymule axis; tepal whorls not differentiated, inserted on a shallowly cup-shaped torus 0.4-0.8 × 0.5-1.0 mm, not constricted at the apex, walls relatively thick and opaque when dry; tepals 6, 0.8-1.5 × 0.5-1.0 mm, ovate to elliptic or oblong-elliptic, more or less patent to torus wall at anthesis, not usually fully reflexed, free or slightly fused at base, membranous, translucent, midrib scarcely thickened; stamens 6, erect, slightly exserted, appearing to be of irregular unequal length, filaments 0.3-0.9 mm long, free, filiform, contorted to coiled in the middle such that the anthers form a dense cluster at the torus mouth, anthers 0.15-0.3 × 0.15-0.4 mm, elliptic-oblong in outline, dorsifixed, pale yellow; pistillode a small, undifferentiated fleshy swelling at the centre of the torus. Female flowers (Fig. 3B) (sub)sessile until capsule development begins, scent not recorded; floral bract 1-1.8(-2.3) × 0.4-0.7 mm, narrowly ovate, long-acuminate, membranous with a thicker midrib, bracteole like bract but smaller, inserted at 90° to it and with a shorter acumen; ovary *c.* 3.4-7.4 mm long, 3-angled, narrowly elliptic to narrowly oblong in outline, becoming oblanceolate, narrowing at the apex into a ridged floral stipe 1.1-1.9 mm long, bearing a shallowly cup-shaped torus (Fig. 3C, D) 0.5-0.8 × 0.5-1.0 mm, dark and opaque when dry; tepals 6, not differentiated into two whorls, 0.7-1.2 × 0.5-0.8 mm, narrowly ovate to elliptic or elliptic-oblong, inserted on the torus rim, ascending to spreading, free or fused at the base, membranous, midrib scarcely differentiated, apex acute to obtuse; staminodia 6, 0.2-0.5 mm long, erect, length unequal, filamentodia straight to curved, antherodia not more than 0.1 mm long, styles 3, 0.7-1.1 mm long, fused for about half their



FIG. 4. — *Dioscorea mayottensis* Wilkin and its tuber: **A**, habit; **B**, immature capsules; **C**, tubers and lower stem; **D**, close-up of tubers and crown, showing the tuber of the previous rainy season from which the plant is growing, and the new rainy season's tuber in early development. On the latter, the insertion of the crown (upper part) on the tuber (lower part) can be seen, with the thick roots emanating from the crown. Photos Fabien Barthelat.

length into an erect column, ascending to spreading above, stigmas narrowly ovate, deeply bifid, tips barely exerted from mouth of torus. Capsules (Fig. 3E) 23-37 × 13-18 mm, ascending at c. 45-30° to axis at dehiscence on a 3-5.5 mm long, narrowly conical, 3-angled pedicel which develops with the capsule, oblong to oblong-elliptic or sometimes broadening slightly towards apex, pale brown, darker towards wing margins, with chestnut brown flecking, base truncate to very shallowly cordate, apex acute to truncate, floral stipe persistent as an apiculus, splitting to give a narrower apiculus on each lobe of capsule, apical part only opening to release seed, seed wing basal and therefore concealed. Seeds (Fig. 3F) 6.5-10 × 4.5-8 mm excluding wing, lenticular-reniform to lenticular-ovoid, dull brown, wing 9-19 × 5-8.5 mm, orientated towards pedicel, oblong, membranous, golden-brown, translucent, apex obtuse to truncate.

#### REMARKS

The specimens *Coulon 31* and *28* have the locality “Grande Comore, Îlot de Baudilé” on the label. However, Grande Comore does not have îlots (it is geologically different from Mayotte) and the locality name is close in spelling to Bandrélé, so we believe that they are most likely to have been collected at the Îlot de Bandrélé off the coast of Mayotte.

*Dioscorea mayottensis* can be recognized in the vegetative state by its rapidly caducous pubescence on very young buds only. *Dioscorea comorensis* is pubescent on buds, young shoots and around the axils; its hairs are more persistent. When in flower, the male plant has a very distinctive inflorescence arrangement, with alternate cymules of (4-)5-7 flowers 4.5-14 mm apart. In *D. comorensis*, the male inflorescence has irregular to subopposite cymules of 3(-4) flowers 0.7-5.0(-7.3) mm apart. The cymule branches and pedicels of *D. mayottensis* are more slender throughout than those of *D. comorensis*, and the pedicels are at least 6 mm long in the first flower of the cymule, usually more than 5 mm long and never less than 4.3 mm long in the subsequent flowers at anthesis. The pedicels of the male flowers of *D. comorensis* do not exceed 3.1 mm long. The torus size and shape differs in the two species (0.4-0.8 × 0.5-1 mm in *D. mayottensis*,

0.2-0.5 × 0.8-1.5 mm in *D. comorensis*). Finally, the filaments of *D. mayottensis* are coiled or contorted rather than reflexed. The numerous differences in reproductive morphological characters suggest that *D. mayottensis* and *D. comorensis* have different pollinators and thus are reproductively as well as spatially isolated. Female plants of *D. mayottensis* can be identified by characters including the winged inflorescence axis, the even spacing and alternate positioning of the ovaries and the 1.1-1.9 mm long floral stipe (see Fig. 3B) at the ovary apex (0.4-0.8 mm long in *D. comorensis*). The capsules and seeds of *D. mayottensis* appear to be larger than those of *D. comorensis* but this may reflect the state of development of the capsules of *Labat et al. 3717*, the only female specimen of the latter.

#### DISTRIBUTION AND ECOLOGY

Endemic to Mayotte. Littoral vegetation, usually in dry forest and scrub to dense humid forest from near sea level to 450 m in elevation, often on slopes. *Dioscorea mayottensis* occurs on several substrates, including seasands, calcareous, cineritic and lateritic soils (but not when the latter are compacted). It has been found in abandoned cultivated areas, so it can tolerate a degree of disturbance, and can be encountered in active cultivation as well as in managed wild populations.

#### VERNACULAR NAMES

*Mitrou* (Shimaoré), *Oviala* (Shibushi).

#### USES

Tubers edible, said to have a very good flavour.

#### CONSERVATION STATUS

IUCN Red List category NT (IUCN 2001). There are c. 11 known populations on Mayotte based on the herbarium specimens cited above. Both deforestation and over-utilisation are probable threats. *Dioscorea mayottensis* is legally protected in Mayotte under arrêté préfectoral DAF no. 42-2006, article 2 of which forbids the sale, purchase or placing for sale any part of the wild plant; it may be collected for consumption only. Nevertheless, its desirability as a food makes a study of its sustainable use a priority to ensure its long-term survival.

## INFLORESCENCE MORPHOLOGY IN *D. COMORENSIS* AND *D. MAYOTTENSIS*

Both *D. comorensis* and *D. mayottensis* possess a cymule in the axil of a bract and bracteole at each node of the inflorescence axis. Burkill (1960) regarded the switch from a single flower on a raceme or spike to a cymule as a means of maximising male reproductive investment. Such cymulose inflorescences were called drepania by Weberling (1989). Evidence that drepania have evolved from racemose and spicate partial inflorescences is found in the bract and/or bracteole at base of each cymule, which are homologous with the floral bract and bracteole. The phylogeny obtained by Wilkin *et al.* (2005) suggests that this change has occurred many times in the genus *Dioscorea* across its geographical range and in most of the main subclades. As Figure 2C shows, *D. mayottensis* appears to have two cymule bracts of more or less equal size. However, the second bract may be the floral bract of the first flower of the cymule, which has its pedicel inserted just above the base of the cymule axis and always has the longest pedicel in the cymule. The length of the inflorescence and the number of flowers in each cymule makes the male inflorescence of *D. mayottensis* highly floriferous. Malagasy endemic species with drepania include *D. sterilis* Weber & Wilkin (Weber *et al.* 2005), *D. maciba* Jum. & H.Perrier (Burkill & Perrier de la Bâthie 1950),

*D. sambiranensis* R.Knuth (Burkill & Perrier de la Bâthie 1950), *D. namorokensis* Wilkin (Wilkin *et al.* 2002), *D. bemarivensis* Jum. & H.Perrier (Haigh *et al.* 2005) and *D. arcuatineris* Hochr. (Burkill & Perrier de la Bâthie 1950). Both the phylogeny in Wilkin *et al.* (2005) and the diversity of other morphological characters in these taxa indicate that there has been more than one origin of drepania in Madagascar alone.

## RELATIONSHIPS OF *D. COMORENSIS* AND *D. MAYOTTENSIS* WITH YAMS FROM MADAGASCAR

The left twining stems, basally winged seeds and lateral nodal organs of both *D. comorensis* and *D. mayottensis* and the tuber morphology of the latter suggest that they are most closely related to species from Madagascar rather than Africa. The modification of the torus and long inflorescences with winged axes suggest links to the campanulate-flowered species group in Madagascar, which includes *D. serifflorea* Jum. & H.Perrier from the humid East and *D. maciba* Jum. & H.Perrier from the seasonally dry West. However, only *D. maciba* of that species group possesses flowers in cymules. A well-sampled phylogenetic study of the Malagasy clade of *Dioscorea* (Wilkin *et al.* 2005) is needed to test this hypothesis.

## KEY TO THE ENDEMIC AND INTRODUCED YAMS (*DIOSCOREA* L.) OF THE COMORO ARCHIPELAGO BASED ON VEGETATIVE CHARACTERS AND DISTRIBUTION

1. Leaves compound ..... 2  
— Leaves entire or rarely lobed ..... 3
2. Tubers ovoid to fusiform, several in a dense cluster. Hairs quite coarse, often dense, especially on leaf lower surface ..... *D. quartimiana*  
— Tubers long, terete, spreading horizontally, with swollen apices. Hairs sparse, also with flattened, deltoid hairs mainly on the leaflet margins ..... *D. bemarivensis*
3. Tuber globose with a flattened base and depressed apex. Mature leaves with acuminate, thickened apices with inrolled margins, juvenile leaves lobed ..... *D. sansibarensis*  
— Tuber(s) not as above. Leaf apex if acuminate not thickened or with inrolled margins, margins always entire ..... 4
4. Leaves opposite throughout. Stems right twining ..... 5  
— Leaves alternate at least on distal shoots. Stems left twining ..... 6

5. Stems square in cross-section, with 4 longitudinal wings ..... *D. alata*  
 — Stems terete, wingless ..... *D. minutiflora* (*sensu* Burkill & Perrier de la Bâthie 1950)
6. Hairs persistent, T-shaped, usually dense and greyish. Stem spiny ..... *D. esculenta*  
 — Hairs absent or caducous, never T-shaped. Stem usually unarmed ..... 7
7. Two membranous semicircular projections at petiole base/node. Axillary bulbils usually abundant ..... *D. bulbifera*  
 — Two fleshy, recurved, acute projections usually present at petiole base/node. Axillary bulbils absent ..... 8
8. Hairs absent except on very young axillary vegetative buds and shoots, which have lax to dense, appressed, very rapidly caducous hairs to 0.2 mm long. Mayotte ..... *D. mayottensis* sp. nov.  
 — Hairs caducous (but more persistent than those of *D. mayottensis*), to 0.7 mm long, dense on young vegetative buds and usually so on shoots, sparsely persistent around the axil and on the leaf blade lower surface, especially on the veins near the point of petiole insertion, usually appressed but sometimes erect on buds. Mwali & Njazidja ..... *D. comorensis*

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