

[NOTE to typesetter: This text includes non-breaking spaces, thin and/or hair spaces and possibly other special characters]

[Article Category: NOMENCLATURE]

[Running Header:] Bruyns & Berry • *Euphorbia candelabrum* Welw. and *E. ingens*

Article history: Received: 4 Dec 2018 | returned for (first) revision: 20 Feb 2019 | (last) revision received: 18 Mar 2019 | accepted: 9 Apr 2019

Associate Editor: Erin Tripp | © 2019 International Association for Plant Taxonomy

The nomenclature and application of the names *Euphorbia candelabrum* Welw. and *Euphorbia ingens* in tropical Africa

Peter V. Bruyns¹ & Paul E. Berry²

1 Department of Biological Sciences, University of Cape Town, 7701 Rondebosch, South Africa

2 University of Michigan Herbarium, Department of Ecology and Evolutionary Biology, 3600 Varsity Drive, Ann Arbor, Michigan 48108, U.S.A.

Address for correspondence: Peter V. Bruyns, peter.bruyns@uct.ac.za

ORCID PVB, <https://orcid.org/0000-0002-9368-7184>

DOI

Abstract During the last 40 years, one of the most widespread and conspicuous succulent trees in East and north-east Africa has been referred to as *Euphorbia candelabrum* Kotschy or as *E. candelabrum* Trémaux ex Kotschy. This name is a later homonym of *E. candelabrum* Welw., and consequently it is illegitimate. The species to which the name *E. candelabrum* Kotschy has been widely applied is shown to be conspecific with *E. ingens*, which occurs from southern Ethiopia to subtropical South Africa.

Keywords Euphorbiaceae; illegitimate name; synonymy; Welwitsch; widespread species

INTRODUCTION

With the publication of accounts of *Euphorbia* in *Flora of Tropical East Africa* (Carter, 1988b), *Flora of Somalia* (Carter, 1993), *Flora of Ethiopia and Eritrea* (Gilbert, 1995) and *Flora Zambesiaca* (Carter & Leach, 2001), much of the major diversity of *Euphorbia* in Africa has been investigated taxonomically, though these works are floristic and do not constitute thorough revisions of the species in the respective areas. A complete revision of the African species of *Euphorbia* has also not

This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: [10.1002/tax.12091](https://doi.org/10.1002/tax.12091)

been attempted so far. Areas where *Euphorbia* is diverse and where accounts are still lacking include Angola and southern Africa (here taken to consist of Namibia, Lesotho, South Africa and Swaziland). Although White & al. (1941) gave a detailed account of the succulent species in southern Africa, this is now considerably out of date.

In southern Africa ±160 species of *Euphorbia* occur naturally and, of these, around 74% are endemic. Of those that are not endemic, some occur near the borders of southern Africa and extend beyond them, often only for a short distance. Examples are *E. rowlandii* R.A.Dyer on the NE border of South Africa (extending into neighbouring parts of Moçambique and Zimbabwe) and *E. eduardoi* L.C.Leach near the NW border of Namibia (extending to just north of Lobito in Angola). Others, such as *E. ingens* E.Mey. ex Boiss. and *E. grandicornis* A.Blanc, appear to have substantially larger distributions outside southern Africa than in it. In preparation for an account of the southern African species of *Euphorbia*, the question arises as to how large the distribution is for these more widespread species. In the case of *E. ingens*, which is considered here, there is also the problem as to what it ought to be called over the wide swathe of Africa where it occurs, as Dyer (1957) already mentioned.

Euphorbia ingens belongs to a group of three closely related species which includes *E. abyssinica* J.F.Gmel. and *E. ampliphylla* Pax (Bruyns & al., 2011) in *E. sect. Euphorbia* (Bruyns & al., 2006). These three species form large trees 8 to 30 m tall (as in Figs. 1D and 2A,D), with a broad, candelabrum-shaped crown arising from a thick, ± cylindrical trunk covered by corky, brown bark. As in *E. ammak* Schweinf. (which is not closely related, Bruyns & al., 2011), their branches are perennial and are not gradually shed as the tree grows taller (Dyer, 1957), as happens in all other arborescent African species of *Euphorbia*. Young plants of these three species are particularly distinctive before they begin to branch (which usually happens at 1 to 3 m tall), as they bear oblanceolate leaves at least 5 cm long towards their tips (with strong pairs of thorns behind each leaf) that are mostly (except in *E. ampliphylla*) much larger than the tiny scale-like leaf-rudiments on the branches. These species share also the unusual feature of a “lobed calyx” beneath the ovary (Brown, 1912; Leach, 1992), which is also recorded for other species (not all closely related) including *E. calycina* N.E.Br. (Brown, 1912) and is shown here in Fig. 3D.

North of Zimbabwe, very similar-looking plants to *E. ingens* have tended to be known as *E. candelabrum* Kotschy (or *E. candelabrum* Trémaux ex Kotschy) since Carter (1987). It is difficult to see what separates these more northerly plants from *E. ingens*. We investigate this further and show that these are actually the same species. We also show that the name *E. candelabrum* Kotschy is illegitimate, being a later homonym of *E. candelabrum* Welw., a different species from Angola (which is also arborescent but closely related to *E. confinalis* R.A.Dyer and not to *E. ingens*: P.V. Bruyns, unpub. data). We further show that it is impossible to apply the name *E. candelabrum* Kotschy with certainty to any of the species found today in north-east Africa and that it may be a different species from *E. ingens*. Consequently we recommend that the populations from East and north-east Africa that have been named *E. candelabrum* Kotschy by several authors, should be included in *E. ingens*.

WAS EUPHORBIA CANDELABRUM WELW. VALIDLY PUBLISHED?

Euphorbia candelabrum Welw. (Fig. 1A–C) was published in an English translation of a letter in German written by Friedrich Welwitsch to Richard Kippist and published in the *Proceedings of the Linnean Society of London* in 1855, after being read at a meeting of the Society in June 1854. The relevant extracts (Welwitsch, 1855) are:

“I have already become acquainted with and plundered upwards of forty miles of coast, from the Guizembo River (three miles N. of Ambriz) to near the mouth of the mighty Cuanza (about 9° 30' S. Lat.), and possess the materials for a Flora of Loanda, of five to six * miles [he referred here to German miles = ±4.5 British miles] in circumference [...].” (p. 328)

“Of *Euphorbia* I have already found near Loanda a gigantic species, with a stem 2½ feet in diameter and upwards of 30

feet high, forming woods, as the *Pinus sylvestris* does with us! This species, which is readily discernable even from ship-board, is not noticed in the ‘Flora Nigritiana.’” (p. 328)

“In the woods of Euphorbia (*Candelabra* n.sp.) is found a wonderfully beautiful terrestrial *Orchidea* [...]” (p. 329)

Although this letter did not give much detail of his “*Euphorbia candelabra*”, there is no other species in the area (i.e., within a radius of ± 20 miles of Luanda, Angola) to which it could refer (Leach, 1974). The manner in which it dominated the countryside was well-known, as shown clearly in the sketch by Rose Monteiro that forms Plate 1 in Monteiro (1875) and is reproduced here as Fig. 4. Since ICN Art. 38.1 does not specify how detailed a description or diagnosis ought to be, the fact that one was provided, that it characterizes the species in the area where it was found and that this diagnosis was made available by publication makes *E. candelabrum* Welw. in Proc. Linn. Soc. 2: 329 (1855, as ‘*candelabra*’) both validly and effectively published (ICN Art. 32.1, 38.1). Hiern (1900: 946) considered, erroneously, that Welwitsch published the “name only” here and so he did not treat this as validly published.

Welwitsch published the name again in *Annaes do Conselho Ultramarino Parte Não Official* in 1856 (p. 251):

“N.º 5 – *Euphorbia spec.* (*Euphorbia candelabrum* Welw mspt) | Arvore de 30 até 45 pés de altura em forma de candelabro; faz matas densas em sitios pedregosos e seccos; é a arvore mais caracteristica de Flora Africano-equinocial, e estando com flores, que são rôxas e em innumeravel quantidade, faz lindissimo effeito.” (Tree of 30 to 45 feet in height in the shape of a candelabrum; forming dense forests in stony, dry places; a tree very characteristic of the Flora of equatorial Africa, when it flowers they are purple-red and in enormous quantity, producing a most beautiful effect.)

This was number 5 in a list of 24 living plants sent by Welwitsch from Luanda to Coimbra (Portugal). Here the diagnosis is more detailed and, though brief, it characterizes the species exactly (Leach, 1974, 1981, 1986, 1992). Since it was once more circulated by publication, *E. candelabrum* Welw. in Ann. Cons. Ultramar. (Portugal), Parte Não Off., ser. 1: 251 (1856) was also validly published (ICN Art. 32.1, 38.1) and was accepted as such by both Hiern (1900: 946) and Brown (1912: 600).

Carter (1985) sought to show that *E. candelabrum* Welw. 1855 and 1856 was not validly published on either of these occasions. To dismiss validity of the publication of 1855 she used such statements as “[...] Welwitsch obviously had not intended his letter to be published [...]” (an argument also put forward by Gilbert, 1995: 336) and “[...] the dimensions of the plant briefly given by Welwitsch in the friendly context of his letter, can hardly constitute a description, certainly not a diagnosis when many other such trees were already known [...]” (p. 699). Since we cannot now know anything about Welwitsch’s intentions in 1854 for his letter, the first comment is without foundation. As pointed out above and by Leach (1974), whether the context was “friendly” or not, the phrases given characterize the species in the area that Welwitsch referred to (namely a radius of ± 20 miles around Luanda, Angola) and therefore *do* constitute a diagnosis. The fact that other similar trees were known elsewhere is irrelevant: in the area Welwitsch referred to there is *no* other such species. Therefore, these arguments do not show that *E. candelabrum* Welw. 1855 was not validly published.

To contest the validity of *E. candelabrum* Welw. 1856, Carter (1985: 699) claimed that by “*Euphorbia spec.* (*Euphorbia candelabrum* Welw. mspt.)”, Welwitsch had added an “alternative manuscript name to ‘*Euphorbia spec.*’” She claimed that this “clearly indicated Welwitsch’s proposal only of the name, in ‘anticipation of the future acceptance of the group concerned’”: i.e., it is not valid since it is a case where Art. 36.1(a) applies. Apart from again stretching Welwitsch’s intentions much beyond what we know, she did not notice that, when Welwitsch (1856) provided a provisional name, as he did for “N.º 3 – *Aloë spec.* (*Aloë arborescens* nob. ad interim)”, he used the expression “ad interim” to indicate clearly that it was provisional. If one examines N.º 10 (quoted fully below) where the “mspt” of N.º 5 was expanded to “Flor ang. mspt”, it is clear that “mspt” provided a cross-reference to a name used in the manuscript of an Angolan Flora that he had prepared (which was never published). So it was not provisional but was a form of reference. Therefore, this is not a case to which ICN Art. 36.1(a) applies, though Gilbert (1995: 336) also claimed that Art. 36 applied here. Since a diagnosis was provided that made the identity of the plant quite clear, since this was circulated by publication and since there is no indication that Welwitsch did *not* intend to publish the name here (both Carter and Gilbert made a major case out of Welwitsch’s intentions, of which we know nothing), it was both validly and effectively published (ICN Art. 32.1, 38.1). To object, further, to its validity on the

grounds that the publication of 1856 was merely a “list of plants” is also unacceptable, since many names accepted today as validly published appeared in lists with only brief diagnoses and such publication is only excluded from 1953 onwards (*ICN* Art. 30.7). For example, species of *Euphorbia* such as *E. inermis* Mill. were briefly characterized by Philip Miller (1768) in lists of plants in cultivation in England at the time, with no indication that Miller had intended to publish a new species (but their validity is unquestioned). Similarly, the publication of names in a seed-list or “*Index Seminum*” is also widely accepted as valid, provided at least a brief diagnosis is present that distinguishes the plant from others in the view of the author.

The rejection by Carter (1985) of *E. candelabrum* Welw. is similar to the rejection by Bullock (1957) of *Tavaresia* Welw. and *Tavaresia angolensis* Welw. (Apocynaceae). In this case Welwitsch (1854: 79) stated: “*Tavaresia Angolensis. Welw.* in litt. ad *Loand.* Novum genus e tribu *stapeliacearum?* – In argillaceo-arenosis territorii Loandensis caespitose crescens – Corolla tubu 3 pollicaris et rigiditate coriacea, laciniis 10 et insignis! Dec. – 1853 – leg. – *Welw.*” (In clayey sand of the vicinity of Loanda growing in clumps – Corolla with tube 3 inches [75 mm] long and rigidly leathery, corona with 10 remarkable, deeply divided and narrow segments.)

In Welwitsch (1856: 252) he also gave “N.º 10 – *Tavaresia angolensis* Welw. – (Heurnia *Tavaresii* nobis. Flor ang. mspt) | Planta da familia das Stapeliaceas, mas da flores mui[to] singulares tubuloso-campanulaceas; é a única especie d’esta familia que até agora foi encontrada na Africa tropical.” (Plant of the family of the Stapeliaceae, but the flowers are very remarkable, tubular-campanulate and it is the only species of this family which has until now been found in tropical Africa.)

Bullock (1957: 509) claimed that “apart from its reference to *Asclepiadaceae* and a statement that the flowers are tubular, there was no description”. This is not correct, since the information given does characterize this species among the stapeliads in the vicinity of Luanda and therefore is a “description or diagnosis” (*ICN* Art. 32.1(c)). He also mentioned that it “appeared in an obscure list of Angolan plants” and “was resuscitated by Hiern” after long being neglected. On this basis he rejected *Tavaresia angolensis* Welw. in favour of the later *Decabelone elegans* Decne. Furtado (1967) and Rozeira (1968) showed that there are no grounds for questioning the validity of either *Tavaresia* Welw. or *Tavaresia angolensis* Welw.: arguments about inadequate descriptions, obscurity of the place of publication or the intentions of Welwitsch at the time are all erroneous, irrational and irrelevant. Furtado (1967) also pointed out a further name, *Hyphaene benguellensis* Welw., that had been overlooked largely as it appeared in a similarly obscure journal in Portuguese, but it was nevertheless validly published according to *ICN* Art. 32.1 and 38.1.

As in the case of *Tavaresia*, there are no grounds for rejecting *E. candelabrum* Welw., so that the arguments put forward by Carter (1985) are without foundation, as they were already shown to be by Leach (1986, 1992).

We therefore have:

Euphorbia candelabrum Welw. in Proc. Linn. Soc. London 2: 329. 1855 (‘*candelabra*’) – Neotype (designated by Leach in *Collectanea Bot.* (Barcelona) 21: 92. 1992): Angola, near Luanda, *F. Welwitsch 641* (LISU barcode LISU223726; isoneotypes: BM!, COI, G!, K!).

= *Euphorbia conspicua* N.E.Br. in Oliver, *Fl. Trop. Afr.* 6(1): 600. 1912, nom. superfl. et illeg. – Holotype: Angola, *F. Welwitsch 641* (BM barcode BM000911284!; isotypes: COI, G!, K!, LISU).

THE APPLICATION OF THE NAME *EUPHORBIA CANDELABRUM* KOTSCHY

Theodor Kotschy (1857a: 169) briefly discussed the characteristic succulent tree that he observed near Mt Fassoglu in eastern Sudan (near where the Blue Nile enters Sudan from Ethiopia):

“Nicht minder trägt zu dem abwechselnden Naturgemälde der Landschaft einiger felsigen Bergseiten das Vorkommen eines Wolfmilchsbaumes, *Euphorbia Candelabrum* Tremeau bei, die mit *E. abyssinica* Raeusch in *A. Rich. fl. abyss.* sehr

verwandt ist. Der 3–4 Klafter [1 Klafter = ±1.8 m] hohe Baum ragt an den Kanten der Felsvorsprünge aus dem übrigen Pflanzenwuchs hervor. Sein Stamm ist rund, grau, oft nahezu mannsdick, die Aeste candelaberartig aufstrebend, kantig geflügelt, sind dem Säulencactus ähnlich und bilden so eine grau-grüne Krone ohne Blätter. Bei Verletzung quillt reichlich eine für giftig geltende Milch hervor, die mit anderer Beimischung zum Vergiften der Speere gebraucht wird.” (The occurrence of one of the wolf-milk-trees, *Euphorbia Candelabrum* Tremeau, contributes no less [than the previously mentioned baobab] to the varying picture of the landscape of certain rocky mountainsides. It is closely related to *E. abyssinica* Raeusch in A. Rich. fl. abyss. The 5–7 m tall tree towers over the remaining vegetation on the sides of the steep slopes. Its stem is round, grey, often as thick as a man, the branches ascending like a candelabrum, with winged angles, forming a grey-green crown without leaves and resembling one of the larger cylindrical cacti. When cut, a milk that is held to be poisonous flows strongly out of the plant. This milk is used in a mixture to poison spears.)

It was more briefly mentioned in Kotschy (1857b: 176). No further details of where Trémaux (which is assumed to have been spelt wrongly by Kotschy) had described this species were given. Boissier (1862: 84) gave “319. *E. candelabrum* (Trémaux ex Klotzsch Allgem. Ueberbl. der Nill. pag. 13)” and provided a brief description that repeated the information given by Kotschy but added nothing new. “Klotzsch” was clearly an error for Kotschy, which was repeated by Berger (1906).

It is usually assumed (e.g., Brown, 1912: 599; Carter, 1985: 699) that Kotschy referred to the description and figures (reproduced here as Figs. 5 and 6) of Pierre Trémaux (1853), who gave the following information (ad pl. 13 & 14): “EUPHORBIA CANARIENSIS | L’une des espèces d’euphorbes que l’on trouve sur les montagnes du Dar-Foq, offre la plus grande similitude avec l’espèce *canariensis*, et je l’ai par conséquent désignée sous ce nom. Le sujet que j’ai dessiné sur la montagne de Kaçane, a une ramification de 7 mètres 50 cent. à 8 mètres de diamètre, ce qui porte sa circonférence à 24 mètres; sa plus grande hauteur au-dessus du sol est aussi d’à peu près 8 mètres; son tronc ainsi que les branches qui s’y attachent, sont formés de bois dur. Les branches secondaires ou rameaux, sont formés de moelle et de parenchyme soutenus par une faible partie ligneuse, ainsi que l’indique la planche 14. Ces rameaux forment des côtes ou arêtes ondulées, ordinairement au nombre de quatre; cependant quelques-uns n’en ont que trois, d’autres en ont cinq. Sur les branches entièrement ligneuses attenantes au tronc, on reconnaît encore les anciennes côtes que se sont transformées en écorce, tandis que la branche a passé de sa forme primitive à la forme cylindrique.” (One of the species of *Euphorbia* found on the mountains of Dar-Foq, is so similar to *E. canariensis* that I have referred to it under this name. The individual that I drew at Mt Kaçane [near the present-day Qeissan, in eastern Sudan where the Blue Nile enters Sudan from Ethiopia], has a branching of 7.5 to 8 m in diameter, which brings its circumference to 24 m [reproduced here in Fig. 5]; its greatest height above the ground is also about 8 m; its trunk and the branches attached to it, are made of hardwood. The secondary branches or twigs are formed of marrow and parenchyma supported by a small woody part, as shown in 614 [reproduced here in Fig. 6]. These branches form wavy ribs or ridges, usually four in number, however, some only have three, others have five. On fully woody branches next to the trunk we can still see the old ribs that have turned into bark as the branch went from its original form into a cylindrical form.)

Trémaux called this plant *E. canariensis* and did not use the name *E. candelabrum*. Therefore, Kotschy was incorrect to attribute the valid publication of the name *E. candelabrum* to Trémaux. Since Kotschy attributed the name to Trémaux but was actually the first to validate this name, it should be cited rather as *E. candelabrum* Trémaux ex Kotschy. Brown (1912) assumed that the trees described by Trémaux and Kotschy were the same, and Carter (1988a: 105) stated that “In 1857 Kotschy also described the same tree [as Trémaux]”. It appears that both were observed in eastern Sudan, near where the Blue Nile leaves Ethiopia, so that they may indeed have been the same.

Kotschy’s name *E. candelabrum* has been attached to the species in Ethiopia, Kenya and Somalia that is identical to *E. ingens* (see below). The only justification for this were statements such as “the tree so common throughout East Africa which has long been known by the name *E. candelabrum*” (Carter, 1984: 52) and “Personally, I have no doubts that there are trees in Kenya identical to the species described by Kotschy from the Sudan” (Carter, 1988a: 105). However, Brown (1912: 598–599) did not include any East African specimens under *E. candelabrum*. Schweinfurth named some of his collections from Sudan as “*Euphorbia candelabrum* Kotschy” (some of these were later placed under other new names by Brown) and

P.R.O. Bally determined some East African plants at BM and K with this name in 1963. However, apart from the presence of the name *E. candelabrum* in the key to the species in Carter (1982: 11), we can find no earlier published use of this name for East African trees. Nevertheless, it appeared as if it were standard usage in Carter (1987).

In East and north-east Africa the two very similar species, *E. abyssinica* and *E. ingens*, are not easily separated, though there is no doubt that two species are involved (Carter, 1988b, 1993; Gilbert, 1995). From Table 1, the only way to separate them is by the number of angles or ribs on the young plants (Figs. 1F, 2E) and by the diameter of their fruits. Although Carter (1985: 700) praised “its detailed descriptions and illustrations” and the “detailed and accurate drawings” of Trémaux (1853), the crucial information to separate his plant (and therefore also *E. candelabrum* Kotschy) from *E. abyssinica* and *E. ingens* is lacking. Consequently, it remains impossible to tell whether Trémaux (1853) and Kotschy (1857a) had not possibly described either *E. abyssinica* or *E. ingens*. On the other hand, as N.E. Brown (1912: 598–599) pointed out, *E. candelabrum* Kotschy, as depicted by Trémaux, has “angles slightly compressed, but not wing-like, with shallowly concave sides between them and a proportionately very thick solid central part” (which is \pm as thick as the angles are long in Trémaux’s illustration). This does not fit the plant in East Africa that is identical to *E. ingens*, where the angles on ultimate branches are much longer than the thickness of the central core of the branch. Consequently, Leach (1981, 1986) was correct in stating that the application of the name *E. candelabrum* Kotschy was uncertain, especially if it were applied to plants identical to *E. ingens* (see below) as done by Carter (1988b, 1993) and Gilbert (1995). However, Carter (1985) dismissed Leach’s misgivings as “erroneous”.

Andrews (1952) placed *E. calycina* N.E.Br. and *E. murielii* N.E.Br. in synonymy under *E. candelabrum* Trémaux ex Kotschy. He also obtained material from near Roseires on the Nile (preserved in alcohol at K; Leach, 1986), near where Kotschy and Trémaux had observed *E. candelabrum*. In Andrews’s material from near Roseires, in the type of *E. murielii* and in the syntypes of *E. calycina* (*Schweinfurth* 2824 [BM], 2824a [K], *Schweinfurth* 1259 [BM, K]) the ovary is exerted from the cyathium on a pedicel that is curved to one side (also noted by N.E. Brown – see Table 1). The cymes are also borne on fairly slender peduncles 10–15 mm long, with the lateral cyathia on peduncles \pm 5 mm long. These features are not found in either *E. abyssinica* or *E. ingens* and appear to justify the synonymy of Andrews (1952). They further suggest that Carter (1985, 1987, 1988a,b, 1993) was not correct in attaching the name *E. candelabrum* Kotschy to the widespread tree of East Africa that is identical to *E. ingens* (see below) and that *E. candelabrum* Kotschy may represent a different species altogether. From the synonymy put forward by Andrews (1952), we have:

Euphorbia murielii N.E.Br. in Oliver, Fl. Trop. Afr. 6(1): 589. 1912 – Holotype: Sudan, near Bahr el Jebel, 19 Feb 1901, *C.E. Muriel* (K!).

= *Euphorbia candelabrum* Kotschy in Mitth. K. K. Geogr. Ges. Wien 1(2): 169. 1857, nom. illeg., non Welw. 1855 –

Lectotype (designated here): [illustration] “VUE DE KAÇANE ... *Euphorbia canariensis* ...” in Trémaux, Voy. Soudan Oriental et dans l’Afrique Septentrionale, Atlas: pl. 13. 1853.

= *Euphorbia calycina* N.E.Br. in Oliver, Fl. Trop. Afr. 6(1): 597. 1912 – **Lectotype (designated here):** Sudan, Meschera-el-Rek, 2 Mar 1869, *G.A. Schweinfurth* 1259 (K!; isolectotype: BM!).

IS THE EAST AND NORTH-EAST AFRICAN SPECIES OFTEN RECENTLY REFERRED TO AS “EUPHORBIA CANDELABRUM KOTSCHY” DISTINCT FROM *E. INGENS*?

According to Carter (1988b: 486) the two are “very closely related” and “may eventually prove to be conspecific”. Gilbert (1995: 336) maintained of “*E. candelabrum* Kotschy” that “very closely related species, possibly conspecific, occur as far south as Natal (*E. ingens* E.Mey)”. Carter & Leach (2001: 398) stated that *E. ingens* is “very similar to *E. candelabrum* Kotschy from east and northeast Africa, and may be conspecific (according to L.C. Leach) [...] it seems most practical at

present to treat populations from the two regions as two species”.

A comparison of the descriptions in Carter (1988b, 1993) for “*E. candelabrum* Kotschy” and Carter & Leach (2001) for *E. ingens* reveals that there are no differences of any significance between them. In most details these descriptions are almost identical and this is reflected in the last two columns of Table 1. Since these descriptions deal with all the known taxonomically significant features for species of *Euphorbia*, these two species must be the same, corroborating Gilbert’s opinion and Leach’s view that they are the same. Comparison of the shapes of the trees and details of the flowering branches between Kenyan and South African specimens (Figs. 2A,D and 2C,F) also shows that they are the same, even down to such details as the red-tinted anthers.

We thus have a single widely distributed species (Fig. 7) that is found from the eastern side of South Africa to southern Ethiopia. Since *E. candelabrum* Kotschy is illegitimate and since it is unlikely that this name is applicable to these trees, they should be called *E. ingens*:

- Euphorbia ingens*** E.Mey. ex Boiss. in Candolle, Prodr. 15(2): 87. 1862 – **Lectotype (designated here)**: South Africa, Natal, in woods near Port Natal, 100', Apr 1832, *J.F. Drège 4614* (S No. S-G-2565!; isolectotypes: K!, P).
= *Euphorbia reinhardtii* Volken in Notizbl. Königl. Bot. Gart. Berlin 2: 263. 1899 ≡ *Euphorbia confertiflora* Volken in Notizbl. Königl. Bot. Gart. Berlin 2: 266. 1899, nom illeg. superfl. – Type: Tanzania, Lushoto Distr., Usambara Mtns, *C. Holst 8821* (B, destroyed).
= *Euphorbia similis* A.Berger, Sukkul. Euphorb.: 69. 1906 – Type: South Africa, Natal? (missing).
= *Euphorbia bilocularis* N.E.Br. in Oliver, Fl. Trop. Afr. 6(1): 594. 1912 ≡ *E. candelabrum* var. *bilocularis* (N.E.Br.) S.Carter in Kew Bull. 42: 681. 1987 – Holotype: Kenya, Machakos Distr., Kibwezi, *G. Scheffler 335* (K!; isotype: BM!).
= *Euphorbia tozzii* Chiov., Fl. Somalia 2: 407. 1932 – Holotype: Somalia, Upper Juba, Tonata Island, near Alessandra, Dec 1901, *R. Tozzi* (FT; isotype: K!).
– *Euphorbia candelabrum* auct. non S.Carter in Kew Bull. 42: 680. 1987; S.Carter in Polhill, Fl. Trop. East Afr., Euphorbieae 2: 485. 1988; S.Carter in Thulin, Fl. Somalia 1: 325. 1993; M.Gilbert in Edwards & al., Fl. Ethiopia & Eritrea 2(2): 336. 1995.

Note. – In Bruyns (2012) the specimen of *Drège 4614* at S was given as the holotype of *E. ingens* on account of annotations on it by Boissier. There are annotations on it in two different hands. One of these notes is clearly by Ernst Meyer but it is not certain that the other was by Boissier and so it is better to designate this specimen as a lectotype. This one is chosen as it is the most complete specimen seen so far of this collection.

AUTHOR CONTRIBUTIONS

PVB conceived and wrote paper, made drawings, took photographs, drew up the map. PEB made additional suggestions to improve manuscript.

LITERATURE CITED

- Andrews, F.W. 1952. *Flowering plants of the Anglo-Egyptian Sudan*, vol. 2. Arbroath: Buncle.
Berger, A. 1906 [“1907”]. *Sukkulente Euphorbien*. Stuttgart: Ulmer. <https://archive.org/details/sukkulenteeupho00berggoog>
Boissier, P.-E. 1862. Euphorbieae. Pp. 3–188 in: Candolle, A.P. de (ed.), *Prodromus systematis naturalis regni vegetabilis*, vol. 15(2). Parisii [Paris]: sumptibus Victoris Masson. <https://doi.org/10.5962/bhl.title.286>

- Brown, N.E.** 1911–1912 [“1913”]. *Euphorbia*. Pp. 470–603 in: Thiselton-Dyer, W.T. (ed.), *Flora of Tropical Africa*, vol. 6(1). Ashford: Reeve. <https://doi.org/10.5962/bhl.title.42>
- Bruyns, P.V., Mapaya, R.J. & Hedderson, T.** 2006. A new subgeneric classification for *Euphorbia* (Euphorbiaceae) in southern Africa based on ITS and *psbA-trnH* sequence data. *Taxon* 55: 397–420. <https://doi.org/10.2307/25065587>
- Bruyns, P.V., Klak, C., Hanáček, P.** 2011. Age and diversity in Old World succulent species of *Euphorbia* (Euphorbiaceae). *Taxon* 60: 1717–1733. <https://doi.org/10.1002/tax.606016>
- Bruyns, P.V.** 2012. Nomenclature and typification of southern African species of *Euphorbia*. *Bothalia* 42: 217–245.
- Bullock, A.A.** 1957. Notes on African Asclepiadaceae VIII. *Kew Bull.* 11: 503–522. <https://doi.org/10.2307/4109137>
- Carter, S.** 1982. New succulent spiny Euphorbias from East Africa. *Hooker's Icon. Pl.* 39: 1–118.
- Carter, S.** 1984. Volkens' species from Kilimanjaro: Euphorbias from East Africa, Part 2. *Euphorbia J.* 2: 51–53.
- Carter, S.** 1985. *Euphorbia candelabrum*, a question of validity (Euphorbiaceae). *Taxon* 34: 699–701. <https://doi.org/10.2307/1222222>
- Carter, S.** 1987. New species and taxonomic changes amongst the succulent trees and shrubs of *Euphorbia* subgen. *Euphorbia* from East Africa. *Kew Bull.* 42: 673–682. <https://doi.org/10.2307/4110076>
- Carter, S.** 1988a. *Euphorbia candelabrum*: A controversial name. *Euphorbia J.* 5: 105–107.
- Carter, S.** 1988b. Euphorbiaceae. Pp. 409–564 in: Polhill, R.M. (ed.), *Flora of Tropical East Africa: Euphorbiaceae* (part 2). Rotterdam: A.A. Balkema.
- Carter, S.** 1993. *Euphorbia*. Pp: 306–337 in: Thulin, M. (ed.), *Flora of Somalia*, vol. 1. Richmond: Royal Botanic Gardens, Kew.
- Carter, S. & Leach, L.C.** 2001. Tribe Euphorbiaceae. Pp: 339–465 in: Pope, G.V. (ed.), *Flora Zambesiaca*, vol. 9(5). Richmond: Royal Botanic Gardens, Kew.
- Dyer, R.A.** 1957. The classification of species of *Euphorbia* with stipular spines. *Bull. Jard. Bot. Bruxelles* 27: 487–493. <https://doi.org/10.2307/3667080>
- Furtado, C.X.** 1967. Some notes on *Hyphaene*. *Garcia de Orta* 15: 427–460.
- Gilbert, M.G.** 1995. Euphorbiaceae. Pp. 265–380 in: Edwards, S., Mesfin Tadesse & Hedberg, I. (eds.), *Flora of Ethiopia and Eritrea*, vol. 2(2). Uppsala: Uppsala University; Addis Ababa: Addis Ababa University.
- Hiern, W.P.** 1900. *Catalogue of the African plants collected by Dr. Friedrich Welwitsch in 1853–61*, vol. 1(4). London: printed by order of the Trustees. <https://doi.org/10.5962/bhl.title.10876>
- Kotschy, T.** 1857a. Allgemeiner Ueberblick der Nilländer und ihrer Pflanzenbekleidung. *Mitth. K. K. Geogr. Ges. Wien* 1(2): 156–182.
- Kotschy, T.** 1857b. Die Nilländer und deren Pflanzenbekleidung. *Bonplandia* 5: 174–177.
- Leach, L.C.** 1974. *Euphorbia succulentae Angolensis*: IV. *Garcia de Orta, Sér. Bot.* 2: 31–54.
- Leach, L.C.** 1981. *Euphorbia candelabrum* Welw. versus *Euphorbia candelabrum* Kotschy. *Taxon* 30: 483–465. <https://doi.org/10.2307/1220156>
- Leach, L.C.** 1986. *Euphorbia candelabrum* Welw. and related matters. *Taxon* 35: 711–714. <https://doi.org/10.2307/1221622>
- Leach, L.C.** 1992. *Euphorbia candelabrum* auctt. *Collectanea Bot. (Barcelona)* 21: 91–95. <https://doi.org/10.3989/collectbot.1992.v21.96>
- Miller, P.** 1768. *The gardeners dictionary*, 8th ed. London: printed for the author. <https://doi.org/10.5962/bhl.title.541>
- Monteiro, J.J.** 1875. *Angola and the River Congo*, 2 vols. London: Macmillan & Co. <https://archive.org/details/angolarivercongo001mont>; <https://archive.org/details/angolarivercongo02mont>
- Rozeira, A.** 1968. *Tavaresia angolensis* Welw. *Garcia de Orta* 16: 277–284.
- Trémaux, P.** 1853. *Voyages au Soudan oriental et dans l'Afrique septentrionale*, Atlas. Paris: chez Borrani. https://archive.org/details/gri_33125008247146
- Welwitsch, F.** 1854. Semina Plantarum. *Ann. Cons. Ultramar. (Portugal), Parte Não Off.* ser. 1: 79–84.

Welwitsch, F. 1855. [Extracts from a letter to Richard Kippist]. *Proc. Linn. Soc. London* 2: 327–329.

Welwitsch, F. 1856. Relação das plantas vivas etc. da flora Angolense que foram remetidas de Loanda, em 21 de Agosto de 1854, ao Conselho Ultramarino, pelo Dr. Welwitsch, com o destino a serem enviadas ao Jardim Botânico de Coimbra, e a outros estabelecimentos hortícolas de Lisboa. *Ann. Cons. Ultramar. (Portugal), Parte Não Off.* ser. 1: 251–253.
<https://catalog.hathitrust.org/Record/011352312>

White, A., Dyer, R.A. & Sloane, B.L. 1941. *The succulent Euphorbieae (southern Africa)*. Pasadena: Abbey Garden Press.

Figure captions [NOTE to typesetter: figures have been prepared to final size – minor adaptations allowed: Use Figs. 1 and 2 two columns wide; Fig. 3; 13 cm wide with caption two columns wide below the drawing; Figs. 4-6: two columns wide; Fig. 7: one column wide]

Fig. 1. *Euphorbia candelabrum* Welw. and *E. abyssinica* J.F.Gmel. **A**, *E. candelabrum*, two trees south of Sumbe, Angola; **B**, *E. candelabrum*, flowering and fruiting branch, east of Sumbe, Angola; **C**, *E. candelabrum*, young tree ± 1.5 m tall, east of Egito Praia, Lobito, Angola. **D**, *E. abyssinica*, tree near Adishihu, Ethiopia; **E**, *E. abyssinica*, fruiting branches on tree near Adwa, Ethiopia. **F**, *E. abyssinica*, young plant ± 0.5 m tall, with 8-angled stem, near Adishihu, Ethiopia. — Photos: P.V. Bruyns.

Fig. 2. *Euphorbia ingens* E.Mey ex Boiss. **A**, Tree near Isiolo, Kenya; **B**, Fruiting branch, near Penge, South Africa; **C**, Part of flowering branch, north of Narok, Kenya; **D**, Tree near Zion City, South Africa (with *Aloe marlothii*); **E**, Young tree ± 1 m tall, with 5-angled stem, near Zion City, South Africa; **F**, Part of flowering branch, Pretoria, South Africa. — Photos: P.V. Bruyns.

Fig. 3. Ovaries with “calyx” in several species of *Euphorbia* sect. *Euphorbia*. **A**, *E. confinalis* (South Africa, Komatipoort, Bruyns s.n.), without any visible “calyx” (scale bar 1 mm, as for B–D); **B**, *E. radyeri* Bruyns (South Africa, Jansenville, Bruyns s.n.), “calyx” small but present; **C**, *E. lividiflora* L.C.Leach (Moçambique, Bruyns 7684 [BOL, E]), with more prominent “calyx”; **D**, *E. ingens* (South Africa, ex hort. NBG), “calyx” consisting of several filiform parts equalling the ovaries. — Drawn by P.V. Bruyns.

Fig. 4. Plate 1 “Travelling in Angola – View near Ambriz”, from Monteiro (1875). Drawing by Rose Monteiro, showing *E. candelabrum* Welw. and *Adansonia digitata* L. dominating the characteristic dry bush near Ambriz, north of Luanda, Angola.

Fig. 5. Plate 13 of Trémaux (1853) with *E. mammillaris* (on the left, later renamed *E. venefica* by Kotschy, 1857a) and *E. canariensis* (on the right, later associated with the name “*E. candelabrum* Kotschy”).

Fig. 6. Plate 14 of Trémaux (1853) with *E. mammillaris* (later renamed *E. venefica* by Kotschy, 1857a) and *E. canariensis* (later associated with the name “*E. candelabrum* Kotschy”).

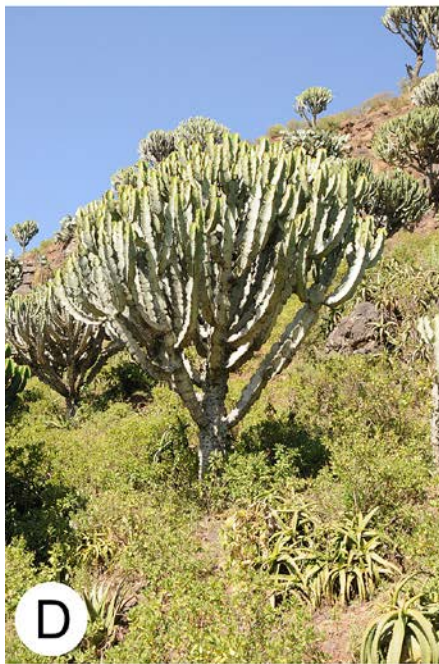
Fig. 7. Approximate distribution of *Euphorbia ingens* E.Mey. ex Boiss. (50% grey area) along the eastern side of Africa from South Africa to southern Ethiopia. Approximate distribution of *E. candelabrum* Welw. (narrow black area, indicated by arrow), endemic to the coastal strip of central and northern Angola.

Table 1. Differences between the species closely related to *Euphorbia ingens* and the two different interpretations of “*E. candelabrum* Kotschy”.

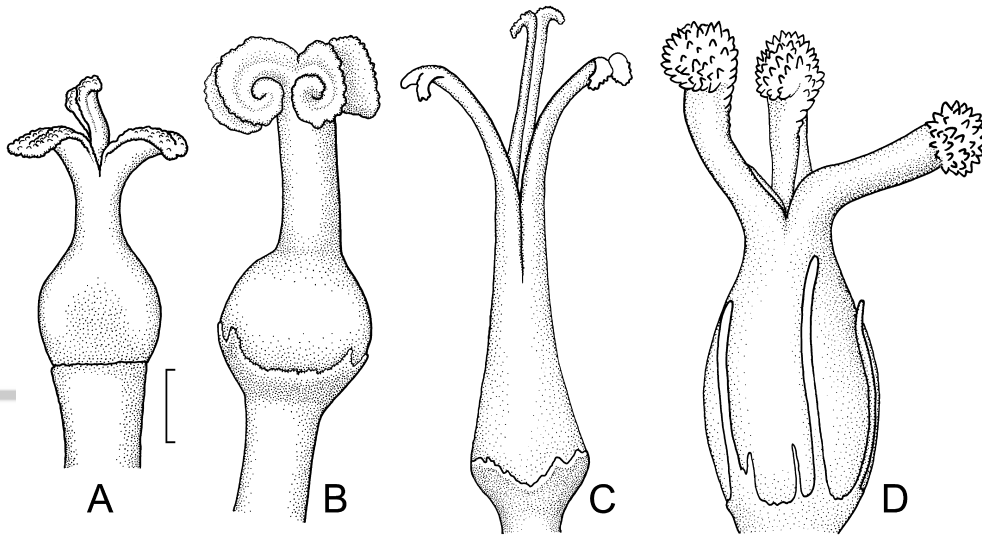
	<i>E. abyssinica</i> J.F.Gmel.	<i>E. ampliphylla</i> Pax	<i>E. murielii</i> N.E.Br. (incl. <i>E. calycina</i> N.E.Br. and “ <i>E. candelabrum</i> Kotschy”)	“ <i>E. candelabrum</i> Kotschy” of Carter (1988b, 1993) and Gilbert (1995)	<i>E. ingens</i> E.Mey. ex Boiss. of Carter & Leach (2001)
Distribution	Eritrea, Ethiopia, Somaliland, Sudan (Carter, 1993; Gilbert, 1995)	Ethiopia, Kenya, Malawi, Tanzania, Uganda (Carter, 1988b; Gilbert, 1995)	Sudan	Ethiopia, Kenya, Malawi, Somalia, Sudan, Tanzania, Uganda, Zaire, Zambia [S. Sudan & Ethiopia southwards to Zambia & Malawi, Carter, 1993] [to South Africa (Natal) & west to Cameroon, Gilbert, 1995]	Angola, Botswana, Ethiopia, Kenya, Malawi, Moçambique, Namibia, Somalia, South Africa, Swaziland, Tanzania, Uganda, Zaire, Zambia, Zimbabwe
Young, unbranched stem	6- to 9-angled (Gilbert, 1995) 8-angled (Brown, 1912)	3- to 4-angled	?	4- to 5-angled	4- to 5-angled
Ultimate branchlets	With numerous constrictions (Brown, 1911–12), (3–)4(–5)-angled	constricted into segments, (3–)4(–5)-angled	Slightly constricted but joints of equal diameter throughout (<i>E. murielii</i>) very slightly constricted (<i>E. calycina</i>) slightly constricted (Andrews, 1952), 4- to 5-angled	± constricted at irregular intervals into oblong segments (Carter, 1988b), (3–)4(–5)-angled	Constricted at irregular intervals into oblong segments (Carter & Leach, 2001), (3–)4(–5)-angled
Cross-section of ultimate branchlets	Sharply (3–)4(– 5)-angled (Carter, 1988b) wing-like angles (Brown, 1911–12)	3(–4)-angled, deeply and thinly winged (Carter, 1988b)	4-winged (Andrews, 1952)	Square to distinctly winged (Carter, 1993), with wings to 2.5 cm wide (Carter, 1988b)	Square to distinctly but stoutly winged with wings to 3 cm wide (Carter & Leach, 2001)
Leaves on young, unbranched stem	Oblanceolate, to 25 × 8 mm (Carter, 1993) [actually to ±70 mm long]	Oblanceolate, to 15 × 6 cm (Carter, 1988b; Carter & Leach, 2001) 6–20 × 2–7 cm (Gilbert, 1995)	?	To 7 × 1.5 cm (Carter, 1988b, 1993)	Oblanceolate, to 8 × 2 cm (Carter & Leach, 2001)
Leaves on ultimate branches	Deltoid ±5 × 5 mm	Oblanceolate 6–20 × 2–7 cm (Gilbert, 1995)	Scale-like (<i>E. calycina</i>), ±2 × 2 mm, triangular (<i>E. murielii</i>)	Deltoid ±5 × 5 mm (Carter, 1988b, 1993)	Deltoid ±3 × 3 mm (Carter & Leach, 2001)
Ovary	Included in cyathium	Included in cyathium	Ovary exerted just	Included in cyathium	Included in cyathium

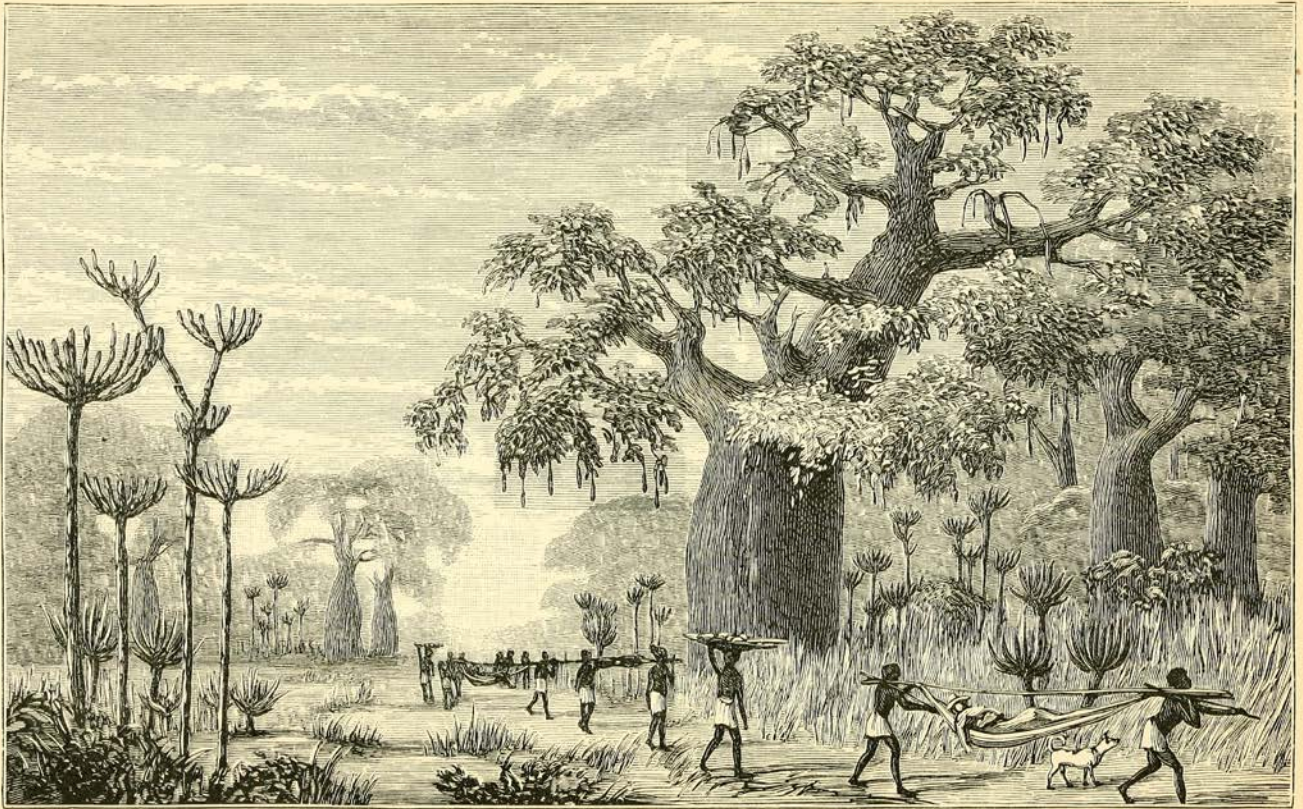
beyond stamens on
pedicel as long as
involucre and curved
to one side

Capsule	Dehiscent $\pm 15 \times 20$ mm (Carter, 1993) 9–13 \times 14–22 mm (Gilbert, 1995) [Fig. 3E]	Dehiscent? fleshy $\pm 9.5 \times 11$ mm (Gilbert, 1995) to 12 \times 16 mm (Carter, 1988b; Carter & Leach, 2001).	? $\pm 6 \times 8$ mm (<i>E. murielii</i>)	Indehiscent (fleshy) $\pm 8 \times 12$ mm (Carter, 1993) ± 5 –7 \times 10 mm (Gilbert, 1995)	Indehiscent (fleshy) 7 \times 10 mm (Carter & Leach, 2001) [Fig. 4B]
	exserted on stout erect pedicel 5 mm long (Carter, 1993)	pedicel stout erect, 3 mm long (Carter, 1988b; Carter & Leach, 2001)	exserted on stout pedicel at least 5 mm long	shortly exserted on stout erect pedicel \pm 5 mm long (Carter, 1988b, 1993)	shortly exserted on stout erect pedicel 5 mm long (Carter & Leach, 2001)









TRAVELLING IN ANGOLA—VIEW NEAR AMBRIZ.

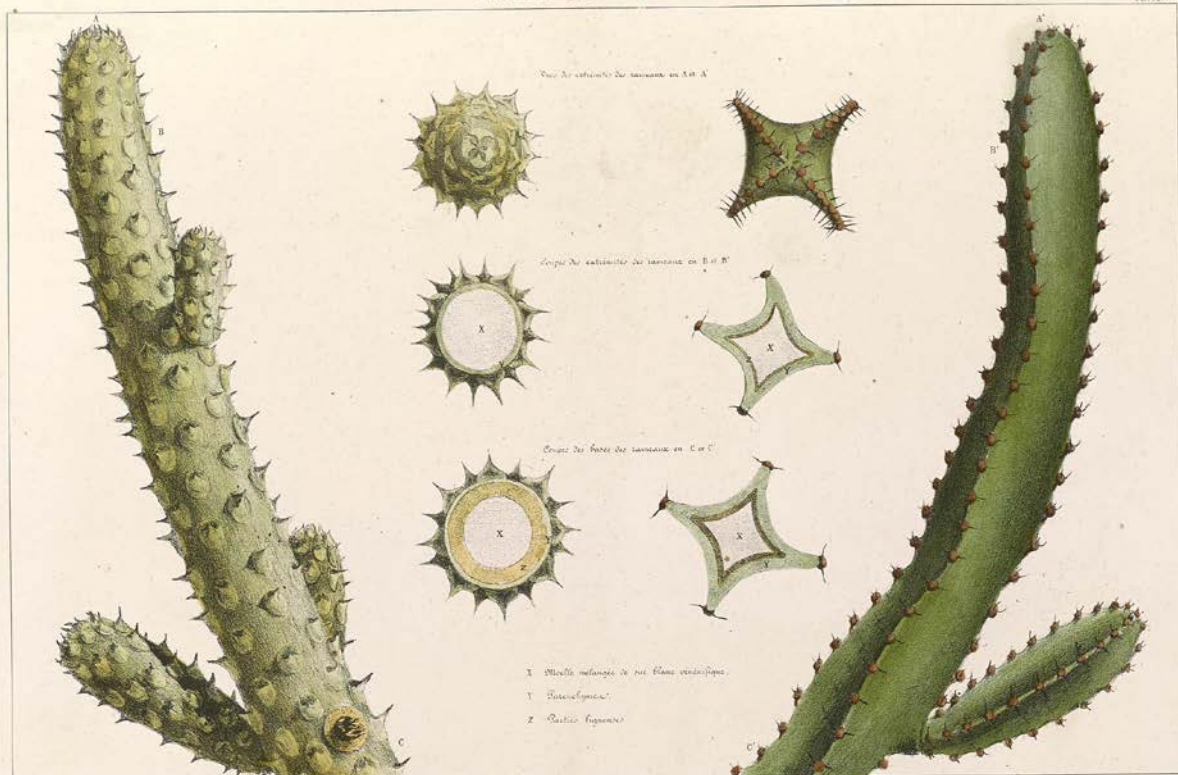
To face page 23.



Un spécimen de l'espèce cultivée et l'autre par l'original.

Lith. Deless. 28, y. Paris chez Poir.

Euphorbia manillaris Espèce nouvelle. VUE DE KAÇANE, Variété de l'espèce *Euphorbia canariensis*.
Village de la Nigritie et Euphorbes arborescentes, avec lesquelles les Nègres empoisonnent leurs armes.



Detail de l'aspect naturel et de la partie tuberculeuse.

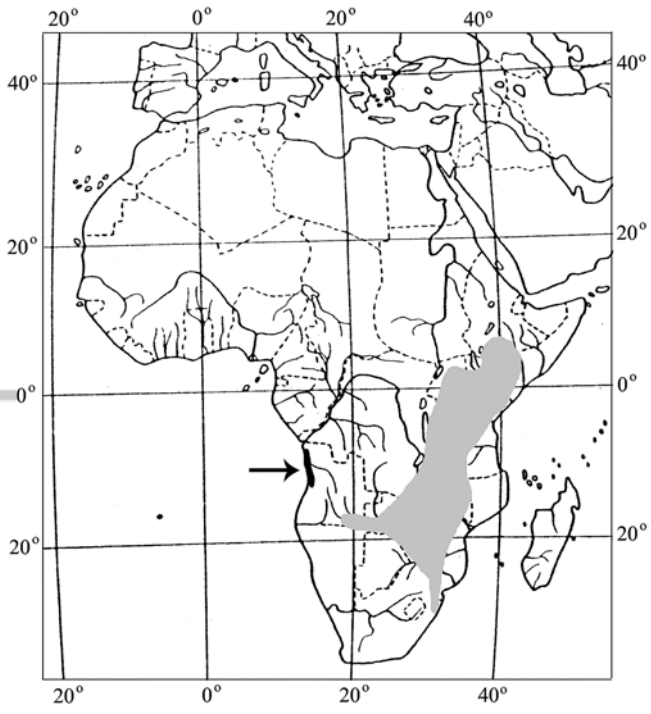
Euphorbia mamillaris.

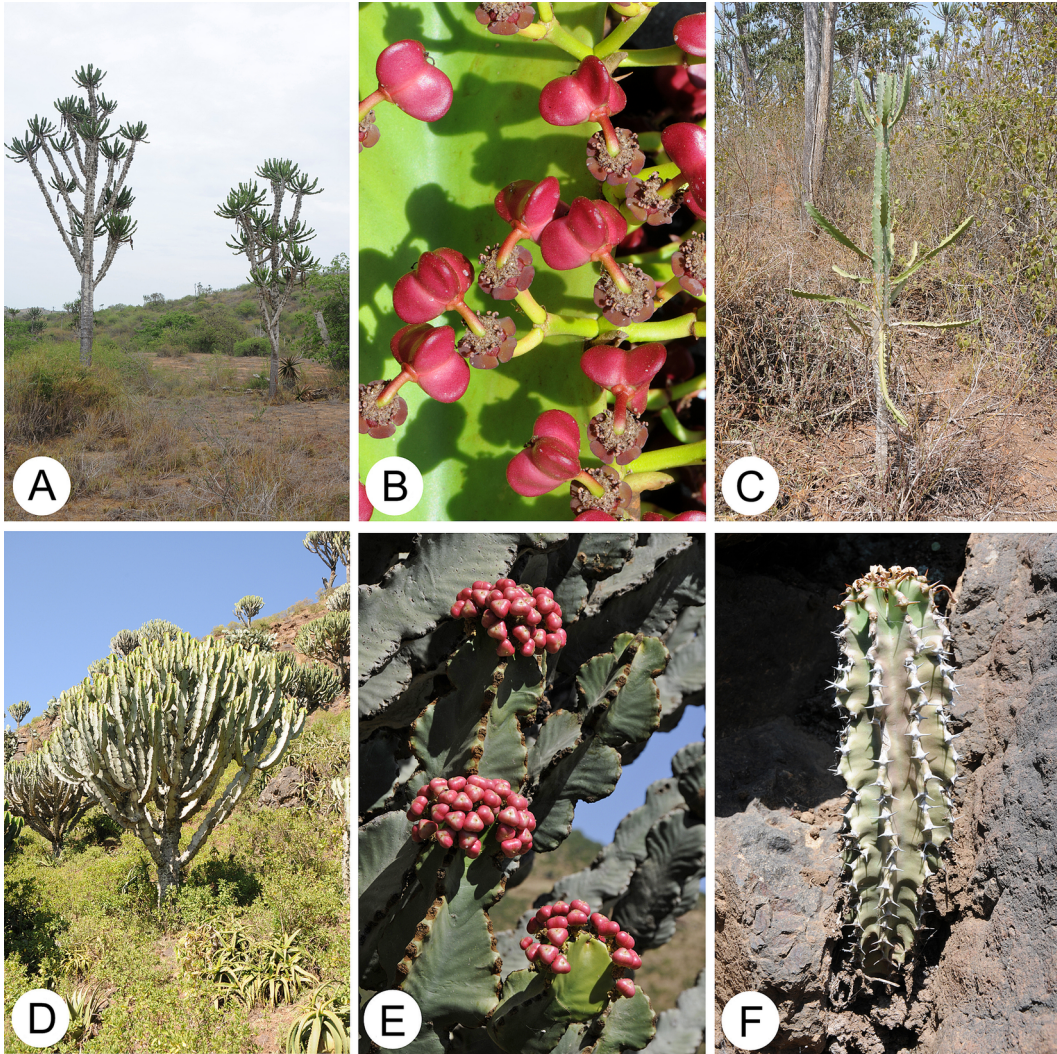
DÉTAILS DES EUPHORBES.
Plantes venant de l'Afrique.

Euphorbia canariensis.

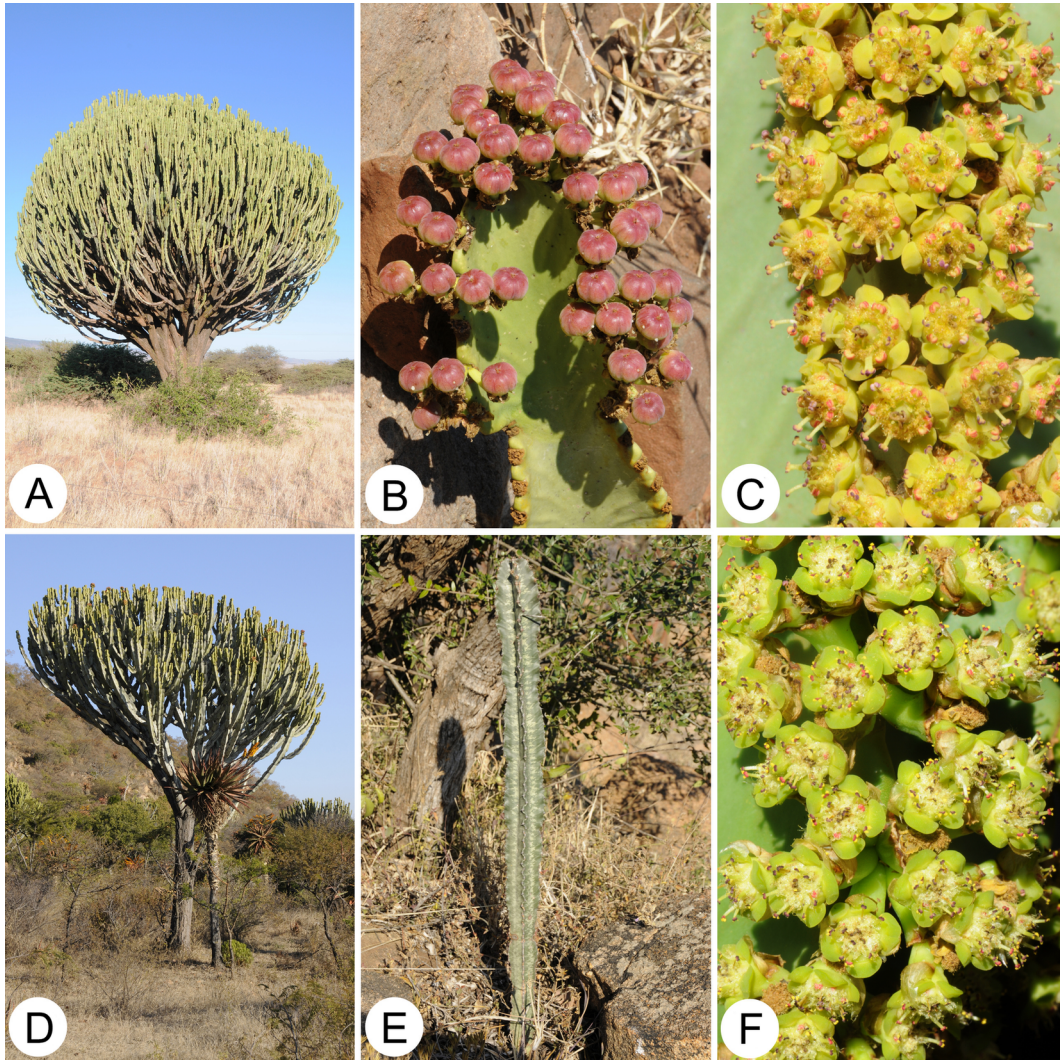
Imp. chez Goussier, Palais National, Paris.

Author Manuscript

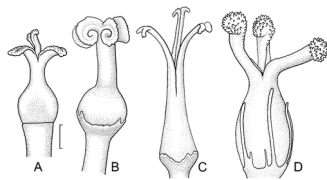




TAX_12091_Figure 1_RGB_LZW.tif



TAX_12091_Figure 2_RGB_LZW.tif



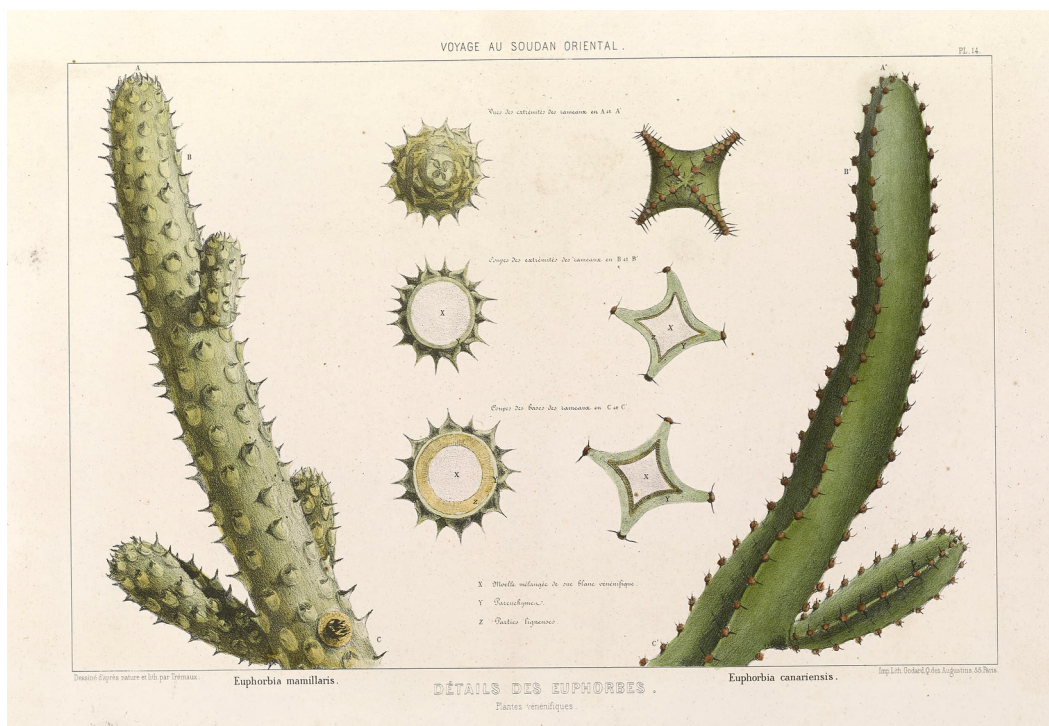
TAX_12091_Figure 3.tif



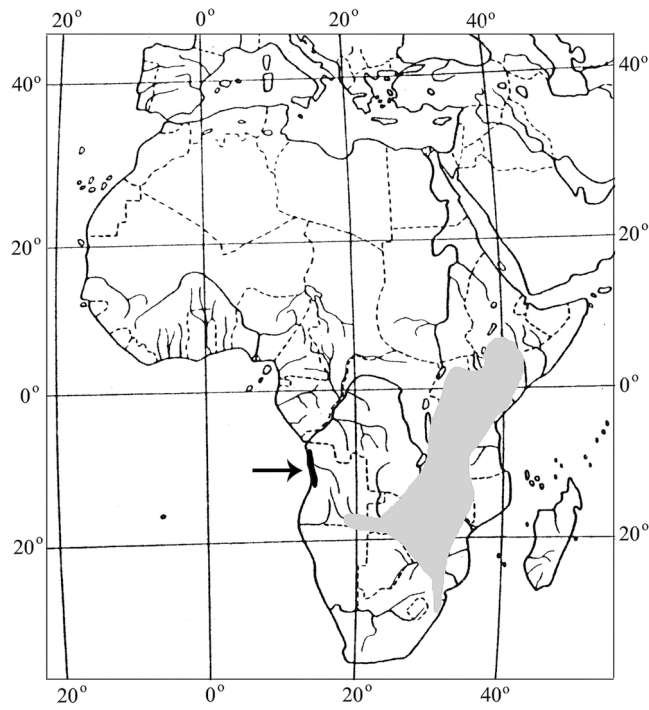
TAX_12091_Figure_4_RGB_LZW.tif



TAX_12091_Figure_5_RGB_LZW.tif



TAX_12091_Figure_6_RGB_LZW.tif



TAX_12091_Figure_7_GRAY_LZW.tif