



Taxonomy and chorology of *Corbichonia* (Lophiocarpaceae s.l.) with further description of a new species from Southern Africa

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Abstract

A re-examination of the herbarium material has allowed to describe a new species, *Corbichonia exellii*, occurring in Southern Africa (Angola, Namibia and South Africa). *C. exellii* represents the third species in the genus. Morphological differences between all three *Corbichonia* species (*C. decumbens*, *C. rubriviolacea*, and *C. exellii*) are provided. The description of the genus is defined using the newly discovered characters (reproductive features). The taxonomy of all *Corbichonia* species (synonyms included) is provided, as well as maps for all species. The lectotypes of *Orygia decumbens* (basonym of *Corbichonia decumbens*) and *O. mucronata* (synonym of *C. decumbens*) are designated on specimens preserved, respectively, at BM and K. The genus *Corbichonia*, recently placed in *Lophiocarpaceae*, is markedly different from the core genus *Lophiocarpus* on the basis of embryological, morphological and carpological characters, and deserves further investigation concerning its taxonomic status.

Key words: Africa, *Corbichonia*, distribution, Lophiocarpaceae, new species

Introduction

The genus *Corbichonia* Scopoli (1777: 264) belongs to the order Caryophyllales Juss. ex Bercht. & J. Presl, but its systematic position was unstable for a long time. Previously, *Corbichonia* was included within Aizoaceae Martinov [e.g., Pax 1889, Pax & Hoffmann 1934 (sub *Orygia* Forsskål (1775: 103)), Hauman 1951, Adamson 1958, Jeffrey 1960, Nazir 1973] or Molluginaceae Bartl. (Fenzl 1836, Harvey & Sonder 1860, Endress & Bittrich 1993, Hofmann 1973, 1994, Sivarajan 1988, Pullaiah 2003) having some morphological similarities in the reproductive characters with both families. Recently, the separate position of *Corbichonia* from Aizoaceae or Molluginaceae was discovered on the basis of molecular data, and it was placed in the so-called ‘Globular Inclusion’ clade as a sister group to *Lophiocarpus* Turczaninow (1843: 55) (Cuénoud *et al.* 2002). The latter genus forms its own family Lophiocarpaceae Doweld & Reveal (2008: 416), which now consists of two genera: core genus *Lophiocarpus* and *Corbichonia* automatically included in this family (Schäferhoff *et al.* 2009, Brockington *et al.* 2013).

Corbichonia unites glaucous, almost glabrous annual or perennial herbs, sometimes with a basally lignified stem; with alternate, shortly-petiolate leaves with broad (obovate, ovoid or oblong) blades terminating in a short tip; bracteose inflorescences; 5 green sepals and numerous petals of staminodial origin; 10–20 normally developed stamens; 5 episepalous carpels bearing a dehiscent loculicidal capsule with many seeds. Only two *Corbichonia* species are known so far. The annual or short-leaved perennial *Corbichonia decumbens* (Forsskål 1775: 103) Exell (1935: 80) has an extended distribution pattern in the tropical (mostly arid) regions of Africa, Arabia and Indian subcontinent (Nazir 1973, Ghazanfar & Fisher 1998). The second species [*C. rubriviolacea* (Friedrich in Suessenguth *et al.* 1953: 340) C. Jeffrey (1960: 235)] is a perennial herb that is clearly distinguished by smaller leaves (up to 2.5 cm) and flowers, with records in southwest Africa (sub *Orygia rubriviolacea* Friedrich in Suessenguth *et al.* 1953: 340). Specimens of *Corbichonia decumbens* that have been examined are different in some characters (especially leaf shape and seed-coat ornamentation) and require further investigation.

The main goals of the present study are (1) to examine the taxonomy and chorology of *Corbichonia*, with the

description of a new species from Southern Africa, and (2) to reveal all possible differences between *Lophiocarpus* and *Corbichonia* as genera now combined in Lophiocarpaceae.

Material and Methods

The review of the material was undertaken in the herbaria B, BM, E, H, K, HUI, LE, MHA, MW, P¹, UZH², W (acronyms follow Thiers 2014+). The specimens examined were used for the mapping of the distribution patterns of all *Corbichonia* species (see Appendix). The seed surface of genus representatives was observed using SEM (JSM-6380, JEOL Ltd., Japan) at 15 kV after critical-point drying and sputtercoating with gold-palladium. The anatomical cross-sections of the seeds were made by hand.

Taxonomic treatment

Corbichonia Scopoli (1777: 264) ≡ *Axonotechium* Fenzl (1836: 354).

Holotype:—*Corbichonia decumbens* (Forsskål 1775: 103) Exell (1935: 80).

Description:—Branched annual or perennial herbs (sometimes suffruticose) up to 70 cm, with glabrous or scarcely pubescent, angular or rounded stems; leaves alternate, exstipulate, shortly-petiolate, orbicular, obovate, ovoid or oblong, usually fleshy and glaucous or greyish; inflorescence bracteose, monochasial, branched; sepals 5, free, with whitish or lilac margins; petals (staminodial origin) 15–30, pink, lilac or rarely white; 10 to 20 normally developed stamens located in two (alternisepalous and antisepalous) whorls; stylodia 5, free and long; ovary superior, 5-locular; fruit a loculicidal capsule with the central column and accrescent septae; seeds 20–50, reniform, shiny, black, 1–1.2 mm long, with small hyaline funicular aril; seed-coat testa hard, 50–65 µm thick, with radial furrows, its outer (periclinal) cell walls convex, with obliquely oriented stalactites, with or without cylindrical outgrowths at the top, anticlinal walls warty; tegmen thin, up to 4 µm, 1–2-layered, with bar-thickening walls; embryo annular; perisperm abundant.

Notes:—*Corbichonia* was described by Scopoli (1777) who listed “*Orygia decumbens*” without transferring this species into the established genus, and the combination *Corbichonia decumbens* (Forsskål) Scopoli cannot be accepted (art. 35.2 of ICN, McNeill *et al.* 2012). The description of the genus *Orygia* Forsskål (1775: 103) is clearly based on *Orygia portulacifolia* Forsskål (1775: 103) with sepals consisting of two segments, and a three-loculicidal capsule that is peculiar to the genus *Talinum* Adanson (1763: 245). *O. portulacifolia* was later transferred to the genus *Talinum* [*T. portulacifolium* (Forsskål) Ascherson ex Schweinfurth (1896: 172)]. The genus *Orygia* with the lectotype *O. portulacifolia* (Exell, 1935) is thus synonymized with the genus *Talinum*.

Here the description of *Corbichonia* is improved with two details: (1) the number of staminodial petals can reach 30 (not only 20 according to all earlier descriptions), and (2) the cells of seed-coat testa have cylindrical outgrowths only in *C. decumbens* (Hassan *et al.* 2005), and they are absent in both *C. exellii* sp. nova and *C. rubriviolacea*.

The seeds of *Corbichonia* species are typical for the core Caryophyllales (for more see Sukhorukov *et al.* 2015), with hard seed-coat testa, thin tegmen with cells having bar-thickened walls, annular embryo and copious perisperm. Three species in Africa and Asia; all species are found in southwest Africa.

1. *Corbichonia decumbens* (Forsskål 1775: 103) Exell (1935: 80). (Fig. 1 A–B).

Bas.: *Orygia decumbens* Forsskål (1775: 103) ≡ *Portulaca decumbens* (Forsskål 1775: 103) Vahl (1790: 33) ≡ *Talinum decumbens* (Forsskål 1775: 103) Willdenow (1799: 864)

Type (lectotype designated here by A. Sukhorukov):—[no information about the locality, date and collector³] (BM-000944675¹, isotype C). Image of the lectotype available at <https://plants.jstor.org/stable/history/10.5555/al.ap.specimen.bm000944675>

1 Images of *Corbichonia* are available at: <http://science.mnhn.fr/institution/mnhn/collection/p/item/search>. Some of them can be identified precisely without a closer look, and have been cited in this article.

2 Images of *Corbichonia* are available at: http://www.herbarien.uzh.ch/static/database/artenliste_en.php?l=&spCouCod=&spTaxFlg=A&spFam=&spGen=Corbichonia&spSpeEpi=&spInfEpi=&spSpeAut=&spColNam=&spCou=&spTaxFlg=A&spTypFlg=%25&spHer=%25&sort=familie&Submit=Suchen. Some of them can be identified precisely without a closer look, and have been cited in this article.

3 The possible location of the authentic specimens is in “Musa” (Forsskål 1775: 103), West Yemen, probably Ta’izz governorate, near Mocha [“Taaes, Musa vicus Mochhae proximus” (Forsskål 1775: 90)].

= *Axonotechium trianthemoides* (B. Heyne 1821: 231) Fenzl (1836: 355).

Bas.: *Glinus trianthemoides* B. Heyne in Roth (1821: 231).

Type: not designated⁴.

= *Telephium laxiflorum* Candolle (1828: 366).

Type:—"Catalogus geographicus plantarum Africae australis extratropicae", *Portulaca*, *Burchell 205A* (holotype, G-DC-G00488203!) (Fig. 2).

= *Orygia mucronata* Klotzsch in Peters (1862: 140) ≡ *Glinus mucronatus* (Klotzsch in Peters 1862: 140) Klotzsch in Peters (1864: 570).

Type (lectotype designated here by Sukhorukov):—MOZAMBIQUE. [Tete province]: Rios de Sena (Tette) [Tete], *Dr. Peters 8* (K-000232039!). Image of the lectotype available at <http://www.kew.org/herbcatimg/37563.jpg>

Typification of *Orygia mucronata*:—The specimen cited is certainly part of the original Peters' collection. The authentic material at B has been missing, perhaps, since the mid-1940s (Robert Vogt, pers. comm.). The specimen at K bears a perennial herb or a subshrub collected in the early reproductive stage with two unripe fruits and many flowers. Despite this, the seeds distinctly possess the papillae-like outgrowths on the seed surface like in *C. decumbens*. Klotzsch (in Peters 1862–1864) distinguished *O. mucronata* from *O. decumbens* s. str. in several characters (suffruticose habit, absence of the petals, and different number of stamens). The restricted number of flowers on the authentic specimen or lack of additional material does not allow a precise confirmation of Klotzsch's conclusion about the total absence of petaloid staminodia in all perennial individuals of *Corbichonia* from East Africa. Further field investigations need to clarify whether perennial forms of *C. decumbens* from Eastern Tropical Africa (Ethiopia, Kenya, Tanzania, and Mozambique) are distant from annual *Corbichonia*, or whether *C. decumbens* can form both annual and perennial life forms. However, such suffruticose individuals are seen on the specimens from diverse African or Asian locations. The synonymization of *Corbichonia decumbens* with *Orygia mucronata* can still be accepted, but with some doubt.

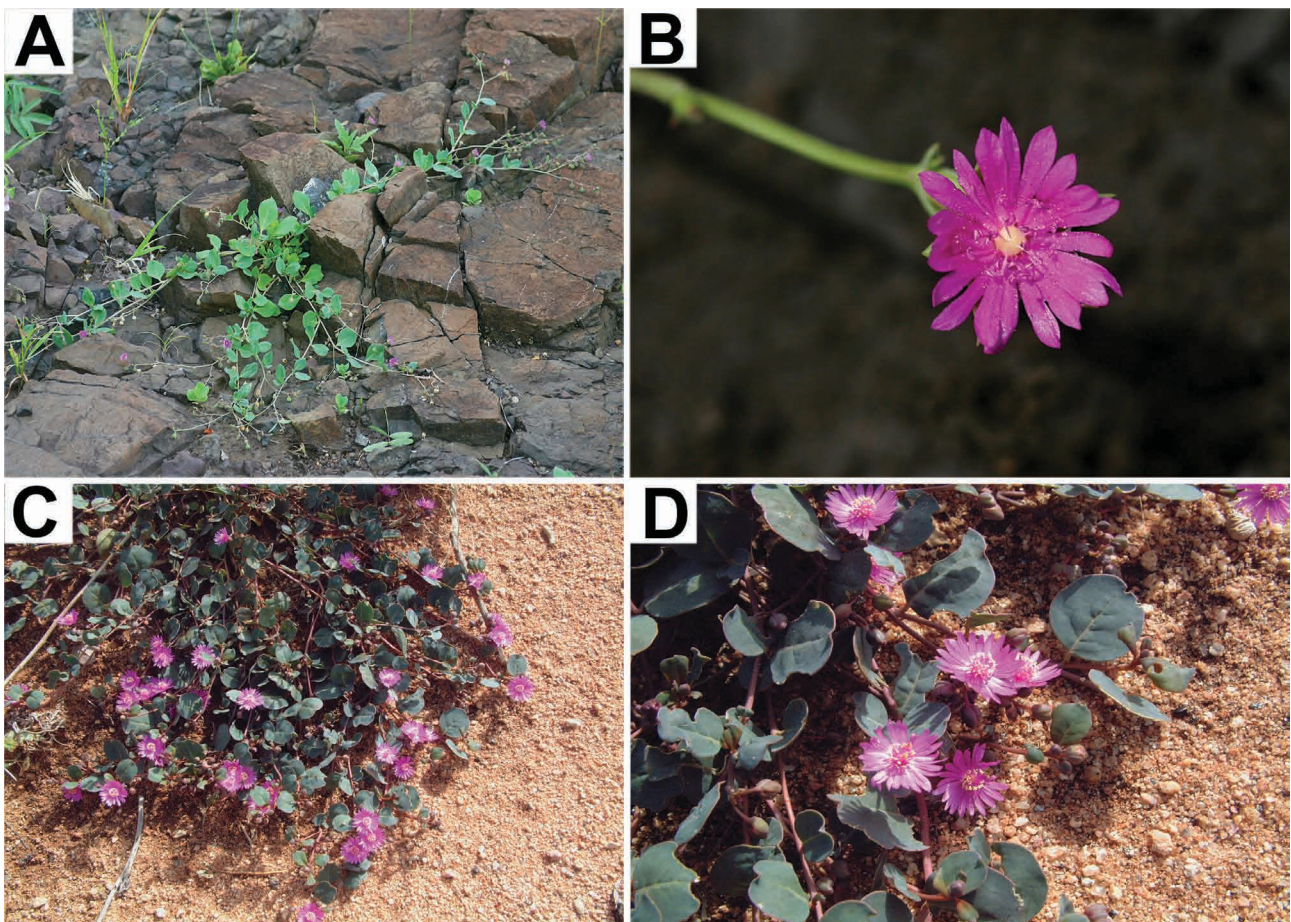


FIGURE 1. Images of *Corbichonia decumbens* (photo by B. Wursten) and *C. rubrivioleacea* (photos by S. Rügheimer *et al.*). **A)** *C. decumbens*, general view (ZIMBABWE. Masvingo province: Malilangwe Wildlife Reserve, 21°6'S 31°52'E, 360 m), **B)** *C. decumbens*, flower (MOZAMBIQUE. Sofala province: Chitengo Camp, Gorongosa National Park, 18°58'47" S 34°21'8" E, 37 m, 29 January 2007), **C)** *C. rubrivioleacea*, general view (SW Africa, without precise location), **D)** *C. rubrivioleacea*, flowers (SW Africa, without precise location).

4 Described from East India without precise location: the type specimens of *G. trianthemoides* are not known, but determinations of B. Heyne were seen at Kew herbarium.

2. *Corbichonia rubrivioleacea* (Friedrich in Suessenguth *et al.* 1953: 340) C. Jeffrey (1960: 235). (Fig. 1 C–D).

Bas.: *Orygia rubrivioleacea* Friedrich (1953: 340).

Type:—SOUTH AFRICA. [Karas region]: Schlucht in der Mulde hinter Nambons, Friedenfelde, Blinkoog, Kraut auf klippigem Boden, [without date] *E. Walter & H. Walter 2366* (holotype, M-0107807! [photo]). Image of the holotype available at <http://plants.jstor.org/stable/10.5555/al.ap.specimen.m0107807>

Notes:—The specimens matching *C. rubrivioleacea* were earlier observed by Dinter (1924) who pointed out that the flowers are relatively small (approximately 15 mm in diameter). He was not able to provide more details on the taxonomy of these specimens due to the lack of other reproductive characters for comparison purposes.

3. *Corbichonia exellii* Sukhor. *sp. nov.*

Type:—ANGOLA. Mossamedes [Namibe province]: 74 km from Mossamedes, Montemor, dry scrub, ca. 500 m, 19 May 1937, *Exell & Mendonça 2186* (holotype, BM-001122713!) (Fig. 3).

Description:—Plants up to 50 cm, very branched from the base; insignificantly lignified white perennial stems bearing angular, upright or ascending annual shoots (Fig. 4A) that are glabrous or sometimes can be covered with solitary simple and short-stalked glandular hairs; all leaves fleshy, glaucous, cuneate, apex shortly mucronate; lowermost leaves obovate, 3.0–7.0 × 1.5–3.0 cm, middle and upper leaves oblong or ovoid (Fig. 4B), with shortened vegetative shoots in their axils; inflorescences monochasial looking umbel-like (Fig. 4C); sepals approximately 4 mm, slightly accrescent (to 6 mm) in fruit; 20–30 petal-like staminodia (Fig. 4D), mauve or pink; stamens 20 or more, anthers white; capsule orbicular, 6–7 mm in diameter, papery; seeds numerous, 1.0–1.2 mm, reniform; testa cells without papilla-like elongations (Fig. 5 G, H, I).

Habitat:—Scrubs, limestone, deserts and ruderal sites; 0–700 m a.s.l. (upper extent of the altitude is not precisely known).

Phenology:—Flowering December–June; fruiting February–July.

Conservation status:—The appropriate data on abundance and/or distribution of the taxon is lacking. It can be included in the Not Evaluated (NE) category of IUCN Red List categories (IUCN 2014) as there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status.

Specimens examined:—ANGOLA. **Namibe:** Mossamedes inter 14 & 16 lat., 1859 & June 1860, *Welwitsch 2418* (BM, K); 108 km from Mossamedes railway, 28–30 April 1909, *Pearson 2800, 2863* (K); Mossamedes, Capangombe, June 1950, *Teixeira 316* (BM); Mossamedes, 10 January 1956, *Santos 134* (BM); Mossamedes, Caracul, 5 May 1962, *Azancot de Menezes 248* (K, P—photo!); **Zaire:** Lengue, 19 December 1932, *Gossweiler 689* (BM, K). **NAMIBIA.** [Omaheke Region/Otjozondjupa Region] Hereroland, 1898, *Dinter 66* (UZH-000075600—photo!); [Karas region] Great Karasberg [Karasburg], on loose step shale slopes in Waterfall ‘Alt Ravine’, common locally, bush with prostrate or ascending branches, fl. crimson, 21 January 1913, *Pearson 8582* (BM); [Erongo region] Brandberg, 2000 ft, 9 April 1950, *Macdonald 582* (BM). **SOUTH AFRICA. KwaZulu-Natal:** Natal, 3000–4000 ft, April 1914, *Wood 5391* (BM); Transvaal, March 1894, *Schlechter 4622* (BM); **Northern Cape:** Augrabies National Park, 28°29′6″S, 20°4′29″E, 559 m, 24 August 2005, *Mothogoane 649* (P-05290981—photo!). **Locus ignotus:** SW Africa, Blesokranz, March 1950, *McDonald 452* (BM).

Etymology:—The species is named after A.W. Exell (1901–1993), an expert in South African flora.

Comments:—The new species was previously identified as *C. decumbens*, e.g. the above mentioned Angolan specimens (by Gonçalves 1970). From both *C. decumbens* and *C. rubrivioleacea*, the new species differs by narrower (oblong or ovoid) leaves and more compact (umbel-like) inflorescence. From morphologically similar *C. decumbens*, the new species is also distinguished by the seeds with the absence of cylindrical elongations of the testa cells, and both *C. exellii* and *C. rubrivioleacea* share the similar seed ultrasculpture (Fig. 5; see also the Table 1). The distribution area of *C. exellii* is restricted to Southern Africa (Fig. 6), with the majority of locations from Angola and Namibia.

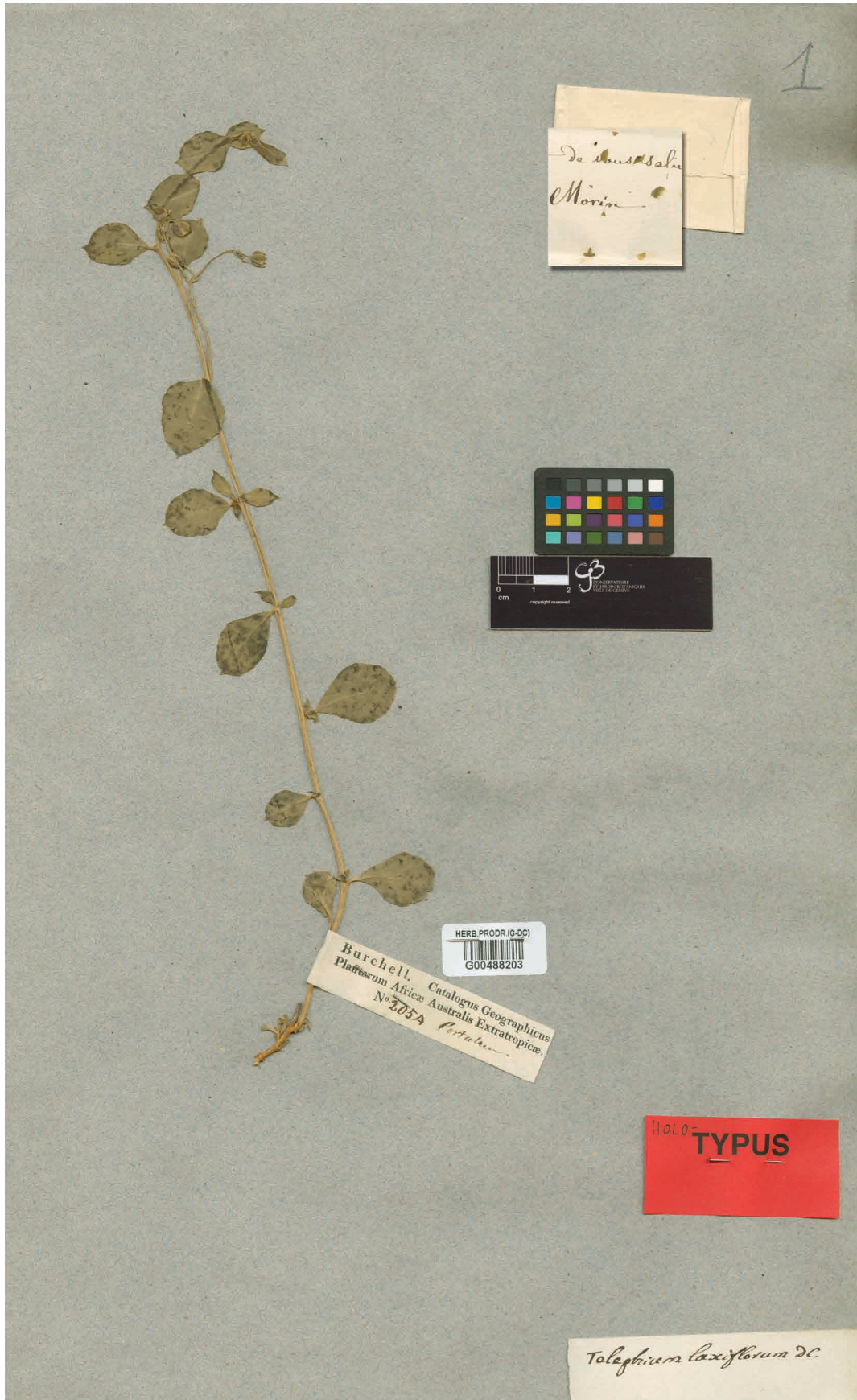


FIGURE 2. Holotype of *Telephium laxiflorum* (G-DC-G00488203!).



FIGURE 3. Holotype of *Corbichonia exellii* (BM-001122713!).

TABLE 1. Morphological differences and distribution pattern of *Corbichonia* species

	<i>C. decumbens</i>	<i>C. exellii</i>	<i>C. rubriviolacea</i>
Life history	annual or perennial herb,	subshrub with many obliquely	perennial herb with several or
Leaves	sometimes dwarf subshrub short-petiolate (petioles to 1.5 cm), cuneate, 2.0–6.0 × 1.0–3.5 cm, lower leaves obovate, stem leaves obovate or ovate	directed or ascending shoots short-petiolate (petioles to 1.5 cm), cuneate, 3.0–7.0 × 1.5–3.0 cm, lowermost leaves obovate, median and upper leaves ovoid or oblong	many prostrate stems sessile (petioles to 0.3 cm), to 3 cm, truncate, all leaves orbicular or near so
Sepals (mm)	3.5–5.0	4.0–6.0	2.5–4.0
Number of petals	ca. 20	approximately 30	approximately 30
Sepal/petal ratio	ca. 1:2	more than 1:2	not reported
Outgrowths of the seed-coat testa (Fig. 5)	present (except some Indian and Pakistani specimens), of cylindrical shape	absent	absent
Distribution pattern (Fig. 6)	Tropical parts of Asia (India, Pakistan, Arabia), Eastern, Sub- Saharan and Southern Africa	SW Africa (Angola, Namibia, South Africa)	SW Africa (Namibia)

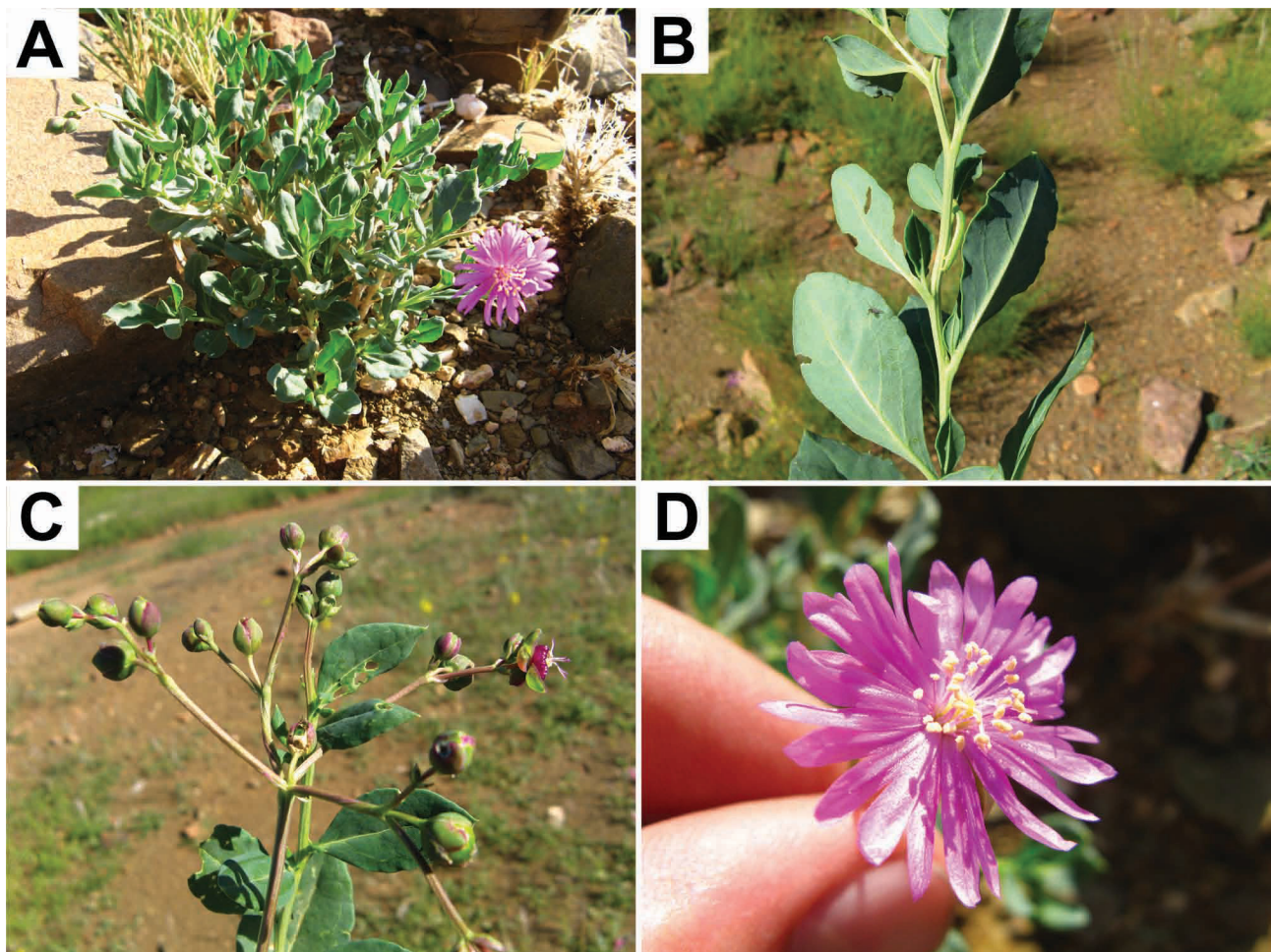


FIGURE 4. Images of *Corbichonia exellii* (NAMIBIA. Hardap region: Maltahöhe district, Kyffhäuser Farm, 24°28'46"S, 16°20'07"E, photographer A. Dreyer). **A)** General view of the plant in early blooming stage, **B)** fragment of the annual shoot showing the leaves from abaxial side, **C)** inflorescence supported by upper leaves, **D)** flower with petals (of staminodial origin).

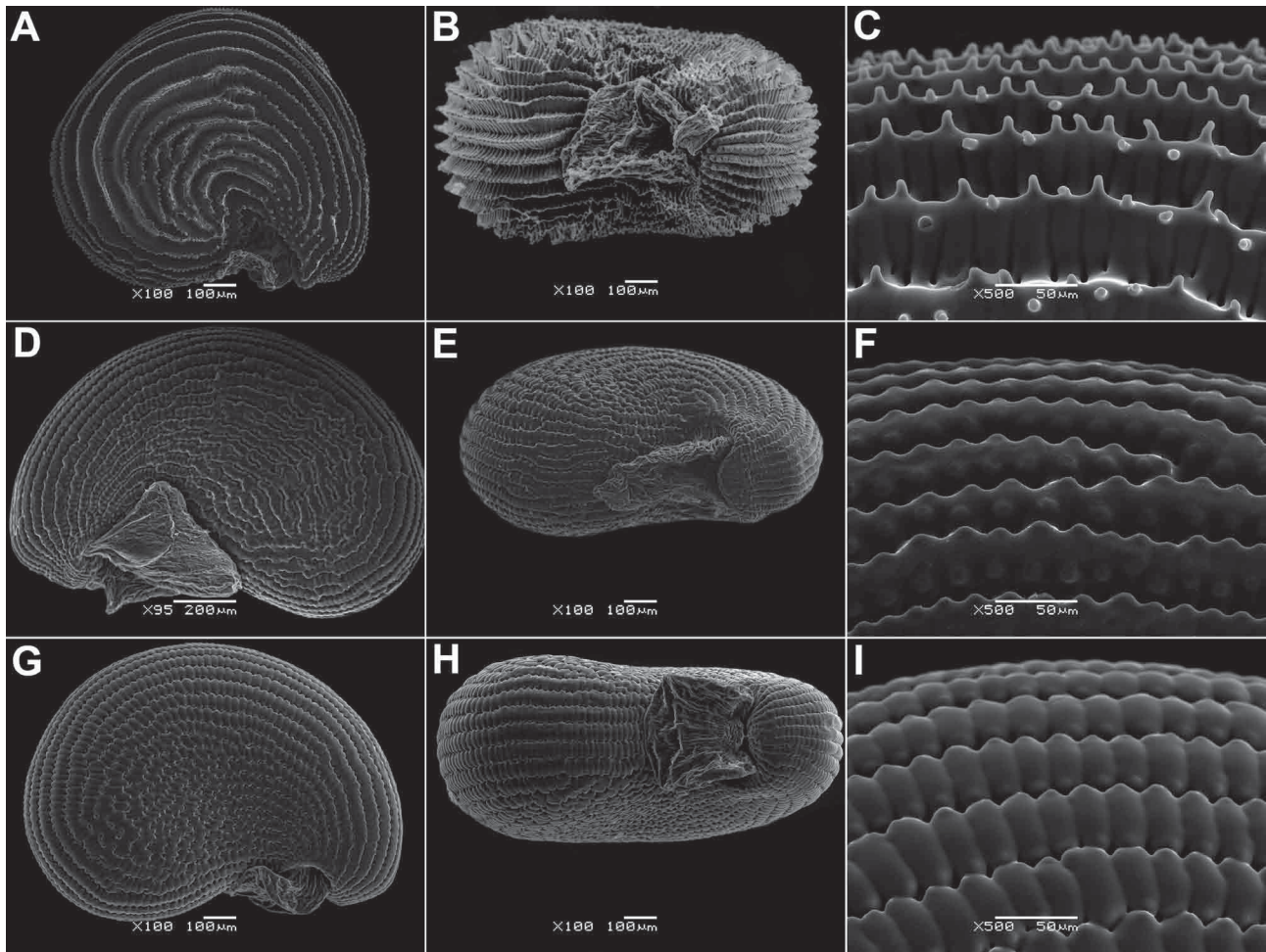


FIGURE 5. Seeds of *Corbichonia decumbens* (A, B, C), *C. rubriviolacea* (D, E, F) and *C. exellii* (G, H, I). **A, D, G:** plan view of the seed; **B, E, H:** view from aril-side; **C, F, I:** ultrasculpture of seed surface (500x). Origin of the material: *C. decumbens*: Rwanda, Kirehe district: Bitshumbi, 1933, *de Witte 1097* (K); *C. rubriviolacea*: Namibia, Karas region, March 2000, *Mannheimer & Curtis CM830* (K); *C. exellii*: Angola, Mossamedes, May 1937, *Exell & Mendonca 2186* (BM).

Discussion

Notes on the composition of Lophiocarpaceae family

The reproductive features (especially the flower and fruit characters) are of special importance to understand the higher-level systematics based on molecular phylogeny (Endress & Matthews 2012). In the last decade many species of Caryophyllales have been intensively studied in relation to their reproductive structures, as well as flower and fruit evolution, with a view to improving the morphological delimitation of the higher-level taxa within the Caryophyllales (Brockington *et al.* 2009, 2013, Ronse de Craene 2007, 2013, Kadereit *et al.* 2010, Greenberg & Donoghue 2011, Sukhorukov & Zhang 2013, Sukhorukov *et al.* 2015). It seems that some genera previously merged together as relatives [*Macarthuria* Hügel ex Endlicher (1837: 11) and *Corbichonia* (see for more: Pax & Hoffmann 1934), or many Molluginaceae in extended circumscription (Endress & Bittrich 1993)] show many similar carpological characters (capsule as fruit type, black and shiny seeds, hard seed-coat testa, occurrence of funicular seed aril, etc.), but an exact comparison of the carpological traits in many-seeded fruits in the taxa of ‘Globular Inclusion’ clade still needs to be conducted (Sukhorukov *et al.*, in prep.). However, the results of morphogenetic studies (in extended Molluginaceae) suggested that *Corbichonia* is set apart from other family members (Hofmann 1973). The differences between *Corbichonia* and *Lophiocarpus*, which contradict the recent, highly unexpected placement of *Corbichonia* into Lophiocarpaceae based on the molecular phylogeny, are presented in Table 2.

The circumscription of the small family Lophiocarpaceae (*Lophiocarpus* with approximately six species and *Corbichonia*, with three species) with the distribution pattern in Southern Africa (except *C. decumbens* with extended

range in the Old World Tropics) still needs further re-evaluation due to (1) the lack of comprehensive molecular studies so far, and (2) highly divergent characteristics of both genera in embryology, morphology, fruit and seed anatomy (Table 2). Regarding the large number of differences between *Lophiocarpus* and *Corbichonia*, the relationship of the latter genus to Lophiocarpaceae must be checked.



FIGURE 6. Distribution patterns of *Corbichonia exellii* (asterisks), *C. decumbens* (dots) and *C. rubriviolacea* (squares).

TABLE 2. Morphological differences between the genera *Lophiocarpus* and *Corbichonia*.

	<i>Corbichonia</i>	<i>Lophiocarpus</i>
Leaf shape	obovate, oblong or ovoid	linear
Inflorescence	monochasium (Endress & Bittrich 1993, present article) or dichasium (Brockington <i>et al.</i> 2013)	thyrsoid consisting of lateral dichasia (Eckardt 1974)
Flower morphology	sepals (5) and dark pink or violet (rarely white) coloured petals (10–30) of staminodial origin; stigmas 5 (Ronse de Craene 2007; Brockington <i>et al.</i> 2013)	perianth consisting of 4–5 green tepals, 4 stamens and 3–4 stigmas (Eckardt 1974; Stannard 1988)
Type of embryo development	Solanad-type (Hakki 2013)	Caryophyllad-type (Johansen 1950)
Fruit	5-valved loculicidal capsule with numerous seeds	one-seeded, indehiscent
Pericarp	smooth, outer cells with lignified walls, the innermost cells without lignification; layers 4 to 8 (Sukhorukov <i>et al.</i> 2015)	verrucose, rarely ribbed, completely or partially with unlignified cells, layers 4 to 10 in inflated parts or ribs (Sukhorukov <i>et al.</i> 2015)
Seed arillus	+ (strophiole)	absent

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TABLE 2. (Continued)

	<i>Corbichonia</i>	<i>Lophiocarpus</i>
Seed-coat testa	sinus-like, triangular in cross-sections, 50–65 µm, warty in upper part, with obliquely oriented stalactites (Sukhorukov <i>et al.</i> 2015)	alveolate, in most species 20–50 µm (ca. 80 µm in <i>L. latifolius</i>), with almost straight stalactites (Sukhorukov <i>et al.</i> 2015)
Ovary obturator	placental (Hakki 2013)	funicular (Hakki 2013)

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Appendix. Specimens used for the mapping of the distribution of *Corbichonia decumbens* and *C. rubriviolacea* (the records of *C. exellii* are cited in the main text). Records of *C. decumbens* from Tropical America (Jeffrey 1961) are not included due to the absence of the specimens from this region in the herbaria visited. Specimens marked with an asterisk (*) after herbarium acronym were used for the carpological investigations. Specimens of *C. decumbens* marked with a double asterisk (**) after herbarium acronym have seeds without papilla-like outgrowths on the seed-coat testa.

Corbichonia decumbens (Fig. 6)

INDIA. Telangana state: Hyderabad, October 1798, *Klein s.n.* (B-W, E); [**Tamil Nadu state**], Coimbatore, April 1870, *Clarke s.n.* (BM); **Rajasthan state**, Jaisalmer, 24 August 1964, *Wadhwa 4975* (LE); **Karnataka state:** Mysore, [without date], *Thomson s.n.* (K)**. **PAKISTAN. Sindh province:** Jemidar Ka Landa, near Kurrachee [Karachi], 1851, *Stocks s.n.* (K); Karachi, July 1956, *Jafri 1496* (E); Karachi, 15 July 1956, *Jafri 1496* (LE); 10–15 km S Sehwan, 26°26' N, 67°52' E, 5 May 1965, *Rechinger 28727* (W-1969-0000740); **Punjab province:** Shahkot, [without date], *Edgeworth s.n.* (K); Sakesar, Kiri Golewala, September 1902, *Kabir 14506* (K); Sangla hill, March 1917, *Stewart 1404* (K); **Khyber Pakhtunkhwa province:** Peshawar distr., August 1958, *Burt 1055* (E); Peshawar to Torkham, May 1965, *Lamond 1593* (E); Wazistan, Darzinda [Darazinda], April 1968, *Khan 4579* (K)**; near Thal, Mount Tor-ghar, 2000 ft, 1880, *Aitchinson 528* (BM, E, K, LE); Inter Saidu Sharif et Malakand, ca. 34°35' N, 72°20' E, 24 August 1962, *Rechinger 19613* (W 1974-0005614); Dera Ismail Khan: Montes Sulaiman, 100 km E Port Sandeman, 31°21' N, 69°31' E, Inter Mughal Kot et Daraban, 31°44' N, 70°22' E, 900–700 m, 21 May 1965, *Rechinger 29976* (W 1969-0000717); South Malakand, 34°30' N, 71°54' E, 7 June 1965, *Rechinger 30873* (W 1969-0000739); **Federally Administered Tribal Areas:** Peshawar, Landi Kotal (Khyber Passa) range, 34°07' N, 71°15' E, 700–1000 m, 29 May 1965, *Rechinger 30290* (W 1969-0000711); **Balochistan province:** Uthal, 25°48' N, 66°40' E, 8 April 1965, *Rechinger 27573* (W-

1969-0000716); Bela, April 1965, *Lamond* 282 (E). **SAUDI ARABIA.** Ada Basalh, 24 April 1876, *de Marchesetti s.n.* (LE); Sail Sarir, Hedjaz, June 1945, *Vesey-Fitzgerald* 1492-1 (BM); Mahdi pass, September 1949, *Huichard* 301 (BM); South Hijaz, March 1979, *Collenette* 1159 (K); Wadi Kharat, February 1980, *Collenette* 1902 (E); **Asir province:** Asir, Wadi Dhilla, 2000 ft, May 1946, *Thesiger s.n.* (BM); **Makkah province:** near Jeddah, 1950, *Kercher* 28 (BM); Namrah area, February 1962, *Zeller* 916 (BM); Madraqah, March 1969, *Popov* 69-112 (BM); Bahr[ah] area, December 1971, *Popov* 71-293 (BM); **Jizan region:** Jizan, 17°20'N 42°30'E, May 1992, *Hedberg* 92044 (K). **YEMEN: Ta'izz governorate:** [Musa, near Mocha] Forsskål (BM, lectotype of *Orygia decumbens*); **Hadramaut governorate:** Mukalla, June 1950, *Guichard* 352 (BM); **Soqatra governorate:** Sokotra Island, January 1953, *Popov* 99-50 (BM); Jebel Rughid, May 1967, *Smith & Lavranos* 714 (K); **Aden governorate:** Aden, Conquest Bay, March-April 1959, *Warung* 128 (BM); **Abyan governorate:** nr Shuqra, February 1989, *Miller et al.* 8060 (E); Jabal Urays, March 2002, *Kilian et al.* 1725 (B); **Al Mahrah governorate:** Al Mahra, between Sayhut and Qeshn, 3 km N of the village Itáb, 15°21'N 51°30'E, November 1999, *Hein et al.* 6466 (B, E); between Al Faydami and Hawf, November 1999, *Hein et al.* 6462 (B); Wadi Chard, August 2002, *Kilian et al.* 3127b (B). **OMAN: Al Buraimi governorate:** Mahadha (Bureimi area), January 1950, *Popov* 521 (BM); **Al Batinah North governorate:** Wadi Sahtan, 30 km from Al Rustaq, April 1982, *Vaconochie* 3362 (E); **Dhofar governorate:** Wadi Ghayz, nr Mirbat, July 1982, *Maconochie* 3535 (E, K). **EGYPT:** Gebel Elba, February 1933, *anonym* 1433 (K). **SUDAN.** Nubia, Togodele, 28 January 1907, *Muschler s.n.* (LE); **Red Sea state:** Suakin, Gebel Uaratab, June 1867, *Schweinfurth* 815 (K, LE); Karam Elba, 1925, *Murray* 3698 (K); Red Sea province, 1928, *Newberry s.n.* (BM); Port Sudan, January 1953, *Drummond & Hemsley* 990 (K); **South Kordofan province:** Jongols post, Leika, July 1951, *Sherif* 3924 (K). **ERITREA. Northern Red Sea region:** Saati, February 1892, *Schweinfurth & Riva* 350 (K); Af Abed [Afabet] to Cub, 3000 ft, March 1949, *Bally* 6719 (K); 87 km from Asmara to Mitsiwa, May 1985, *Edwards et al.* 3788 (K). **ETHIOPIA.** Hawashfloden, April 1958, *Smeds* 1394 (K); **Southern Nations, Nationalities, and People's region:** Lower Omo, August 1970, *Carr* 901 (LE); Gamu-Gofa region, Lower Omo valley, 40 km SW of Turmi, January 1998, *Friis et al.* 8974 (K); Rift valley below Konso, 5°20'N, 37°36'E, 900 m, January 2003, *Friis et al.* 11340 (K); **Shewa region:** Shoa region, 1300 m, May 1980, *Thulin et al.* 3868 (K); **Gambela region:** Illubabor region, 22 km W of Gambela, November 1996, *Friis et al.* 8029 (K)*. **SOMALIA.** [Woqooyi Galbeed region]: Mt. Elmis, March 1945, *Glover & Gilland* 838 (BM); Kalmedo, August 1957, *Newbold* 877 (K). **DJIBOUTI.** Mabla Mts., February 1938, *de la Rue s.n.* (P-05275040—photo!); Tadjoura, June 1938, *de la Rue s.n.* (P-05275034—photo!); **MAURITANIA.** Adrar region: Azougui, December 1976, *anonym* 16149 (P-05086245—photo!). **KENYA. Turkana county:** Todenyang [Todonoyang], Lake Rudolf [Lake Turkana], July 1934, *Champion* 318 (K); Turkana distr., November 1977, *Carter & Stannard* 156 (K); **Baringo county:** Lake Baringo, 3600 ft, August 1956, *Bogdan* 4231 (K); **Narok county:** Masailand, Olekuseron [Olokuseroi], 3025 ft, June 1962, *Glover & Samuel* 2960 (K); **Machakos distr. [county]:** Kiboko Station, June 1971, *Muriithi* 321 (K); **Coast province:** Matuga, July 1982, *Robertson* 3284 (K); **Tharaka-Nithi county:** Tharaka, Gatunga, February 2007, *Kirika & Mbale* 048426 (K). **UNITED REPUBLIC OF TANZANIA. Dar-es-Salaam region:** Dar-es-Salaam, 1928, *Marshall* 15 (K); Msasani beach, nr Dar-es-Salaam, April 1969, *Mwasumbi* 10502 (K); Dar es Salaam, 7 February 1972, *Hansen* 614 (LE); **Pwani region:** Bagamoyo, November 1952, *Curle* 403 (BM); **Tanga region:** Lushoto distr., May 1953, *Drummond & Hemsley* 2332 (K); **Morogoro region:** Kilosa distr., October 1961, *Semsei* 3350 (K); **Lindi region:** Selous Game reserve, 18 km WSW of Kingupira, March 1976, *Vollesen* 3403 (K). **DEMOCRATIC REPUBLIC OF THE CONGO: Orientale province:** Mahagi, August 1953, *Robyns* 3985 (BM); Mahagi port, April 1957, *Froment* 103 (K); **North Kivu province:** Beni, Parc nat. Albert, 1000 m, November 1954, *de Witte* 11304 (K); Rutshuru, September 1956, *de Witte* 13418 (K). **NIGER.** [Agadez region]: Iferouane, Tamgak range, 19° N, 8°50'E, December 1961, *Hall s.n.* (K). **CHAD. Ennedi region:** 1922, *Le Testu* 7 (P-05275020—photo!); Guelta d'Archei, September 1935, *Zolotarevsky et al.* 135 (P-05275022—photo!); **RWANDA.** Kirehe district: Bitshumbi, 1933, *de Witte* 1097 (K). **UGANDA: Northern region:** Iriiri Bokora co., June 1957, *Wilson* 357 (K); **Western region:** Ishasha river, Q. Elizabeth park, May 1961, *Symes* 670 (K)⁷; **Eastern region:** Pallisa co., Kachinga, May 2003, *Rwaburindore* 5601 (K). **ZIMBABWE. Manicaland province:** Southern Rhodesia, Chikwesi [Chikwasi], February 1931, *Myres* 677 (K); Sabi valley, Nyanyadzi, February 1948, *Wild* 2500 (K); distr. Melsetter [Chimanimani District] December 1951, *Chase* 4253 (BM); Chipinga, February 1958, *Plowes* 2027 (K); **Matabeleland North province:** Deka River, June 1934, *Wankie* 7969 (BM). **MOZAMBIQUE. Gaza province:** Sul do Save, March 1954, *Barbosa & Balsinhas* 5505 (BM); between Chibuto & Chaimite, February 1942, *Torre* 3950 (P-06865362—photo!); **Sofala province:** Ponte do Pungoe, March 1906, *Vasse* 309 (P-05275037—photo!); **Tete province:** Rios de Sena (Tette) [Tete], *Peters* 8 (K-000232039, lectotype of *Orygia mucronata*)*; **Maputo province:** Mangulane, May 1954, *Gomes & Sousa* 3345 (K); Lourenço Marques, Ressano Garcia, February 1955,

⁷ The collector indicates on the label the flowering hours: "flowers opened from 10 [a.m.] to 3 p.m."

Exell et al. 473 (BM)*; Lourenço Marques, Matola, April 1967, *Marques 1955* (E); **Zambezia province**: Morrumbala Mt., December 1971, *Pope & Mueller 607* (K); **Sofala province**: Chitengo Camp, Gorongosa National Park, 18°58'47" S 34°21'8" E, 37 m, 29 January 2007, *Ballings & Wursten PB-388* (LMU; see also Fig. 1). **BOTSWANA. Kgatleng district**: Mochudi, March 1967, *Mitchison 45* (K); **Kgalagadi district**: Southern Kalahari, Mobuasehube Game Reserve, March 1976, *Potsan & Stee 2422* (K). **MALAWI**. Southern Region, Chikwawa distr., April 1970, *Brummitt 10017* (K), and other collections from the same location (K). **SWAZILAND. Shiselweni district**: Hlatikulu, November 1959, *Dlamini s.n.* (K). **SOUTH AFRICA**. Cape of Good Hope, 1826, *Drége s.n.* (LE; HAL—photo! sub *Senebiera aizoides* E. Mey. in herb.); **Northern Cape province**: Cape prov., Prieska distr., May 1961, *Schlieben 8786* (K); [**Eastern Cape province**, without precise location], 2700 ft, *Bolus 426* (UZH-00037300, photo!); **Mpumalanga province**: Transvaal, Barberton distr., January 1966, *Hilliard & Burt 3605* (E); Mpumalanga, Banks of Crocodile River next to Crocodile Bridge, 25°38'S 31°9'E, May 2004, *Venter 10381* (W 2012-0009117); **KwaZulu-Natal province**: Natal, Pongola plain, February 1969, *Pooley 360* (E); Natal Region, Pietermaritzburg, March 1972, *Strey 2393a* (K); Natal Region, Louwsburg distr., December 1975, *Brown & Shapiro 2731* (K); Natal, Kwazulu, Umvoti distr., January 1990, *Balkwill et al. 5341* (E); KwaZulu-Natal [without date], *Gerrard 1489* (W 1889-0161913).

C. rubriviolacea (Fig. 6)

NAMIBIA. Karas region: Friedenfelde, Blinkoog, 1953, *E. Walter & H. Walter 2366* (M-0107807—holotype of *Orygia rubriviolacea*); Karas region, near Ham river, going south of road 202, 27°43' S 18°25' E, 1177 m, 25 March 2000, *Mannheimer & Curtis CM830* (K)*; **Erongo region**: 34 miles E from Walvisbays [Walvis Bay], 16 February 1963, *Giess et al. 5124* (E); Swakopmund district, 34 miles E from Walvysbays [Walvis Bay], way to Damsberg, 16 February 1963, *Giess, Volk & Bleissner 5124* (K)*; **Hardap region**: Maltahöhe district, Kyffhäuser Farm, 24°28'46"S, 16°20'07"E (image), photographer A. Dreyer.

After acceptance of the article we have received other images of *Corbichonia*, and the photos from Zimbabwe (At foot of hills just outside of Zvishavane on road to Mbalabala, photographer Bart Wursten) obviously depict *C. rubriviolacea*. This record is more than 700 km to the east from the records listed above (Namibia). The photo is available at: http://www.zimbabweflora.co.zw/speciesdata/utilities/utility-display-all-images-by-genus.php?genus_id=555