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Taxonomic dissolution of *Sarcostemma* (Apocynaceae: Asclepiadoideae)

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Summary. Since molecular analyses have demonstrated that *Sarcostemma* R. Br. is deeply nested in the predominantly Madagascan stem-succulent clade of *Cynanchum* L., the genus has been treated as a synonym of *Cynanchum*. Some of the former *Sarcostemma* species have been transferred to *Cynanchum* in the course of various Flora treatments, and some new species belonging to this radiation have been described under *Cynanchum*. The present contribution serves to complete the formal transfer of *Sarcostemma* taxa to *Cynanchum*, in which a total of nine species are concerned: *Cynanchum arabicum, C. areysianum, C. brevipedicellatum, C. daltonii, C. forskaolianum, C. mulanjense, C. pearsonianum* (a substitute name for *Cynanchum pearsonii*), *C. sarcomedium* (a substitute name for *C. intermedium*), and *C. socotranum*. In addition, six subspecies of *Cynanchum viminale* are newly combined: *C. viminale* subsp. *australe, C. viminale* subsp. *brunonianum, C. viminale* subsp. *orangeanum, C. viminale* subsp. *stocksii, C. viminale* subsp. *thunbergii* and *C. viminale* subsp. *welwitschii*. Finally, notes on recent introductions from southern Yemen are made, and illustrations of *Cynanchum areysianum* are provided.

Key Words. *Cynanchum*, *Cynanchum areysianum*, new combinations, Old World, taxonomy.

Introduction

The palaeotropical genus *Sarcostemma* R. Br. has long been considered as a difficult group in Apocynaceae-Asclepiadoideae-Asclepiadeae. In consequence deviating perceptions are widespread in the taxonomic literature (Liede & Meve 1992; Meve & Liede 1996; Bruyns 2003, 2011; Goyder 2008). In the last 20 years, the generic delimitation within Asclepiadeae saw much phylogenetic enlightenment. Molecular studies using cpDNA markers have convincingly refuted the enlarged concept of *Sarcostemma* introduced by Holm (1950), which was based mainly on morphological similarities of corona structure. It has been shown that neither *Oxystelma* R. Br., nor the American genera *Funastrum* E. Fourn., *Pentacyphus* Schltr. and *Philibertia* Kunth are congeneric with core *Sarcostemma* (Liede & Täuber 2000). All these taxa constitute well circumscribed genera in their own right, occupying widely divergent positions in the Asclepiadeae, so that their corona similarities have to be interpreted as convergences (Meve & Liede 1999).

Both cpDNA and (nuclear) ITS data have shown that *Sarcostemma* s.s., a group that accommodated smooth, non-warty and non-striate succulents spread over the Old World tropics, characterised by a 'double' corona of an outer ring and inner staminal corona parts (as opposed to the 'simple' ring-shaped corona of typical *Cynanchum*), is deeply nested in *Cynanchum* L., which would be paraphyletic if *Sarcostemma* was considered an independent genus (Liede & Kunze 2002; Liede & Täuber 2002). *Sarcostemma* was demonstrated to constitute a subclade of the large clade formed by all Madagascan stem succulent Cynanchinae, including the small genera *Folotsia* Costantin & Bois, *Karimbolea* Desc. and *Platykeleba* N. E. Br. This clade, again, constitutes the top clade of a *Cynanchum* clade consisting exclusively of Madagascan species. Meve & Liede (2002) concluded that the African mainland must have been originally colonised by Madagascan precursors of *Sarcostemma viminale* (L.) L. It is, however, still unclear, whether other regions of the distribution areas of *Sarcostemma* taxa, e.g. India, have been reached via mainland Africa (and Arabia), or independently and directly from Madagascar by long distance dispersal, and whether redistributions from these secondary areas back to Madagascar have taken place as well.

Following these results, the other small succulent genera have been merged with *Cynanchum* and their species have been transferred formally to *Cynanchum* by Liede & Meve (2001). However, for *Sarcostemma*, only those species needed for Flora treatments have hitherto been transferred to *Cynanchum* (Madagascar, Liede & Meve (2001); tropical Africa, Goyder 2008).

A wide variety of commonly used molecular markers has hitherto failed to produce any differences between morphologically well distinguishable units in *Sarcostemma* (Liede-Schumann, unpubl. results), leading to the conclusion that the genetic distances

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between the different *Sarcostemma* taxa are extraordinarily low. For this reason, the traditional taxonomic concept using morphological and karyological characters for taxon delimitation is followed to the present day (cf. Liede & Meve 1989, 1992, 1993, 1995; Meve & Liede 1996, 1997) and will also be applied here. Our taxonomic work in *Sarcostemma* is based on the concept that species are characterised by differences in floral structure, whereas subspecies are characterised by differences at least in habit (Liede & Meve 1993). Following this concept, a number of circumscribable entities have been described as new taxa, the last by Liede-Schumann & Meve (2005). The many subspecies of *Cynanchum viminale* (L.) L. typically represent 'discernable natural groups' which are often identical with a specific 'geotype', e.g., a distinct regional representative of the *C. viminale* complex (cf. Liede & Meve 1993; Meve & Liede 1996; Liede-Schumann & Meve 2005). However, this concept is still somewhat vague since recognition of the different subspecific taxa needs some experience in that group. Also, it is not possible to allocate a subspecific taxon name to every collection of *C. viminale* s.l. Specimens from western and central Africa are especially poor in specific characters that would allow classification beyond attribution to *C. viminale* s.l. With the new combinations proposed in the following, the genus *Sarcostemma* ceases to exist as an accepted taxon.

New combinations

Cynanchum arabicum (*Bruyns & P. I. Forst.*) *Meve & Liede*, **comb. nov.**

http://www.ipni.org/urn:lsid:ipni.org:names:77120418-1

Sarcostemma arabicum Bruyns & P. I. Forst., *Edinburgh J. Bot.* 48: 333 (Bruyns & Forster 1991). Type: Saudi Arabia, Hijila, 15 km E of Abha, *Nasher* IH 137 (holotype E).

Cynanchum areysianum (*Bruyns*) *Meve & Liede*, **comb. nov.**

http://www.ipni.org/urn:lsid:ipni.org:names:77120419-1

Sarcostemma areysianum Bruyns, *S. African J. Bot.* 77: 802 (2011). Type: Yemen, Abyan Governorate, Jabal Areys, 1,400 – 1,700 m alt., Jan. 2007, *Bruyns* 10287 (holotype B; isotype E).

NOTES. First counts of the chromosome number of *Cynanchum areysianum* are here provided: 2n = 22. Vouchers: **YEMEN.** Tawr al-Bahah, 13°11'N 44°18'E, c. 250 m alt., 21 Nov. 2000, *Lavranos, Mies & McCoy* 31335 (UBT); above Khadifut in the mountains of Ra's Fartaq, 15°39'N, 52°12'E, c. 150 m alt., 15 Nov. 2000, *Lavranos, Mies & McCoy* 31313 (UBT).

For further remarks see below 'Notes on novelties from southern Yemen'.

Cynanchum brevipedicellatum (*P. I. Forst.*) *Liede & Meve*, **comb. nov.**

http://www.ipni.org/urn:lsid:ipni.org:names:77120420-1

Sarcostemma brevipedicellatum P. I. Forst., *Austral. Syst. Bot.* 5: 59 (Forster 1992). Type: Australia, Queensland, Gregory North Distr., Toko Tange, Glenormiston Stn., Dec. 1982, *Forster* 1420 (holotype BRI; isotypes AD, CANB, CBG, DNA, K!, MEL, PERTH, PRE, QRS).

Cynanchum daltonii (*Decne. ex Webb*) *Liede & Meve*, **comb. nov.**

http://www.ipni.org/urn:lsid:ipni.org:names:77120421-1

Sarcostemma daltonii Decne. ex Webb, in Hook., *Niger Flora*: 149, t. 14. (Hooker 1849). Type: Cape Verde Islands, *J. D. Hooker* 1843 (lectotype K!, designated here).

NOTES. This endemic of the Cape Verde Islands has been placed as a synonym of *Sarcostemma viminale* subsp. *thunbergii* (G. Don) Liede & Meve, a decision influenced by the tetraploid genomes found for both taxa (Liede & Meve 1993). However, we have since investigated more material of the complex and realised that *S. daltonii* should be separated from *Cynanchum viminale* based on the unique character composition of a non-twining, trailing to arching habit, long and short laterals (peduncles; cf. Gonçalves 2002), and a chromosome number of 2n = 44. Regarding floral characters, *C. daltonii* is morphologically most close to *C. viminale* subsp. *viminale*, though the follicles are much stouter. Also, subsp. *viminale* always possesses a diploid genome with 2n = 22 chromosomes (Liede & Meve 1995; Malla *et al.* 1978, Meve, unpubl. data).

Cynanchum forskaolianum (*Schult.*) *Meve & Liede*, **comb. nov.**

http://www.ipni.org/urn:lsid:ipni.org:names:77120422-1

Sarcostemma forskaolianum (as "*forskålianum*") Schult. in Roem. & Schult., *Syst. Veg.* (ed. 15) 6: 117 (Schultes

1820). Type: Saudi Arabia, between Mudhaylif and Mahayl on the Jeddah-Gizan road, 500 ft., *Collenette* 1977 (neotype K!, designated by Meve & Liede (1996)).

Cynanchum mulanjense (*Liede & Meve*) *Liede & Meve*, **stat. nov.**

http://www.ipni.org/urn:lsid:ipni.org:names:77120423-1

Sarcostemma mulanjense Liede & Meve, *Novon* 2: 223 (1992). Type: Malawi, Mulanje (Mt), outer slopes at the Chitakale stream, west branch, *Chapman & Chapman* 6892 (holotype MO!).

Cynanchum viminale (L.) L. subsp. *mulanjense* (Liede & Meve) Goyder (2008: 417).

NOTES. Goyder (2008) considered *Cynanchum mulanjense* a subspecies of *C. viminale*. Applying the concept of species and subspecies as outlined above, namely, using variation in floral morphology as a criterion of species delimitation, *C. mulanjense* deserves specific status. It is characterised by nodding flowers, narrow, slightly twisted creamy petals and an elongated gynostegium, although the latter character breaks down in central and northern Malawi (cf. Goyder 2008). With this character combination, *C. mulanjense* seems to be more closely related to *C. oresbium* (Bruyns) Goyder than to *C. viminale*. These two species share both floral similarities and a preference for similar habitats, rocky outcrops in Malawi and Mozambique, respectively.

Cynanchum pearsonianum *Liede & Meve*, **nom. nov.**

http://www.ipni.org/urn:lsid:ipni.org:names:77120424-1

Sarcostemma pearsonii N. E. Br., *Bull. Misc. Inform., Kew* 1913: 301 (Brown 1913), non *Cynanchum pearsonii* N. E. Br. (Brown 1914: 18). Type: Namibia, Great Karasberg, on stony plains SW of Krai Kloof, 1,600 m alt., 19 Jan. 1913, *Pearson* 8460 (holotype K!; isotype BOL!).

NOTES. *Sarcostemma pearsonii*, a species that is confined to very dry and stony habitats in Namibia and NW South Africa, was neglected for a long time, although its erect, shrubby habit and the small and twisted corolla lobes make it one of the most easiest species to identify (Liede & Meve 1989). Brown (1914) assigned the name *Cynanchum pearsonii* to a shrubby species with small leaves, which is nowadays treated as a synonym of *Cynanchum meyeri* (Decne.) Schltr. (Liede 1993).

The necessary nomen novum proposed here, tries to resemble as much as possible that of the name *Sarcostemma pearsonii*, under which this species has started to become a well-known taxon within the last 20 years.

Cynanchum sarcomedium *Meve & Liede*, **nom. nov.**

http://www.ipni.org/urn:lsid:ipni.org:names:77120425-1

Sarcostemma intermedium Decne., in DC., *Prodr.* 8: 538 (Decaisne 1844), non *Cynanchum intermedium* N. E. Br. (Brown 1908: 747). Type: India ([‘Peninsula Ind. orientalis’]), *Herb. Wight* 1556 (holotype P, not traced; isotype G-DC! (2 sheets)).

NOTES. Medium-thick stems, small and acute corona lobes and an elongated style-head make this species readily distinguished from the other representatives of the *Cynanchum viminale* relationship in India. But since N. E. Brown (1908) used the name *Cynanchum intermedium* for a leafy South African twiner (of an uncertain status), a replacement name for *Sarcostemma intermedium* in *Cynanchum* became necesssary, and the name *Cynanchum sarcomedium* is proposed here.

Cynanchum socotranum (*Lavranos*) *Meve & Liede*, **comb. nov.**

http://www.ipni.org/urn:lsid:ipni.org:names:77120426-1

Sarcostemma socotranum Lavranos, *Natl. Cact. Succ. J.* 27 (2): 37 (1972). Type: Yemen, Socotra, Hama-di-roh, on vertical limestone faces, c. 350 m alt., April 1967, *Smith & Lavranos* 309 (holotype K!).

Cynanchum viminale *(L.) L.* (Linnaeus 1771: 392) subsp. **viminale**

NOTES. The protologue of *Cynanchum viminale* refers to an illustration of a plant from Egypt (Felfel Tavil) as the type and states explicitly ‘Habitat in Africae maritimis’. However, Indian taxa such as *Sarcostemma acidum* (Roxb.) Voigt and *S. brevistigma* Wight & Arn. were synonymised under *S. viminale* subsp. *viminale* by Ali (1983), based on material from Pakistan. Later, this synonymy has been adopted by Jagtap & Singh (1999) for India. Other regional Floras, such as the *Flora of China* and the *Flora of Nepal* (www.eFloras.org) have not followed this usage and recognised *S. acidum* and *S. brevistigma* as separate species. The present authors follow the view of Ali (1983) and consider these two species as synoynyms of *C. viminale* subsp. *viminale*, thus extending the area of the latter from West Africa and Egypt to India.

Cynanchum viminale (*L.*) *L.* subsp. **australe** (*R. Br.*) *Meve & Liede*, **comb. nov.**

http://www.ipni.org/urn:lsid:ipni.org:names:77120428-1

Sarcostemma australe R. Br., *Prodr.*: 463 (Brown 1810). Type: Australia, South Australia, Bird Island, Petral Bay, Isle St. Francis, 3 Feb. 1802, *R. Brown* (Iter Australiense 2872) (lectotype BM!, designated by Forster (1992)).
Sarcostemma viminale subsp. *australe* (R. Br.) P. I. Forst., *Austral. Syst. Bot.* 5: 64 (Forster 1992).

Cynanchum viminale (*L.*) *L.* subsp. **brunonianum** (*Wight & Arn.*) *Meve & Liede*, **comb. nov.**

http://www.ipni.org/urn:lsid:ipni.org:names:77120429-1

Sarcostemma brunonianum Wight & Arn., in Wight, *Contr. Bot. India*: 59 (1834). Type: India, ['Peninsula Ind. orientalis'], Cody Cally, village of Autcherroccum, *Herb. Wight* 1557 (lectotype G-DC! (No. G00301010), designated here; isolectotypes E, G-DC! (No. G00136527)).
Sarcostemma viminale (L.) R. Br. subsp. *brunonianum* (Wight & Arn.) P. I. Forst. (Forster 1992: 63).

Cynanchum viminale (*L.*) *L.* subsp. **orangeanum** (*Liede & Meve*) *Liede & Meve*, **comb. nov.**

http://www.ipni.org/urn:lsid:ipni.org:names:77120430-1

Sarcostemma viminale subsp. *orangeanum* Liede & Meve, *Bot. J. Linn. Soc.* 112: 70 (1993). Type: South Africa, Northern Cape, 11.4 km E Kuruman, *Liede & Meve* 579 (holotype K!; isotype MSUN!).

Cynanchum viminale (*L.*) *L.* subsp. **stocksii** (*Hook. f.*) *Meve & Liede*, **comb. nov.**

http://www.ipni.org/urn:lsid:ipni.org:names:77120431-1

Sarcostemma stocksii Hook. f., *Fl. Brit. India* 4: 27 (Hooker 1883). Type: Pakistan, Sind, *Stocks* 509 (holotype K!).
Sarcostemma viminale subsp. *stocksii* (Hook. f.) Ali (1983: 31).

NOTES. This subspecies seems to be indistinguishable from *Cynanchum viminale* subsp. *viminale* except for the stouter follicles that are much more divaricate and taper only insignificantly towards base and apex. The seeds are also thicker, and wingless, dark brown and rugulose (cf. Liede 2002: 235). A very good illustration of the type of *Sarcostemma stocksii* is available: Hooker (1852, plate 861), published under 'S. brachystigma', an erroneous name for *S. brevistigma*, now a synonym of *C. viminale* subsp. *viminale* (http://www.bio.uni-bayreuth.de/psysl/hooker/hooker.php?pg=0861).

Cynanchum viminale (*L.*) *L.* subsp. **thunbergii** (*G. Don*) *Liede & Meve*, **comb. nov.**

http://www.ipni.org/urn:lsid:ipni.org:names:77120432-1

Sarcostemma thunbergii G. Don, *Gen. Hist.* 4: 156 (1838). Type: South Africa, Cape Province, Worcester, Karoo Botanic Garden, *Bayer* 68 (neotype NBG!, designated by Liede & Meve (1993).
Sarcostemma viminale subsp. *thunbergii* (G. Don) Liede & Meve (1993: 10).

Cynanchum viminale (*L.*) *L.* subsp. **welwitschii** (*Hiern*) *Liede & Meve*, **comb. et stat. nov.**

http://www.ipni.org/urn:lsid:ipni.org:names:77120433-1

Sarcostemma welwitschii Hiern, *Cat. Afr. Pl.* 1: 689 (1898). Type: Angola, Huilla, base of Morro de Lopollo, *Welwitsch* 4261 (holotype BM!; isotypes BR!, C).

NOTES. This element described from southern Angola is still quite poorly known, though, undoubtedly, it is a member of the *Cynanchum viminale* complex that extends into Namibia. It is a remarkably glabrous, vigorously tangling scrambler and climber, which can produce voluminous plants. The inflorescences are mostly lateral and sessile, rarely on short laterals (peduncles) or terminal. The most conspicuous character seems to be the rather low number (two to five) of flowers per inflorescence. *C. viminale* subsp. *welwitschii* is a tetraploid with a chromosome number of 2n = 44, as the single count available suggests, obtained from material from northernmost Namibia (Voucher: Ruacana, *Albers et al.* 3617, UBT). With its polyploidy, subsp. *welwitschii* is distinguished from *C. viminale* subsp. *stipitaceum* (Forssk.) Meve & Liede and subsp. *viminale*, the taxa otherwise having most similarities with subsp. *welwitschii*. From the other tetraploid taxon of southern Africa, *C. viminale* subsp. *thunbergii*, *C. viminale* subsp. *welwitschii* differs in habit, and in stems that are thinner, softer and green instead of grey-green.

Figueiredo & Smith (2009) included two taxa in their list of succulents of Angola; *Sarcostemma welwitschii* Hiern and *S. viminale* subsp. *viminale*. These authors neither mention the second Angolan taxon described by Hiern, *S. andongense* Hiern, nor *S. viminale* subsp. *stipitaceum* into which Liede-Schumann & Meve (2005) have sunk *S. andongense*. More material, especially living plants, from Angola and adjacent regions need to be studied before a final taxonomic conclusion can be made.

Notes on novelties from southern Yemen

A floristic inventory by J. Lavranos, T. McCoy and B. Mies in southern Yemen in November 2000 yielded some additional morphological variants of stem-succulent *Cynanchum* of the *Sarcostemma* subgroup. Four living cuttings taken during this excursion were transferred into cultivation in the greenhouse of the Department of Plant Systematics, University of Bayreuth. All four accessions flowered in the following years. One accession from near Lawdar (*Lavranos, McCoy & Mies* 31372, UBT) was found to represent a rose- to white-flowered form of *Cynanchum viminale* subsp. *stipitaceum* (Fig. 1A), another one from Ra's Fartaq (*Lavranos, McCoy & Mies* 31363, UBT) is vegetatively similar to subsp. *stipitaceum*, florally a mixture of this subspecies and *C. areysianum* or *C. arabicum* (Fig. 1B), but possesses a reddish to red-coloured corolla. It could represent a natural hybrid. Hybrids, however, are rare in *Cynanchum*, and molecular analysis to support this assumption has yet to be done. Finally, two accessions, one from Tawr al-Bahah (*Lavranos, Mies & McCoy* 31335, UBT), and one from above Khadifut in the mountains of Ra's Fartaq (*Lavranos, Mies & McCoy* 31313, UBT), are vegetatively comparable to *C. arabicum*, but florally similar to the Socotran endemic *C. socotranum* (Figs 1B – E, 2). For this element we therefore prepared a new species description but later had to recall it from the manuscript when Bruyns (2011) described *Sarcostemma areysianum*, which exactly matches our new species. In addition to the brief differential diagnosis given by Bruyns (2011) we made further observations on the status of the three closely related taxa *C. arabicum, C. areysianum* and *C. socotranum*: Vegetatively, *C. areysianum*

Fig. 1. A *Cynanchum viminale* subsp. *stipitaceum*, Yemen; B *Cynanchum areysianum* (left) together with *Cynanchum arabicum*, Yemen (right); C *Cynanchum areysianum*; D shoots of *Cynanchum areysianum*, *C. socotranum* and *C. arabicum* (from left to right); E *Cynanchum socotranum.* A from *Lavranos et al.* 31372; B from *Lavranos et al.* 31313 (left), *Radcliffe-Smith & Henchie* 4624 (right); C from *Lavranos et al.* 31335; D from *Lavranos et al.* 31335 (left), *Mies et al.* 1503 (middle), *Radcliffe-Smith & Henchie* 4624 (right); E from *Mies et al.* 1503 (all in UBT). PHOTOS: ULRICH MEVE.

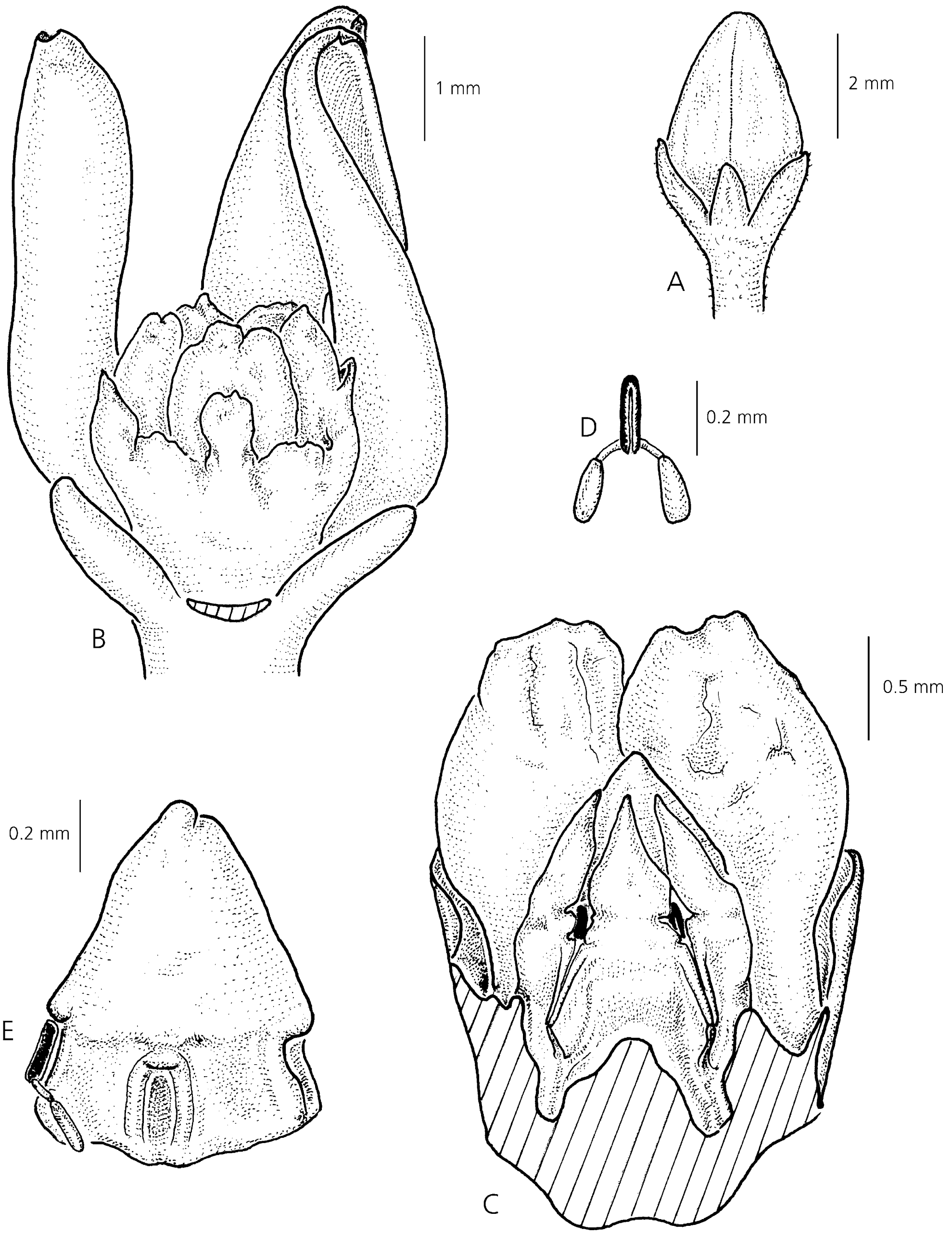

Fig. 2. *Cynanchum areysianum*. **A** flower bud; **B** flower in lateral view, with two petals removed; **C** gynostegium and corona, with parts of corona removed; **D** pollinarium; **E** style-head, with one pollinarium in natural position. All from *Lavranos, Mies & McCoy* 31335 (UBT). DRAWN BY ULRICH MEVE.

cannot be directly distinguished from *C. arabicum*, with its erect to arching (non-twining), thick (usually 6 – 7 mm diam.), greyish green and stout stems (Fig. 1D). Usually the stems and especially the nodes of *C. areysianum* are even thicker than in *C. arabicum* and additionally equipped with a corky ring; the internodes are mostly shorter (cf. Fig. 1D). *C. areysianum* therefore is really a stout plant totally different in habit from the delicate *C. socotranum*, whose stems are around 2.5 – 3.5 (– 4) mm thick and often constricted at the nodes (Fig. 1D, central shoot). Flowers in *C. areysianum* appear terminally or on short lateral peduncles (Fig. 1B, top, 1 C), as can be seen in most plants of *C. arabicum*, whereas the flowers in *C. socotranum* normally appear laterally in a (sub)sessile manner (Fig. 1E). With *C. socotranum*, however, *C. areysianum* shares the rather small flowers with membraneous, oblong, suberect to erect corolla lobes, although the flowers are a bit larger and the corolla lobes are much more twisted as in *C. socotranum*, and also creamish brown to rose instead of greenish yellow. Other shared features include the thickish, rounded and more or less erect staminal corona lobes. However, in contrast to *C. socotranum* the corona lobes are inflated, uneven and much surpassing the style-head (Fig. 2C). All three species lack a complete outer coronal ring formed by interstaminal and (outer) staminal parts as found in most other 'Sarcostemma' taxa. Instead, the 'ring' is not continuous and broken into 'five plus five' separated fringes or scales. Very significant for *C. areysianum*, one mostly lobular and emarginate scale is fused to the basal back of each staminal corona lobe (cf. Fig. 2B). This corona structure is unique in *Cynanchum*. In addition, the staminal corona lobes are of very delicate tissue and inflated. They are also larger, as in the two related species, and of an uneven surface and irregular outline. Furthermore, they cover and greatly exceed the conspicuously large, massive and strictly conical style-head (Fig. 2E). Details of the gynostegium look very similar to those found in *C. socotranum*, although it is larger: the gynostegium is clearly higher than broad (but as high and as broad as in *C. arabicum*, cf. Bruyns & Forster 1991: Fig. 1E), the guide rails are strictly pointed (not forming a 'mouth' as in *C. arabicum*), and the fleshy base of the gynostegium leaves considerable open space beneath the guide rail entrance (whereas the mouth/base of each guide rail is directly fused to the gynostegium without leaving an open space beneath in *C. arabicum*). In contrast to both species, the anther appendages are much longer than wide, triangular-lanceolate and rather acute, while they are triangular-deltate and more or less as long as wide in *C. socotranum* and *C. arabicum*. Finally, the style-head (Fig. 2E) is larger and higher than in the two related species, whereas the style itself is elongated up to 0.8 mm in length (not shown in Fig. 2), and reminiscent of *C. socotranum*. In *C. arabicum* the style is considerably shorter. *C. areysianum* indeed shares a number of significant features, especially of the flowers, with *C. socotranum*, which is therefore clearly identified as its sister-species.

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