

In defence of *Tenaris* and *Macropetalum* (Asclepiadaceae)

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The Asclepiadaceae *s.str.* have been the subject of much attention in recent years, with many changes having been made at the generic level. The recent placement of *Tenaris* and *Macropetalum* into synonymy under *Brachystelma* is questioned. In this article, the merits of this decision are critically assessed and rejected. All three former genera are re-instated and new name combinations are made. A synopsis of the taxa of *Tenaris* and *Macropetalum* is provided with the hope of clarifying their taxonomic concepts.

Keywords: Asclepiadaceae, *Brachystelma*, *Macropetalum*, Taxonomy, *Tenaris*.

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Introduction

The taxa of the Asclepiadaceae *s.str.* have been subjected to much taxonomic shuffling since the family's creation by Robert Brown in 1810, with little generic stability having been achieved since then (Nicholas 1989). This has been especially noticeable over the last few decades within the tribes Stapelieae and Asclepiadieae (Nicholas & Goyder 1990). Researchers, both amateur and professional, often have conflicting, and usually vociferous, opinions as to how various genera of the Asclepiadaceae should be classified, playing havoc with the taxonomic hierarchy. A recent example is the placement of *Tenaris* E. Mey. and *Macropetalum* Decne. into synonymy under *Brachystelma* R. Br. (Peckover 1996). In this paper we explore and discuss the merits of these particular changes.

Discussion

Peckover (1996) criticised Bruyns's (1995) interpretation of the genus *Macropetalum* on the basis of two inconsistent characters which he used to distinguish it. However, it appears that Peckover misunderstood the aim of Bruyns's paper. The characters which Bruyns used to distinguish this genus from *Tenaris* (stems and exterior of corolla glabrous) are key characters used for identification purposes and not important diagnostic characters of classificatory or evolutionary significance. Peckover (1996) stated that these characters were 'not consistent' and could, therefore, not be used to distinguish it from *Tenaris*, and on this basis combined *Macropetalum* with *Brachystelma*.

Dyer (1975) distinguished *Macropetalum* on the basis of it having corona lobes in one series, on or below the back of the anthers, not connected at the corolla base. *Brachystelma*, *Ceropegia* L. and *Tenaris*, on the other hand, have corona lobes in two series, or falsely in one series of 3-fid lobes, the outer series sometimes reduced to small pouches, or slits, between the inner series opposite the anthers. The position and structure of the corona of *Macropetalum* (which is actually pseudouniseriate rather than uniseriate), as well as its relationship to the enlarged gynostegial head, are unique in the Asclepiadaceae (Brown 1908). When this unique and presumably derived character is combined with features such as the long, wholly reflexed corolla lobes, extremely exposed gynostegial column and laterally placed anthers with conspicuous erect appendages, it becomes difficult to justify placing this genus into *Brachystelma*, even though they may have evolved from the same distant common ancestor. The floral differences seen in *Macropetalum* are

probably due to some unique pollination syndrome not found in other species of *Brachystelma* and, in our judgement, are important enough to warrant recognition at the generic level. Even Peckover (1993) admits to the significance of these differences, saying that *Macropetalum* is 'an unusual plant which is unique amongst the stapeliads, especially with regard to its floral form'.

Peckover (1996), however, later appeared to have changed his mind, sinking *Macropetalum* into *Brachystelma*. He attempts to justify this change by comparing morphology within a genus which is heterogeneous (and possibly polyphyletic). Thus the range of character variation is so vast that one can justify sinking almost anything into it. As a result, such taxa become taxonomic 'black holes' sucking in all surrounding genera. Peckover (1996) states that he has attempted to create a system in which only *Ceropegia* and *Brachystelma* would be recognised for 'this group' of related genera. However, following through with this logic, structurally transitional species such as *Ceropegia mafekingensis* (N.E. Br.) R.A. Dyer and *Brachystelma gymnopodum* (Schltr.) Bruyns make this impossible to achieve and would require the sinking of *Brachystelma* under the older name *Ceropegia*! The range of variation in *Ceropegia* would then be such that it would no longer be possible to justify the retention of *Riocreuxia* Decne., *Anisotoma* Fenzl and possibly even *Sisyranthus* E. Mey. as separate genera. The subtribe Ceropeginae in southern Africa would become an unwieldy, meaningless genus - which would probably end up being split into a series of sections and subgenera based on many groups now in existence at the generic level.

Another factor apparently not taken into account by Peckover (1996) is that homoplasy is (because of similar pollination pressures) fairly common in the Asclepiadaceae - a situation accentuated in large paraphyletic or polyphyletic taxa. Hence, to compare the complete synorganisation of the outer and inner corona lobes in *Macropetalum* with the same trend seen in *Brachystelma blepharantha* Huber (which is a short plant, with spatulate leaves, campanulate corolla with short spreading erect lobes and linear-clavate inner corona lobes) is, in its evolutionary significance, like comparing the reduction of the petal whorl in grasses with that in sedges. The phenomenon is of interest, but being non-homologous, cannot be used to lump the Poaceae with the Cyperaceae. Such comparisons become relevant only when they are made between taxa that are known, or at least suspected, to be closely related, and in which the characters compared have not come about due to parallel or convergent evolution. Only

then can the comparison take on any classificatory significance.

In consequence of the above discussion, the genus *Macropetalum* is still recognised as a distinct taxon at the National Herbarium, Pretoria.

Tenaris E.Mey.

This genus is slightly more difficult to define than the closely allied *Macropetalum*. *Tenaris rubella* E. Mey., on which Meyer (1837) established the genus, is quite distinct from *Brachystelma*. This species is immediately distinguished by its leafless, terminal raceme or panicle-like inflorescence, bright pink flowers, and long spreading, spatulate corolla lobes; see the figure given in Harvey (1859). Bullock (1954) sunk *T. rostrata* N.E. Br. and *T. simulans* N.E. Br. under *T. rubella*. However, it is suspected that this broad interpretation may need to be abandoned if critically re-examined. The later addition of species such as *T. filifolia* N.E. Br. and *T. chlorantha* Schltr. (Brown 1908), which have leafy, plainly racemose inflorescences, purple-brown green flowers and filiform corolla lobes, clearly alters the circumscription of the genus as envisioned by Meyer, and creates problems as *Tenaris* now begins to merge with the graminoid species of *Brachystelma*. However, these newly included species are clearly more closely related to *T. rubella*, having in common the same slender habit, short corolla tube and small biserial or double corona arising above the corolla base, and consisting of concave outer lobes and linear, incumbent inner lobes. In their overall features, especially floral, they are more closely related to *T. rubella* than to the graminoid species of *Brachystelma*. It is probably for this reason that Bruyns (1995) commented that 'there appears to be a case for maintaining *Tenaris* as distinct from *Brachystelma* provided it is confined to the seven species of Brown', and why it has been maintained as distinct by Malaise (1985), Brummitt (1992) and Liede and Albers (1994).

The only other species of *Brachystelma* in southern Africa that resemble *Tenaris* are *B. gracile* E.A. Bruce and *B. schultzei* (Schltr.) Bruyns. However, *B. gracile*, which is notoriously variable (Meve 1993), can be immediately distinguished by the fact that it has no corolla tube, a reflexed calyx, corolla lobes that are usually (except in pressed material) connate apically, and quite a different corona structure, the outer lobes being large and deeply bifid, the inner lobes spatulate (and sometimes emarginate) and incumbent-erect above the anthers. For a more detailed description, see Dyer (1980 & 1983) and Meve (1993), the latter with an illustration.

Brachystelma schultzei, from Namibia, was placed in *Tenaris* without comment by Phillips (1941). It superficially resembles *Tenaris* in its stem tuber, habit, few-flowered, leafy, racemose inflorescences, very short corolla tube and long, linear corolla lobes, but this similarity may be either plesiomorphic or due to homoplasy. The corolla lobes differ in being puberulous on both surfaces, and almost ciliate at the expanded base where it forms the mouth of the shallow corolla tube, this being reminiscent of certain species of *Sisyranthus*. The corona is almost pseudomonoserial, with small deltoid, slightly bifid outer corona lobes alternating with long, erect, filiform and connivent inner lobes with tips reflexed. In many ways, the corona is more like that of some species of *Ceropegia* than those of *Brachystelma*, and this is why Schlechter (1913) erected the genus *Kinepetalum* for it. Also, unlike *Tenaris*, the gynostegium may be exerted as is seen in some species of *Brachystelma* and in *Macropetalum*. Phylogenetically, this strange combination of characters from several genera could indicate that *B. schultzei* is near the base of the subtribe, viz. stem Ceropeginae rather than crown Ceropeginae. However, most of its features seem to place it within *Brachystelma* but basal to the tuberous species. However, this must remain speculative and we hope it will be tested in time using

molecular and cladistic studies within the subtribe.

In consequence of the above discussion, the genus *Tenaris* is still recognised as distinct at the National Herbarium, Pretoria.

Conclusion

Evidence available indicates that *Brachystelma* is heterogeneous, and probably polyphyletic. However, a solution is unlikely to be found using purely classical methods. As a result, it is hoped that molecular systematic work and cladistic analysis will eventually be brought to bear on the problem. Although affinities of the genus *Tenaris* are, without doubt, close to some of the tuberous species of *Brachystelma*, they form a coherent group of taxa based on a unique suite of correlated characters (see below). The genus *Macropetalum*, although similar to *Tenaris* in its habit and long filiform corolla lobes, is clearly distinct in its floral and coronal structure from all other genera of the Asclepiadaceae and therefore, like *Tenaris*, it warrants generic status.

Formal taxonomy

Key to genera of the subtribe Ceropeginae in southern Africa

Owing to its structural heterogeneity, *Brachystelma* keys out at several points.

- 1a. Flowers with corolla tube long and cylindrical 2
- 1b. Flowers with corolla tube cupulate, campanulate or absent ... 6
- 2a. Corolla lobes up to 3 mm long *Brachystelma*
- 2b. Corolla lobes usually longer than 4 mm 3
- 3a. Corona monoserial *Orthanthera*
- 3b. Corona biserial 4
- 4a. Leaves absent, or linear to ovate; if large, then not heart-shaped *Ceropegia*
- 4b. Leaves broad (> 30 mm) and long (50–120 mm), heart-shaped with cordate base 5
- 5a. Corolla asymmetrical or with bottle-neck-like constriction near lobes; corolla lobes with long white or purple cilia or at least pubescent *Ceropegia*
- 5b. Corolla symmetrical and without a bottle-neck-like constriction near lobes; corolla lobes glabrous *Riocrexia*
- 6a. Plants with stems trailing along the ground or climbing 7
- 6b. Plants with stems more or less erect and unsupported 9
- 7a. Petioles longer than 25 mm *Emplectanthus*
- 7b. Petioles shorter than 20 mm 8
- 8a. Plants with leaves heart-shaped and cordate at the base; rootstock deep-seated and woody; corona over-topping the style-stigma apex *Anisotoma*
- 8b. Plants with leaves never heart-shaped and cordate at base; rootstock a stem tuber; corona not over-topping style-stigma apex *Brachystelma*
- 9a. Plants graminoid, with thin erect stems not noticeably hairy ... 10
- 9b. Plants not graminoid, if taller than 650 mm, then leaves never linear and noticeably hairy 14
- 10a. Plants with fascicled roots 11
- 10b. Plants with stem tubers 12
- 11a. Corona monoserial; anther appendages present and usually with a few long white hairs *Sisyranthus*
- 11b. Corona biserial; anther appendages obsolete or if present, then without hairs *Brachystelma* (e.g. *B. longifolium* & allies)
- 12a. Corolla lobe tips connate forming a cage around gynostegial column *Brachystelma gracile* & *B. stenophyllum*
- 12b. Corolla lobe tips never connate, usually spreading to reflexed 13
- 13a. Corona monoserial or pseudomonoserial with lobes adnate to staminal column up to anther lobes, then free above; anthers with erect membranous appendages. *Macropetalum*

- 13b. Corona biseriate, not adnate to but arising from just above staminal column base; anthers without appendages *Tenaris*
 14a. Leaves with petioles longer than 20 mm; corona monoseriate or pseudomonoseriate *Riocreuxia aberrans*
 14b. Leaves with petioles never longer than 18 mm; corona lobes noticeably biseriate
 *Brachystelma* (e.g. *B. gracillimum* & allies)

Reinstated genera

Macropetalum Burch. ex Decne. in DC. Prodr. 8: 626 (1844).

Type species: *Macropetalum burchellii* Decne.

This genus can be defined by the following unique, correlated suite of characteristics:

Slender, erect plants up to 1 m high, with branched (usually from near the base) or unbranched stems, produced from a discoid stem tuber. Leaves linear, up to 3 mm wide, up to 100 mm long, usually shorter than, or as long as, the internodes. Inflorescences 4–7-flowered. Flowers facing down. Petals completely free, wholly reflexed from receptacle base at anthesis, thus exposing and presenting gynostegial column. Corona pseudomonoseriate, produced from base of gynostegium where it is adnate to staminal curtain, with lobes free, linear-lanceolate, erect and recurved apically completely over-topping gynostegium. Anthers lateral on stout style-stigma head with conspicuous, erect anther appendages. The genus is monotypic and found only in the central and eastern parts of the southern African subcontinent.

Macropetalum burchellii Decne. in DC. Prodr. 8: 626–627 (1844).

Brachystelma burchellii (Decne.) Peckover: 43 (1996).

Note: This species can be divided into two varieties.

Variety *burchellii*

Corolla whitish or greenish white, up to 30 mm long. Without small teeth on upper edge of recurved corona lobes.

Variety *grandiflora* N.E. Br. in Fl. Cap. 4(1): 799 (1908).

Corolla yellow-green, yellowish or even somewhat orange, longer than 31 mm. With small teeth on upper edge of corona lobes which are not recurved.

Excluded taxa

Macropetalum benthamii K. Schum. in Engl. & Prantl. Naturl. Pflanzenfarn. 4(2): 266 (1897). = *Tenaris rubella* E. Mey. Comm. Pl. Afr., 1837: 198.

Macropetalum filifolium Schltr. in Engl. Bot. Jahrb. 38: 36 (1907). = *Tenaris filifolia* (Schltr.) N.E. Br. Fl. Cap. 4(1): 797 (1908).

Tenaris E. Mey. Comm. Pl. Afr.: 198 (1837). **Type species:** *Tenaris rubella* E. Mey. The genus is based on the following unique, correlated suite of characters:

Stem tuber discoid to globose, producing long, slender, erect stems that are simple or much branched from near base. Leaves linear, shorter than, or as long as, the internodes. Flowers in pairs, or up to 7. Corolla tube short. Corona small, biseriate, arising from staminal curtain above its base, outer corona lobes concave and \pm spreading, inner corona lobes linear and incumbent on back of anthers, and anther appendages \pm absent. This combination of characters suggests that the species of *Tenaris* outlined below form a coherent group, and probably arose from a common ancestor. The genus is composed of five species.

Key to the species of *Tenaris*:

- 1a. Corolla lobes linear-spathulate, pink *T. rubella*
 1b. Corolla lobes filiform or linear-filiform, green, yellow, purple or

- brown 2
 2a. Species found in Zimbabwe *T. bikitaensis*
 2b. Species found in South Africa 3
 3a. Inner corona lobes much longer than anthers. *T. filifolia*
 3b. Inner corona lobes shorter than or subequalling anthers 4
 4a. Flowers > 25 mm in diameter *T. christianeae*
 4b. Flowers < 20 mm in diameter *T. chlorantha*

1. *Tenaris rubella* E. Mey. Comm. Pl. Afr.: 198 (1837).

Brachystelma rubellum (E. Mey.) Peckover: 43 (1996).

Tenaris rostrata N.E. Br.: 473–474 (1903).

Tenaris simulans N.E. Br.: 796 (1908).

Tenaris volkensii K. Schum.: 327 (1895).

Note: This is the type species of the genus. With further investigation, *T. rostrata* and *T. simulans* may prove to be distinct and may need to be reinstated.

2. *Tenaris chlorantha* Schltr. in Engl. Bot. Jahrb. 20: Beibl. 51: 44 (1895).

Brachystelma chloranthum (Schltr.) Peckover: 43 (1996).

Macropetalum benthamii K. Schum.: 266 (1897).

3. *Tenaris filifolia* (Schltr.) N.E. Br. in Fl. Cap. 4(1): 797 (1908).

Macropetalum filifolium Schltr.: 36 & fig. 4. (1907). Please note that the corona structure is not accurately depicted in this figure.

Brachystelma filiformis (N.E. Br.) Peckover: 43 (1996).

4. *Tenaris christianeae* (Peckover) J.E. Victor & Nicholas, comb. nov.

Brachystelma christianeae Peckover in: Aloe 29: 56 (1992).

Holotype: Nkandla, KwaZulu-Natal. R.G. Peckover 141 (PRE).

5. *Tenaris bikitaensis* (Peckover) J.E. Victor & Nicholas, comb. nov.

Brachystelma bikitaensis Peckover in: Aloe 32: 78 (1995)

(Please note that captions for figures 2a and 2b are incorrect, and should be switched around).

Holotype: Zimbabwe, R. G. Peckover 242 (PRE).

Excluded taxa

Tenaris somalensis (Schltr.) N.E. Br. in Fl. Trop. Afr. 4(1): 473 (1903).

Lasiostelma somalense Schltr.: 61 (1899).

Tenaris somalensis was suggested by Peckover (1996) to have fusiform rootstocks, however, we have been unable to confirm this. Gilbert (pers. comm.) has informed us that the type of *T. somalensis* is actually a detached inflorescence of *Caralluma priogonium*.

Tenaris subaphylla (K. Schum.) N.E. Br. in Fl. Trop. Afr. 4(1): 473 (1903).

Brachystelma subaphyllum K. Schum.: 40 (1898).

Gilbert (pers. comm.) has kindly informed us that *Tenaris subaphylla* is probably conspecific with *Ceropegia botrys*. We have therefore excluded it from *Tenaris* until this is verified.

Tenaris browniana S. Moore. Excluded owing to the possession of fusiform roots.

Possibly belongs to *Brachystelma*.

4. *Tenaris schultzei* Schltr. = *Brachystelma schultzei* (Schltr.) Bruyns.

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