

Caputia tomentosa

Asteraceae: Asteroideae: Senecioneae

South Africa

Caputia tomentosa (Haw.) B.Nord. & Pelser in Comp. Newsl. 50: 65 (2012). *Kleinia tomentosa* Haw.: 314 (1812); Berger: 35 (1905); Berger: 390 (1910); Berger: 154 (1931); Marloth: 269, t.68 (1932); Van Laren: 94, fig. 126 (1934); Brown: 130 (1945); Higgins: 64, t.23 (1949); Butterfield: 153 (1954). *Cacalia tomentosa* Haw.: 189 (1803) non Jacq. (1775). *Cacalia canescens* Willd.: 56 (1814). *Cacalia haworthii* Sweet: 336 (1830). *Kleinia haworthii* DC.: 338 (1838); Harvey: 318 (1865). *Kleinia cana* DC.: 338 (1838); Harvey: 319 (1865). *Senecio haworthii* (Sweet) Steudel: 561 (1841); Jeffrey: 934 (1986). *Senecio quinquangulatus* Sch.Bip.: 500 (1845). *Senecio haworthii* (DC.) Sch.Bip.: 500 (1845); Hooker: t.6063 (1873); Jacobsen: 832 (1960); Rowley: 37 (1967a); Rowley: 39 (1967b); Jacobsen: 368, t.130.2 (1974); Rowley: 102 (1994); Rowley: 34 (2002); Smith et al.: 197 (2017a).

The Asteraceae (the daisy family) have a cosmopolitan geographic distribution and with between 25 000 and 30 000 species, it is the largest family of flowering plants. In southern Africa the daisy family has also diversified extensively and some 2 000 species – just less than 10% of the global total – have been recorded in the region. Locally, the Asteraceae are especially well known for being the main contributor to the remarkable spring wild flower display in Namaqualand and surrounding areas along South Africa's western, Atlantic coastline.

As can be expected of a family that includes thousands of species, a vast range of life and growth forms is found among the daisies. Daisy species are annual or perennial herbs, shrubs, or trees. In the western arid, winter-rainfall areas of southern Africa many species have opted for leaf, stem, or caudiciform succulence as a survival strategy in a region that has very hot, dry summers. Succulence is found among about 100 daisy species that belong especially to *Kleinia* Mill. (formerly included in *Senecio* L.) and *Othonna* L., with succulence also present in several other smaller genera (Smith et al. 1997).

Even when not in flower, *Caputia tomentosa* (*tontelbos* in Afrikaans) is an especially attractive and distinctive succulent plant, and so it is surprising that it has not previously been featured in this illustrated series. Its absence from these pages can perhaps be explained by the reticence of some clones to flower in cultivation, particularly when grown under glass in the suboptimal conditions of northern Europe. Despite this and even though their capitula lack ray florets, the discoid heads with butter-yellow disc florets are no less attractive than the downy white leaves.

Caputia tomentosa has a very long and complex taxonomic and nomenclatural history, only summarised here. This species was first described as *Cacalia tomentosa* Haw. (Haworth 1803), but this name is predated by *Cacalia tomentosa* Jacq. (Jacquin 1775). Haworth (1812) transferred the species to *Kleinia*, but with the illegitimate combination *Kleinia tomentosa* Haw.



PLATE 2360 *Caputia tomentosa*

Nordenstam & Pelsner (2012) therefore treated *Kleinia tomentosa* Haw. 'as a new name dating from 1812 and not a new combination since the earlier potential basionym [Haworth 1803] is illegitimate'. This name, however, was adopted by many subsequent authors who separated many species of succulent Asteraceae from the broad concept of *Senecio*, for which the binomial *Senecio haworthii* (DC.) Sch.Bip. was published in 1845.

There has been much debate on the generic placement of most succulent Asteraceae with the result that the genus *Kleinia* Miller (1754) has not been universally accepted. Rowley (1967a, b, 1994, 2002) adopted a broad approach to *Senecio*, notably in his book *Succulent Compositae*, resolutely ignoring *Kleinia*. However, taxonomic tides tend to turn and Jeffrey (1986), emphasising morphological evidence, resuscitated the succulent genus *Kleinia* containing ca. 40 taxa. More recently, molecular evidence (Pelsner et al. 2007, 2010) supports the fragmentation of the huge genus *Senecio* into many segregates including an entity that approximates to *Kleinia*. *Caputia tomentosa*, however, belongs to a distinct clade within the Senecioneae for which the new generic name *Caputia* B.Nord. & Pelsner was subsequently published (Nordenstam & Pelsner 2012). Pelsner et al. (2010) had earlier interpreted the incongruent phylogenetic position occupied by *Caputia* to relate to an ancient hybridisation event, a notion supported in part by morphological data. As originally conceived, this new genus contained just four species confined to South Africa and Swaziland, all succulent perennial herbs with more or less fleshy tomentose or glabrescent leaves. The generic name commemorates the old geographical name *Caput bonae spei*, applied to the Cape of Good Hope, Cape Province, South Africa, or even to the whole of southern Africa. A fifth species (*C. oribiensis* (Van Jaarsv.) J.C.Manning) was added just a year later (Manning 2013). Our species became *Caputia tomentosa* (Haw.) B.Nord. & Pelsner, whose authors regarded *Kleinia tomentosa* Haworth (1812) as a new name not based on the illegitimate earlier name of *Cacalia tomentosa* Haworth (1803).

Caputia tomentosa has acquired a number of other synonyms. *Kleinia cana* DC., for example, was described as a distinct species with shorter and stouter leaves. This was dismissed as phenotypic variation and reduced into synonymy by Marloth (1932).

Further consideration of its history provides fascinating insights to this succulent. Haworth (1812) wrote that this plant had been introduced into cultivation in 1795 and that 'this extraordinary plant has not yet produced any flowers with me. It is completely enveloped in a short dense skin-like cover of cottony wool, which is even capable of being stripped off the leaves like a skin, leaving the leaves themselves green after being divested of it. This cotton, if lighted in the flame of a candle ... slowly consumes in the manner of touch-paper; owing to the resinous quality this genus abounds in. *C. [K.] tomentosa* is capable of living very long without water, as are also other woolly succulents ...' In being difficult to flower, this *Caputia* finds good company with several succulent introductions from southern Africa that grew well in Europe for decades before yielding a single bloom. *Crassula arborescens*, described initially as a species of *Cotyledon*, is another notable such example (Smith et al. 2017b).

It is worth emphasizing that Haworth (1812) placed his new species in two different genera without any knowledge of its flowers. The tardy flowering performance of this species in the northern hemisphere appears to be a persistent feature, for over a half-century



FIGURE 1.—*Caputia tomentosa* in flower in the Conservatory of the Kirstenbosch National Botanical Garden, Cape Town. Photograph: N.R. Crouch.

later Harvey (1865) would document that the flowers were still not known. In fact, the first description and illustration of the reproductive parts appear to be by Hooker (1873), based on a plant that flowered in the garden of Thomas Hanbury at Palazzo Orengo (now well known as La Mortola) near Ventimiglia on the Italian Riviera. Rowley (1967a, b) next recorded flowering in London. He was astonished when one of his plants ‘burst into bloom in a small, grimy London glasshouse in the wet autumn of 1966’. In contrast, flowering (Figure 1) and fruiting (Figure 2) in the conservatory in the Kirstenbosch National Botanical Garden appears to be a regular occurrence.

Caputia tomentosa is unique in the genus in having a dense silvery-white persistent tomentum and disciform capitulum. The other four species, *Caputia medley-woodii* (Hutch.) B.Nord & Pelsler, the type species, first described in this journal (Hutchinson 1923) (Figure 3); *C. oribiensis*; *C. pyramidata* (DC.) B.Nord. & Pelsler; and *C. scaposa* (DC.) B.Nord. & Pelsler (also included here by Dyer 1931) are in contrast all araneose-tomentose or glabrescent, and with prominently radiate capitula (Nordenstam & Pelsler 2012). Of these close relatives, the most recently discovered species, *C. oribiensis*, is closely related to *C. medley-woodii*, but has spatulate leaves arranged in dense terminal rosettes (Van Jaarsveld 2011). *Caputia oribiensis* has a very narrow distribution range, being endemic to the Oribi Gorge in southern KwaZulu-Natal, whereas its sister species, named for John Medley Wood, is more widespread in the Eastern Cape, KwaZulu-Natal, and neighbouring Swaziland.



FIGURE 2.—*Caputia tomentosa* in fruit in the Conservatory of the Kirstenbosch National Botanical Garden, Cape Town. Photograph: N.R. Crouch.



FIGURE 3.—*Caputia medley-woodii*, the type species of the genus, which in contrast to *C. tomentosa* lacks densely woolly leaves and possesses capitula with prominent ray florets. Photograph: N.R. Crouch.

As a typical leaf succulent that contains aerial water-storing tissues, it is to be expected that *Caputia tomentosa* would have evolved mechanisms to protect its stockpile of this essential resource, considering the extreme aridity of at least some of its natural habitats. Commonly, succulents that grow in such regions have thickened outer epidermal cell walls, a thick cuticle, and often even epicuticular waxes (Von Willert et al. 1992). Examples of succulents rendered virtually pure white by such protective waxes abound: the Madagascan *Kalanchoe pumila* Baker and *Dudleya saxosa* (M.E.Jones) Britton & Rose subsp. *col-lomiaae* (Rose) Moran from Arizona, USA, both Crassulaceae, being well-known examples. The papery-scaled members of *Anacampseros* (Anacampserotaceae) also come to mind. Hairy leaves are, however, much rarer among succulents than those with a waxy bloom. The presence of hairs on leaf surfaces, such as abound in *C. tomentosa*, fulfils a role similar to that of wax in preventing excessive water loss. It also protects plants against damage by UV-radiation (Von Willert et al. 1992).

Caputia tomentosa is generally an easy subject in cultivation. Higgins (1949) noted that it 'is inclined to grow leggy and lose its lower leaves; if this occurs the tops of the branches can be cut off and re-rooted and the old plants will probably break again from the base'. Rowley (1974) described *C. tomentosa* [*Senecio haworthii*] as being 'surely the whitest of all white succulents', a statement emphasizing the attractiveness to growers of this remarkable succulent (Figure 4). There are at least two named cultivars. The first, 'Cass's Variety' (Figure 5) was named by Brown (1945) for a mutant that originated in the nursery of



FIGURE 4.—*Caputia tomentosa* growing in the Conservatory of the Kirstenbosch National Botanical Garden, Cape Town. Photograph: N.R. Crouch.



FIGURE 5.—*Caputia tomentosa* 'Cass's Variety' in cultivation in Scotland. Plant ca. 350 mm tall growing in a 140 mm diameter pot. Photograph: C.C. Walker.

Charles L. Cass in San Diego, describing it as 'distinct from the type by its more robust growth. The leaves are more erect and incurving, longer and broader, flattened on the face, more obtusely pointed, the base of leaves never narrowing into a petiole. The leaves and stems are whiter due to the thicker felt-like covering'. The second, 'Hans Herre', has cylindrical leaves near the base, expanding above into a flattened wedge-shaped tip with low notches (Rowley 1994). This cultivar was named by Rowley (1967b) in honour of the mesemb expert and intrepid explorer Hans Herre, who originally collected it at the top of the Karrachab Mountains in the Richtersveld. Unfortunately, this very attractive plant has proven tricky in cultivation and slow to propagate (Rowley 1994), and no longer exists in at least European collections.

Caputia tomentosa is a South African endemic that flowers between November and March, and prefers a rocky slope habitat (Figure 6). It has a wide distribution from the southern Richtersveld in the Northern Cape, southwards to the Great Karoo where it may be found, for example, near Laingsburg and in the Camdebo, and with outlying populations in the more mesic western parts of the Eastern Cape Province (Marloth 1932; Nordenstam & Pelsler 2012; Herman et al. 2013) (Figure 7). It is not known from the generally less arid Core Cape floral region.



FIGURE 6.—The habitat of *Caputia tomentosa* in the Richtersveld National Park (July 2010). Photograph: A.W. Klopper.

Apart from *tontelbos*, it is recorded by Smith et al. (2017a) as having the additional Afrikaans common name of *kapokmadeliefie*, while in English it is known as snow daisy in South Africa, and is documented (Watt & Breyer-Brandwijk 1962) to contain inulin and be used to treat chest complaints.

Description.—Perennial, evergreen, sparsely to densely branched shrublets, 0.5(–1.2) m tall, stems erect, 10–15 mm in diameter, virtually all aboveground plant parts covered by a bright white tomentum. *Branches* erect to leaning to creeping, usually branching from near the base, often leafless below and branching at tips, white-felted when young. *Leaves* sessile, fusiform-cylindrical, or biconvex, distinctly tapering at both ends, densely to subdensely arranged along branches, particularly crowded at tips, white-tomentose, 20–40(–60) × 6–15 mm; apex pointed or rarely slightly notched. *Inflorescence* a solitary, terminal, disciform capitulum; peduncle white-felted, to 150 mm long; involucre cylindrical-campanulate, 15–20 mm in diameter; phyllaries 10–15, uniseriate, obtuse, fleshy, 15–20 × 3–5 mm; calyculus bracts 1–3, resembling the peduncular bracts; ray florets absent; disc florets up to

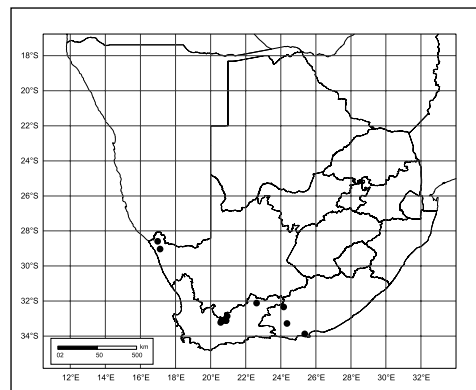


FIGURE 7.—Known distribution of *Caputia tomentosa*.

40, marginal florets female, filiform, bright yellow; hermaphrodite; corolla tubular, 5-lobed; lobes triangular-ovate, apically subcucullate and papillate. *Anthers* basally obtuse, shortly sagittate. *Style* bifurcate, apically subtruncate. *Cypsel*a ellipsoid-oblong, densely puberulous basally. *Pappus* to 15 mm long, white, barbellate. *Chromosome number* $2n = 20$ (Arano 1977). Plate 2360.

ACKNOWLEDGEMENTS

We are indebted to and, hence, gratefully thank several people who have helped prepare material for this publication. Adam Harrower, the manager of the Conservatory at Kirstenbosch National Botanical Garden, kindly allowed access to accessioned material of *Caputia tomentosa*. Dr Ronell Klopper, Biosystematics Research and Biodiversity Collections Division, South African National Biodiversity Institute, provided advice on distribution. Dr Hester Steyn, National Herbarium, South African National Biodiversity Institute produced the distribution map. Arrie Klopper is thanked for the use of his photograph of a habitat of the species. Two anonymous referees are thanked for useful comments on the manuscript.

REFERENCES

- ARANO, H. 1977. Cytological studies in subfamily Carduoideae of Compositae XXIX. Chromosome analysis in some species of foreign succulent *Senecio* (1.) *Journal of Saitama University [Faculty of Education]* 26: 5–16.
- BERGER, A. 1905. Systematische Übersicht der kultivierten Kleinien. *Monatsschrift für Kakteenkunde* 16: 10–14, 19–21, 35–39.
- BERGER, A. 1910. *Stapelieen und Kleinien einschliesslich einiger anderer verwandter Sukkulenten. Beschreibung und Anleitung zum Bestimmen der wichtigen Arten mit kurzer Angabe über die Kultur* [Succulent Compositae: 377–417]. Eugen Ulmer, Stuttgart.
- BERGER, A. 1931. *Kleinia* L. Section II – *Eukleinia*. *Desert* 2: 154.
- BROWN, J.R. 1945. An interesting *Kleinia*. *Cactus and Succulent Journal (U.S.)* 17: 130–131.
- BUTTERFIELD, H.M. 1954. *Kleinia tomentosa* and its synonyms. *Cactus and Succulent Journal (U.S.)* 26: 153–155.
- DE CANDOLLE, A.P. 1838. *Kleinia*. In *Prodromus systematis naturalis regni vegetabilis, sive enumeratio contracta ordinum, generum, specierumque plantarum huc usque cognitarum, juxta methodi naturalis normas digesta* 6: 336–339. Treuttel et Würtz, Paris.
- DYER, R.A. 1931. *Senecio scaposus*. *The Flowering Plants of South Africa* 11: t. 434.
- HARVEY, W.H. 1865. Compositae. In W.H. Harvey & O.W. Sonder (eds), *Flora capensis* 3: 44–530. Hodges, Smith & Co., Dublin / I.C. Juta, Cape Town.
- HAWORTH, A.H. 1803. *Miscellanea naturalia, sive dissertationes variae ad historiam naturalem spectantes*. J. Taylor, London.
- HAWORTH, A.H. 1812. *Synopsis plantarum succulentarum, cum descriptionibus, synonymis, locis; observationibus anglicanis, culturaque*. Richard Taylor, London.
- HERMAN, P.P.J., MANNING, J.C. & BRUYNS, P.V. 2013. *Senecio*. In D.A. Snijman (ed.), *Plants of the Greater Cape Floristic Region, Volume 2: the Extra Cape Flora*. *Strelitzia* 30: 322–328. South African National Biodiversity Institute, Pretoria.
- HIGGINS, V. 1949. *Succulent plants illustrated*. Blandford Press, London.
- HUTCHINSON, J. 1923. *Senecio medley-woodii*. *The Flowering Plants of South Africa*. 3: t. 83.
- HOOKER, J.D. 1873. *Senecio (Kleinia) haworthii*. *Curtis's Botanical Magazine* 99: t. 6063.
- JACOBSEN, H. 1960. *A handbook of succulent plants*. Vol. 2. Blandford Press, London.

- JACOBSEN, H. 1974. *Lexicon of succulent plants. Short descriptions, habitats and synonymy of succulent plants other than Cactaceae*. Blandford Press, London.
- JACQUIN, N. VON. 1775. *Florae austriacae, sive plantarum selectarum in austriae archiducatu sponte crescentium, icones, ad vivum coloratae, et descriptionibus, ac synonymymis illustratae* 3: 20. Vienna.
- JEFFREY, C. 1986. The Senecioneae in East Tropical Africa. *Kew Bulletin* 41: 873–943.
- MANNING, J.C. 2013. Two new combinations in *Caputia* and *Curio* (Senecioneae). *Bothalia* 43: 93.
- MILLER, P. 1754. *The gardener's dictionary. Containing the methods of cultivating and improving all sorts of trees, plants, and flowers, for the kitchen, fruit and pleasure gardens; as also those which are used in medicine. With directions for the culture of vineyards, and making of wine in England. In which likewise are included the practical parts of husbandry. Abridg'd from the last folio edition*. 3 vols. John and James Rivington, London.
- MARLOTH, R. 1932. *The flora of South Africa with a synopsis of the South African genera of phanerogamous plants*. 3(2). Darter Bros. & Co., Cape Town / Wheldon & Wesley, London.
- NORDENSTAM, B. & PELSNER, P.B. 2012. *Caputia*, a new genus to accommodate four succulent South African Senecioneae (Compositae) species. *Compositae Newsletter* 50: 56–69.
- PELSNER, P.B., KENNEDY, A.H., TEPE, E.J., SHIDLER, J.B., NORDENSTAM, B., KADEREIT, J.W. & WATSON, L.E. 2010. Patterns and causes of incongruence between plastid and nuclear Senecioneae (Asteraceae) phylogenies. *American Journal of Botany* 97: 856–873.
- PELSNER, P.B., NORDENSTAM, B., KADEREIT, J.W. & WATSON, L.E. 2007. An ITS phylogeny of tribe Senecioneae (Asteraceae) and a new delimitation of *Senecio* L. *Taxon* 56: 1077–1104.
- ROWLEY, G.D. 1967a. *Senecio haworthii* in bloom. *The Cactus and Succulent Journal of Great Britain* 29: 37.
- ROWLEY, G.D. 1967b. Succulent Compositae. 3. *Senecio haworthii* Sch.Bip. *The National Cactus and Succulent Journal* 22: 39–40.
- ROWLEY, G.D. 1974. *Senecio haworthii* 'Hans Herre'. *Ashingtonia* 1: 46.
- ROWLEY, G.D. 1994. *Succulent Compositae. A grower's guide to the succulent species of Senecio & Othonna*. Strawberry Press, Mill Valley.
- ROWLEY, G.D. 2002. *Senecio*. In U. Egli (ed.), *Illustrated Handbook of Succulent Plants: Dicotyledons*: 29–43. Springer-Verlag, Berlin.
- SCHULTZ, C.H. 1845. Ueber einige mit *Senecio* zu verbindende Gattungen. *Flora* 28: 497–500.
- SMITH, G.F., CROUCH, N.R. & FIGUEIREDO, E. 2017a. *Field guide to succulents of southern Africa*. Struik Nature, Cape Town.
- SMITH, G.F., FIGUEIREDO, E. & MORT, M.E. 2017b. Taxonomy of the three arborescent crassulas, *Crassula arborescens* (Mill.) Willd. subsp. *arborescens*, *C. arborescens* subsp. *undulatifolia* Toelken, and *Crassula ovata* (Mill.) Druce (Crassulaceae) from southern Africa. *Bradleya* 35: 87–105.
- SMITH, G.F., VAN JAARSVELD, E.J., ARNOLD, T.H., STEFFENS, F.E., DIXON, R.D. & RETIEF, J.A. (eds) 1997. *List of southern African succulent plants*. Umdaus Press, Pretoria.
- STEUDEL, E.G. 1841. *Nomenclator botanicus seu: synonymia plantarum universalis, enumerans ordine alphabetico nomina atque synonyma tum generica tum specifica et a Linnaeo et a recentioribus de re botanica scriptoribus plantis phanerogamis imposita*. Vol. 2. J.G. Cottae, Stuttgart & Tubingen.
- SWEET, R. 1830. *Hortus britannicus; or, a catalogue of plants cultivated in the gardens of Britain; arranged in natural orders; with the addition of Linnean classes and order to which they belong, reference to the books where they are described, their native places of growth, when introduced, time of flowering, duration, & reference to figures, with numerous synonyms*. 2nd ed. James Ridgeway, London.
- VAN JAARSVELD, E.J. 2011. *Senecio oribiensis* (Asteraceae), a new cliff-dwelling species from Oribi Gorge, KwaZulu-Natal, South Africa. *Aloe* 48: 78–81.

- VAN LAREN, A.J. 1934. *Succulents other than cacti*. Abbey San Encino Press, Los Angeles.
- VON WILLERT, D.J., ELLER, B.M., WERGER, M.J.A., BRINCKMAN, E. & IHLENFELDT, H.-D. 1992. *Life strategies of succulents in deserts with special reference to the Namib Desert*. Cambridge studies in ecology. Cambridge University Press, Cambridge.
- WATT, J.M. & BREYER-BRANDWIJK, M.G. 1962. *The medicinal and poisonous plants of southern and eastern Africa*, edn. 2. E. & S. Livingstone, Edinburgh & London.
- WILLDENOW, C.L. 1814. *Enumeratio plantarum horti regii botanici berlinensis: continens descriptiones omnium vegetabilium in horti dicto cultorum: supplementum*. Libraria Scholae, Berolini [Berlin].

C.C. WALKER^{1,*}, G.F. SMITH², N.R. CROUCH³ and GILLIAN CONDY⁴

¹School of Environment, Earth & Ecosystem Sciences, The Open University, Milton Keynes, MK7 6AA, England.

²Department of Botany, P.O. Box 77000, Nelson Mandela University, Port Elizabeth, 6031 South Africa.

³Biodiversity Research, Assessment and Monitoring, South African National Biodiversity Institute, P.O. Box 52099, Berea Road, Durban, 4007 South Africa; School of Chemistry and Physics, University of KwaZulu-Natal, Durban, 4041 South Africa.

⁴South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

*Author for correspondence: C.Walker702@btinternet.com.