

the corolla is covered with fine papillae which are \pm twice the length of those in *H. oculata*.

The corona is broader in *Huernia calosticta* than in *H. oculata* and lacks the very slight stipe found at the base in *H. oculata*. While the outer corona lobes are similar in both, the two differ in the inner corona lobes. In *H. calosticta* the inner lobes are broader, rising slightly over the anthers and then descending towards their apices, rather than rising up well above the style apex as in *H. oculata*. The inner corona lobes have especially broad dorsal gibbositities, that are \pm twice as broad as those in *H. oculata*. Another difference is the presence here of a fairly conspicuous, erect tubercle beneath each guide-rail, a feature absent in *H. oculata*.

Other material examined

ANGOLA.—Near Catengue, SE of Benguela, 780 m, Bruyns 10756 (BOL).

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ASTERACEAE

TRIPTERIS CALCICOLA, A NEW CALCIPHILLOUS SPECIES FROM WESTERN CAPE, SOUTH AFRICA

The small tribe Calenduleae of the family Asteraceae is centred in southern Africa, where it is concentrated in the winter rainfall parts of the Western and Northern Cape Provinces of South Africa. About 110–120 species are known, currently distributed among 12 genera (Nordenstam 2006, 2007), but the generic limits and relationships within the tribe are still far from completely resolved. The last revision of the southern African species recognized the six genera *Castalis* Cass., *Chrysanthemoides* Fabr., *Dimorphotheca* Vaill. ex Moench., *Garuleum* Cass., *Gibbaria* Cass. and *Osteospermum* L. (Norlindh 1943). The largest of these, *Osteospermum*, was divided on the basis of cypsel morphology into subgenus *Osteospermum*, with 12 sections, and subgenus *Tripteris* (Less.) T.Norl., with three sections (Norlindh 1943). Following a morphological cladistic analysis of the tribe, the genus *Castalis* was included in *Dimorphotheca* along with *Osteospermum* sect. *Blaxium* (Cass.) T.Norl.; and *Osteospermum* subgenus *Tripteris* and *O.* section *Oligocarpus* (Less.) T.Norl. were each recognized at generic level as *Tripteris* Less. and *Oligocarpus* Less. respectively (Nordenstam 1994a, b). As a result of these adjustments, the tribe Calenduleae then comprised the eight genera *Calendula* L., *Chrysanthemoides*, *Dimorphotheca*, *Garuleum*, *Gibbaria*, *Oligocarpus*, *Osteospermum* and *Tripteris*.

This treatment remained current until recently, when analysis of DNA sequence data suggested that several of the genera were paraphyletic as circumscribed. As a result, the circumscriptions of some of the genera were substantially narrowed in an attempt to define them as monophyletic lineages (Nordenstam 2006; Nordenstam *et al.* 2006). The species *Gibbaria ilicifolia* was segregated as the new monospecific genus *Nephrotheca* B.Nord. & Källersjö, and the following elements were removed from *Osteospermum* and *Tripteris* into new or existing genera: the two species of *Tripteris* sect. *Unifenestrata* T.Norl. were transferred to the new genus *Nephrotheca*; the new genus *Norlindhia* B.Nord. was erected to accommodate the two species of *Tripteris* sect.

Efenestrata T.Norl. subsect. *Confusa* T.Norl. plus a third, newly described species, *N. aptera* B.Nord. (Nordenstam 2006); the new genus *Monoculus* B.Nord. was described for the two species previously placed in *Tripteris* sect. *Unifenestrata*; the monotypic genus *Inuloides* B.Nord. was described for the single species of *Tripteris* sect. *Efenestrata* subsect. *Tomentosa* T.Norl.; and a single species of *Osteospermum* was transferred to each of the genera *Dimorphotheca* and *Oligocarpus*.

Currently, therefore, the tribe Calenduleae comprises the genera *Calendula* (\pm 15 spp.), *Chrysanthemoides* (2 spp.), *Dimorphotheca* (20 spp.), *Garuleum* (8 spp.), *Gibbaria* (1 sp.), *Inuloides* (1 sp.), *Monoculus* (2 spp.), *Nephrotheca* (1 sp.), *Norlindhia* (3 spp.), *Oligocarpus* (2 spp.), *Osteospermum* (\pm 45 spp.) and *Tripteris* (20 spp.) (Nordenstam 2007). Despite these taxonomic adjustments, the genus *Osteospermum* is still evidently paraphyletic as currently circumscribed (Nordenstam *et al.* 2006). The distinction between *Osteospermum* and *Chrysanthemoides* in particular has been blurred by the discovery of a species that is intermediate between them in cypsel morphology (Wood & Nordenstam 2003).

Few synapomorphies are available for the recognition of most of these new segregates, several of which are mono- or oligotypic. It is clear that additional genera will need to be recognized as further taxa are included in a molecular analysis if this treatment is to be carried to its logical conclusion (Nordenstam 2007). An alternative, and in our opinion a more useful treatment, is to adopt a synthetic view of the genus *Osteospermum* as constituting the monophyletic clade sister to the genus *Dimorphotheca* as resolved in the phylogenetic analysis reproduced by Nordenstam *et al.* (2006), thus including the genera *Calendula*, *Chrysanthemoides*, *Gibbaria*, *Inuloides*, *Monoculus*, *Nephrotheca*, *Norlindhia*, *Oligocarpus* and *Tripteris*. In this circumscription the two genera *Dimorphotheca* and *Osteospermum* are separated from *Garuleum* by the synapomorphy of a shortly bilobed style with an annular collar of hairs in the disc florets, and are in turn distinguished from one another by

several morphological, micromorphological and chemical characters: *Dimorphotheca* by large flower heads with ray florets more than twice as long as the involucre, \pm uniseriate involucre, ray florets that are white, orange or purple (rarely pure yellow) and flushed dark beneath, fertile or functionally male disc florets, uniseriate corolla hairs, and the presence of dimorphecolic acid; and *Osteospermum* by the smaller flower heads with ray florets usually up to twice as long as the involucre, mostly bi- or triseriate involucre, yellow or orange-yellow ray florets, functionally male disc florets, biseriate corolla hairs, and the presence of significant quantities of calendic acid (Nordenstam 1994b).

Until a complete classification of the tribe is available, however, we follow current practice and describe the following new species in the genus *Tripteris* s. str. (Nordenstam 2006), with which it accords in its 3-winged cypselae with the apical air chamber enclosed by three translucent windows. In this narrow sense, *Tripteris* comprises \pm 20 species of perennial (rarely annual) herbs, subshrubs or shrubs that are widely distributed through Africa, with about half the species occurring in the winter rainfall parts of South Africa and southern Namibia. An attractive new species from coastal limestone outcrops at Jacobsbaai on the Saldanha Peninsula in the Western Cape represents the first limestone endemic in the genus, which we describe here as *T. calcicola*.

***Tripteris calcicola* J.C.Manning & Goldblatt, sp. nov.**

Herba multicaulis perennis, caulibus florentibus 200–300 mm altis *Tripteris aghillanae* affinis sed ab ea habitu rhizomatoso (non suffrutex pulviniformis), rhizomate multiramato lignoso \pm 5 mm diam., foliis latoribus 30–40 mm (non 5–20 mm) latis, bracteis involucralibus \pm 20 (non 12 ad 15) atque flosculis radiati involucro \pm triplo (non duplo) longioribus distinguitur.

TYPE.—Western Cape: 3217 (Vredenburg): Jacobsbaai, inland of Mauritzbaai, limestone outcrops, (–DD), 15 August 2007, Manning 3100 (NBG, holo.; MO, iso.).

Multi-stemmed, rhizomatous perennial, 200–300 mm high; rhizome much-branched, \pm 5 mm diam., producing clusters of tufted shoots that elongate the following year and flower before dying down; stems suberect, sparsely branched, nodding in fruit, glabrous on first season's growth but densely glandular-pubescent on second season's growth, pale green with glandular heads of trichomes purple. *Leaves* alternate throughout, congested basally, erect, decreasing in size acropetally, lower leaves broadly obovate to oblanceolate, tapering below into long, petiole-like base, midrib prominent abaxially, petiole 35–45 mm long; blade 30–40 \times 20–30 mm, leathery, puberulous with glandular and eglandular trichomes, these longer along margins, margins sparsely and weakly \pm 10-dentate, subobtusely-mucronulate, upper leaves oblong-lanceolate, 10–20 \times (3–)5–7 mm. *Capitula* heterogamous, radiate, \pm 60 mm diam., solitary on shortly leafy, peduncle-like stems. *Involucre* shallowly campanulate, 10–12 mm diam.; involucral bracts \pm 20, uniseriate, lanceolate, 6–7 \times 2–3 mm, acute, densely glandular-pubescent, glandular heads of trichomes purple,

with scarious margins 0.5–1.0 mm wide. *Receptacle* flat, glabrous. *Ray florets* female-fertile, 20–22; tube sparsely glandular-pubescent, \pm 0.8 mm long, up to 9 setting fruit; lamina spreading but recoiling in afternoon, narrowly elliptic, 4-veined, \pm 3 \times as long as involucre, 20–25 \times 4–5 mm, straw-yellow marked with dark maroon adaxially in basal 5–6 mm, flushed reddish abaxially, veins red. *Anthers* vestigial, free, reduced to 4, subulate staminodes \pm 0.8 mm long, yellow. *Style* terete, on short stylopodium, branching \pm 1 mm above mouth of tube, branches narrowly elliptic-lanceolate, obtuse, \pm 1.5 mm long, yellow, lateral margins stigmatic. *Ovary* obovoid, 3-angled, \pm 2 mm long, shortly glandular-pubescent. *Cypselae* homomorphic, 3-winged, 10–12 \times 7 mm, body narrowly turbinate, \pm 6 mm long, glandular-pubescent, with apical, trifenestrate airchamber, windows ovate, 3.5 \times 2.0 mm, wings translucent, \pm 2.5 mm wide. *Disc florets* functionally male, numerous; corolla narrowly funnel-shaped, 4–5 mm long, yellow; tube glandular-hairy, \pm 3 mm long; lobes suberect, triangular, \pm 2 mm long, with marginal veins joining at sinuses and continuing down tube. *Anthers* 2 mm long, dark purple with yellow filaments; anther base tailed, tails equalling filament collar; anther appendage ovate. *Ovary* compressed-ovoid with lateral ribs, \pm 1 mm long, glandular-pubescent. *Style* terete, on short stylopodium, shortly bilobed apically, lobes deltoid, acutely papillate with basal fringe of longer trichomes. *Flowering time*: August. Figure 17.

Distribution and ecology: so far known only from the vicinity of Jacobsbaai just north of Saldanha Bay on the west coast of the Western Cape (Figure 18), the species is a component of Saldanha Limestone Strandveld (Mucina & Rutherford 2006), a rare coastal vegetation type that is almost entirely limited to the Saldanha Peninsula and is rich in Red Data species. Plants of *Tripteris calcicola* are restricted to exposed outcrops of limestone, where they grow in shallow, loamy soils overlying limestone pavement. Co-occurring endemic shrublets include *Diosma* cf. *guthriei* (Rutaceae), *Felicia elongata* (Asteraceae) and *Nenax hirta* subsp. *calciphila* (Rubiaceae).

The woody rhizomes of *Tripteris calcicola* creep along the surface of the rock through the shallow soil layer, sending up numerous aerial shoots with tufts of leaves during the growing season. These shoots do not die back during the ensuing summer but elongate over the second growing season during the winter, and flower in the early spring before dying back completely after fruiting. This distinctive growth form results in a single ramet spreading over an area of one or two square metres, producing numerous, tufted shoots each year plus several suberect flowering stems. The flower heads expand fully during the mid-morning but the ray florets curl back by mid-afternoon. The flower heads have a remarkable similarity in size, colour and marking to the local form of *Ursinia anthemoides* (for illustration see Manning 2003: 256).

Diagnosis and relationships: the large, 3-winged cypselae with 3-windowed apical air chambers place this species among those treated as *Osteospermum* subgenus *Tripteris* section *Trifenestrata* by Norlinth (1943) and as the genus *Tripteris* s. str. by Nordenstam (1994a). Among these species it appears to be most closely allied to *T. aghillana* DC., a cushion-forming subshrub with



FIGURE 17.—*Tripteris calcicola*, Manning 3100 (NBG). A, vegetative shoots; B, flowering shoot; C, involucre bracts. D–F, details of ray floret: D, floret; E, staminode; F, style branches. G–I, disc floret: G, floret; H, single anther; I, style branches. J, fruiting head; K, cypselae. Scale bars: A, B, J, 10 mm; C, 1.5 mm; D, G, K, 2 mm; E, F, H, I, 0.5 mm. Artist: J. Manning.

large, homomorphic cypselae, basally congested leaves, and large flower heads in which the ray florets are strongly marked at the base with dark purple bands and the anther appendages at least are also dark purple. Ray florets with dark bases are known elsewhere in the subgenus only in the somewhat distantly related *Monoculus monstrosus* (Burm.f.) B.Nord. (= *Tripteris clandestina* Less.), an annual species placed in *Osteospermum* subgenus *Tripteris* section *Unifenestrata* by Norlindh (1943). *T. calcicola* differs from *T. aghillana* in distri-

bution, ecology, habit and morphology. *T. aghillana* is widespread through the interior of the Western Cape, reaching the coast only at Cape Agulhas, and although also a subshrub with annual flowering stems, it is not rhizomatous, and the persistent woody bases of the stems are carried above ground so that the plant develops a rounded, cushion-like habit. This is in contrast to the subterranean woody rhizomes of *T. calcicola*, in which only the leafy shoots project above the soil surface and the plant develops a creeping, mat-like habit. *T. calcicola*

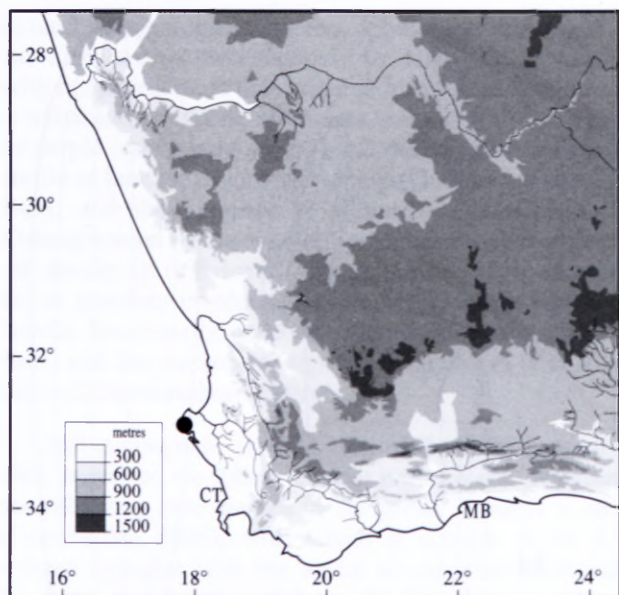


FIGURE 18.—Known distribution of *Tripteris calcicola*.

is further distinguished by its broader leaves, 30–40 mm wide vs 5–20 mm; more numerous involucre bracts, ± 20 vs 12–15; and longer ray florets, \pm three times as long as the involucre vs \pm twice as long.

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