

Two new species of *Cineraria* (Senecioneae, Asteraceae) from KwaZulu-Natal, South Africa

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Abstract

Two new species of *Cineraria* L. (Senecioneae) are described: *Cineraria glandulosa* Cron, endemic to KwaZulu-Natal, and *Cineraria dryogeton* Cron from the Umtamvuna Nature Reserve on the border of KwaZulu-Natal and the Eastern Cape. Both species are narrow endemics, restricted to specific habitats and geological formations, and are therefore vulnerable to human-induced disturbance and the threat of extinction. However, both species occur in nature reserves, which reduce the threat of extinction.

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1. Introduction

Cineraria L. (Senecioneae, Asteraceae) comprises mainly perennial herbs and subshrubs with heterogamous, radiate capitula with yellow florets. As the name suggests (from *cinereus* meaning ash-coloured), many of the species have grey leaves and stems due to a tomentose or cobwebby indumentum. The genus is distinguished by its obovate, compressed cypselae with narrow wings or margins, and palmately veined, commonly auriculate leaves (Cron, 1991; Bremer, 1994). The capitula have a uniseriate, calyculate involucre and the cypselae have a distinct carpodium. As a senecioid member of the Senecioneae, *Cineraria* has balusterform (dilated) filament collars in its anthers and discrete stigmatic areas (Nordenstam, 1978; Bremer, 1994). The style apex is obtuse, usually fringed with sweeping hairs.

Cineraria is essentially an African genus, ranging from the Cape Peninsula and mountains of South Africa along the eastern highlands of Africa to Ethiopia. In the west, it occurs in the mountainous areas of Namibia and southern Angola. One species, *Cineraria abyssinica* Sch. Bip. ex A. Rich, extends from Ethiopia into Yemen and Saudi Arabia, and another,

Cineraria anampoza (Baker) Baker, is endemic to Madagascar. *Cineraria* has an afroalpine (to afroalpine) affinity, occurring at 1600–4300 m in the mountains of tropical East Africa (Hedberg, 1957) and 1200–3300 m in the Drakensberg range in South Africa (Hilliard, 1977; Cron, 1991), but also reaches sea-level in the Western Cape, a pattern consistent with the biogeographic relationship of altitude and latitude.

Of the 35 species of *Cineraria*, 31 (89%) occur in southern Africa (South Africa and/or one or more of its immediate neighbours) and 17 (49%) occur only in South Africa. Thirteen of these southern African species are restricted to a single province, mountain or coastal region. Only six species are widespread: *Cineraria aspera* Thunb., *Cineraria deltoidea* Sond., *Cineraria erodioides* DC., *Cineraria geraniifolia* DC., *Cineraria lobata* L'Hér. and *Cineraria lyratifformis* Cron.

Narrow endemic species in southern Africa include *Cineraria cyanomontana* Cron from the Blouberg Mountain (Limpopo Province), *Cineraria longipes* S. Moore from southern Gauteng, *Cineraria pinnata* O. Hoffm. from Maputaland (southern Mozambique and northern KwaZulu-Natal), *Cineraria atriplicifolia* DC. from the coastal to inland regions of KwaZulu-Natal, *Cineraria vagans* Hilliard from the Amatole Mountains in the Eastern Cape, *Cineraria saxifraga* DC. from the Albany region in the Eastern Cape and *Cineraria angulosa* Lam. (previously *C. humifusa* L'Hér.) from the Saldanha region in the Western Cape. In most cases, each

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species is associated with a specific substrate, e.g., *C. angulosa* with granites and *C. longipes* with basalts. Included in this tally of local endemic species are the species described here. They are narrow endemics in KwaZulu-Natal and are also associated with specific geologies.

2. *Cineraria glandulosa* Cron, sp. nov., formae foliorum et auricularum *C. erodioides* simile, sed folia et caules pilis glandulosis densis vestita, quoque involucriorum squames pilis glandulosis interdum vestita

TYPE: South Africa, KwaZulu-Natal, Mphendle District, Farm Tillietudlem, 1640 m [5000'], 6 April 1947, *Huntley 154* (NH, holo.!, NU, iso.!).

Perennial (?) herb, to about 0.5 m tall. *Stems* woody, branching towards base, green with reddish-brown lines or brown, hairy. *Leaves* deltoid-reniform to reniform, occasionally with one or two lateral pinnae; lamina 10–24 × 12–26 mm, green, densely pilose glandular; apex obtuse; margin dentate; base subcordate to cordate; petiole 6–32 mm long, densely covered with glandular hairs; auricles conspicuous, concurrent on petiole, rarely absent. *Capitula* heterogamous, radiate, few 2–10 (–46) per stem, in a lax panicle; peduncles 7–35 mm long, glabrous to densely hairy; bracteate; bracts 2.0–3.5 mm long. *Involucre* campanulate; calyculate; calyculus bracts with glandular hairs, phyllaries 8–10, 4–5 (–7) mm long, glabrous or hairy; margins scarious. *Ray florets* female, 5, rarely 7, 6.0–8.5 mm long; limb narrowly elliptic to

oblanceolate, 3.0–6.0 × 1.1–2.2 mm, 4-veined, sparsely villos at base with biseriate glandular hairs. *Disc florets* 18–24, corolla tubular below, narrowly campanulate above, ca. 4 mm long, glabrous, lobes 0.5–1.0 mm long. *Cypselae* obovate, compressed, median midrib sometimes pronounced, narrowly margined, brown, 2.0–3.0 × 0.9–1.2 mm, glabrous. *Pappus* white bristly, ca. 3.5 mm long.

2.1. Flowering time

C. glandulosa flowers in March and April.

2.2. Distribution and habitat

The species occurs in KwaZulu-Natal: in the Mphendle, Umlazi and New Hanover Districts, as well as near Murchison (Fig. 1). It grows amongst grass and rocks on slopes of river valleys, or at base of cliffs above river gorges, on Natal Group Sandstones. Altitude: (630–) 1400–1800 m.

2.3. Conservation status

The species is rare and sparsely distributed, known from few localities and is restricted in distribution with small populations. It has been collected twice from Loteni Nature Reserve, where it is protected. The taxon has been placed on the Orange List for South African plants (J. Victor, *pers. com.*) as its habitat is not very prone to destruction by humans.

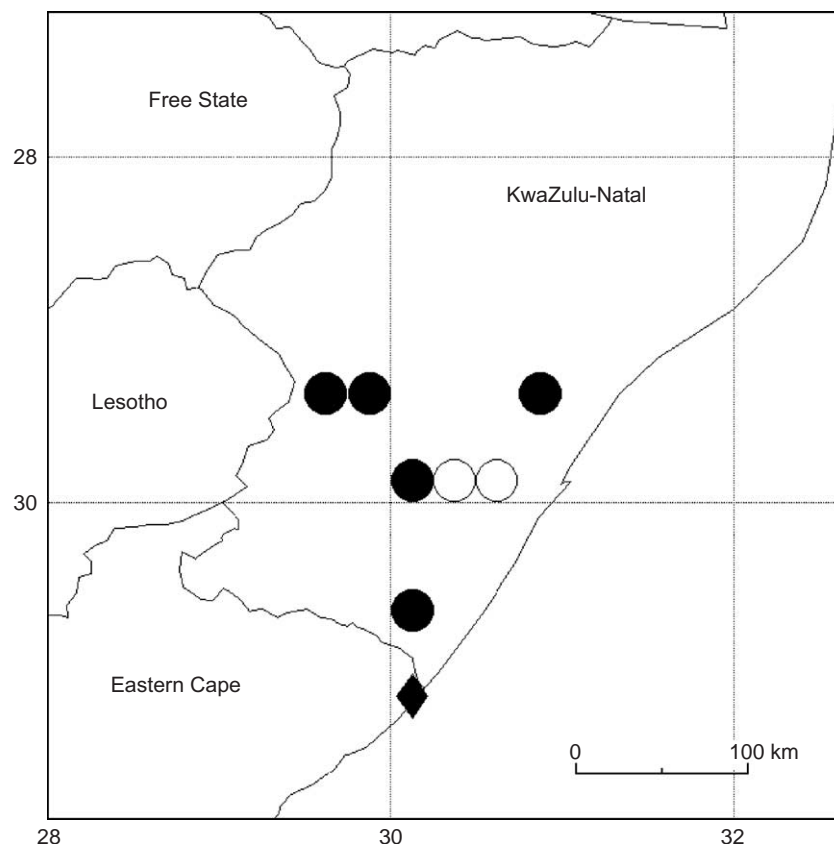


Fig. 1. Known distribution of *C. glandulosa* (●) and its potential hybrid with *C. atriplicifolia* (○) and *C. dryogeton* (◆).

2.4. Diagnostic characters

C. glandulosa resembles *C. erodioides* in the concurrent auricles on the petiole and reniform leaves (Figs. 2a and 3a,b), but differs in the dense glandular indumentum of the leaves and stem and calyculus bracts (and sometimes the involucre bracts) and the generally smaller capitula (five ray florets and 18–24 disc florets). *C. erodioides* is a very variable species with 5–8(–13) ray florets and (20–)25–40(–80) disc florets, but the populations with smaller capitula mainly occur at low altitude in the Eastern Cape.

Hilliard (1977) recognised this as a potentially distinct species (no. 6, pp. 379–380), but included in her description

Moll 3037 (K, NU) from Richmond District, matched by *Cron and Scott-Shaw 9* (J, K, MO) from the same district. The leaves of this specimen resemble those of *C. atriplicifolia* in their deltoid shape and dissection, especially of the uppermost leaves but have a glandular indumentum (Figs. 2b and 3c,d) (Hilliard, 1977, Fig. 15Da). The auricles are not concurrent and also differ in being sharply toothed and dissected. The specimens have many more capitula on shorter peduncles and their growth form resembles *C. atriplicifolia* more closely than *C. glandulosa*. *C. atriplicifolia* also has small capitula in a compact synflorescence, but has caducous auricles and has glandular hairs only in the angles of the lobes of its leaves. The striate patterning of the epicarp of the cypselae (Fig. 2c)

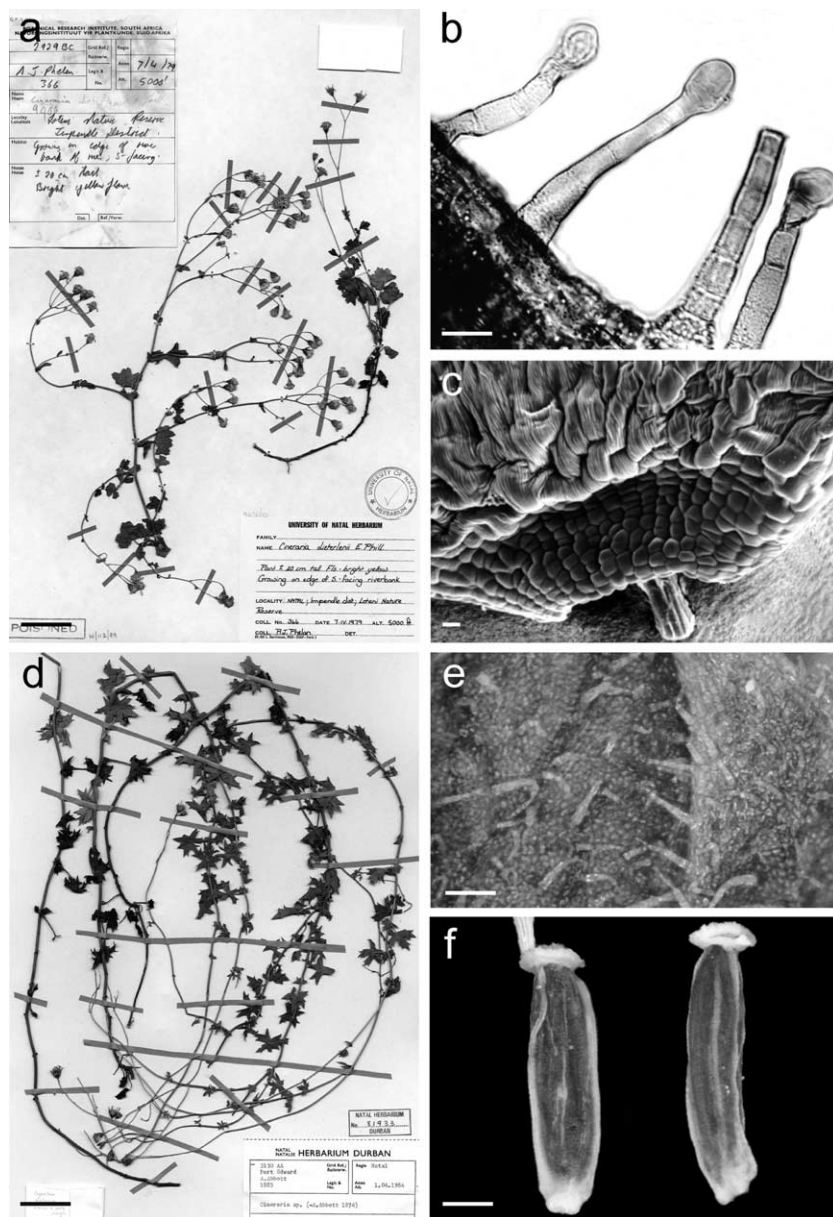


Fig. 2. Morphological and micromorphological characters of *Cineraria*: (a) *C. glandulosa* (Phelan 366), bar=30 mm. (b) Glandular trichomes (*Cron and Scott-Shaw 9*), bar=15 µm. (c) Carpopodium and base of cypselae of putative hybrid between *C. atriplicifolia* and *C. glandulosa* (*Cron and Scott-Shaw 9*), bar=10 µm. (d) *C. dryogeton* (Abbott 1885), bar=32.4 mm. (e) Hairs on ventral surface of leaf of *C. dryogeton* (Abbott 1885), bar=250 µm. (f) Glabrous cypselae of *C. dryogeton* (Abbott 1885), bar=315 µm.

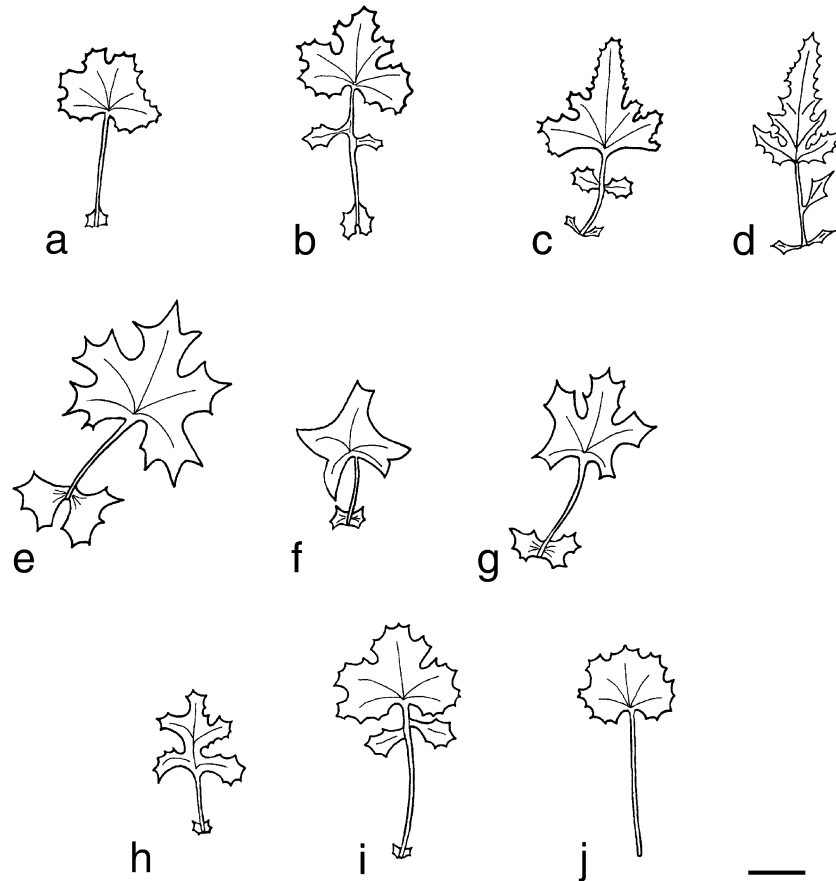


Fig. 3. Variation in leaf shape and auricles of *Cineraria*: (a–b) *C. glandulosa* (Huntley 154); (c) putative hybrid between *C. atriplicifolia* and *C. glandulosa* (Cron and Scott-Shaw 9); (d) *C. atriplicifolia* (Cron 7); (e–g) *C. dryogeton*: (e) Abbott 7809 (PRU), (f–g) Abbott 1885 (NH); (h–j) *C. geraniifolia*: (h) Balkwill, Manning and Cadman 1323 (NU), (i) Hilliard and Burt 9739, (j) Drège 5902 (K). Bar=10 mm.

also matches *C. atriplicifolia* (Cron, 1991). We suggest that these specimens are the result of reticulate evolution between *C. glandulosa* and *C. atriplicifolia*. The manuscript name of *C. collina* Hutch and Taylor ined. is indicated on the *Medley Wood 1898* specimens (NH, K), but the name has never been published.

Balkwill 9509a (J) from Horseshoe Valley, north of Port St. Johns in the Eastern Cape, also matches *C. glandulosa* in having glandular hairs and decurrent auricles on the petioles, but its cypselae are hairy and the ray cypselae are unusually broad-winged. Its leaf shape is more deltoid like *C. decipiens*, which also has hairy cypselae. Indumentum of the cypselae is a variable character in some species, e.g., *C. deltoidea*, *Cineraria albicans* N.E.Br. and *C. erodioides*. The affinity of this specimen needs to be confirmed.

2.5. Specimens examined

South Africa, KwaZulu-Natal:

- 2929 (Underburg): Loteni Nature Reserve (–BC), *Phelan 366* (NU); *ibidem*, *Cron and Goodman 586* (J); Mpendhle, “Tillietudlem” (–BD), *Huntley 154* (NH, NU).
- 2930 (Pietermaritzburg): New Hanover District, Little Noodsberg, Lager Farm (–BD), *Hilliard and Burt*

14512 (K, NU); hills above Illovo River (–CC), *Medley Wood 1898* (BOL, K, NH).

- 3030 (Port Shepstone): Murchison (–CA), *Medley Wood 3074* (NH).

Putative hybrids between *C. glandulosa* and *C. atriplicifolia*
 – 2930 (Pietermaritzburg): Richmond, Tala Farm (–CD), *Moll 3037* (NH, NU); Richmond District, on Farm Wingfield (–DC), *Cron and Scott-Shaw 9* (J, K, MO).

3. *Cineraria dryogeton* Cron, sp. nov., affinis *C. geraniifolia* sed folia et caules pilis densis vestita, folia et auriculae lobis profundis dentatis acutis, quoque auriculis magniores. Differt capitulis minoribus plerumque quinque flosculis radiis et cypselis anguste obovatis

TYPE: South Africa, KwaZulu-Natal, Umtamvuna Nature Reserve, near Umfafa Falls, 8 March 2001, *Abbott 7809* (PRU, holo.!, J, K, NH, iso.!).

Annual or short-lived perennial herb, up to 1.0 m tall. *Stems* herbaceous, slender, very densely hairy, rarely branched near base; base slightly woody, ca. 2 mm in diameter. *Leaves* sagittate to reniform, distinctly three- or five-lobed, occasionally with a pair of lateral pinnae; lamina 10–19 × (7–) 17–32 mm, green, densely hairy; apex acute; margin with sharply acute, large teeth; base sagittate to cordate; petiole (3–) 8–25 mm

long, densely hairy; auricles conspicuous, sharply toothed. *Capitula* heterogamous, radiate, lax, 2–8 per corymb; terminal peduncles 24–60 (–90) mm long, glabrous; bracts sparse, 1.5–2.0 (–4.0) mm long. *Involucre* campanulate, calyculate; phyllaries 8, 5.0–5.5 mm long, glabrous, margins scarious. *Ray florets* 5 or 6 (rarely 7 or 8), 7–9 mm long; limb narrowly elliptic to oblanceolate, 5.0–7.0 × 2.2 mm, four-veined, sparsely villous at base with biseriate glandular hairs. *Disc florets* ca. 18–20; corolla tubular below, narrowly campanulate above, 4.5–5.0 mm long, glabrous, lobes 1 mm long. *Cypselae* narrowly obovate, compressed, brown with paler margins, 2.0 × 0.5–0.8 mm, glabrous. *Pappus* white, bristly, 3.5–4.0 mm long.

3.1. Flowering time

The species flowers in March and April.

3.2. Distribution and habitat

C. dryogeton is known only from the Umtamvuna Nature Reserve in southern KwaZulu-Natal, South Africa (Fig. 1), bordering the Eastern Cape. This area forms part of the Pondoland Centre of Plant Endemism, a region with many restricted-range plant species associated with sandstone of the Msikaba Formation (Van Wyk and Smith, 2001). The species grows in grasslands near forest margins and forest margins near waterfalls, in sandy-loam soil overlying sandstone rocks of the Msikaba Formation, at altitudes of 300–400 m.

3.3. Conservation status

The species is rare and is endangered due to its limited distribution, very likely restricted to this forest and similar forests in the region.

3.4. Diagnostic characters

C. dryogeton shows an affinity with *C. geraniifolia* in its growth form and leaf shape, but differs markedly in the dense indumentum of its stems and leaves (Fig. 3). *C. geraniifolia* is typically a multi-stemmed, slender, perennial herb with reniform, lobed leaves and two or three fairly large capitula on long peduncles, with 12 or 13 involucre bracts and 8–13 rays. In contrast, *C. dryogeton* is usually a single-stemmed trailing annual or biennial herb, bearing smaller capitula with 8 involucre bracts and 5 (rarely 7 or 8) rays. It is difficult to ascertain whether *C. dryogeton* is annual or a short-lived perennial as its habitat is dense, tall grassland along forest margins subject to regular burning (A. Abbott and A.E. van Wyk, personal communication). This may also account for the long, unbranched stem of *C. dryogeton* (Fig. 2d) that enables it to compete with the tall grass, which in turn serves to support it. The cypselae of both species are glabrous with a distinct pale narrow wing or margin, but are broadly obovate in *C. geraniifolia* and narrowly obovate in *C. dryogeton* (Fig. 2f). Occasionally, the lobing of the leaves of *C. geraniifolia* is deeper than usual, but then the lobes are not

as large nor as sharply acute (Fig. 3h,i,j) as in *C. dryogeton* (Fig. 3e,f,g). The auricles also differ, being much more sharply toothed and deeply dissected and conspicuous in *C. dryogeton* than in *C. geraniifolia*.

C. geraniifolia is a widespread and quite variable species, extending from East London in the Eastern Cape through KwaZulu-Natal to Graskop in Mpumalanga. It occurs mainly at higher altitudes (1200–2500 m) than *C. dryogeton* and is found in the Amatole and Great Winterhoek Mountains in the Eastern Cape and in the Drakensberg of KwaZulu-Natal. Some of the lower-altitude, coastal specimens from Gonubie in the Eastern Cape are unusual, having very elongate leaves and growing in marshy areas (Cron, 1991). Another odd form of *C. geraniifolia* grows in grazed fields of the Hogsback and has extremely dissected leaves, with very narrow lobes (e.g., Johnson 1187, Phillipson 1276, Cron and Goodman 563). Allied forms of *C. geraniifolia* in the mountains near Maclear in the Eastern Cape [e.g., Bester 2459 (PRU)] have smaller capitula with 8 involucre bracts and 5 rays. These forms differ from *C. dryogeton* in their degree of lamina dissection and shape of the leaf lobes, indumentum and the very small or absent auricles.

3.5. Specimens examined

South Africa, KwaZulu-Natal:

- 3130 (Port Edward): Umtamvuna Nature Reserve, near Umfafazo Falls (–AA), Abbott 1885 (NH, PRU); *ibidem*, Abbott 7809 (J, K, NH, PRU); Umtamvuna Nature Reserve, Chestnut Grove, Abbott 1874 (UNR).

4. Discussion

4.1. Endemic regions and conservation status

Many *Cineraria* species (22%), including the species described here, are narrowly endemic. Most of them are associated with centres of plant endemism (Van Wyk and Smith, 2001).

4.2. KwaZulu-Natal Midlands

The KwaZulu-Natal Midlands are the centre of diversity for *Cineraria* within southern Africa: 34% (12/35) of the species occur in the province with the largest number in degree grid squares 2929 and 3029. This centre of diversity is part of the larger Maputaland Pondoland Phytogeographic Region (Van Wyk and Smith, 2001). The area is dissected by river gorges and the altitudinal range is considerable (600–1500 m). Grasslands predominate with pockets of forest in areas protected from fire. The Midlands merge into the foothills of the Drakensberg escarpment. All these factors contribute to a varied landscape, which can accommodate a wide diversity of plants.

In KwaZulu-Natal, the Asteraceae outnumber other angiosperm families: 551 indigenous species in 113 genera, with 30%

endemic to the province (Hilliard, 1978). Hilliard (1978) described two minor centres of endemism in KwaZulu-Natal, one associated with the Natal Group and Msikaba Formation sandstone (where about 4% of the Asteraceae endemic to KwaZulu-Natal occur); the other on the sandy Maputaland (=Tongaland) coastal plain. *Cineraria* occurs in 5 of the 12 associations/groups of Asteraceae in KwaZulu-Natal recognised by Hilliard (1978). *C. glandulosa* and *C. dryogeton* both appear to fall into Group 3, viz. KwaZulu-Natal endemics not confined to the Drakensberg, and some in the “Table Mountain Sandstone” outcrops and gorges, as they were previously known.

C. glandulosa grows at the base of cliffs above river gorges or on the slopes of river valleys, at altitudes ranging from 1000 to 1800 m in Mphendle, Umlazi and New Hanover Districts and at lower altitude on the Oribi Flats near Murchison (Port Shepstone District). The populations resulting from putative hybridization between *C. glandulosa* and *C. atriplicifolia* occur in grassland or scrub associated with river gorges in the Richmond District. *C. atriplicifolia* is also rare with a scattered distribution and is classified at a “lower risk” level of threat (Scott-Shaw, 1999). *C. glandulosa* is certainly also rare with small, scattered populations, with a relatively small range (estimated at less than 20,000 km²). Its habitat is restricted, but the threat by expansion of rural communities is limited due to its location on river banks and at the base of cliffs and its occurrence in the Loteni Nature Reserve provides some protection. It is therefore classified as “near threatened”.

4.3. Pondoland

C. dryogeton is thus far known only from the Umtamvuna Nature Reserve on the border between KwaZulu-Natal and the Eastern Cape, an important conservation area in the Pondoland Centre of Plant Endemism (Abbott et al., 2000). This area is rich in palaeoendemics and also neoendemics with a strong Cape and Afromontane affinity (Van Wyk and Smith, 2001). The predominant rock type in the Pondoland Centre is sandstone of the Msikaba Formation with a quartz content of 70–96%, with potassium feldspar and mica next most abundant (Hobday and Mathew, 1974). The sandstone islands are surrounded by sediments of the Karoo Supergroup and basement rocks (granites, gneisses, schists) of the Natal Metamorphic and Structural Province. The Msikaba Formation sandstones show more similarity to the Table Mountain Group sandstone of the Cape than to the Natal Group sandstone (Van Wyk and Smith, 2001). The Umtamvuna River Gorge is one of the narrow river gorges with forest on the steep sides and a grassland plateau above that characterise the Pondoland sandstone region. A large number of plant species are endemic or largely confined to these sandstone areas, including at least 17 endemic/near-endemic herbs and shrublets occurring inside forests or on forest margins, three of which are Asteraceae (Van Wyk, 1990).

Van Wyk and Smith (2001) noted that there is a clear path of migration between the Pondoland Centre and KwaZulu-Natal Drakensberg via the Ngeli Range. This might have been the

migration route for *C. dryogeton* if, as suggested here, it is closely related to *C. geraniifolia*, which occurs in the Drakensberg and the Eastern Cape mountains. *C. albicans*, a near-endemic to the region, also occurs in the adjacent mountains of the Eastern Cape and the KwaZulu-Natal Midlands (Hilliard, 1977; Cron, 1991).

Much of the grassland in the Pondoland Centre has been floristically depleted or destroyed by anthropogenic activities and the remaining small patches of forest are under intense human pressure (Van Wyk, 1993; Abbott et al., 2000). *C. dryogeton*, although protected in the Umtamvuna Nature Reserve, is known only from a few small populations in the reserve and would be under considerable threat of extirpation in similar habitats outside the reserve where it might occur. It is therefore considered endangered.

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References

- Abbott, A., Van Wyk, A.E., Johnson, D.N., Scott-Shaw, R., 2000. Checklist of the macrofungi, lichens, bryophytes and vascular plants of the Umtamvuna Nature Reserve, South Africa. *Lammergeyer* 46, 1–17.
- Bremer, K., 1994. *Asteraceae: Cladistics and Classification*. Timber Press, Portland, Oregon, ISBN: 0-88192-275-7.
- Cron, G.V., 1991. A systematic study of certain species of *Cineraria*. Unpublished MSc. thesis. University of the Witwatersrand, Johannesburg.
- Hilliard, O.M., 1977. *Compositae in Natal*. Natal University Press, Pietermaritzburg, ISBN: 0 86980 088 4.
- Hilliard, O.M., 1978. The geographical distribution of Compositae native to Natal. *Notes from the Royal Botanic Garden Edinburgh* 36, 407–425.
- Hobday, D.K., Mathew, D., 1974. Depositional environment of the Cape Supergroup in the Transkei. *Transactions of the Geological Society of the South Africa* 77, 223–227.
- Nordenstam, B., 1978. Taxonomic studies in the tribe Senecioneae (Compositae). *Opera Botanica* 44, 1–84.
- Scott-Shaw, R., 1999. *Rare and Threatened Plants of KwaZulu-Natal and Neighbouring Regions*. KwaZulu-Natal Nature Conservation Service, Pietermaritzburg, ISBN: 1-919795-64-2.
- Van Wyk, A.E., 1990. The sandstone regions of Natal and Pondoland: remarkable centres of endemism. *Palaeoecology of Africa* 21, 243–257.
- Van Wyk, A.E., 1993. Notes on the flora of the Umtamvuna Nature Reserve. The Umtamvuna Nature Reserve. Umtamvuna River Trust, Port Edward, pp. 8–10.
- Van Wyk, A.E., Smith, G.F., 2001. *Regions of Floristic Endemism in Southern Africa*. Umdaus Press, Pretoria, ISBN: 1-919766-18-9.