

Two new species and a variety of *Cineraria* (Asteraceae) from tropical Africa.

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Summary. Two new species and a new variety of *Cineraria* L. from tropical Africa are described: *C. pulchra* Cron from the Nyanga and Chimanimani Mountains of Zimbabwe and Mozambique (Mount Gorongosa), *C. huilensis* Cron from the Sera da Chela in the Huila Province of Angola and *C. mazoensis* S.Moore var. *graniticola* Cron from the granite domes of Zimbabwe.

Key words. *Asteraceae*, *Cineraria*, conservation, *Senecioneae*, tropical Africa.

Introduction

Cineraria L. (*Senecioneae*, *Asteraceae*) comprises mainly perennial herbs and subshrubs with heterogamous, radiate capitula with yellow florets. Many of the species have grey leaves and stems due to a tomentose or cobwebby indumentum, as indicated by its name - from 'cinereus', meaning ash-coloured. The genus is distinguished by its obovate, compressed cypselae with narrow wings or margins, and palmately-veined, usually auriculate leaves (Hilliard, 1977; Cron, 1991; Bremer, 1994). The capitula have a uniseriate, calyculate involucre and the cypselae have a substantial carpopodium. As a senecioid member of the *Senecioneae*, *Cineraria* has balusterform filament collars in its stamens and discrete stigmatic areas (Nordenstam, 1978; Bremer, 1994). The style apex is obtuse and 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. *Cineraria abyssinica* Sch.Bip. ex A.Rich. extends from Ethiopia into Yemen and Saudi Arabia, and *C. anampoza* (Baker) Baker is endemic to Madagascar. *Cineraria* is afroalpine (to afroalpine) in its affinity, occurring at altitudes of 1600 – 4300 m in the mountains of tropical East Africa (Hedberg, 1957), and between 1200 – 3300 m in the Drakensberg range in South Africa (Hilliard, 1977; Cron, 1991), but extends from mountain peaks to sea-level in the Western Cape and Eastern Cape.

Of the 35 species of *Cineraria* currently recognised (Cron, 2005a; Cron *et al.*, submitted), 32 (91%) occur in southern and tropical Africa (including southern Angola and Malawi) and 27 in South Africa. *Cineraria deltoidea* Sond. (including plants previously known as

C. grandiflora Vatke) is widespread throughout the mountains of the Rift Valley of Africa, including the high plateau regions of Malawi (Nyika, Zomba, Mulanje and mountains near Blantyre) and the eastern highlands of Zimbabwe. *Cineraria mazoensis* S.Moore occurs mainly in Zimbabwe, but also on the Mchinji Mts in central Malawi and in Mazabuka in Zambia. No other species of *Cineraria* were known to occur in Zimbabwe. However, several specimens in various herbarium collections seemed anomalous and did not match either of these two previously described species. We therefore embarked on a collecting trip that clarified the status of a new species and a new variety described here: *C. pulchra* Cron from the eastern highlands of Zimbabwe and Mt Gorongosa in Mozambique, and *C. mazoensis* S.Moore var. *graniticola* Cron, associated with the granite domes/inselbergs in southern and eastern Zimbabwe.

Several Angolan specimens of *Cineraria* were previously known only by manuscript names. *Cineraria huilensis* Cron is described here, based on specimens annotated as *C. barbosa* Torre ined. and *C. mendesii* Torre ined. Specimens given the manuscript name of *C. paracanescentis* Torre ined. may be part of the variation in *C. deltoidea* and have not been otherwise formally named, pending further collecting in the region.

Three species of *Cineraria* are now known to occur in Mozambique: *C. deltoidea* and *C. pulchra* from the Chimanimani and Gorongosa Mts and *C. pinnata* O.Hoffm. ex Schinz, an annual plant from seasonal wetlands and grasslands near sea-level in the southern regions, including Inhaca Island.

All specimens cited have been seen, including types for *Cineraria pulchra* and *C. mazoensis*. In *C. huilensis*, those types seen are indicated '!'. Coordinates for collecting localities for the Flora Zambesiaca region follow the format used by Pope & Pope (1998).

***Cineraria pulchra* Cron sp. nov.** affinis *C. mazoensis* sed multo plus fruticosus, capitulis pluribus majoribus et folia venis multo prominentibus ventraliter, lamina pinnatisecta basi, auriculis magnis dentatis differt. Type: Zimbabwe, Vumba, summit of Castle Beacon, 19 May 1998, 1900 m, *Cron & Balkwill* 510c (holotype J; isotypes K, MO, PRE, SRGH).

Perennial suffrutex or spreading shrublet, to 1.2 m tall. *Stems* woody and branching near the base, rooting along decumbent stems, tomentose to cobwebby, glabrescent. *Leaves* deltoid-reniform to reniform in outline, deeply 5 – 7-lobed with rounded sinuses between lobes, with 1 – 3 pairs of lateral pinnae; lamina often extending along petiole, 26 – 55 × 26 – 63 mm (excluding lateral pinnae at base), green, cobwebby, glabrescent above, tomentose white or grey below with very prominent venation; apex acute to obtuse; margin dentate; base subcordate to truncate, often merging with lateral pinnae; lateral pinnae oblanceolate, 5 – 15 × 3 – 11 mm, sharply dentate; petiole 20 – 72 mm long (including

portion supporting lateral pinnae), tomentose, sometimes glabrescent; auricles very conspicuous, auriform and running up petiole. *Capitula* heterogamous, radiate, many (12 – 60 per stem branch), in a compact corymbose cyme; peduncles 3 – 14 mm long, thickly cobwebby, glabrescent, distinctly bracteate near capitula, bracts lanceolate to linear, 3 – 6 mm long. *Involucre* calyculate, calyculus bracts few to many, descending peduncle, phyllaries 8 – 12, 4 – 5 mm long, thickly or thinly cobwebby, occasionally glabrescent; margins scarious. *Ray florets* 8 (– 13), 5 – 9 (– 11) mm long, limb 4.0 – 6.0 (– 8.5) mm long, 4-veined, rarely 5-veined. *Disc florets* 26 – 43, corolla 4 – 5 mm long. *Cypselae* obovate, compressed with distinct median rib on inner surface, margined, sometimes appearing narrow-winged when immature, dark brown when mature, ca. 2 mm long, ciliate and sparsely to moderately hairy on the faces, rarely glabrous. *Pappus* 3.5 – 4.0 mm long.

PHENOLOGY. Flowering from March to July, mainly in April and May, but also in Sept. and Oct. in Mozambique.

DISTRIBUTION. Africa: Zimbabwe and Mozambique: From Nyangani, Vumba and the Chimanimani Mts in the eastern highlands of Zimbabwe and from Mt Gorongoza and the Chimanimani Mts in Mozambique. Map 1.

ZIMBABWE. Nyanga, Nyangani (1832Bd), *Garley* 716 (K); *ibidem*, *Cron & Balkwill* 499 (E, J, K, MO, PRE, SRGH); *ibidem*, *Cron & Balkwill* 500 (CM, J, PRE); *ibidem*, *Cron & Balkwill* 501 (J); summit ridge of Nyangani, *Gilliland* 1891 (BM); *ibidem*, *Whellan & Davies* 989 (K); Mutare, SW side of Castle Beacon, Vumba Mts (1932Ba), *Chase* 8422 (K, PRE); summit of Castle Beacon, Vumba, *Cron & Balkwill* 508 (J); *ibidem*, *Cron & Balkwill* 110a (B, J); *ibidem*, *Cron & Balkwill* 110b (J, S); *ibidem*, *Cron & Balkwill* 110c (J, K, MO, PRE, SRGH); track to Castle Beacon, *Cron & Balkwill* 504 (B, J, K); along track mountainside, Vumba Mts, *Hanham s.n.* (BM); main Vumba roadside (1932 Bb), *Cron & Balkwill* 512 (J, M, RSA); Vumba, Chikwera Peak (1932Bb), *Chase* 6127 (BM, BR, K, PRE); Mutare, Himalayas, Engwa (1932Bd), *Wild* 4479 (K, PRE) (very glabrescent); Chimanimani Mts (1933Cc), *Wild* 2867 (K); Chimanimani, *K. Coates-Palgrave* 70616 (K, SRGH); Chimanimani, Mt Peni (1932Dc), *Goldsmith* 110/68 (K, PRE).

MOZAMBIQUE. Sofala District: Mt Gorongoza (1834 Ac), *Müller & Gordon* 1416 (K, LISC); Serra da Gorongoza, *Torre & Pereira* 12 495 (LISC); Gorongoza, *Torre* 5949 (LISC); Chimanimani Mts (1933Cc), *Munch* 93 (K, LISC).

Putative hybrids between *Cineraria deltoidea* and *C. pulchra*: **ZIMBABWE.** Cashel-Chimanimani Road (1932Da/b), *Levyns* 9935 (BOL); Cashel-Chimanimani road, *Cron & Balkwill* 519 (J, K); *ibidem*, *Cron & Balkwill* 520 (J, PRE); *ibidem*, *Cron & Balkwill* 525 (J, MO); between Cashel and Chimanimani, *Schelppe* 4019 (BM).

HABITAT. *Cineraria pulchra* grows between rocks on mountain summits or on south to eastern slopes in the mist belt, in *Erica* scrub above the forest on Mt Gorongosa in Mozambique, on quartzite and granite; 1700 – 2550 m.

CONSERVATION STATUS. Least concern. Restricted in distribution but locally abundant in preferred habitats, which are at fairly high altitude, above the average level of human impact on the mountains in Zimbabwe and Mozambique.

NOTES. *Cineraria pulchra* occurs in the eastern mountains of Zimbabwe at higher altitude than *C. mazoensis* and has a different growth form, being much more shrubby with many more capitula in a compact synflorescence (Figure 1a), creating a glorious display of bright yellow heads (hence the name ‘*pulchra*’, meaning beautiful). It is most easily recognised on a herbarium sheet by its leaf shape and venation, distinguished from *C. mazoensis* by the very prominent veins on the lower surface of the leaves (especially noticeable in younger leaves of pressed specimens), as well as the more extensively pinnatifid base of the lamina, which frequently runs along the petiole, as do the conspicuous auricles (Figures 1b, c). *Cineraria pulchra* is also characterised by rounded (vs. obtuse) ray florets and a distinctly bracteate peduncle nearest the capitula. Leaf trichomes are long and fine, creating a thick woolly tomentum ventrally, and comprising 2 – 4 narrow basal cells and a long, multi-celled apical wisp (Figure 1d). *Cron & Balkwill* 501 from Nyangani is unusual in that it has glabrous cypselae.

Goldsmith 110/68 (K, PRE) from Mt Peni in the Chimanimani Mts is a very glabrescent specimen and has glabrous cypselae, but otherwise appears to match *C. pulchra*. Putative hybrids between *Cineraria pulchra* and *C. deltoidea* occur in the Cashel-Chimanimani region of Zimbabwe. Specimens with features intermediate between the two species were observed growing in mounds of soil at the side of the road (i.e. in disturbed ground). Their leaves are not as deeply nor extensively lobed or dissected as in *C. pulchra*, yet they have the raised venation on the ventral surface of the leaves and very large toothed auricles and lateral pinnae characteristic of that species, while leaf shape and lobing more closely match *C. deltoidea*. A putative parent population of *C. deltoidea* was growing alongside in the “dwarf miombo woodland”; *C. pulchra* grows at higher altitude in the Chimanimani range. The status of these populations can be tested using DNA techniques as diagnostic markers are present for these species in both chloroplast and nuclear ribosomal DNA sequences (Cron, 2005b; Cron *et al.*, in prep.).

Cineraria mazoensis S.Moore (1908: 43). Type: Zimbabwe, Mazoe, Iron Mask Hill, April 1906, 1600 – 1650 m [5000 – 5200'], *F. Eyles* 345 (holotype BM; isotype BOL).

Perennial, possibly short-lived, single- or multi-stemmed herb, to ca. 1 m tall.

Stems herbaceous, slightly woody and sometimes branching near the base, cobwebby, sometimes glabrescent. *Leaves* reniform to deltoid-reniform in outline, distinctly (3 –) 5 – 7-lobed with deep rounded sinuses, occasionally with lateral pinnae, 10 – 66 × 13 – 72 mm, green and cobwebby above, glabrescent, white or grey, cobwebby to thickly tomentose below; apex obtuse to acute; margin dentate; base cordate to truncate, uppermost leaf forming bract below peduncles with acute base; petiole 10 – 43 (– 56) mm long, tomentose on younger leaves, sparsely cobwebby on mature leaves; auricles conspicuous or very small (rarely absent), ovate to auriform, sometimes extending along petiole (especially on uppermost leaves). *Capitula* heterogamous, radiate, few (4 – 12 per stem branch) to many (up to 30 per stem branch) arranged in lax corymbose panicle; peduncles (2 –) 10 – 47 (– 67) mm long, cobwebby (especially near bracts) or glabrous. *Involucre* sparsely calyculate, calyculus bracts descending peduncle, phyllaries 10 – 13, 4 – 5 mm long, cobwebby or glabrous, with scarious margins. *Ray florets* 7 or 8, 6.0 – 8.5 mm long, limb 3.5 – 5.0 mm long, 4-veined (rarely more). *Disc florets* 25 – 40, corolla 3.5 – 5.0 (– 6.0) mm long. *Cypselae* obovate, compressed, margined to narrow-winged, brown, 2.2 – 2.8 mm long when mature, sparsely to moderately ciliate; faces densely to very sparsely hairy. *Pappus* as long as or slightly longer than disc corolla.

PHENOLOGY. Flowering April to June.

DISTRIBUTION. Zimbabwe, from the Matobo region in the south-west, to near Lake Mutirikwi and the Bikita region in the south, north-eastwards to Mutare, at Mazoe and Mt Darwin to the north of Harare and Hwedza Mountain to the west. Malawi: Mchinji Mts near Fort Manning. Zambia: Mazabuka. Map 1.

Key to varieties

Involucral bracts and peduncles cobwebby, glabrescent, ventral surface of leaf does not stick together *C. mazoensis* var. *mazoensis*
 Involucral bracts and peduncles glabrous, ventral surface of leaf sticks like velcro when fresh
 *C. mazoensis* var. *graniticola*

Cineraria mazoensis S.Moore var. *mazoensis*

Perennial herb, to ca. 0.50 m tall. *Leaves* (3 –) 5 – 7-lobed, thickly tomentose below; trichomes on dorsal surface of leaves agranular with narrow or slightly tapering basal cells and a long multi-celled apical wisp (Figure 2a); trichomes on ventral surface with 2 – 4 narrow basal cells (not tapering) and a long multi-celled apical wisp (Figure 2b). Peduncles thickly or thinly cobwebby, especially near bracts. *Involucre* cobwebby, sometimes glabrescent, remaining cobwebby amongst calyculus bracts, phyllaries 12 – 13. *Rays* commonly 8 (rarely 7). *Disc floret* corolla ca. 3.5 – 3.8 mm long.

SPECIMENS EXAMINED. MALAWI: Mchinji Mts near Mchinji (Fort Manning) (1332Db), *B.D. Burt* 6200 (BR, K). ZAMBIA: Mazabuka (1527Dd), *Fanshawe* F6591 (BR, K). ZIMBABWE: Mt Darwin, Mvuradona Mts (1631Dc), *Wild* 6528 (K); Mazoe, Iron Mask Hill (1730Db), *Eyles* 345 (BM, BOL); Harare (1731Cc), *Bayliss* 10147 (MO); Hwedza Mountain (1831Dc), *Wild* 6504 (BR); *ibidem*, *Dale, Müller & Scott* SKF330 (BR); Romorehota, northern summit of Hwedza Mountain (1831Dc), *Cron & Balkwill* 486 (J, K, MO, PRE); Mutare, Spinney Hill, Christmas Pass (1832Cd), *Chase* 223 (BM, K); Chimanimani, Haroni Valley, Chimanimani foothills (2033Aa), *Wild* 5720 (K).

HABITAT. *Cineraria mazoensis* var. *mazoensis* grows on the slopes of hills, on river gorge walls, among boulders, and on pyroxenite hills; 600 – 1600 m in Zimbabwe; 1830 m in the Mchinji Mts, Malawi.

CONSERVATION STATUS. Data deficient. *C. mazoensis* var. *mazoensis* is fairly widespread, but occurs in small populations requiring a specific habitat. The species' habitat is under threat from human activities such as burning in certain areas of Zimbabwe, notably on Hwedza Mountain (Robertson, 1991).

***Cineraria mazoensis* S.Moore var. *graniticola* Cron var nov.** differt a involucris bracteis pedunculisque glabris, paginis ventralis foliorum viscosis propter pilos. Type: Zimbabwe: S of Lake Mutirikwi, 21 May 1998, 1064 m, *Cron & Balkwill* 532 (holotype J, isotypes B, E, K, PRE, S, SRGH). Figure 3 a – c.

Perennial herb to about 1.0 m tall. *Leaves* 5 – 7-lobed, thinly tomentose to cobwebby below; trichomes on dorsal surface usually with granular, tapering basal cells with long multi-celled apical wisp (Figure 2c, d); trichomes on ventral surface have 4 – 8 basal cells, narrowly tapering or not, with long multi-celled apical wisp that twists like a cork screw (Figure 2e, f), creating a velcro effect when ventral surfaces touch. *Peduncles* glabrous. *Involucral bracts* glabrous, 10 – 13. *Rays* usually 7, occasionally 8. Disc floret corolla 4 – 5 mm long.

DISTRIBUTION. Africa: Zimbabwe. Map 1.

ZIMBABWE. Mutare, Dora Farm (1932Ba), *Chase* 802 (BM, K); *ibidem*, *Fisher* 1614 (NU); Matobo District: Farm Quaringa (2028Bd), *Miller* 2776 (K); *ibidem*, *O.B. Miller* 5862 (K); Besna Kobila (2028Bc), *O.B. Miller* 5222 (K); *ibidem*, *O.B. Miller* 8250 (K); *ibidem*, *O.B. Miller* 4293 (K); W side of Lake Mutirikwi (2030Bb), *Carter & Coates-Palgrave* 2224 (K); Belingwe, Buhwa Hill (2030Cb), *Müller* 783 (MO); *ibidem*, *Biegel, Pope & Simon* 4272 (K); Mt Buhwa, *Mahohoma* 31 (K); S of Lake Mutirikwi (2031Aa), *Cron & Balkwill* 532 (B, E, J, K, MO, PRE, S); Bikita District, confluence of Turgwe River and Dafana River (2031Bc), *Biegel* 3005 (K, PRE, S).

HABITAT. *Cineraria mazoensis* var. *graniticola* grows at the foot of or on "shelves" in large crevices on huge granite domes, or in wooded gullies amongst granite domes or hills; 1100 – 1500 m.

CONSERVATION STATUS. *Cineraria mazoensis* var. *graniticola* is at greater risk than *C. mazoensis* var. *mazoensis* due to its more restricted distribution and even smaller populations.

NOTES. Distinguishing features of *Cineraria mazoensis* var. *graniticola* are mainly provided by the leaves, which possess deep sinuses between the coarsely dentate lobes (Figure 3a). The cobwebby tomentum on the dorsal surface of the leaves is created by trichomes with ca. six tapering (usually granular) basal cells, and a multi-celled, long apical wisp (Figure 2c, d), while the grey (sometimes very dense) tomentum of the lower surface is created by finer woolly trichomes (Figure 2e, f). These hairs act like “velcro”, sticking most effectively when the leaves are fresh. The long apical cells twist like a cork-screw creating the adhesive quality of the hairs. This combination of trichomes, together with the glabrous involucre bracts and peduncles, and a tendency to lack pinnae on the petioles distinguish this variety from *C. mazoensis* var. *mazoensis*. *Cineraria mazoensis* var. *mazoensis* usually has fine agranular trichomes on both surfaces of the leaf (that do not create the velcro effect seen in var. *graniticola*), and always has cobwebby involucre bracts and peduncles. In addition, *C. mazoensis* var. *graniticola* has slightly smaller capitula, usually 7 rays (versus 8 in *C. mazoensis* var. *mazoensis*) and the auricles of its uppermost leaves run up the petiole.

The variation in size and form of *Cineraria mazoensis* var. *graniticola* is considerable. The Chase and Fisher collections of *C. mazoensis* var. *graniticola* from “a sheltered gully between wooded granite hills” on Dora Farm south of Mutare and O.B. Miller’s collections from “beneath rocks” on the granite whalebacks/domes from the Matobo region in southwestern Zimbabwe initially appeared unrelated. The Miller collections from the Matobo region are much smaller plants (ca. 25 cm tall) with small, grey, angular, lobed leaves and few capitula. The plants from near Mutare are much larger (75 cm tall), possessing large leaves with rounded lobes and deep sinuses. These collections represent extremes of the range in form, habitat and distribution of this variety.

The variation in growth form is apparently related to the position of the plant on the granite whaleback, with moister, more shaded habitats promoting a more luxuriant growth form, i.e. a branching multi-stemmed herb reaching a height of 1 m at the base of the whaleback or in gulleys, where wooded vegetation creates good shade. *Cineraria mazoensis* var. *graniticola* also sometimes grows in horizontal crevices that have weathered to form “shelves” with shallow soil and some shade. In this more arid habitat, the single-stemmed

herb hardly reaches 25 cm. Regional rainfall may also play a role, with larger specimens occurring in the eastern region of the country. Additional variation between populations from the different localities includes presence/absence of auricles as well as thickness of tomentum on the leaves and degree of hairiness of the cypselae. All of these characters are also highly variable in other species of *Cineraria* (Cron, 1991).

There is some overlap in some of the characters distinguishing these varieties, as may be expected: *Chase 223* (BM, K) from Christmas Pass near Mutare has trichomes on the dorsal surface of its leaves that match those of *C. mazoensis* var. *graniticola* and has a glabrous involucre in the BM specimen, but is cobwebby amongst the calyculus bracts in the K specimen and has cobwebby peduncles as in *C. mazoensis* var. *mazoensis*. Its ventral trichomes are of the fine narrow-based type characteristic of var. *mazoensis* (Figure 2b).

The duplex trichomes on the cypselae of both varieties of *C. mazoensis* are mucilaginous, releasing threads upon wetting (Figure 3c). These presumably assist the fruits to anchor to the substrate (sometimes very thin soil on a granite inselberg) once rain has fallen in the generally arid environment.

***Cineraria huilensis* Cron sp. nov.** affinis *C. deltoidea* sed foliis plerumque multo discoloribus, viridibus vel canis araneosis dorsaliter, tomentosis albis ventraliter, venis prominentibus ventralibus differt. Type: Angola, Huila, Lubango (Sa da Bandeira), Tundavala, ao 18 km, junto a Fenda, 27 April 1971, *Borges 89* (holotype LISC!, isotypes BM!, BR!, K!, LUAI, P!, PRE!, SRGH). Figure 3 d – f.

Manuscript names: *Cineraria barbosa* Torre; *C. mendesii* Torre.

Perennial shrublet or shrub, to 0.8 m tall. *Stems* woody, branching, lined, tomentose grey, glabrescent. *Leaves* deltoid to deltoid-reniform, shallowly 5 – 7-lobed; lamina 11 – 46 × 12 – 48 mm, usually very discolorous, green, cobwebby, glabrescent above, hairs remaining mainly in sunken veins towards base of lamina, thickly tomentose grey or white below, tips of teeth glabrous (often revolute when dried), veins prominent below; apex acute to obtuse; margin dentate; base subcordate to cordate, rarely truncate; petiole 6 – 51 mm long, tomentose grey, occasionally glabrescent; auricles small and caducous or absent. *Capitula* heterogamous, radiate, usually many (26 – 56 per branch) or occasionally few (10 – 12 per branch) arranged in a compact (occasionally lax) corymbose panicle; peduncles 3 – 35 mm long, tomentose to cobwebby, glabrescing somewhat, bracteate, bracts 1 – 4 mm long. *Involucre* sparsely calyculate, phyllaries 8 – 13, (3.5 –) 4.0 – 5.0 mm long, cobwebby, slightly to very glabrescent, or glabrous; margins scarious. *Ray florets* 5 – 8 (– 11), (5.4 –) 6.0 – 9.0 mm long, limb (3.0 –) 4.0 – 6.5 mm long, 4-veined (occasionally 6-veined). *Disc florets* 20 – 42 (– 55), corolla 4.0 – 5.0 mm long.

Cypselae obovate, compressed, narrow-winged (to margined), brown, wing sometimes paler brown, 2.2 – 2.4 mm long, ciliate with sparsely hairy to almost glabrous faces, rarely glabrous. *Pappus* ca. 4 mm long.

PHENOLOGY. Flowering mainly in April, also in Oct.

DISTRIBUTION. Africa: Angola : Huila Province, on the Serra da Chela plateau, near Lubango (Sa da Bandeira), Humpata, Tchivinguiro and Leba Hill. Map 2.

ANGOLA. Huila Province: 18 km from Lubango, near the Crack of Tundavala, *Borges* 89 (BM, BR, K, LISC, P, PRE); Lubango (14°55'S 13°30'E), *Brito Teixeira et al.* 12 536 (LISC); NW of Lubanga (Sa Da Bandeira) on the Chela Mts, *Kers* 3386 (LISC); Serra da Chela, in the region of Humpata (15°01'S 13°21'E), *Humbert* 16639 (P); Humpata, Buraco do Bimbo, *Mendes* 3775 (LISC); Huila, Humpata, on the slopes of Leba Hill, *Borges* 347 (BM, K, LISC, PRE); Serra da Chela, Tchivinguiro, *Gossweiler* 12709 (LISC).

HABITAT. Growing clustered around rocks and at the base of cliffs, or near rivers, apparently associated with granites or quartzites; 1700 – 2400 m.

CONSERVATION STATUS. Data deficient. Only a few collections of *Cineraria huilensis* are known, but the area and country as a whole are very under-collected. No formal protection is provided for montane grassland or for the relict pockets of afro-montane forests in Angola (Huntley & Matos, 1994).

NOTES. *Cineraria huilensis* is a species that shows considerable variation in a number of characters, most notably the degree of leaf indumentum, peduncle length, size of capitulum and hairiness of the cypselae. All of these features vary within a single gathering in some instances and so cannot reliably be used to separate taxa. Torre originally recognised (but never published) two species, *C. barbosa* and *C. mendesii*, the latter with three varieties. Torre distinguished the varieties on the basis of indumentum of the leaves, presence or absence of auricles, length of peduncles and indumentum of the cypselae. As noted above, these features are extremely variable even amongst single gatherings. For example, *Borges* 89 (BR) differs from the K and LISC specimens by having few capitula on longer peduncles and more thickly cobwebby involucre bracts, as opposed to many compact capitula and glabrescent involucre bracts. Similarly, the cypselae of the LISC and PRE specimens of *Borges* 347 are glabrous, whereas the BM and K specimens have ciliate cypselae with hairy to sparsely hairy faces.

The lobing and dentition of the leaves may be features that could separate these specimens into distinct varieties, but more collections from populations in the area are needed to elucidate the variation. *Mendes* 3775 (LISC) is more distinctly lobed and toothed than

most of the other specimens. Tomentum also varies: *Borges* 347 (BM, K, LISC, PRE) from the slopes of the Leba, near Humpata, and *Gossweiler* 12709 (LISC) from Serra da Chela, Tchivingiro, have less discoloured leaves than *Borges* 89 (BM, BR, K, LISC, P, PRE) as their leaves are more cobwebby above; they also have smaller capitula with fewer and smaller rays and disc florets, and very glabrescent (or glabrous) involucre bracts. These differences may simply be due to lower altitude or habitat differences, as seen in other species of *Cineraria* (e.g. *C. erodioides* DC.). Further collecting is needed to fully investigate the variation in this species before infraspecific names can be applied.

Discussion

Malawi, Zimbabwe, Zambia, Mozambique and Angola all belong to the Zambesian Subcentre of endemism (White, 1983), with 4590 endemic vascular plant species of a total of 8500 (Beentje *et al.*, 1994). *Cineraria pulchra* and *C. deltoidea* are associated more specifically with the Afromontane Centre of endemism. These montane areas are scattered “islands” of a distinctive flora surrounded by other vegetation types (Beentje *et al.*, 1994). Similarly, *C. mazoensis* var. *graniticola* is associated with inselbergs, another “island-like” phenomenon in the landscape. *Cineraria huilensis* appears to be endemic to the Huila district in Angola, an important region of endemism (Brenan, 1978). Angola (as a whole) appears to be a significant centre of endemism in southern tropical Africa, with 27.3 % of a sample of species being endemic (Brenan, 1978) and the largest number of endemics occurring in the Huila, Benguela and Bié districts.

Zimbabwe: Chimanimani-Nyanga Centre of endemism

High levels of plant endemism in the Eastern Highlands of Zimbabwe have been recognised for a long time (White, 1983). *Cineraria pulchra* is associated with the Chimanimani-Nyanga Centre of endemism (after Van Wyk & Smith, 2001), characterised by quartzite rocks and nutrient-poor, sandy soils. The Chimanimani range consists of deformed and metamorphosed quartzites, while quartz schists and shales form the plateau to the west of the mountains. In contrast, the Nyanga Mts consist of granites as well as sedimentary shales and siltstones of the Umkondo Group (Stagman, 1978; Clarke 1991). The quartzites weather to create a craggy landscape, while the Umkondo group have a rounded topography (Wild, 1964).

The Chimanimani Subcentre is much richer in endemics than the Nyanga Subcentre to the north (Wild, 1964; Van Wyk & Smith, 2001). In addition to being an edaphic island, the Chimanimani Mts are isolated from other afromontane “islands” by the hot dry Zambezi valley in the north and the Limpopo valley in the south (Wild, 1964). Most of the endemics in this region are confined to the white, sandy quartzite-derived soils, which have very little clay and are subsequently poor in nutrients, especially phosphorus (Wild, 1964). Wild (1964) suggests that this unfavourable habitat has resulted in ecological stresses that

have intensified natural selection. If plants are adapted to and tolerant only of the quartzite-derived soils, an edaphic barrier exists which isolates the plants from surrounding areas.

Cineraria pulchra occurs at high altitude in the Nyanga Mts to the north, the Vumba Mts centrally and in the Chimanimani Mts to the south. It therefore appears to tolerate quartzite-, dolerite- and granite-derived soils, and precipitation is possibly the main factor determining its distribution. It occurs only above 1700 m, and more frequently above 1900 m, where mist is a regular occurrence. We observed *C. pulchra* growing on the eastern, windward slopes of the summit ridge of Mt Nyangani (the highest peak in Zimbabwe at 2593 m), that receive a high annual rainfall (3000 – 4000 mm; Van Wyk & Smith, 2001). Like most species of *Cineraria*, *C. pulchra* grows amongst rocks, which offer some protection against fire in the afro-montane grassland.

Conservation of *Cineraria pulchra*

Fortunately most of the Zimbabwean side of the Chimanimani Mountain range is conserved in the Chimanimani National Park (Timberlake & Müller, 1994). Although most of the highlands of the Nyanga Mts fall within the greater Nyanga National Park, parts are being used for agriculture and commercial afforestation. Invasive alien trees pose a threat to the natural vegetation and forced lack of fire also impoverishes the grasslands, although there is probably less threat to the grasslands at high altitude. *Cineraria pulchra* is only found on and near mountain summits in localised populations, where it requires a specific habitat. It is therefore potentially vulnerable as its area of occupancy is roughly estimated to be a maximum of 565 km² (based on area of mountain ranges at required altitude), but its populations are probably not threatened due to their being at high altitude. Some measurement of the size and stability of its populations is needed before an accurate assessment of its conservation status can be made. In Mozambique, Mt Gorongosa occurs outside the National Park boundary (Bandeira *et al.*, 1994) and the status of its vegetation also needs assessing.

Zimbabwe: Granite inselbergs: *Cineraria mazoensis* var. *graniticola*

Cineraria mazoensis var. *graniticola* is associated with granite inselbergs, which are “xeric islands”, both edaphically and microclimatically (Seine *et al.*, 1998). They support a vegetation which contrasts sharply with that of the surrounding plains, providing an ideal situation for speciation within a landscape. Zimbabwe encompasses the largest homogeneous area of granitic and gneissic rock in Africa (Kayser, 1957), with a distribution as shown in Map 1. A total number of 549 vascular plant species occur on Zimbabwean inselbergs, with 522 angiosperm species (Seine *et al.*, 1998). Out of a total of 95 Zimbabwean endemic vascular plant species (Brenan, 1978), fifteen were recorded in inselberg vegetation, and of these, seven species were restricted to inselbergs (Seine *et al.*, 1998). Inselberg vegetation (vascular plants) is quite uniform over most of Zimbabwe

(Seine *et al.*, 1998) and is floristically quite similar to that found in Malawi (Porembski, 1996), where *C. mazoensis* var. *graniticola* may also occur.

As noted previously, *Cineraria* characteristically occurs in rocky places providing some protection from fire, such as at the base of cliffs or in rocky gorges. A number of species are apparently restricted to or strongly associated with certain rock types, for example, *C. erosa* (Thunb.) Willd. and *C. canescens* Wendl. ex Link are both found mainly on granite in the Western Cape and Northern Cape, South Africa. *Cineraria mazoensis* var. *graniticola* is another of these, associated with granite inselbergs.

Cineraria mazoensis seems to be generally associated with granites. Many of the mountains (e.g. Mt Buhwa, Hwedza Mountain and Iron Mask Hill) on which it occurs contain banded ironstone or other ultramafic rocks, but *C. mazoensis* does not seem to occur on these specific formations.

Conservation of *Cineraria mazoensis*

Cineraria mazoensis var. *mazoensis* occurs in Hwedza Mountain Forest Reserve where overgrazing has reduced grass cover to a point where sheet erosion occurs ubiquitously and severe gully erosion is common, especially on the lower slopes (Robertson, 1991). It took much searching at the various known localities to find plants of *C. mazoensis* var. *graniticola*, an indication that the plants are quite rare.

Angola: *Cineraria huilensis*

Although Angola is the second largest country in sub-Saharan Africa and includes a wide diversity of habitats, its flora is poorly known (Huntley & Matos, 1994). Six of White's (1983) phytochoria are represented in Angola, including some small isolated afro-montane forest patches in the west-central highlands of Angola. In the south, relict afro-montane forests occur in a mosaic of undifferentiated montane communities (Barbosa vegetation type 5) on the Serra de Chela of Huila Province, in deep ravines and isolated peaks at altitudes above 1800 m (Huntley & Matos, 1994). Open grasslands with widely scattered trees and shrubs (Barbosa vegetation type 32) cover large areas of the highland plateau above 1600 m in the Huambo, Bié and Kwanza Sul provinces. The grasslands are fire-prone and drained areas contain shrub species such as *Erica benguelensis*, *Erica* spp., *Protea trichophylla*, *Stoebe vulgaris* and *Cliffortia* sp. and grasses *Themeda triandra*, *Tristachya* spp., *Festuca* (Barbosa, 1970; Huntley & Matos, 1994). This is a likely community for *Cineraria huilensis*, which probably occurs in rocky areas. (No habitat notes are provided on any of the specimens of *C. huilensis*.)

Cineraria huilensis grows on the high plateau Serra da Chela (Planalto de Mossamedes), which at Humpata is more than 2200 m high. It forms a steep scarp of up to 1000 m high on the east side of the coastal plain. Average rainfall in Lubango and Huila is 880 and 902

mm p.a. respectively (Faber, 1926), although the escarpment can receive more than 1770 mm p.a., creating seasonal marshes at its base (Airy Shaw, 1947). It is a summer rainfall region where the rain begins in October and continues until the end of April.

The uppermost portion of Serra de Chela comprises horizontal layers of white quartzitic sandstone, conglomerate and red claystone or mixtures (Faber, 1926). The underlying rock is granite. Mouta & O'Donnell (1933) identify the geology of this region as belonging to the "Système du Bembe". The "Série inférieure" conglomerates are not well represented at Humpata, where the rocks are clearly very hard with small pieces of white and red quartzite, latticed with schists silicified with concentrations of magnetite. Grès supérieur is found only at Humpata and the rock is a "grès grossier", clear, friable, irregularly stratified, with intercalations of the conglomerate (Mouta & O'Donnell, 1933).

The Huila Plateau has a high level of endemism, although its flora is not very rich in species and does not qualify as one of the "Centres of Plant Diversity" (Beentje *et al.*, 1994). The "Huila Centre", including the northern end of the Namibe Centre as well as the coastal scarp mountains and the Huila Plateau, also shows high levels of endemism (Linder, 2001). This region is not currently protected (- only 11 of Barbosa's 32 vegetation types are represented within existing protected areas [Huntley & Matos, 1994]), and a great deal more collecting is needed to more fully know the flora of the region.

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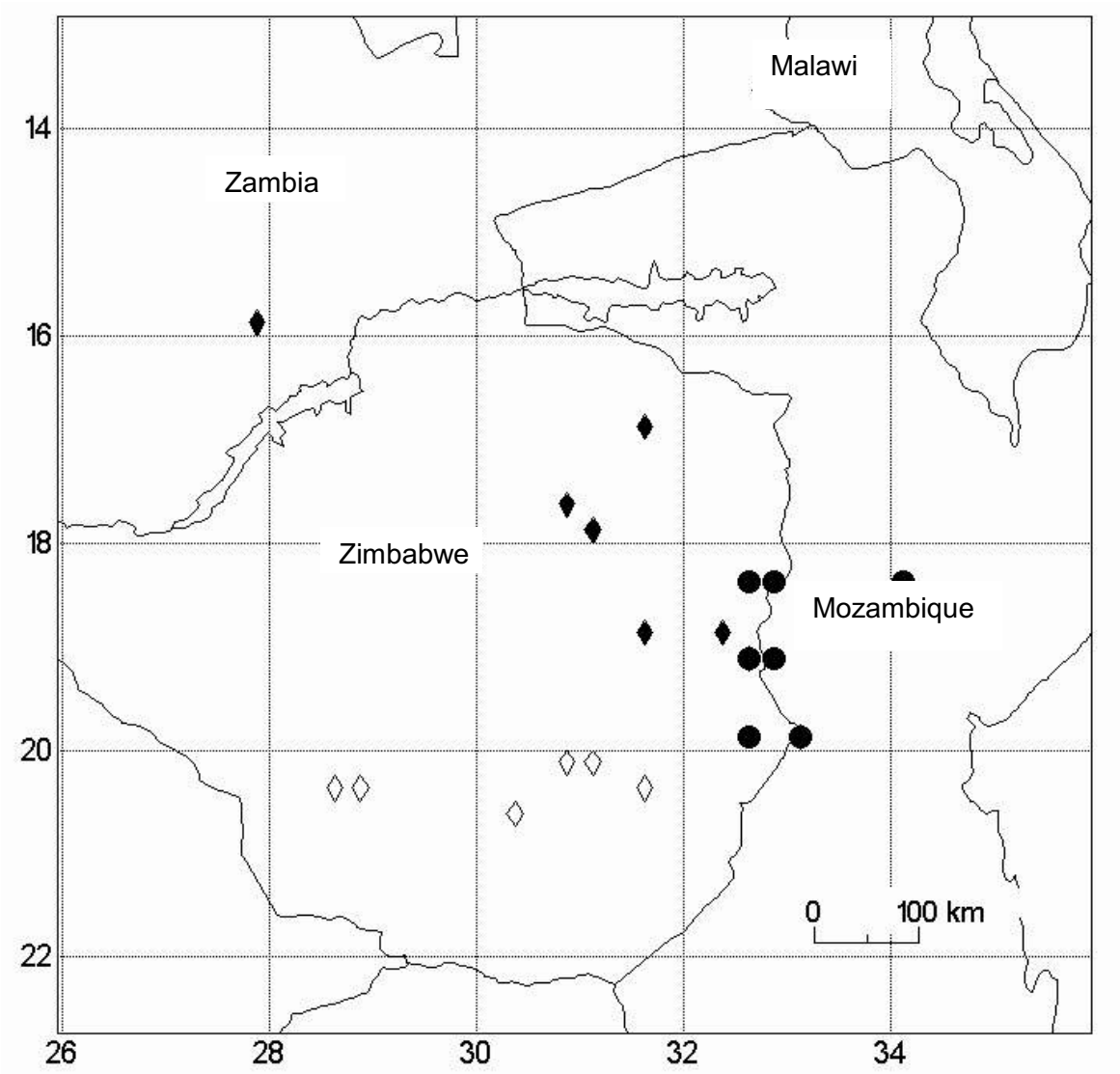
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Maps and Figures



Map 1. Map of known distribution of *Cineraria pulchra* (●), *C. mazoensis* var. *mazoensis* (◆), *C. mazoensis* var. *graniticola* (◇). Dotted line indicates the outline of occurrence of granite in Zimbabwe (according to Seine *et al.*, 1998).

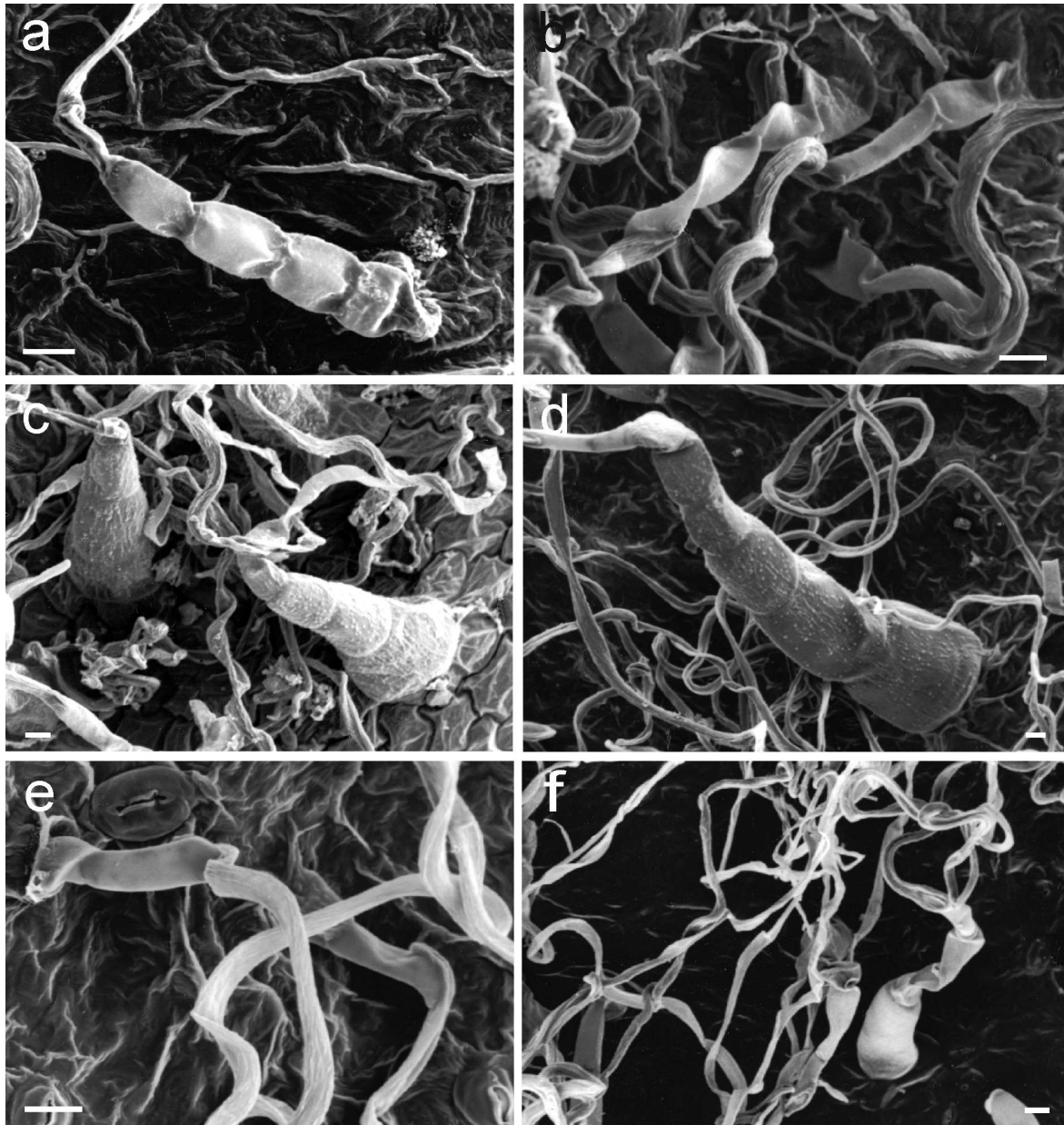


Figure 1. *Cineraria pulchra* (a) Many headed synflorescence. Scale bar = 28 mm. (b) *Chase 8422* (K) from the type locality: Castle Beacon, Vumba. Scale bar = 32 mm. (c) Leaf with prominent veins, rounded sinuses between lobes, lamina extending to lateral pinnae. Scale bar = 6 mm. (d) Fine trichomes with four narrow basal cells and long multi-celled apical wisp on ventral surface of leaf. Scale bar = 10 μm . (e) Detail of junction of base and apical wisp of trichome on ventral surface of leaf. Scale bar = 10 μm .

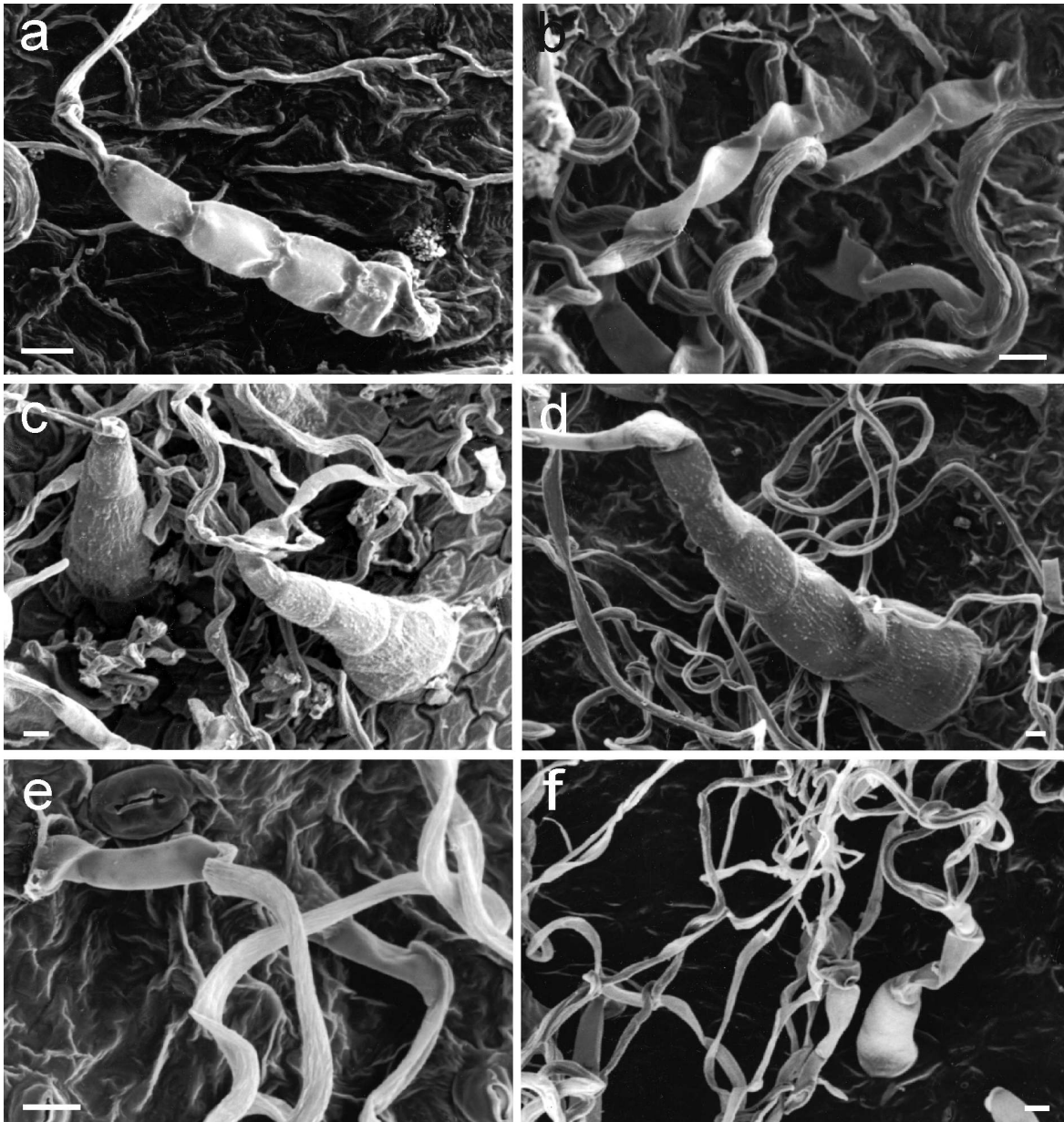


Figure 2. Trichomes of *Cineraria mazoensis*: (a) *var. mazoensis*, dorsal surface, Bayliss 10147 (MO); (b) *var. mazoensis*, ventral surface, Chase 223 (K); (c) *var. graniticola*, dorsal surface, Mahohma 31 (K); (d) *var. graniticola*, dorsal surface, Miller 2859 (K); (e) *var. graniticola*, ventral surface, Miller 5222 (K); (f) *var. graniticola*, ventral surface, Cron & Balkwill 532 (J). Scale bars = 10 μ m.

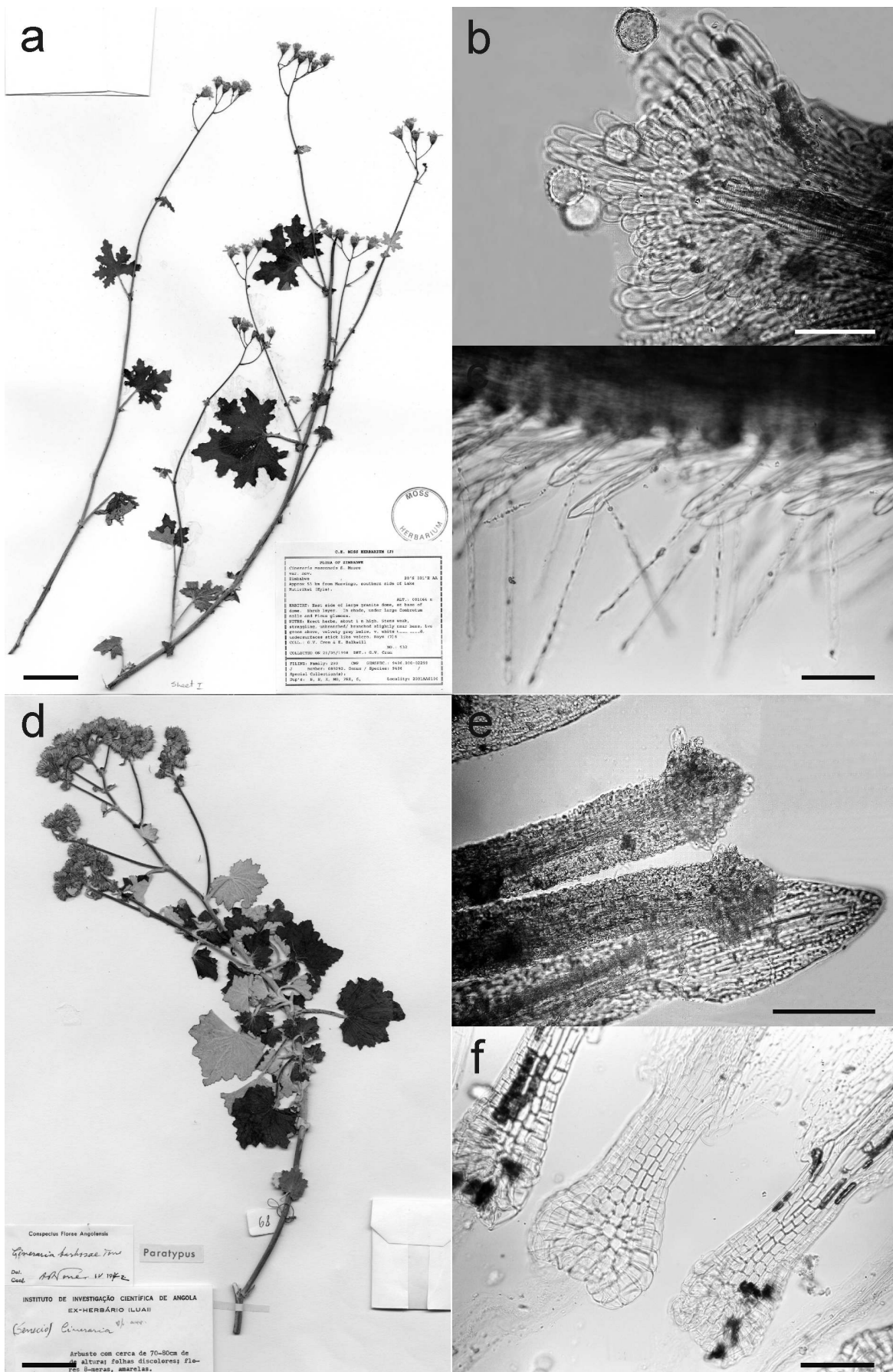
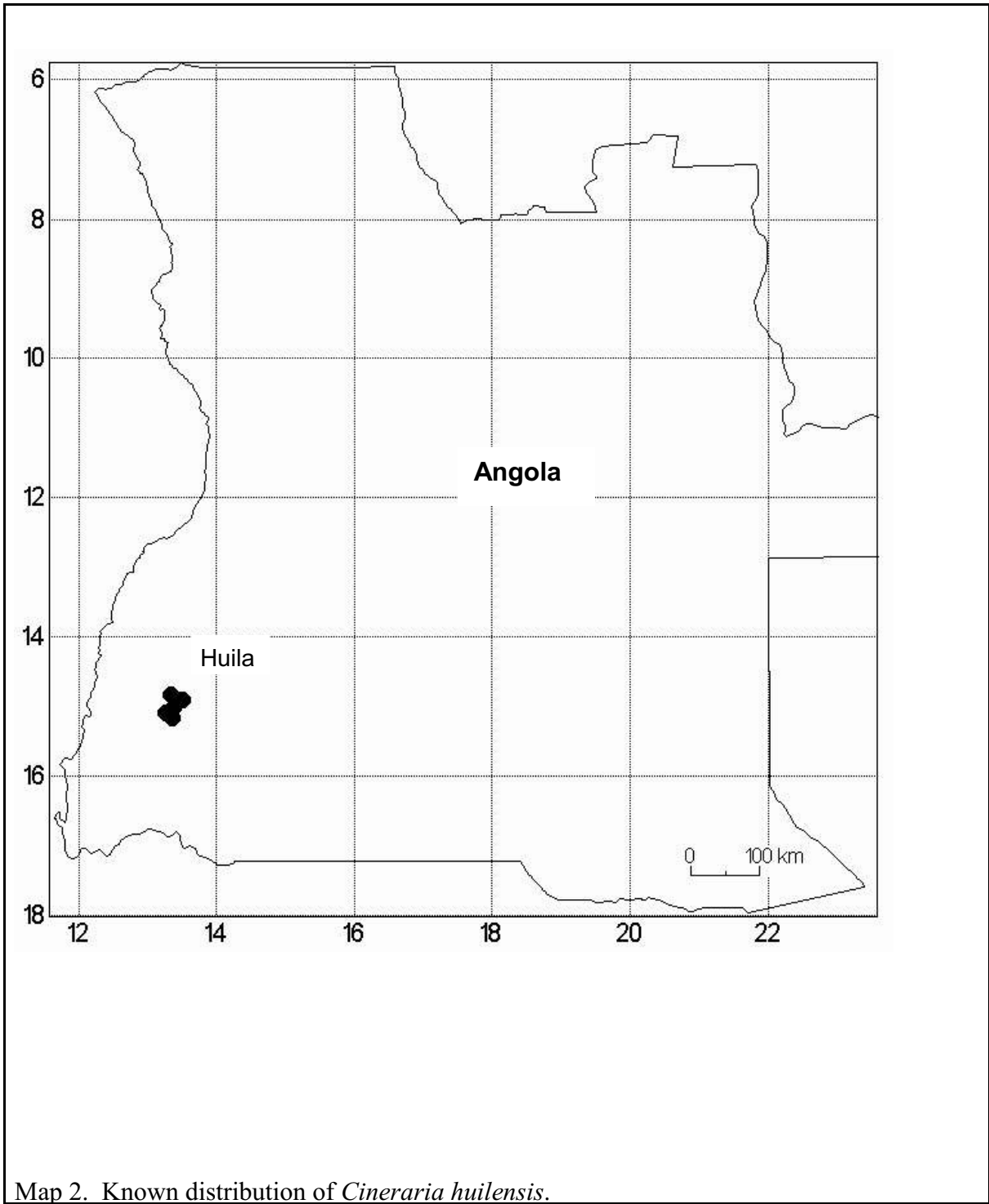


Figure 3. (a – c) *Cineraria mazoensis* var. *granitica*: (a) Type specimen: Cron & Balkwill 532 (J). Scale bar = 33.5 mm. (b) Style apex with sweeping hairs. Scale bar = 50 μ m. (c) Duplex trichome on cypselum with released mucilaginous threads. Scale bar = 100 μ m. (d – f) *Cineraria huilensis*: (d) Type specimen: Borges 89 (LISC). Scale bar = 28 mm. (e) Style apex (young). Scale bar = 100 μ m. (f) Balusterform filament collars. Scale bar = 100 μ m.



Map 2. Known distribution of *Cineraria huilensis*.