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Dicoma chatanensis sp. nov. (Compositae) from Yemen, and notes on the other species of Dicomeae on the Arabian Peninsula and Socotra

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Three species of *Dicoma* and one of the newly re-established segregate genus *Macledium* (Dicomeae) are recognized on the Arabian Peninsula and Socotra. The (sub)shrubby *Dicoma chatanensis* N. Kilian sp. nov. with affinities especially to *D. aethiopica* from southwest Ethiopia, is described from open habitats of the sea-facing escarpments of Jabal Chatan in east Al-Mahra, Yemen. Based on additional material, *D. schimperi* subsp. *cinerea* is reconsidered to have a disjunct distribution in north Somalia and southeast Yemen, in the latter region replacing subsp. *schimperi*. *Dicoma tomentosa* is very rare in the area and known only from southwest Saudi Arabia, north Yemen and, as a rare weed, from Socotra. The common description and illustration (under *Dicoma*) of the flowers of the Socotran endemic *Macledium canum* with lobes rolled backwards spirally is confirmed to be erroneous and a lectotype is designated for the basionym. A key to the four species is provided.

The genus *Dicoma* Cass. of the tribe Dicomeae of the family Compositae (Asteraceae) comprises in its wide circumscription about 50 species of herbs, shrubs or, rarely, small trees, mainly distributed in tropical and southern Africa and Madagascar (Ortiz et al. 1998). A phylogenetic analysis of *Dicoma* based on morphological and anatomical characters by Ortiz (2000, 2001) revealed the necessity to reconsider the delimitation of the genus. Facing the choice of either enlarging *Dicoma* to include also the small tropical African genus *Pasaccardoa* Kuntze, or to split it into three smaller genera, Ortiz (2000, 2001) provided convincing arguments for the latter alternative and reinstated *Macledium* Cass. with about 20 species of tropical and southern Africa (Ortiz 2001) and *Cloiselia* S. Moore with four shrubby and tree-like species of Madagascar (Ortiz 2006).

In *Dicoma* s.s. some 25 species remain, mainly distributed in tropical and southern Africa; a centre of diversity, with 12 species, is the Horn of Africa region, especially north Somalia (Ortiz et al. 1998). Two species have been reported to occur on the Arabian Peninsula, *D. schimperi* and *D. tomentosa* (Ghazanfar 1992, Wood 1997, Collenette 1999, Chaudhary 2000, Jongbloed 2003). Farther east, on the Asian mainland, *D. tomentosa* is present in Pakistan and India, and *D. schimperi* has been reported from south Pakistan. On the Yemeni island of Socotra, off the easternmost tip of the African continent and separated from the Arabian Peninsula by the Gulf of Aden, the northeasternmost species of *Macledium,* the endemic *M. canum,* occurs (Balfour 1888, Miller and Morris 2004 under *Dicoma cana*, Ortiz 2001).

Ortiz et al. (1998), when treating *Dicoma* for the Horn of Africa region, noticed a disjunct distribution of a tomentose taxon, otherwise strongly resembling *D. schimperi,* in north Somalia and across the Gulf of Aden in Hadhramout, Yemen. These authors pointed at the close phytogeographical connection between north Somalia and south Arabia, which is in fact witnessed by numerous similar disjunctions. Recent field work of the present author in the southern coastal mountains of the Arabian Peninsula revealed the presence of another, yet unknown taxon, which is described as a species new to science here. At this occasion, a revised treatment of and a key to the species of *Dicoma* and *Macledium* on the Arabian Peninsula and Socotra is provided.

Material and methods

The present study is based on the author's field work on the southern Arabian Peninsula (Yemen and Oman) and Socotra during 1997–2003, on the material present in the herbarium of the Botanic Garden and Botanical Museum Berlin-Dahlem (B), also including duplicates of the personal herbarium of Bruno Mies, on material of the National Herbarium of Oman (ON), and on high resolution images of types and other material viewed through Aluka (2007+).

Micromorphological features were examined under a Wild M5 optical reflected-light microscope and photographed with a Leica DFC290 digital camera. Pappus

samples were mounted onto SEM stubs on double-sided sticky tape, coated with 20 nm Au–Pd using an Emitech K550 sputter-coater, examined with a Philips SEM 515 scanning electron microscope and documented with the Point Electronic WinDISS III digital imaging device (hard- and software).

Dicoma chatanensis N. Kilian sp. nov. (Fig. 1)

Dicomae aethiopicae et D. popeanae affinis, sed habito (suf)fruticoso (non herbaceo annuo vel perenni), foliis conspicue bicoloris (non concoloris), (late) ellipticis ad ovatis (non peranguste ellipticis ad oblanceolatis) et integris (non serrulatis), capitulorum involucro 11–14 mm (non 6–12 mm) longo, phyllis involucri ca 25–30 (non 40–100), corolla 9–12 mm (non 4.0–8.2 mm) longa et pappo 6–8 mm (non 4–6 mm) longo bene distinguitur.

Type: Yemen, Al-Mahra, coastal mountains, northwest of Jadib, slope with boulders (0.2–1.0 m in diameter), immediately below the escarpment from the summit plateau of Jabal Chatan, limestone, 900 m a.s.l., 16°39′N, 52°57′E, mixed *Anogeissus* woodland with evergreen elements, 13 Nov 2000, N. Kilian, S. O. Bahah, P. Hein, M. A. Hubaishan & C. Naumann NK 6805 (holotype: B 100220545, isotypes: C, E, herb. AREA Dhamar).

Caespitose or chasmophytic pendulous subshrub or shrublet, up to 60 cm in diameter; young twigs more or less white-tomentose of simple hairs and thus greyish green, glabrescent with age. Leaves (5–)20–40(–48) × (2–)6–10 (–13) mm, lamina elliptic to ovate, apically subobtuse to acute, mucronate, basally abruptly attenuate into a pseudopetiole (1–)4–8(–10) mm long, margin entire, conspicuously bicolorous, upper surface loosely white-tomentose

Figure 1. *Dicoma chatanensis* sp. nov. (A) branchlet, (B) capitula in detail, (C) involucre spread to show the involucral bracts, dorsal view, (D) flowers, (E) achene with pappus, (F) portion of pappus with inner (broader) and outer (narrower) bristles, SEM from the base (a), the middle third (b) and the apex (c). Scale bars: (A) = 2.5 cm, (B) = 1 cm, (C) = 0.5, (D)–(E) = 2 mm, (F) = 500 µm. (A)–(B), (D) (right), (E), (F) from the holotype Kilian et al. NK 6805, (C), (D) (left) from Kilian et al. YP 590.

and green, lower surface densely white-tomentose and greyish green to grey. Capitula single at the end of twigs, subtended by a few leaves usually shorter to somewhat longer than the capitulum. Involucre 11–14 mm long, with 25–30 involucral bracts arranged in several series, progressively becoming longer inwards, the shortest ca 1.5–3.0 × 0.8–1.3 mm, the longest ca 10–13 × 1.5–2.0 mm, lanceolate to linear-lanceolate, the outer loosely white-tomentose, the others glabrous, all acute with a cartilaginous tip and with a green to purplish area between the abaxially prominent, whitish and cartilaginous midrib and the distinct scarious, entire to remotely denticulate margin; all starwise spread at fruiting. Receptacle alveolate, the areoles bordered by a membranous fringe. Flowers ca 25–35 per capitulum; corolla (pale?) yellow, with very short glandular hairs, conspicuous when corolla still closed, tube (of fully opened flowers) 4.8–6.8 mm long, the 5 lobes 4.2–5.0 mm long, linear-lanceolate, acute, rolled backwards spirally at anthesis; stamens well exserted beyond the revolute corolla lobes, with filaments ca 2–3 mm long and pale reddish brown anthers, ca 4.8–6.0 mm long including apical appendage and tails, anther tails ca 1.3–1.5 mm long, linear-lanceolate, distally with ca 0.4 mm long, straight, acute, retrorse ramifications, proximally with shorter, acute antrorse ramifications, apical appendage ca 1.0–1.5 mm long, lanceolate; style 9.5–12 mm long, stylar branches ca 1.1–2.0 mm long. Achenes turbinate, 1.8–2.5 mm long, up to ca 1.4–1.6 mm in diameter, with 10 very prominent, thick, 0.3–0.4 mm wide ribs, brown and densely villose of antrorse, straight, up to ca 1.5 mm long twin hairs inserted between the ribs chiefly in the lower half of the achene. Pappus 6–8 mm long, isomorphic, of ca 60–80 flattened, barbellate bristles, the outer narrower and shorter than the inner.

Distribution and habitat

The species is so far only known from the easternmost part of the governorate of Al-Mahra, southeast Yemen, where it has been collected in the sea-facing escarpments of the coastal mountains from the foothills little above sea level to altitudes of up to 1200 m a.s.l. The escarpments of the central south coast of the Arabian Peninsula are regularly affected in summer by the southwest monsoon and therefore shelter luxurious semideciduous forest and woodlands, predominantly of the endemic Hybantho durae–Anogeissetum dhofaricae association (Kürschner et al. 2004). *Dicoma chatanensis,* however, was found growing in rather open, rocky places, below or, more frequently, above the *Anogeissus dhofarica* forest, preferably at the foot or in crevices of rock faces. Species collected in close vicinity of the new species include: *Actiniopteris semiflabellata* Pich.-Serm., *Adiantum incisum* Forssk., *Azima tetracantha* Lam., *Blepharis dhofarensis* A. G. Mill., *Brachiaria arida* (Mez) Stapf, *Dhofaria macleishii* A. G. Mill., *Dorstenia foetida* (Forssk.) Schweinf., *Dyerophytum indicum* (Wight) Kuntze, *Euclea schimperi* (DC.) Dandy, *Grewia trichocarpa* Hochst. ex A. Rich., *Gypsophila montana* Balf. f., *Hypodematium crenatum* (Forssk.) Kuhn, *Justicia areysiana* Deflers, *Lavandula dhofarensis* A. G. Mill. subsp. *dhofarensis, Lindenbergia indica* (L.) Vatke, *Pistacia falcata* Mart., *Psiadia punctulata* (DC.) Vatke, *Pulicaria argyrophylla* subsp. *oligophylla* (Gamal-Eldin) N. Kilian & P. Hein, *Pyrostria phyllanthoidea* (Baillon) Bridson and *Rhus somalensis* Engl.

Additional specimens examined (paratypes)

Yemen, Al-Mahra: Footpath through the vertical escarpment to the summit plateau of Jabal Chatan northeast of the permanent spring 'Ain Ayn', at ca 16°38′N, 52°57′E, ca 950–1200 m a.s.l., small terraces, 23 Nov 1999, N. Kilian 6339 (B); coastal mountains, north of Jadib, slope with boulders (0.2–1.0 m in diameter), directly below the Jabal Chatan escarpment, limestone rocks, 850–920 m a.s.l., 16°39′N, 52°57′E, dense semi-deciduous woodland, 13 Nov 2000, P. Hein 8149 (B); Hawf Mts, slopes below the summit escarpment, above 'Uteq', 16°38′57.5″N, 52°57′39.2″E, at 820 m a.s.l., towards 16°39′14.3″N, 52°57′27.2″E, dry gorge at 1200 m a.s.l. in the wind shade of huge rock faces, 30 Sep 2001, N. Kilian, J. Meister & S. A. Salem Kodah YP 590 (B; herb. AREA Dhamar); foot of Hawf Mts immediately north of Jadib, 16°38′N, 52°58′E, 10–50 m a.s.l., small wadi with steep rocky escarpments, 21 Nov 1999, N. Kilian 6203 (B), P. Hein 6648 (B); upper escarpment to Jabal Chatan, on sea facing vertical cliffs and ledges, 950–1150 m a.s.l., 16°39′N, 52°58′E, 23 Nov 1999, P. Hein 6749 (B); footpath from the village Con on the second plateau over the steep escarpment up to the summit plateau of Jabal Chatan, ca 16°40′N, 53°02′E, 900–1100 m a.s.l., rock faces and ledges, 22 Nov 1999, N. Kilian 6286 (B), P. Hein 6702 (B).

Etymology

The specific epithet is coined after the local toponym 'Jabal Chatan' for the part of the coastal mountain chain where the new species was found.

Relationship and delimitation

Dicoma chatanensis clearly belongs to *Dicoma* s.s. (Ortiz 2000, 2001), because of, in particular, (1) the corolla without long twin glandular hairs, (2) corolla lobes rolled backwards spirally at anthesis, (3) the anther tails distally with acute retrorse ramifications (Ortiz 2000, his Fig. 5, in the caption erroneously termed 'antrorse'), (4) the ribbed achenes with trichomes situated between the ribs, (5) the involucral bracts with a conspicuous midvein and longitudinal herbaceous stripes on either side.

The species shows morphological affinities to a group of three mesic species, especially to *Dicoma aethiopica* S. Ortiz & Rodr. Oubiña, endemic to the southwest Ethiopian provinces of Bale and Sidamo growing at 1400–1500 m a.s.l. in *Acacia–Commiphora* bushland, and further including *D. popeana* S. Ortiz & Rodr. Oubiña, endemic to the central Somali province of Hiiraan, and *D. anomala* Sond., widespread in east and south tropical as well as southern Africa. The relevant characters are compared and the differences summarized in Table 1. In particular, *D. chatanensis* is distinguished from the three other species by the rather broad, entire leaves and the low

Table 1. Comparison of *Dicoma chatanensis* with the morphologically closest species *D. aethiopica, D. popeana* and *D. anomala*. The data for *D. aethiopica* and *D. popeana* are based on Ortiz et al. (1998) and the high resolution specimen images in Aluka (2007+). Data for *D. anomala* are based on Jeffrey and Beentje (2000) and material present at B.

	D. chatanensis	*D. aethiopica*	*D. popeana*	*D. anomala*
Habit	subshrub or shrublet	annual to perennial herb	annual herb	subshrub (perennial woody herb)
Stem and branches	young twigs with white–tomentose indumentum, greyish green	branches with moderately greyish white–tomentose indumentum, greenish to purple	stems moderately greyish white–tomentose	branches white–tomentose
Leaves				
size (mm)	5–48 ×2–13	15–90 ×2–17	15–25 ×2–3	30–90 ×2–11
shape	elliptic to ovate	linear–elliptic to oblanceolate	linear–elliptic	linear to lanceolate
margin	entire	serrulate	serrulate	minutely serrulate
colour	bicolorous, upper surface loosely white–tomentose and green, lower densely white–tomentose and greyish green to grey	concolorous, both surfaces greenish to purple, upper slightly darker and slightly more glabrescent	concolorous, both surfaces greenish	bicolorous, upper surface deep dull green and glabrous, lower surface silvery–white tomentose
Involucre				
length (mm)	11–14	9–12	6–8	13–24
involucral bracts	ca 25–30	ca 70–100	ca 40–60	ca 80–270
inner involucral bracts (mm long)	10–13	9–11	6.0–7.5	12–22
Flowers				
per capitulum	25–35	15–25	8–12	10–60
colour	yellowish	white	yellowish	white to pale purplish
length (mm)	corolla 9–12, lobes 4.2–5.0	corolla 5.0–8.2, lobes 3.3–3.5	corolla 4–5, lobes 2.8–3.5	corolla 6–12, lobes 3.5–6.0
Achene length (mm)	1.8–2.5	1.5–2.5	1.5–2.0	2–4
Pappus				
bristles	ca 60–80	ca 40–80(–100)	ca 25–40	>100
length (mm)	6–8	4–6	4–5	7–12

number of involucral bracts, and from *D. aethiopica* and *D. popeana* by the habit, the bicolorous leaves and the longer involucre, corolla and pappus.

Dicoma schimperi (DC.) Baill. ex O. Hoffm.

Two subspecies can be recognized:

1. Stems, leaves and involucre ± glabrous; leaf lamina narrowly elliptical to lanceolate . . . . . *Dicoma schimperi* subsp. *schimperi*
   – Stems, leaves and involucre with a white-tomentose indumentum; lamina of at least the lower leaves ovate to suborbicular . . . . *Dicoma schimperi* subsp. *cinerea*

Dicoma schimperi subsp. *schimperi*

Basionym: *Hochstetteria schimperi* DC.

The typical subspecies is distributed in the Horn of Africa region (Djibouti, Somalia), extending northwards to Sudan, southeast Egypt, Sinai and Jordan, and eastwards to the Arabian Peninsula, where it is present in west Saudi Arabia (Collenette 1999, Abedin and Mossa in Chaudhary 2000), south Yemen (Anderson 1860, p. 23; own data), Oman (Ghazanfar 1992, p. 45; own data) and eastern coastal UAE (Jongbloed 2003, p. 152, Fawzi and Fawzi 2007, p. 254). Reports from coastal southern Pakistan (Stewart 1972, p. 752, Rechinger 1989, p. 113) need confirmation (Santiago Ortiz, pers. comm.).

Specimens examined

Saudi Arabia. Prope Meccam, Spitzel (B).

Yemen. Aden peninsula, upper Crater, plateau southwest of the Tower of Silence, ca 120–170 m a.s.l., 12°47′N, 45°02′E, 3 Mar 1996, P. Hein 96-35 (B); ibid., 22 Mar 1997, N. Kilian 4491 (B).

Oman. Dhofar, Jabal Qamar, along road to Arfit & Dhalkut, drier parts of seaward cliffs, ca 1000 m a.s.l., 16°49′46.9″N, 53°39′35.0″E, 15 Oct 1999, G. Baird & al. 312 (B); Hamriyah-Gitti track, ca 23°34′N, 58°34′E, 500′ (152.4 m a.s.l.), 27 Mar 1992, S. Collenette 8034 (ON); Quryat-Mutrah-Hwy, 23°15′N, 58°50′E, 300 m a.s.l., 2 Apr 1985, S. P. Ferrand 35 (ON).

Dicoma schimperi subsp. *cinerea* (S. Ortiz & Rodr. Oubiña) S. Ortiz & Rodr. Oubiña (in Ortiz et al. 1998, p. 451)

Basionym: *Dicoma cinerea* S. Ortiz & Rodr. Oubiña (1994, p. 1479).

Type: Somalia, Sanaag, Einand, 11°02′N, 48°55′E, 2000′ (609.6 m a.s.l.), limestone screes and boulders, dry stream bed slope, 21 Aug 1957, Newbold 1013 (holotype: K 000252246!).

The only known Somali collection of this taxon (Ortiz and Rodríguez-Oubiña in Ortiz et al. 1998, in Thulin 2006) and the Arabian plants share the white-tomentose indumentum and, more or less so, the leaf shape and the pustulate teeth. In the Arabian Peninsula the taxon apparently replaces typical *Dicoma schimperi* in the coastal mountain chains of southeast Yemen, known there from Hadhramout and Al Mahra (Fig. 2), with the western and northern limits of its area so far not precisely established. It appears therefore justified to consider the populations on both sides of the Gulf of Aden as one subspecies with a disjunct distribution in north Somalia (Sanaag) and southeast Yemen (Hadhramout and Al-Mahra), rather than, as done by Ortiz and Rodríguez-Oubiña (in Ortiz et al. 1998), the Yemeni plants as a transitional form between the typical subspecies and subsp. *cinerea,* and the latter considered as endemic to north Somalia. Weakly tomentose, glabrescent plants with narrower leaves have been found in west Oman and northeast Hadhramout (see Specimens examined) and can safely be considered as transitional populations between both subspecies in their contact areas.

Similar disjunct distribution patterns are in fact rather frequent among the flora of the Horn of Africa region and south Arabia. Two examples in the Compositae are *Pulicaria argyrophylla* Franch. subsp. *argyrophylla*, with populations in northeast Somalia and Hadhramout (Kilian and Hein 1999, p. 193) and *Launaea crassifolia* (Balf. f.) C. Jeffrey, with population in north Somalia, southwest Yemen/south Oman and Socotra (Kilian 1997).

Specimens examined

Yemen. Hadhramout: Jol plateau, some km northwest of Ghail-bin-Yemen on the track to As-Saah (south of Ghayl Omar), 850–930 m a.s.l., 15°31′38.1″N, 48°57′20.0″E, 18 Sep 2001, N. Kilian, P. Hein & M. A. Hubaishan YP 190 (B). – Al-Mahra: Jabal Sharwayn, east–southeast facing slopes west of Qeshn, 300–400 m a.s.l., 15°24′N, 51°37′E, 17 Nov 2000, N. Kilian 6898 (B); eastern flank of Jabal Sharwayn west of the town Qeshn, 250 m a.s.l., 15°24′N, 51°37′E, on rocky slopes, locally common, 17 Nov 2000, P. Hein 8275 (B); road between Huswain and Atub, west of Ras Fartaq massif, 15°51.90′N, 52°00′E, 450 m a.s.l., among limestone blocks, bushland in fissures, 13 Nov 2000, B. Mies 1592 (B); southwestern flank of the Jabal Fartak, along the track from Haswayn to Nishtun, 250 m a.s.l., 15°48′N, 51°59′E, 6 Nov 2000, N. Kilian 6647 (B); coastal mountains between Hawf and Damqawt, 16°35′N, 52°54′E, little above sea level, upper edge of sand beach and foot of slope with boulders, ca 5–10 m a.s.l., 12 Nov 2000, N. Kilian 6763 (B).

Specimens transitional between *Dicoma schimperi* subsp. *cinerea* and *Dicoma schimperi* subsp. *schimperi:*
Yemen. Hadhramout: North above Wadi Masilah on new road to Thamud, 16°16′46.5′′N, 49°26′11.4′′E, 870 m a.s.l., rocky gravelly slope of table mountain with water run-off, 19 Aug 2002, N. Kilian, P. Hein & M. A. Hubaishan YP 2784 (B).

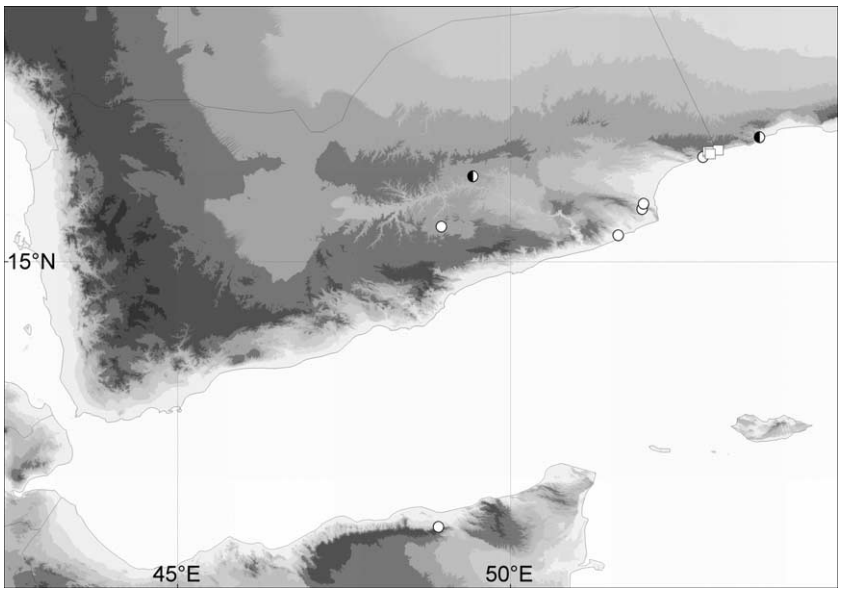

Figure 2. Distribution of *Dicoma chatanensis* (squares) and *D. schimperi* subsp. *cinerea* (circles; half solid circles: specimens transitional to subsp. *schimperi*). Georeferenced map based on the specimens seen and generated with DIVA-GIS (Hijmans et al. 2005) using an adaptation of the SRTM 90 m digital elevation data (CGIAR-CSI 2004).

Oman. Dhofar: Coastal mountains of Jabal Qamar ca 5 km west of Mughsayl,16°52′N, 53°45′E, southwest exposed limestone slopes with many succulents, 50–250 m a.s.l., 9 Oct 1998, N. Kilian 5595 (B).

Dicoma tomentosa Cass.

This annual herb is widespread in southern and tropical Africa northwards extending to Jabal Elba (southeast Egypt), as a rare weed also on Socotra (Balfour 1888, Miller and Morris 2004), on the Arabian Peninsula very rare in southwestern Saudi Arabia (Collenette 1999, Abedin and Mossa in Chaudhary 2000) and northern Yemen (Wood 1997), scattered in Pakistan and India.

Specimens examined

Yemen. Socotra: Wadi Ayn Tass, Bir Kam, 12°39′N, 54°06′E, 100 m a.s.l., 24 Jan 1998, B. Mies 951 (B).

Macledium canum (Balf. f.) S. Ortiz (2001, p. 740)

Basionym: *Dicoma cana* Balf. f. (1882, p. 841).

Type (designated here): [Yemen], Socotra, [''in montibus prope Gollonsir'', see protologue], 2.-3.1880, I. B. Balfour 157 (lectotype: K 000252232!; isolectotypes: E 00239594!, K 000252233!, OXF, P 0011001!).

Two equally instructive specimens of the type collection Balfour 157 (erroneously cited as ''757'' in the protologue, corrected in Balfour 1888, p. 143) are present at K, where the first set of Balfour's Socotra collection is deposited (Stafleu and Mennega 1992, p. 296), one accompanied by an initial sketch of flower details (K 000252232), one by more elaborate detail drawings (K 000252233), which served as the basis for the plate in Balfour (1888, Table 42). The first specimen I select as the lectotype of the name. The type collection comes from ''the cliffs overhanging the shore southwest of Gallonsir at an elevation over 1500 foot [457.2 m]'' (Balfour 1888, p. 143).

The corolla lobes are shown on the plate in Balfour (1888, Table 42) and on the corresponding drawing accompanying the isolectotype K 000252233 to be rolled backwards spirally, as is typical for *Dicoma*. In contrast, on the initial drawing accompanying the lectotype, the lobes are drawn more or less erect, and this is actually correct as revealed by the material studied. The same mistake is repeated in the illustrated key in Miller and Morris (2004, p. 163). The straight corolla lobes of *Macledium canum* are shared with the other species of this genus (Ortiz 2000, 2001) and, among other features, delimit it from *Dicoma*.

This cushion-forming shrublet is endemic to the island of Socotra, where it occurs in open dwarf shrubland on the drier limestone plateaus in the east and west of the island at altitudes of 300–700 m a.s.l. (Miller and Morris 2004). Flowering and fruiting is from January to April.

Additional specimens examined

Yemen. Socotra: Eastern limestone plateau, ca 10 km west of Ras Momi, open plain, 500 m a.s.l., 3 Feb 1990, A. G. Miller et al. 10251 (B); Mumi plateau, 1 km northwest of Shilhin, 12°32′N, 54°19′E, 470 m a.s.l., 28 Mar 1996, P. Hein 96-420 (B); Hamadero plateau, western part, 12°36′N, 54°15′E, 450 m a.s.l., 26 Feb 1999, B. Mies 1498 (B); Ma'ala plateau, 12°39′37.3′′N, 53°25′53.9′′E, 650–700 m a.s.l., 6 Mar 2003, N. Kilian, P. Hein & H. Kürschner YP 3731 (B).

Key to the species of *Dicoma* and *Macledium* on the Arabian Peninsula and Socotra

1. Shrublet, forming dense, white-tomentose cushions to ca 20 cm high; involucral bracts abaxially uniformly coloured, the outer yellowish-greenish white, the inner almost pure white, the outer involute and brownish adaxially, the inner almost flat and also white adaxially; flowers red, corolla lobes ± erect; achenes without thick ribs . . . . . *Macledium canum*
   – Herbs or shrublets of different habit; involucral bracts abaxially with green to purplish stripes on either side of the midrib, adaxially pale, flat; flowers of some shade of yellow or, more rarely, whitish or pale pink; corolla lobes rolled backwards spirally; achenes with 10 thick ribs 2
2. Capitula (sub)sessile in the leaf axils; pappus of bristles and scales . . . . . *Dicoma tomentosa*
   – Capitula at the end of the twigs; pappus of bristles only, all equal or the outer somewhat thinner and shorter than the inner. 3
3. Pappus uniseriate, of 8–10 flattened bristles . . . . . *Dicoma schimperi*
   – Pappus of 2–3 series of ca 60–80 bristles, the outer bristles thinner and shorter than the somewhat flattened inner ones . . . . . *Dicoma chatanensis*

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References

Aluka 2007+. African plants. <www.aluka.org/page/content/plants.jsp>, accessed February 2009.

Anderson, T. 1860. Florula adenensis. – J. Proc. Linn. Soc. 5 suppl. 1: i–xxiv, 1–47.

Balfour, I. B. 1882. Diagnoses plantarum novarum et imperfecte descriptorum phanerogamarum socotrensium; pars altera. – Proc. R. Soc. Edinburgh 11: 834–843.

Balfour, I. B. 1888. Botany of Socotra. – Trans. R. Soc. Edinburgh 31: 1–46, 100 pl.

Chaudhary, S. A. 2000. Flora of the Kingdom of Saudi Arabia illustrated 2(3). – Ministry of Agriculture and Water, Kingdom of Saudi Arabia.

CGIAR-CSI [Consortium of Spatial Information] 2004. NASA Shuttle Radar Topographic Mission (SRTM) 90 m digital elevation data (DEMs). <http://srtm.sci.cgiar.org>.

Collenette, S. 1999. Wildflowers of Saudi Arabia. – Natl Commission of Wildlife Conserv. and Devel., Kingdom of Saudi Arabia.

Fawzi, H. K. and Fawzi, N. H. 2007. Flora of the United Arab Emirates 2. – UAE Univ. Publications 98.

Ghazanfar, S. A. 1992. An annotated catalogue of the vascular plants of Oman. – Scripta Bot. Belgica 2.

Hijmans, R. et al. 2005. DIVA-GIS, ver. 5.2. <http://diva-gis.org>.

Jeffrey, C. and Beentje, H. J. 2000. Mutisieae. – In: Beentje, H. J. and Smith, S. A. L. (eds), Flora of tropical east Africa, Compositae, part 1. R. Bot. Gard. Kew, pp. 3–35.

Jongbloed, M. 2003. The comprehensive guide to the wild flowers of the United Arab Emirates. – ERWDA.

Kilian, N. 1997. Revision of *Launaea* Cass. (Compositae, Lactuceae, Sonchinae). – Englera 17.

Kilian, N. and Hein, P. 1999. Studies in the Compositae of the Arabian Peninsula and Socotra – 2. *Pulicaria samhanensis* sp. nova (Inuleae) from Dhofar and notes on other S Arabian species of the genus. – Willdenowia 29: 187–196.

Kürschner, H. et al. 2004. The Hybantho durae–Anogeissetum dhofaricae ass. nova – phytosociology, structure and ecology of an endemic south Arabian forest community. – Phytocoenologia 34: 569–612.

Miller, A. G. and Morris, M. 2004. Ethnoflora of the Socotra archipelago. – R. Bot. Gard. Edinburgh.

Ortiz, S. 2000. A phylogenetic analysis of *Dicoma* and related genera (Asteraceae: Cichorioideae: Mutisieae) based on morphological and anatomical characters. – Ann. Miss. Bot. Gard. 87: 459–481.

Ortiz, S. 2001. Reinstatement of the genus *Macledium* Cass. (Asteraceae, Mutisieae): morphological and phylogenetic arguments. – Taxon 50: 733–744.

Ortiz, S. 2006. Systematics of *Cloiselia* (Asteraceae, Mutisieae s.l.), a reinstated Madagascan genus. – Syst. Bot. 31: 421–431.

Ortiz, S. and Rodriguez-Oubiña, J. 1994. *Dicoma paivae* and *Dicoma cinerea* (Asteraceae), two new species from Somalia. – Can. J. Bot. 72: 1478–1481.

Ortiz, S. et al. 1998. A taxonomic revision of *Dicoma* (Asteraceae: Cichorioideae: Mustisieae) for the Horn of Africa. – Ann. Miss. Bot. Gard. 85: 440–459.

Rechinger, K. H. 1989. Mutisieae. – In: Dittrich, M. et al. (eds), Flora iranica 164. Akademische Druck- und Verlagsanstalt, pp. 111–116.

Stafleu, F. A. and Mennega, E. 1992. Taxonomic literature, suppl. 1. – Reg. Veg. 125.

Stewart, R. R. 1972. An annotated catalogue of the vascular plants of west Pakistan and Kashmir. – Fahkri Printing Press.

Thulin, M. 2006. Flora of Somalia 3. – R. Bot. Gard. Kew.

Wood, J. R. I. 1997. A handbook of the Yemen flora. – R. Bot. Gard. Kew.