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A taxonomic revision of the genus *Nanobubon* (Apiaceae: Apioideae)

A.R. Magee*, B.-E. Van Wyk, P.M. Tilney

Department of Botany and Plant Biotechnology, University of Johannesburg, P.O. Box 524, Auckland Park 2006, South Africa

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Abstract

Nanobubon is a recently described genus consisting of two evergreen, perennial suffrutices endemic to the Cape Floristic Region of South Africa. *Nanobubon strictum* (Spreng.) Magee and *N. capillaceum* (Thunb.) Magee share a partly sympatric distribution, from the Cape Peninsula northwards to the Cedarberg mountains and eastwards to Port Elizabeth. Although both species are relatively similar in their highly sclerified and much-divided evergreen leaves with sub-terete ultimate segments, they can be distinguished from one another by the orientation of the leaves (erect or reclining), the branching pattern of the leaves (pinnae erect or spreading), the curvature of the leaf rachises and segments (straight or refracted), the colour of the flowers (yellow or cream-coloured) and the prominence of the dorsal ribs on the fruits (prominent or inconspicuous). The nomenclature and typifications, as well as complete descriptions and known geographical distributions are presented.

Keywords: Apiaceae; Cape Floristic Region; *Nanobubon*; *Peucedanum*; South Africa; Taxonomy

1. Introduction

Nanobubon Magee was recently established by Winter et al. (2008) to accommodate two sclerophyllous Cape endemic species belonging to an African peucedanoid clade within the subfamily Apioideae. Both species of *Nanobubon* were previously treated as part of the large and unwieldy cosmopolitan genus *Peucedanum* L. An analysis of nuclear ribosomal ITS sequence data demonstrated that the African contingent of *Peucedanum*, form a clade with other African endemic genera in the tribe Tordylieae (Winter et al., 2008). As this clade is clearly separate from the remaining Eurasian species, which are dispersed within the tribe Selineae (Winter et al., 2008; Spalik et al., 2004), a new generic classification system was proposed to better reflect the extreme morphological and anatomical diversity found within the African species.

Nanobubon shares numerous morphological adaptations with *Notobubon* B.-E. van Wyk, a closely related Cape peucedanoid genus (Magee, 2007; Magee et al., in press-a). These two genera can readily be distinguished from other peucedanoid genera by the permanent woody stems and evergreen habit (Winter et al., 2008). Both these characters represent common adaptations of fynbos plants in response to the nutrient-poor soils and the dry, often windy summers that define this vegetation type (Goldblatt and Manning, 2002). As the species of *Nanobubon* resprout rapidly after fire, these small suffrutices are often most prominent in recently burnt vegetation.

2. Materials and methods

This revision is based on field observations and studies of the complete collections from the following herbaria: BM, BOL, JRAU, K, NBG (including SAM and STE), PRE, S and UPS. Using this material, together with information from Leistner and Morris (1976), the distribution areas of the species were ascertained and mapped.

For anatomical procedures the fruit material was fixed in FAA for at least 24 h and then treated according to the method of Feder and O'Brien (1968) for embedding in glycol methacrylate (GMA), but modified so that the material was infiltrated in GMA for five days in the final infiltration. Staining was done according to the periodic acid Schiff/toluidine blue

* Corresponding author.
E-mail address: a.r.magee@hotmail.com (A.R. Magee).

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(PAS/TB) staining method (Feder and O'Brien, 1968). Voucher specimens for the fruit anatomical study are listed below.

Nanobubon capillaceum: Perdeberg, *Viviers 945* (NBG), immature fruit; mountains near Loeri and Van Stadens Rivers, *Ecklon and Zeyher 2237* (S), immature fruit; Fernkloof Nature Reserve, *Drewe 892* (HER), mature fruit; Vogelgat, *Williams 2707* (NBG), mature fruit. *Nanobubon strictum*: Zachariashoek, *Smith 202* (PRE), immature fruit; Noordhoek Pass, *Magee et al. 58* (JRAU), mature fruit; Table Mountain, *Marloth 5189* (PRE), mature fruit.

3. Results and discussion

The two species of *Nanobubon,* while sharing persistent, evergreen leaves with *Notobubon*, differ markedly in their small (less than 0.4 m tall), rhizomatous, suffrutescent (not shrubby) habit and in their terete, needle-like ultimate leaf segments (usually flat and laminar in *Notobubon*). Like many other fynbos species, they are adapted to fire and so resprout rapidly from their underground stems.

The leaves are rosulate and borne at or near ground level. They are cauline, sclerophyllous in texture and evergreen. The two species are most easily distinguished by obvious leaf morphological characters. In *N. capillaceum* (Thunb.) Magee the leaves are reclining (Fig. 1a), while in *Nanobubon strictum* (Spreng.) Magee they are erect (Fig. 1b), although in very exposed conditions they may become decumbent. The pinnae are erect and ascending at acute angles to one another in *N. strictum* (Fig. 1b), or divaricate to geniculate and spreading at obtuse angles to one another in *N. capillaceum* (Fig. 1a). Both the rachis and ultimate leaflet segments are prominently refracted in *N. capillaceum*, as opposed to those of *N. strictum* in which they remain straight. The ultimate leaflet segments are rigid and reduced to linear, sub-terete segments in both species.

The inflorescence consists of a single, dominant terminal umbel surrounded by reduced (or even absent) secondary umbels. The primary umbels are largely composed of hermaphroditic flowers and the lateral umbels mainly of functionally male flowers. In *Nanobubon* it appears that the percentage of functionally male flowers increases towards the centre of the umbellules, with the central raylets composed almost entirely of male flowers, as found also by Bell (1971) in *Zizia* Koch and *Thaspium* Nutt. The primary umbels are prominently flat-topped, with the inner rays significantly shorter than the outer. The number of rays varies from nine to 27, and is not taxonomically useful at the species level. In both species only the raylets were found to be distinctly scabrous while the remainder of the inflorescence is glabrous or sparsely scabrous.

The flowers are typical for the subfamily but the sepals are relatively large, ranging from 1/4 to 1/2 the length of the petals. Field observations of both species show that the petals of *Nanobubon strictum* are yellow, while those of *N. capillaceum* are cream-coloured. Furthermore, the stylopodium of *N. capillaceum* is dark purple in colour and so contrasts sharply with the pale cream-coloured petals, whereas in *N. strictum* the stylopodium and the petals are similar in colour. The stylopodia of the young fruit of *N. capillaceum* secrete a substance that attracts large numbers of ants. This seems to function as an "extrafloral" nectary, with the ants perhaps protecting the developing fruit against pathogens and herbivores.

The mature fruit of *Nanobubon* are relatively large (Fig. 2) — more than 10 mm long (fruit less than 9 mm long in *Notobubon*).

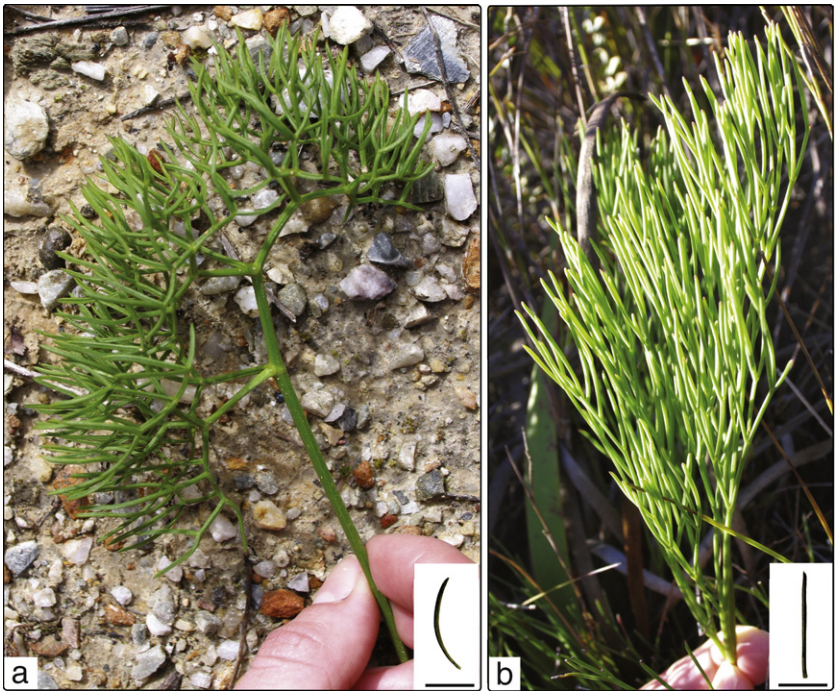

Fig. 1. Leaf morphology of *Nanobubon capillaceum* (a) and *N. strictum* (b). Ultimate leaflet segment shown in insets. Vouchers: (a) *Magee et al. 57*, JRAU; (b) *Magee et al. 58*, JRAU. Scale: 10 mm.

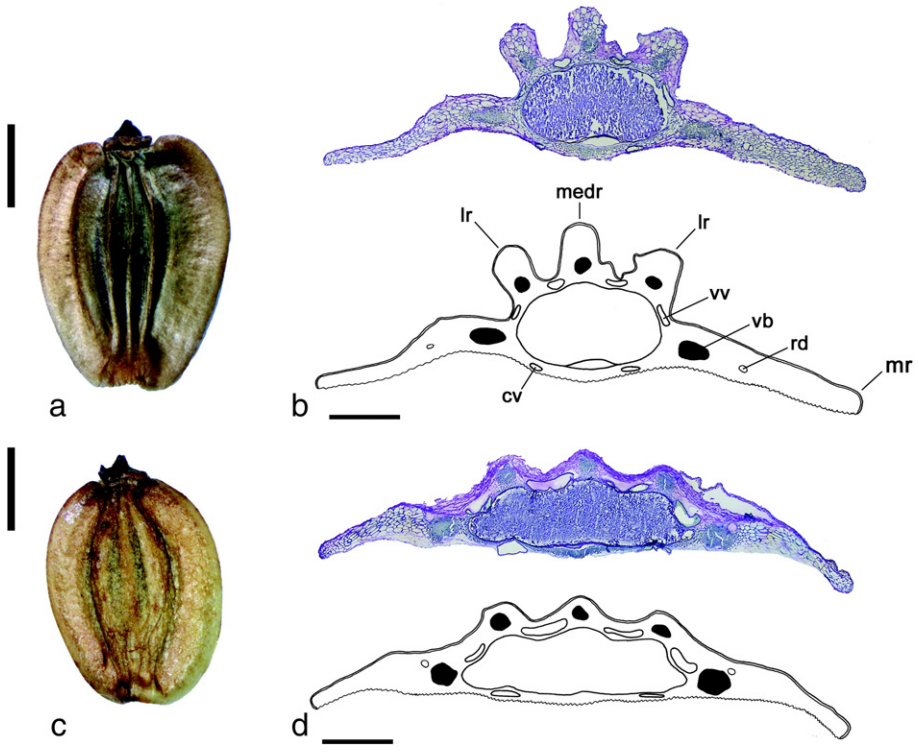

Fig. 2. Fruit morphology and anatomy (transverse section) of *Nanobubon capillaceum* (a, b) and *N. strictum* (c, d). Vouchers: (a) *Leighton 1563*, BOL; (b) *Drewe 892*, HER; (c) *Esterhuysen 22772*, BOL; (d) *Marloth 5189*, PRE. Scale: (a, c) 5 mm; (b, d) 1 mm. mr, marginal rib; medr, median rib; lr, lateral rib; vb, vascular bundle; cv, commissural vitta; vv, vallecular vitta; rd, rib oil duct.

They are homomorphic and dorsally compressed with the marginal ribs expanded into very broad, thick wings (Fig. 2). The commissure extends over the full width of the mericarp (i.e. to the very edge of both marginal ribs). The dorsal surface of the mericarp is weakly three-ribbed in *N. strictum* (Fig. 2d), while it is much more prominently ribbed in *N. capillaceum* (Fig. 2b). In both species the epidermal cells are square to periclinally elongated. The mesocarp cells are slightly lignified in the ribs and wings, with the lignified cells in the wings not prominently elongated. The lignified cells in the wings of *Notobubon* are also similarly non-elongated (Magee et al., in press-a), while those of *Cynorhiza* Eckl. and Zeyh. (Magee et al., in press-b) and typically many other African peucedanoid species (Ostroumova and Pimenov, 1997a,b) are prominently elongated. In both species of *Nanobubon* the rib oil ducts in the fruit are situated external to the vascular bundles in the ribs, as well as in either the median or distal portions of the marginal wings. The vittae are relatively narrow, with four solitary vallecular vittae and two commissural vittae.

4. Taxonomic treatment

Nanobubon Magee in Winter et al., Taxon 57(2): 356 (2008). TYPE — *Nanobubon strictum* (Spreng.) Magee.

Woody resprouting suffrutices, 0.1–0.4 m tall (excluding the inflorescence), evergreen. *Stems* short, mostly subterranean. *Leaves* rosulate, basal, permanent, sclerophyllous, erect or reclining, less often decumbent, 3- to 5-pinnate. *Petioles* 30–250 mm long, terete, sheathing at the base, pinnae compound, erect or divaricate to geniculate, rachis straight or refracted, segments erect, straight or refracted, rigid, linear, sub-terete, mucronulate, margins entire, glabrous. *Inflorescence* long (several times longer than the diameter of the primary umbel), peduncle striate, usually with a terminal umbel and 0 to 4 smaller lateral umbels, umbels compound. *Primary umbel* with 9 to 27 (32) rays, flat-topped; involucral bracts numerous, lanceolate to narrowly ovate, acuminate, glabrous or sparsely scabrous; rays unequal (the outer rays longer), glabrous or sparsely scabrous, involucel bracteoles numerous, lanceolate to narrowly ovate, acuminate, glabrous or scabrous, usually equal in length to the raylets; raylets glabrous or scabrous; umbellule many-flowered. *Flowers* pentamerous, those on outer raylets hermaphrodite, those on inner raylets often functionally male; sepals distinct to relatively large, obtuse to acuminate, glabrous; petals yellow or cream-coloured, elliptic to obovate, acuminate, with inflexed tips, glabrous, secretory ducts branched; stamens with tips inflexed; stylopodium broadly conical; styles short, elongating and often becoming reflexed in young fruit. *Fruit* dorsally compressed, broadly elliptic to broadly obovate, 10–15 mm × 8–11 mm, bases truncate, apices obtuse to slightly notched; mericarps homomorphic, median and lateral ribs clearly visible but not prominently raised or very distinct and prominently raised, marginal ribs very broadly-winged, thick; commissural vittae 2, narrow [in total 20–25% of actual fruit width (excluding the marginal wings)]; vallecular vittae 4, narrow; commissure very broad, ±100% of mericarp width; carpophore bipartite. Flowering occurs from November to January.

4.1. Diagnostic characters

The two species of *Nanobubon* are evergreen, resprouting, suffrutices with woody subterranean stems and persistent, sclerophyllous leaves. The fruit are relatively large, 10–15 mm long with broad marginal wings.

4.2. Distribution and habitat

The genus is restricted to the Western Cape Province of South Africa and endemic to the Cape Floristic Region. Plants occur in montane fynbos and rapidly resprout after fire, making them particularly prominent in recently burnt veld.

4.3. Key to the species of Nanobubon

1a. Leaves usually erect, occasionally decumbent; pinnae erect (ascending at acute angles to one another), rachis and segments straight; dorsal surface of mericarp with ribs clearly visible but not prominently raised..... 1. *N. strictum*.

1b. Leaves reclining; pinnae spreading (divaricate and geniculate, ascending at obtuse angles to one another), rachis and segments refracted (curved); dorsal surface of mericarp with ribs very distinct and prominently raised..... 2. *N. capillaceum*.

4.4. Nanobubon strictum

N. strictum (Spreng.) Magee in Winter et al. Taxon 57 (2) 358 (2008). *Ferula stricta* Spreng. in Roem. et Schultes, Syst. Veg. 6. 592 (1820); D. Dietr., Syn. Pl. 2. 963 (1840). *Peucedanum strictum* (Spreng.) B.L.Burtt in Edinb. J. Bot. 48(2). 237 (1991); Goldblatt et Manning, Cape Pl. 278 (2000). TYPE — South Africa, [Western Cape Province], Cape of Good Hope, *Hesse s.n.* (W, photo!, lecto., designated here). [Note: It is known that the Apiaceae of Sprengel's herbarium went to W (Stafleu and Cowan 1976).]

Peucedanum sieberianum Sond. in Harv. and Sond., Fl. Cap.2. 556 (1862); Adamson and Salter, Fl. Cape Penins. 624 (1950). TYPE — South Africa, [Western Cape Province], Du Toits Kloof [3319 CA], *Drège s.n.* (S!, lecto., designated by Burtt, 1991; BM!, K!, isolecto).

Leaves erect or less often decumbent, 80–470 × 60–260 mm, rachis straight, pinnae erect (ascending at acute angles), segments straight, 5–60 mm long. *Inflorescence* 200–720 mm long. *Primary umbel* with 13 to 25 rays; rays 35–82 mm long, glabrous. *Flowers* yellow with greenish yellow stylopodia; sepals distinct to relatively large, (0.3) 0.4–0.9 mm long, obtuse to acute. *Fruit* 10–14 mm × 8–9 mm, median and lateral ribs clearly visible but not prominently raised.

4.5. Diagnostic characters

Nanobubon strictum differs from *N. capillaceum* in its erect leaves (although in very exposed conditions they may be decumbent) and erect pinnae (ascending at acute angles to one another) with both the rachis and the ultimate segments remaining straight. The petals are yellow (not cream-coloured as in *N. capillaceum*) and the stylopodium greenish yellow (not dark purple). The median and lateral ribs of the fruit are also less prominently raised than those of *N. capillaceum*.

4.6. Distribution and habitat

Nanobubon strictum has been recorded from numerous localities in the Western Cape Province (Fig. 3), where it occurs from the Cape Peninsula in the south-west to the Cedarberg Mountains in the north and westwards as far as Houw Hoek (which is also the westernmost locality recorded for *N. capillaceum*). An outlying population of *N. strictum* has been recorded from Mossel Bay. *Nanobubon strictum* occurs in montane fynbos and grows on gentle or steep rocky, stony or sandy slopes. The erect, sub-terete ultimate leaf segments closely resemble the stems of various species of Restionaceae, so that the plants are often difficult to detect when not in flower.

4.7. Additional specimens examined

South Africa. Western Cape Province. —**3219** (Wuppertal): 1 km N.W. of Krakadoupoort (–AA), *Taylor 12027* (NBG); Agterkop (–CC), *Hanekom 1765* (K, PRE); Ondertuin, Koue Bokkeveld (–CC), *Hanekom 2526* (K, PRE). —**3318** (Cape Town): Devil's Peak (–CD), *Thode 6242* (NBG); Kirstenbosch (–CD), *Bolus s.n sub Bolus 3359B* (BOL, K), *Esterhuysen 11839a* (BOL); Table Mountain (–CD), *Adamson 2784* (BOL), *Marloth 5189* (PRE), *Norman 285* (BM), *Wahlberg s.n.* (S), *Worsdell s.n.* (K); Nursery Ravine (–CD), *Kinnon s.n.* (NBG); Paarl (–DB), *Adamson 3745* (PRE), *Bond 740* (BOL), *Compton 760* (NBG); Botmaskop (–DD), *Forsyth 378* (NBG); Langrivier (–DD), *Kerfoot K5447* (PRE); Jakkalsvlei (–DD), *Taylor 4598* (NBG, PRE); Second waterfall, Jonkershoek (–DD), *Borchardt 743* (PRE); Stellenboschberg (–DD), *Garside 1203* (K). —**3319** (Worcester): Ceres (–AD), *Bolus 8335* (BOL, PRE); Mitchell's Pass (–AD), *Anon. s.n.* (NBG); Du Toits Kloof (–CA) *Esterhuysen 22772* (BOL, S), *Magee and Boatwright 18* (JRAU), *Van Wyk and Schubert s.n.* (JRAU), *Williams 7158* (NBG); Franschhoek Pass (–CC), *Van Wyk, Winter and Tilney 3500* (JRAU); Mont Rochelle (–CC), *Winter s.n.* (JRAU); Zachariashoek (–CC), *Kruger 1773* (NBG, PRE), *Smith 202* (PRE). —**3418** (Simonstown): Bergvliet Farm, Firgrove (–AB), *Purcell 336* (SAM); Cape Point Nature Reserve, back of Redhill (–AB), *Goldblatt 5282* (PRE); between Constantia Corner and Castle Rock (–AB), *Lewis s.n.* (SAM); Constantia Corner (–AB), *Salter 9535* (BM); slopes above Constantia Nek Waterworks (–AB) *Acock 3891* (S); Disa Gorge (–AB), *Compton 21469* (NBG); Muizenberg, Kalk Bay (–AB), *Bolus 3359* (BOL, K); Noordhoekberg, plateau above Retreat (–AB), *Gillett 3567* (K); Table Mountain, Orange Kloof (–AB), *Adamson 895* (PRE), *Bolus s.n. sub BOL 127169* (BOL), *Wolley Dod 864* (BM); Noordhoek Pass (–AB), *Magee et al. 58* (JRAU); Simonsberg (–AB), *Wolley Dod 274* (BOL, K); Sneeuberg (–AB), *Bolus s.n. sub BOL 127170* (BOL);

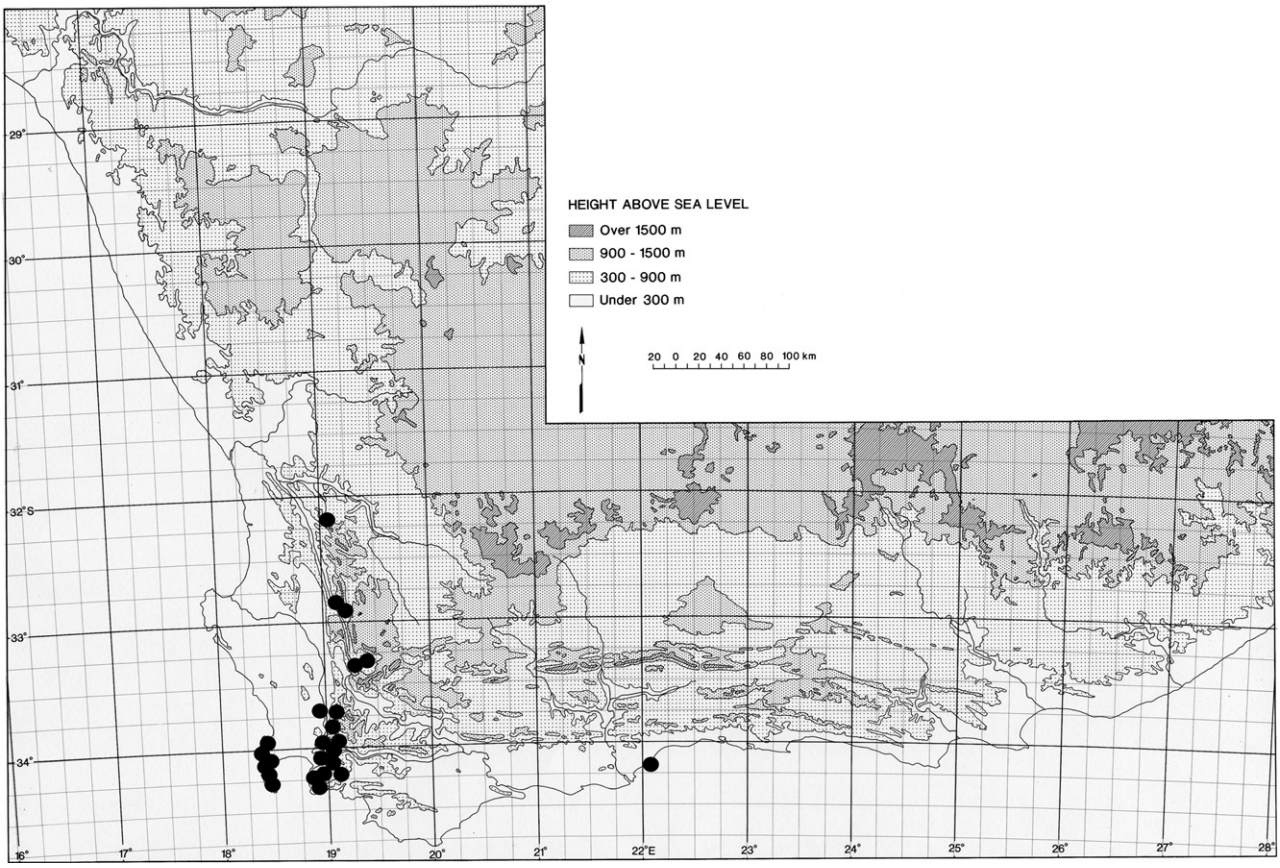

Fig. 3. The known geographical distribution of *Nanobubon strictum*.

Vlakkenberg (–AB), *Compton 12650* (NBG); slopes of low mountains behind Smitswinkel (–AD), *Acock 4066* (S); S. of Smitswinkel valley (–AD), *Taylor 6780* (PRE); Elgin Basin, Arieskraal Farm (–BB), *Rode 647* (NBG); Sir Lowry's Pass (–BB), *Bayer and Chandler 1070* (PRE), *Schlechter 7264* (BM, K, PRE); Kogelberg Forest Reserve, Platbos forest margin (–BD), *Boucher 1133* (K, PRE); Kogelberg State Forest (–BD), *Kruger 220* (NBG); Rooi Els River (–BD), *Stokoe s.n.* (SAM). **—3419** (Caledon): S.E. side of French Hoek Mountains (–AA), *Stokoe s.n.* (SAM); Grabouw, Lebanon F.R. (–AA), *Verdoucq* 74 (NBG); Jakkalsrivier Experimental Catchment (–AA), *Lamb 138* (NBG); Jonkershoek State Forest, Dwarsberg (–AA), *Kerfoot 6627* (NBG, PRE); Sandy plateau above Viljoens Pass (–AA), *Goldblatt 7621* (PRE). **—3422** (Mossel Bay): Hill ±2.5 km W. of Mossel Bay, near reservoir (–AA), *Vlok 1424* (PRE).

Precise locality unknown: Cape of Good Hope, *Wallich s.n.* (BM, K, PRE, S); Clanwilliam district: Cedarberg Mountains, *Norman 340* (BM); *Ecklon and Zeyher 2234* (BM, PRE, S, SAM); *Rogers 50222* (BM); *Sieber 212* (K, S); *Zeyher s.n.* (SAM).

4.8. Nanobubon capillaceum

N. capillaceum (Thunb.) Magee in Winter et al. Taxon 57(2): 358 (2008). *Peucedanum capillaceum* Thunb., Prodr. Fl. Cap. 50 (1794); Spreng. in Roem. and Schultes, Syst. Veg. 6. 570–571 (1820); Thunb., Fl. Cap. 257 (1823); DC., Prodr. IV. 178 (1825); Ecklon and Zeyh., Enum. Pl. Afric. Austral. 350 (1837); Meisn. in J. D. Hook., Lond. J. Bot. 2. 535 (1843); Sond. in Harv. and Sond., Fl. Cap. 2. 555–556 (1862); B.L. Burtt in Edinb. J. Bot. 48(2). 229 (1991); Goldblatt and Manning, Cape Pl. 278 (2000). TYPE — South Africa, [Western Cape Province], mountains near Soet Melks Valley [3419 BA], *Thunberg s.n. sub THUNB-UPS 6915* (UPS!, lecto., designated here). [Note: The specimen in Thunberg's herbarium bears a handwritten annotation of the exact locality on the back of the sheet.]

Peucedanum capillaceum var. *rigidum* Sond. in Harv. and Sond., Fl. Cap. 2. 556 (1862); B.L. Burtt in Edinb. J. Bot. 48(2). 229 (1991), synon. nov. TYPE — South Africa, [Eastern Cape Province], mountains near Loeri and Van Stadens Rivers [3325 CC], *Ecklon & Zeyher 2237* (S!, sheet A, photo in K!, lecto., designated here; S!, sheet B, photo in K!, isolecto.). [Note: The sheet labeled A in S shows the distinctive leaves and is the most complete specimen.]

Peucedanum rigidum Eckl. and Zeyh., Enum. Pl. Afric. Austral. 350 (1837), D. Dietr., Syn. Pl. 2. 968 (1840), nom. illegit., non Bunge (1835). TYPE — As above.

Peucedanum zeyheri Steud., Nomencl. Bot. ed. 2, 2. 312 (1841). TYPE — As above.

Peucedanum ecklonis Walp., Repert. Bot. Syst. 2. 410 (1843). TYPE — As above.

Leaves reclining, 110–320 mm x 40–140 mm, rachis refracted (curved), pinnae divaricate to geniculate, segments

refracted, 4–44 mm long. *Inflorescence* 250–760 mm long. *Primary umbel* with 9 to 27 (32) rays; rays 20–63 mm long, sparsely scabrous. *Flowers* cream-coloured with dark purple stylopodia; sepals distinct to relatively large, 0.3–1.5 mm long, obtuse to acuminate. *Fruit* 13–15 mm × 10–11 mm, median and lateral ribs prominently raised.

4.9. Diagnostic characters

Nanobubon capillaceum differs from *N. strictum* in the reclining leaves and divaricate to geniculate pinnae with prominently refracted (curved) rachis and ultimate segments. The petals are cream-coloured in *N. capillaceum* (not yellow as in *N. strictum*) and the stylopodium dark purple (not greenish yellow). The median and lateral ribs in the fruit are also much more prominently raised than those of *N. strictum*.

4.10. Distribution and habitat

Nanobubon capillaceum is widely distributed in the Western and Eastern Cape Provinces (Fig. 4) and has been recorded from Houw Hoek in the southwest to the Van Staden's Mountains in the east. It occurs in montane fynbos and grows on gentle or steep rocky, stony or sandy, south or east facing slopes.

4.11. Additional specimens examined

South Africa. *Western Cape Province*. **—3319** (Worcester): Baviaans Kloof (–DC), *Bolus 6938* (BOL). **—3320** (Montagu): near Lemoenshoek (–DD), *Esterhuysen 18272* (BOL). **—3321** (Ladismith): Langberg, Perdeberg (–DC), *Viviers 945* (BOL 1, 2, 3 & 4, NBG). **—3322** (Oudtshoorn): Moerass River Drift near Robinson's Pass (–CC), *Bolus 11921* (BOL); George (–CD), *Bolus 8655* (BOL), *Guthrie 4320* (NBG); Outeniqua Pass (–CD), *Magee et al. 80* (JRAU). **—3419** (Caledon): Bosjesveld Mountains (–AA), *Stokoe s.n.* (SAM); Houw Hoek (–AA), *Guthrie 2250* (NBG); Swartberg (–AB), *Bolus 7389* (BOL, K); Fernkloof Nature Reserve, Hermanus (–AD), *Drewe 892* (HER); *Guthrie s.n.* (BOL), *Magee and Boatwright 14, 36, 57* (JRAU), *Orchard 360* (K, NBG, PRE); Vogelgat (–AD), *Williams 2707* (NBG); Genadendal (–BA), *Ecklon and Zeyher 2236* (SAM), *Galpin 9798* (PRE), *Guthrie 3640* (NBG), *Schlechter 9798* (BM, BOL, K, PRE); Greyton, Abdulskop (–BA), *Oakes & Oakes s.n.* (NBG); Paardenberg (–BC), *Jordaan 18741* (NBG); Bredasdorp Mountains, Grootkop (–BD), *Manning 2300* (NBG); Danger Point Mountain (–CB), *Leighton 1563* (BOL); Bleskloof, near homestead (–DA), *Hugo 1605* (PRE). **—3420** (Bredasdorp): De Hoop, Oulande (–AD), *Van Wyk 2254* (NBG). *Eastern Cape Province*. **—3323** (Willowmore): Uniondale, Mountains S. of Avontuur (–CA), *Pillans 2068* (BOL); Knysna (–CC), *Bolus s.n. sub BOL 2318* (BOL); Knysna,

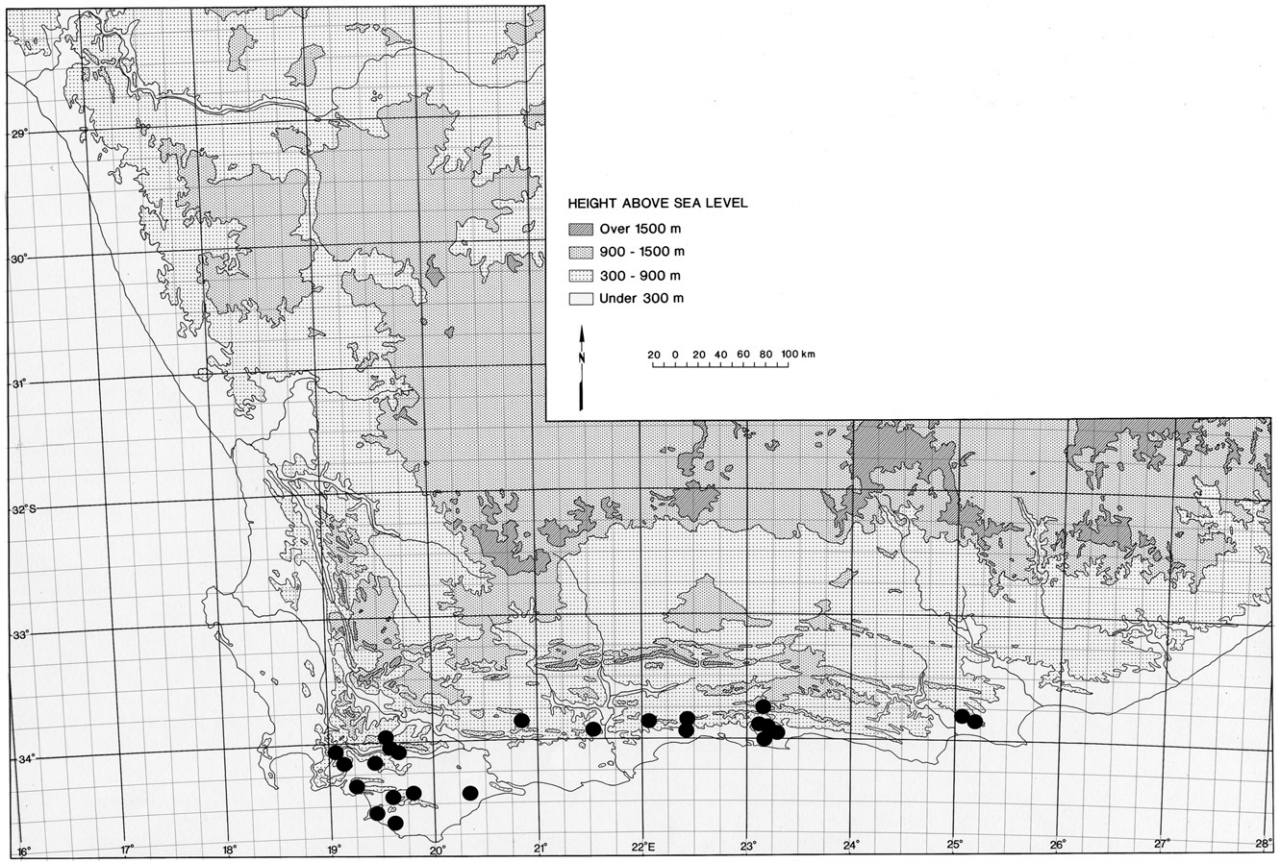

Fig. 4. The known geographical distribution of *Nanobubon capillaceum*.

Perdekop (–CC), *Acocks 21754* (BOL, K, PRE); Prince Alfred Pass, about 1/4 mile S. of summit (–CC), *Thomas s.n.* (NBG); Plettenberg Bay, Perdekop road (–CD), *Winter 156* (JRAU); Cradock Peak, Montagu Pass (–CD), *Stokoe s.n.* (SAM). — **3325** (Port Elizabeth): near Van Stadens River Mountains, Uitenhage (–CC), *Ecklon and Zeyher 721* (SAM). —**3423** (Knysna): Kruisfontein Mountains (–AA), *Galpin 4096* (PRE); Kruisfontein (–AA), *Morris 2229* (NBG).

Precise locality unknown: Swellendam district, *Bowie s.n.* (BM); *Drège s.n.* (K).

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