

Notes and new taxa in *Lobelia* sect. *Holopogon* (Campanulaceae: Lobelioideae)

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Abstract

Descriptions and notes on distribution, habitat and conservation status are provided for three new species of *Lobelia* sect. *Holopogon* Benth., (*L. archeri* N.G.Walsh, *L. fissiflora* N.G.Walsh and *L. simulans* N.G.Walsh), and three new subspecies in existing species of the section (*L. heterophylla* Labill. subsp. *centralis* N.G.Walsh and *pilbarensis* N.G.Walsh, and *L. tenuior* R.Br. subsp. *dictyosperma* N.G.Walsh). The new taxa are from Western Australia and central Australia. The eastern states *Lobelia browniana* Schult. is recognised here at specific rank in contrast to recent Australian treatments. A key to the 19 members of *Lobelia* section *Holopogon* is provided.

Keywords: annual, post-fire species, stem-succulents

Muelleria 28(2): 146-162 (2010)

Introduction

In preparation of a full revision of *Lobelia* and related genera in Australia, a number of new taxa have come to light. A molecular phylogenetic study is in progress and in order to have names available for that work, the following account provides names for new taxa in section *Holopogon* Benth. (Bentham 1868), which includes mostly erect, few-leaved annual species, the best known and most widespread of which is probably *Lobelia gibbosa* Labill. A revised infrageneric classification of *Lobelia* circumscribes *Holopogon* as an entirely Australian section (Lammers 2010, in press) *contra* Wimmer (1956) who included in the section species from South and Central America, Mexico, southern Asia and Africa. The Australian members of section *Holopogon* have fascinating attributes that are unusual in *Lobelia*: some are first-year, post-fire species; some have minute seeds and mycorrhizal associations (Warcup 1988); some are stem-succulents with root systems that are dead at the onset of flowering (and continue to grow after being collected).

Two nomenclatural changes affecting the Australian species of *Lobelia* sect. *Holopogon* have recently been made. *Lobelia andrewsii* Lammers has replaced *L. gracilis* Andrews because it is a later homonym of *L. gracilis* Salisb. (Lammers 2001). *Lobelia winifrediae* Diels (honouring Miss Winifred Lynette George) has been corrected from the original publication as '*winifridae*' (Lammers 2007).

Taxonomy

1. *Lobelia archeri* N.G.Walsh *sp. nov.*

L. gibbosae affinis sed planta plerumque minore e floribus minoribus (corolla ad 6.5 mm longa, tubo staminis ad 1.5 mm longo) differt.

Type: Western Australia. 1 km S of Mt Merivale, 2.i.2006, W.R. Archer 201061m (holotype: MEL2331006; isotype: CANB!, PERTH!)

Erect *annual*, 15–45 cm high, arising from a short taproot. *Plants* simple,





Figure 1: Holotype of *Lobelia archeri*.

rarely 1–few-branched below the inflorescence. *Stems* glabrous, terete, continuing growth after being uprooted. *Leaves* cauline, often withered at anthesis, sessile, linear, sometimes the very basal leaves obovate, 3–12 mm long, 0.2–0.8(–1.2) mm wide, entire, glabrous, sometimes purple-tinted, concolorous, veins indistinct. *Inflorescence* racemose, 3–7-flowered, flowers secund; pedicels ascending, 2–6 mm long, elongating to c. 8 mm in fruit, arising adjacent to a leaf-like bract 1.5–2.5 mm long on rachis with a similar bracteole inserted at the base of the pedicel. *Hypanthium* glabrous, narrowly obovoid, slightly asymmetrical, but hardly gibbous, 3–5 mm long, 2–3 mm wide. *Calyx-lobes* erect, narrowly triangular to subulate 1.1–2.5 mm long. *Corolla* 4–6.5 mm long, pale blue, the 3 ventral lobes with a darker zone near the base, distal to a yellow-green zone near the throat; tubular part of corolla 2–3.5 mm long, slit dorsally to the hypanthium, externally glabrous, internally sparsely pilose; upper 2 lobes recurved, entire, 1.4–1.8 mm long, 0.5–0.8 mm wide, glabrous or shortly papillose; lower 3 lobes spreading, central lobe elliptic to oblanceolate, 2.5–3 mm long, 1.3–1.5 mm wide, acute or subacute, lateral lobes of similar general shape to the central lobe but slightly falcate, 1.5–2 mm long, 0.8–1.2 mm wide; *staminal filaments* 1.2–1.8 mm long, glabrous, distally connate for up to 0.2 mm, basally free or adnate to corolla for up to 1 mm, anther tube 1.2–1.5 mm long, glabrous except for minute, even hairs at orifice c. 0.1 mm long. *Capsule* obconical to truncate-obovoid, not gibbous but often slightly asymmetric, 5–8 mm long, 2.5–3.5 mm diam. *Seeds* ellipsoid in outline, trigonous, 0.4–0.5 mm long, 0.3 mm wide, not winged but the angles minutely raised; testa smooth, ±shining, mid-brown. Fig. 1.

Flowering period: Flowers and fruits December to January.

Specimens examined: WESTERN AUSTRALIA. Woodup Swamp/Mt Merivale district, *W.R. Archer* 30128920 & 1912012 (MEL2123149, 2123148); 2 km SSE of Mt Merivale, *W.R. Archer* 2412041 (IND, MEL2265042); 1 km S of Mt Merivale, *W.R. Archer* 2412042 (MEL2265039).

Distribution: Known only from the Mt Merivale area, c. 20 km east of Esperance. IBRA region ESP (DEWHA 2009–).

Habitat: Occurs on dune slopes of tertiary acid sands in low heathland dominated by Myrtaceae and Cyperaceae.

Etymology: The epithet commemorates William Archer of Esperance, Western Australia, who discovered the species and who has, to date, furnished all herbarium material of it.

Conservation status: This species is regarded as Critically Endangered (CR) *sensu* IUCN (2001).

Notes: Related to *Lobelia gibbosa* in general floral, fruit and seed morphology, but distinctly smaller in all floral parts and in the barely asymmetrical ovary and capsule. This is the smallest-flowered member of the Section *Holopogon*.

2. *Lobelia fissiflora* N.G. Walsh sp. nov.

L. rarifoliae affinis lobis ventralibus corollae latioribus et lobis dorsalibus liberis e basi, filamentis ad corollam vix adnatis differt.

Type: Western Australia. Kalbarri National Park, Z Bend, 8.ix.1990, *D.E. Albrecht* 4311 & *B.A. Fuhrer* (holotype: MEL2022811: isotype: NT!)

Erect annual, 7–40 cm high, arising from a short taproot. *Plants* simple or several-branched from midway or above, rarely from near the base. *Stems* glabrous, terete or with slight ridges decurrent from leaf bases, often reddish toward the base. Plant soon withering after being uprooted. *Leaves* cauline, sparse, mostly ±evenly spaced along stem, sessile, narrow-linear to lanceolate, 5–18 mm long, 0.5–2.2 mm wide, entire, glabrous, sometimes purple-tinted, concolorous, veins indistinct. *Inflorescence* cymose, sometimes a single flower, mostly up to 8-flowered; pedicels ±erect, 10–60 mm long, elongating only slightly in fruit, emerging from the axil of a leaf-like bract, with a reduced leaf-like bract to c. 5 mm long, attached around midway along pedicel. *Hypanthium* glabrous, obovoid, dorsally gibbous, 1.5–3.5 mm long, 2–4 mm wide. *Calyx-lobes* erect, narrowly triangular to subulate 2.5–3.5 mm long. *Corolla* 11–21 mm long, blue, mauve or purple, the 3 ventral lobes with a white or yellow patch toward the throat, distal to a small greenish patch; tubular part of corolla 4–7 mm long, completely slit dorsally, externally glabrous, internally often with a patch of short erect hairs in the palate; upper 2 lobes strongly recurved, entire, 2.5–4 mm long, 0.7–1.8 mm wide, glabrous or shortly ciliate on margins and/or tip; lower 3 lobes spreading, central lobe obovate 8–15 mm long, 6–11 mm wide, obtuse, sometimes shortly apiculate,

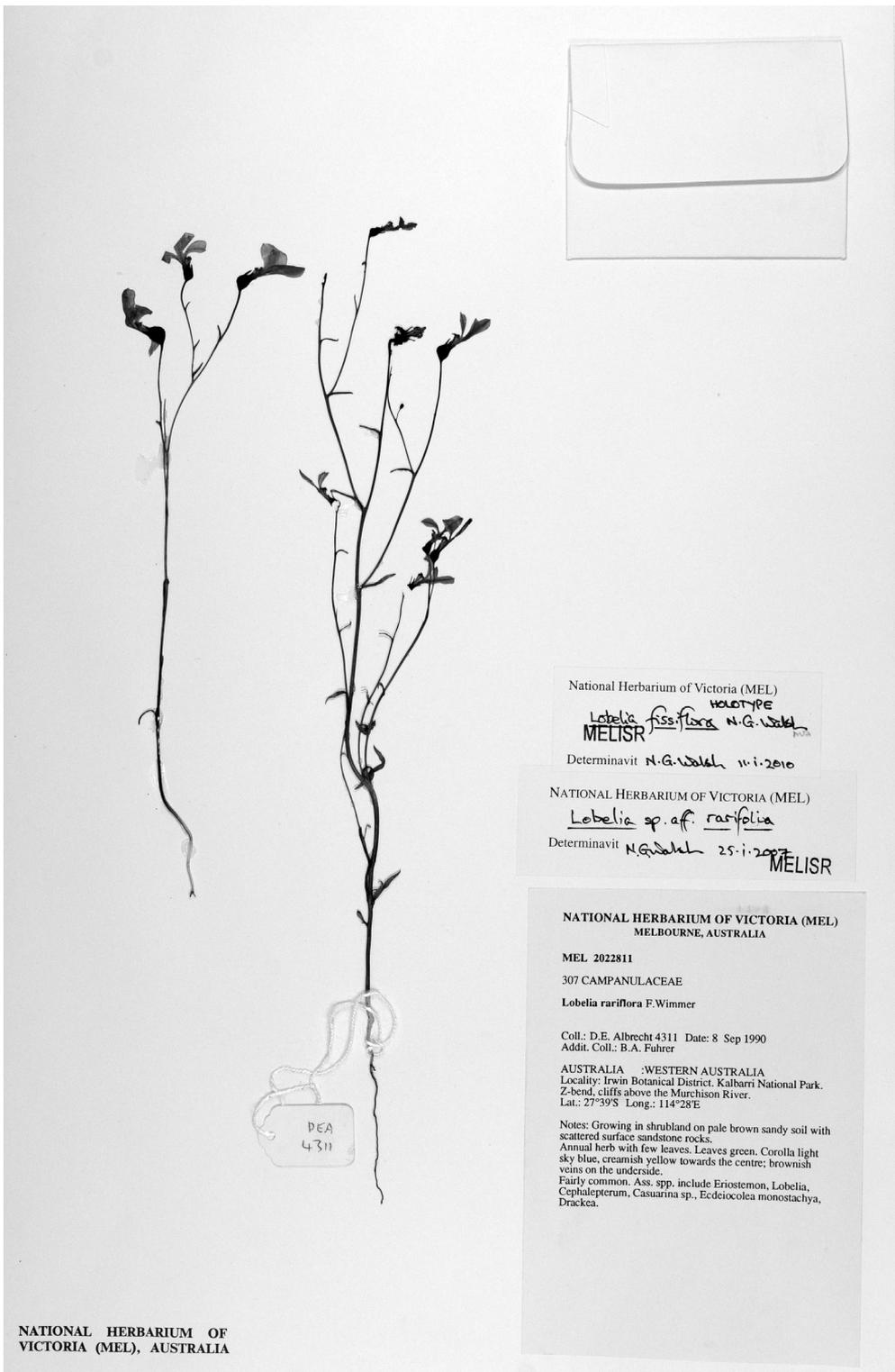


Figure 2: Holotype of *Lobelia fissiflora*.

lateral lobes obovate, asymmetric to slightly falcate, 7–11 mm long, 5–11 mm wide; *staminal filaments* 2.8–3.5 mm long, glabrous, distally connate for 1.2–1.5 mm, the non-dorsal filaments basally adnate to corolla for up to 0.8 mm; anther tube 1.2–2 mm long, glabrous except for minute, even hairs at orifice c. 0.2 mm long. *Capsule* obovoid, distinctly gibbous, 4.5–6 mm long, 3–4.5 mm wide dorsiventrally. *Seeds* ellipsoid in outline, trigonous to triquetrous, 0.25–0.3 mm long, c. 0.2 mm wide, not winged; testa smooth, ±shining, pale to mid-brown. Fig. 2.

Flowering period: Flowers and fruits September to November.

Specimens examined: WESTERN AUSTRALIA.

Waddouring, Oct. 1915, *W.B. Alexander s.n.*, (PERTH); 300 mile post on Mullewa-Morawa Rd, *A.C. Burns 77*, (PERTH); Hartfield Rd, Forrestfield, *R.J. Cranfield 863* (PERTH); 23 km SSE of Sunday Bore, Perrinvale Stn, *R.J. Cranfield 7126*, (PERTH); Great Northern Hwy, 63.4 km NE of Wubin, *J.D'Alonzo 479*, (PERTH); 210.5 mile peg, Paynes Find Rd, *H. Demarz 5208* (KPBG, PERTH); 32.6 km N of Cleary on road to Paynes Find, *J.W. Green 5223*, (PERTH); 5 km S of Paynes Find, Great Northern Hwy, *M. Gustaffson & K. Bremer 106*, (PERTH, UPS); *M. Koch 1220* (PERTH); 3 km NE of Comet Vale townsite, *A.V. Milewski 91*, (PERTH); 2.5 km NE of Comet Vale townsite, *A.V. Milewski 406*, (PERTH); 28 km NE of Bungalbin Hill, *K. Newbey 9088*, (PERTH); Junction of Scottsmans Rd with north-east [road] out of Beacon, *B.H. Smith 786* (MEL1555062).

Distribution: Known from an area bounded in the south by Wubin and Comet Vale (c. 200 and 450 km inland respectively) to as far north as Kalbarri National Park within c. 50 km from the coast and Paynes Find (c. 300 km inland). IBRA Regions AW, GS, K, Y (DEWHA 2009–).

Habitat: Collectors' notes includes descriptions of habitat such as: 'Acacia scrub, flat, sand with limestone', 'shrubland on skeletal soil with scattered surface rocks, associated spp. include *Eriostemon*, *Cephalopterum*, *Casuarina*, *Ecdeiocolea monostachya*', 'woodland, clayey sand over laterite', 'open scrub, clayey sand', *Eucalyptus leptopoda* over *Amphipogon caricinus* on reddish gravelly sand', '*Eucalyptus* spp., *Acacia coolgardiensis* – *Triodia scariosa* on deep sand'; 'granite silt – *Acacia*, *Grevillea*'.

Etymology: The epithet, from the latin *fissus* = cleft, and *flora* = flower, refers to the completely dorsally split corolla, particularly in relation to the similar *Lobelia rariflora* (see above).

Conservation status: The species is known from only 13 herbarium collections, and only six of these since 1980. Several unsuccessful searches have been made at the type locality at supposed appropriate dates in seasons of low and normal rainfall, suggesting that the species is very short-lived, limited to a very small population and/or responsive to particular weather patterns or fire regimes. It is conserved within Kalbarri National Park, but most, if not all, other collections are from roadsides or private property.

Considering the known range, the fragmentary nature of its distribution, and lack of recent collections, *Lobelia fissiflora* is considered to be probably either Vulnerable (VU) or Endangered (EN) applying the Red List criteria *sensu* IUCN (2001).

Notes: Apparently most closely related to *Lobelia rarifolia* E. Wimm. from which it differs by the much broader ventral perianth lobes, the completely dorsally cleft corolla 'tube' and the staminal filaments which are not or barely adnate to the corolla at their bases.

As far as is known, the species occurs north of latitude 30°S whereas *L. rarifolia* is known from only south of this line.

3. *Lobelia heterophylla* Labill., Nov. Holl. Pl. 1:52, t. 74 (1805)

Type: Van Leeuwin-Land. *Labillardière*. lecto (here chosen): FI!; isolecto: B – fiche seen at MEL), BM!, G!

Erect or somewhat sprawling *annual*, 5–40(–100) cm high, arising from a short to long taproot. *Plants* simple or branched from the base or above. *Stems* glabrous to hispid or pilose, usually somewhat to strongly angled, often glaucous, usually rather succulent and remaining so for considerable periods after being uprooted. *Leaves* basal and cauline, sometimes withered at anthesis, sessile or pseudopetiolate, linear to ovate or obovate, 10–70 mm long, 1–30 mm wide, entire or variously toothed to deeply pinnatifid with up to 6 teeth or narrow lobes on each side, glabrous to sparsely hispid, acute or obtuse at apex, concolorous, lateral veins usually apparent on lobed leaves. Inflorescence simple or several-branched of single or multiple cymes, superficially appearing racemose, flowers usually secund, pedicels arising more or less opposite a leaf-like bract on rachis, straight, arcuate or gently sinuate and upturned in distal part, 5–20(–35) mm long (elongating

to c. 45 mm in fruit), a bracteole 2–20 mm long present near halfway along pedicel. *Hypanthium* glabrous or sparsely (rarely densely) shortly hispid, truncate-obovoid to ellipsoid, 3–7 mm long, 2–5 mm wide. *Calyx-lobes* erect, narrowly triangular or \pm linear, 3–7 mm long. *Corolla* 13–20(–25) mm long, sky-blue through lilac and mauve to deep purple, yellow in throat (often yellowish externally in bud); tubular part of corolla 8–15 mm long, slit dorsally to, or very nearly to, the hypanthium, externally glabrous (rarely sparsely hairy), internally sparsely hairy; upper 2 lobes scalpelliform to weakly arcuate, entire, 3–5 mm long, 1.5–2 mm wide; lower 3 lobes spreading, central lobe oblanceolate to obovate, 4.5–10(–16) mm long, 2–10(–16) mm wide, subacute to obtuse, sometimes apiculate, lateral lobes broadly falcate, 4.5–13 mm long, 2–12 mm wide, subacute; *staminal filaments* 5–9 mm long, glabrous, distally connate for 1–4.5 mm, basally free or adnate to corolla for up to 1 mm, anther tube 2.5–4.5 mm long, glabrous except for minute, even hairs at orifice 0.2–0.4 mm long, rarely extending as 2 short bands on dorsal surface. *Capsule* obovoid, ellipsoid or nearly globose, 6–15 mm long, 4–10 mm diam. *Seeds* \pm ellipsoid in outline, acutely trigonous 0.8–2 mm long, 0.7–1.5 mm wide, including a 0.1–0.5 mm wing arising from each of the 3 angles, very rarely the wing vestigial, or the seed biconvex and 2-winged; testa smooth, shining, mid-brown.

Three subspecies are recognised.

3a. *Lobelia heterophylla* subsp. *heterophylla*

Erect or ascending *herb*, 5–40(–60) cm high, glabrous to shortly hispid. *Leaves* entire, shallowly toothed or pinnatifid, 10–30(–40) mm long, 1–6 mm wide, with up to 4 teeth or narrow lobes along each margin, usually somewhat thick-textured and conspicuously glaucous. *Pedicels* 8–25 mm long (to 35 mm in fruit). *Hypanthium* 3–6 mm long, 2–5 mm wide. *Calyx-lobes* 3–7 mm long. *Corolla* 15–22(–25) mm long; tubular part of corolla 10–15 mm long; central lobe 6.5–9.5 mm long, 6–8.5(–11) mm wide, lateral lobes 6–9 mm long, 3–5 mm wide. *Capsule* 8–15 mm long, 5–9 mm diam. *Seeds* 0.8–1.2 mm long, 0.4–0.6 mm wide.

Flowering period: Flowers and fruits October to December.

Selected specimens examined (total >250): WESTERN AUSTRALIA. 26.5 km NNE Mt Heywood *W.R. Archer 14129113*

(MEL2019294); Eastern side of Barker Inlet, *W.R. Archer 2021011* (MEL); King George 3rd Sound, 1802, *R. Brown s.n.* (BM, MEL); 28 km S from Billabong, *H. Demarz 8607* (KPBG); East Mt Barren, *A.S. George 554* (PERTH); Near Lake Lefroy, c. 25 km SE Kalgoorlie, xi.1891, *R. Helms s.n.* (AD); 80 km E of Lake King, *G.J. Keighery 412* (KPBG); Cockleshell Gully, *L.S.J. Sweedman 6017* (PERTH); 4 miles [6.4 km] W of Zanthus, *R.D. Royce 5273* (PERTH); Geraldton-Mt Magnet Rd, 1.6 km E of Pindar, *N.G. Walsh 5438* (IND, MEL2104929, 2104930, PERTH); North Twin Peak Island, Recherche Archipelago, 20.xi.1950, *J.H. Willis s.n.* (MEL2261467).

Distribution: Endemic to Western Australia, occurring widely from near the Gascoyne River south to Esperance, east to Zanthus area, and up to c. 300 km inland e.g. near Kalgoorlie, but commoner nearer the coast. IBRA regions CAR, COO, ESP, GS, JF, MUL, MUR, SWA, WAR, YAL (DEWHA 2009–).

Habitat: Occurs through a wide range of habitats (e.g. *Eucalyptus* and *Acacia* woodlands with *Triodia*, heath, shrubland), on a range of substrates (e.g. sand, loam, granitic and lateritic gravels, limestone-derived soils).

Notes: The commonest of the subspecies. Even with the segregation of *Lobelia cleistogamoides* N.G. Walsh & Albr. (Walsh & Albrecht 2007) and the other two subspecies described below, this remains a very variable entity in degrees of hairiness and degree of division of the foliage, glaucescence, degree of branching etc. At the northern limit of its range there is some approach to subsp. *pilbarensis*, but the stouter overall aspect of plants of subsp. *heterophylla* and their typically pronounced glaucescence usually allows ready separation.

Conservation status: It is regarded as of Least Concern (LC) applying the criteria of the IUCN Red List Categories (IUCN 2001).

3b. *Lobelia heterophylla* subsp. *centralis* N.G. Walsh subsp. nov.

Ab alii subspecie lobo medio corollae angustiore, seminibus majoribus, foliis glabris integris vel vix dentatis et habitatione desertorum differt.

Type: Northern Territory. KataJuta-Docker R. Rd, 56 km WSW of KataJuta t/o, 28.ix.2001, *D.E. Albrecht 10008* (holotype: NT!; isotype: MEL2263334)

Lobelia heterophylla subsp. Central Australia (*A.S. George 8132*) *sensu* Western Australian Herbarium (2009).

Erect or ascending *herb*, 10–40 cm high, glabrous.

Leaves linear to narrowly elliptic, 10–60 mm long, 1–7 mm wide, entire, or occasionally with 1–3 teeth to c. 2 mm long along each margin, often glaucous. *Pedicels* 7–35 mm long (to 45 mm in fruit). *Hypanthium* 3.5–6 mm long, 2–3.5 mm wide. *Calyx-lobes* 3–5 mm long. *Corolla* 13–20 mm long; tubular part of corolla 8–12 mm long; central lobe 4.5–7 mm long, 2–4(–5) mm wide, lateral lobes 4.5–7 mm long, 1.5–2.5 mm wide. *Capsule* 6–13 mm long, 4–8 mm diam. *Seeds* 1.3–1.5 mm long, 0.5–0.7 mm wide (not including wing). Fig. 3.

Flowering period: Flowers and fruits September to November.

Selected specimens (total 38): WESTERN AUSTRALIA. 21 km E of Terhan Rockhole on Warburton Rd, A.S. George 8132 (PERTH); Little Sandy Desert, 8.2 km NW of Cooma Well, S. van Leeuwen 2861 (MEL, PERTH). **NORTHERN TERRITORY.** 45 km SSE Docker R settlement, P.K. Latz 980 (NT); Muranji Rockhole, Mt Winter, B.G. Thomson 1580 (NT); East Lake, Amadeus Basin, P.K. Latz 5701 (NT); Between Mt Olga and Barrow Range, 1873/4, W.E.P. Giles (MEL2261133); 28 km NNW Kings Canyon, G. Leach 1166 (DNA, NSW, NT); Near Mt Connor, 18.x.1960, G. Chippendale s.n. (DNA, NT); 62 km NE of Charlotte Waters, 13.x.1957, G. Chippendale s.n. (AD, NT); NW Simpson Desert N.M. Henry 1001 (BRI, NT, PERTH);. **SOUTH AUSTRALIA.** Great Victoria Desert, Connie Sue Hwy, c. 40 km W of Vokes Hill Junction, D.E. Symon 12496 (AD); Musgrave Ranges, Mt Harriet Rd, c. 35 km S of Musgrave Park Stn, J.Z. Weber 130 (AD, AK, COLO, NCU); Simpsons Desert, via Purnia and Mokari Bores 78.4 km in from W edge, D.E. Symon 9466 (AD).

Distribution: Occurs principally in central Australia, from the Western Australian border near Docker River east to the western part of the Simpson Desert and south to near Oodnadatta. Isolated specimens from the Little Sandy Desert and Terhan Rockhole in central Western Australia suggests that it is likely to occur in other areas between there and the Northern Territory border. IBRA regions CR, FIN, GD, GSD, GVD, MAC, SSD (DEWHA 2009–).

Habitat: Commonly associated with *Triodia* hummock grasslands and associated *Allocasuarina decaisneana* and *Acacia* spp. woodlands in sand dune country. Some collectors' notes refer to sites having been burnt and it is likely that germination is enhanced by recent fires.

Etymology: The epithet, from the Latin, refers to the distribution of this subspecies, which is principally central Australia.

Conservation status: Despite only 38 known collections, the occurrence of this subspecies in the

largely unmodified and scantily collected Central Australian region suggests it is not at risk and is more widespread than current information indicates.

Notes: Likely to be locally abundant, but perhaps not germinating annually and possibly dependent on suitable conditions (e.g. fire, rainfall). It is distinguished from the other two subspecies by the wholly and consistently glabrous vegetative parts, the entire or nearly entire leaves, and the generally smaller flowers that have a distinctly narrower mid-lobe. The seeds are slightly larger than those of the other two subspecies (although this is based on a limited number of fruiting specimens).

3c. *Lobelia heterophylla* subsp. *pilbarensis* N.G. Walsh subsp. nov.

Ab alii subspecie foliis latioribus, membraneis, capsulis globosis vel subglobosis et habitatione plerumque in locis saxosis ferratis differt.

Type: Western Australia. Pilbara, Mt Nameless, c. 1 km S from summit, 22.ix.2006, N.G. Walsh 6482, D. Halford & D. Mallinson (holotype: MEL2296073; isotype: IND!, K!, PERTH!)

Lobelia heterophylla subsp. Pilbara (R. Meissner & Y. Caruso 1) sensu FloraBase (2009).

Decumbent, sprawling, or ascending to erect *herb*, 10–100 cm high, glabrous or stems, hypanthia and leaves sometimes invested with short fine erect hairs. *Leaves* oblong, elliptic, lanceolate, oblanceolate, ovate or obovate, c. 14–70 mm long, 3–30 mm wide, entire, irregularly toothed or shallowly lacerate with up to 6 teeth or lobes to c. 8 mm long along each margin, rather thin-textured and not conspicuously glaucous. *Pedicels* 5–15 mm long (to 40 mm in fruit). *Hypanthium* 3–7 mm long, 3–5 mm wide. *Calyx-lobes* 5.5–9 mm long. *Corolla* 16–22 mm long; tubular part of corolla 8–11 mm long; central lobe 8–16 mm long, 6–16 mm wide, lateral lobes 7–13 mm long, 7–12 mm wide. *Capsule* 8–10 mm long, 7–20 mm diam. *Seeds* 1–1.2 mm long, c. 0.5 mm wide (not including wing). Fig. 4.

Flowering period: Flowers and fruits August to November.

Selected specimens examined (total 26): **WESTERN AUSTRALIA.** Ca 27 km N Brockman Stn homestead, W.R. Archer 309941 (MEL); 23 miles W of Wyloo, H. Demarz 2475 (KPPG); Diamond Drillers Hill, Wittenoom, Lullfitz 2743 (KPPG);

c. 5 km NE of Beringarra – Cue Rd, Jack Hills area, *R. Meissner* & *Y. Caruso* 1, (PERTH 7201354); 35.4 km S of Yalgoo, *L.S.J. Sweedman* 2347 (KPBG); Kennedy Range, Gascoyne River area, ix.1948, *C. Teichert s.n.* (MEL); Hamersley Range NP, S side of Murandoo Ridge, *M.E. Trudgen* 2255 (PERTH); 33.5 km from North West Coastal Highway on main access road to Glen Florrie Homestead, *S. van Leeuwen* 5093 (AD, MEL, PERTH); Mt Phillips, Pilbara, Mt Brockman Range, *N.G. Walsh* 6534 (MEL, PERTH); Augustus, *J.Z. Weber* 4836, (AD).

Distribution: Endemic to Western Australia, occurring from the Pilbara at least as far north as Tom Price, and south to the upper Murchison River catchment. A depauperate collection from near Yalgoo (*Sweedman* 2347) appears to be this subspecies and if so, represents a southern outlying population. IBRA regions GAS, MUR, PIL, ?YAL (DEWHA 2009–).

Habitat: Found mainly on and near cliff-lines of iron-rich sedimentary parent material, occurring with a diverse range of saxicolous specialists (e.g. *Astrotricha hamptonii*, *Corymbia ferritcolia*, *Eucalyptus gamophylla*, *Pomax rupestris*, *Rhodanthe margarethae*). Recorded, to a lesser extent, from flatter gibber country, and also from a granite outcrop.

Etymology: The epithet refers to the core distributional area of this subspecies in the Pilbara region of Western Australia.

Conservation status: Given the restriction or near-restriction of this subspecies to ironstone formations of the Pilbara, a geology that is being extensively mined for iron ore, it is considered to be Vulnerable (VU) applying the Red List criteria *sensu* IUCN (2001).

Notes: Locally common. Distinguished from the other subspecies by its less erect, often somewhat sprawling habit, its broader and thinner-textured, non-glaucous leaves, corollas with the mid-lobe usually relatively wider, and ovaries that enlarge after pollination to become nearly round in profile (at least in herbarium material). See also note under subsp. *heterophylla*.

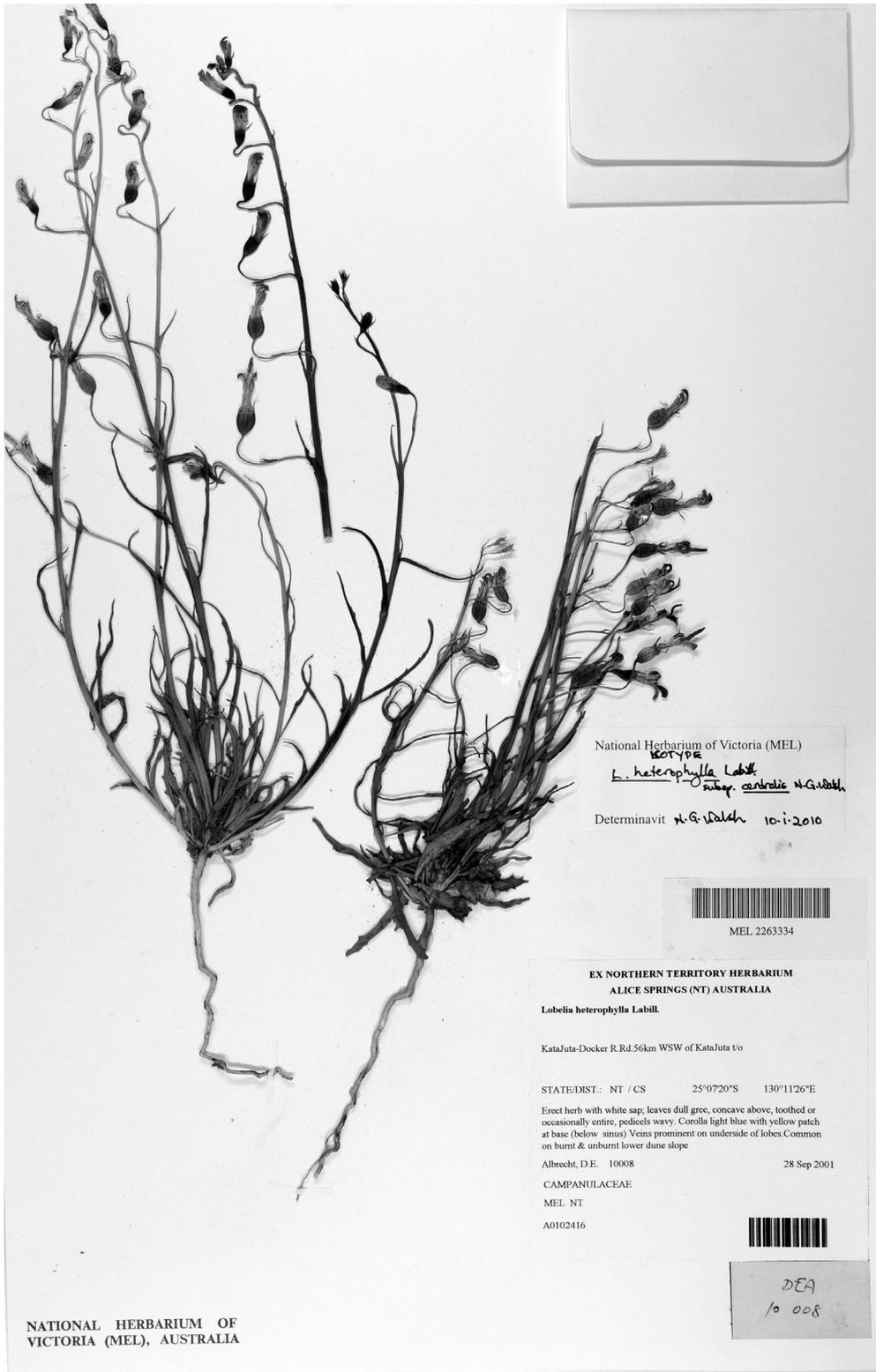
4. *Lobelia simulans* N.G. Walsh *sp. nov.*

Lobelia winifrediae et *L. rhytidosperrae affinis*, *a primo petalis dorsalis sine lobis falcatis auxiliaribus et a secundo seminibus largioribus et ab ambobus fissura dorsali corollae profundiore differt.*

Type: Western Australia. c. 30 km S of Mt Augustus, c.

325 km ENE of Carnarvon, 9.viii.1970, *A.M. Ashby* 3397 (holotype: PERTH!; iso: AD!, F, G!, MEL!, NSW, TAI.)

Erect or ascending, *annual*, c. 6–30 cm high, arising from a short taproot. *Plants* unbranched or branched, usually from or near the base, but with little if any second-order branching. *Stems* glabrous (rarely minutely scabrous-papillate), angular to \pm terete, subsucculent, often retaining moisture for several days after being uprooted. *Leaves* few, both basal (in a weak rosette) and cauline, but at least the basal leaves usually withered before flowering. *Leaves* oblanceolate, obovate or spatulate, 5–25(–40) mm long, 1–3(–6) mm wide, entire or with up to 3 short teeth or lobes on each side, glabrous or minutely scabrous-papillate, obtuse to acute at apex, concolorous, venation indistinct. *Inflorescence* an elongating monochasial cyme, sometimes appearing racemose and 1-sided, occasionally reduced to a single flower; pedicels 10–40 mm long (not differentiated in 1-flowered plants), usually with a simple linear bracteole 3–12 mm long attached c. 1/3–1/2 from the base of the pedicel. *Hypanthium* glabrous or minutely scabrous-papillate, obconical to obovoid, 6–9 mm long, 2.5–4 mm wide. *Calyx-lobes* erect, narrowly triangular, 5.5–8 mm long. *Corolla* 15–30 mm long, blue to mauve, yellow in throat, extending for a short distance on the central or all 3 ventral lobes; tubular part of corolla 7–12 mm long, slit dorsally to within 1(–2) mm of the hypanthium, glabrous; upper 2 lobes reflexed, arcuate, 6–11 mm long, \pm entire, initially clasped over the anther tube via their fringed margins; lower 3 lobes spreading, central lobe broadly obovate or broadly spatulate, 9–18 mm long, 7–18 mm wide, obtuse or truncate, often shortly apiculate, lateral lobes similarly shaped to the central lobe but recurved-asymmetric, 7–12 mm long, 6–13 mm wide, the midrib arcuate and strongly eccentric; *staminal filaments* 4–8 mm long, glabrous, free from corolla, distally connate for up to 3 mm below anther tube, anther tube 2.5–4 mm long, glabrous except for minute, even hairs at orifice c. 0.5 mm long and longer, weakly tufted hairs at point of attachment to filaments. *Capsule* obconical or obovoid, 7–13 mm long, 3–5 mm diam. *Seeds* broadly ellipsoid, somewhat straight-sided, dark red-brown, (0.6–)0.7–1 mm long, 0.5–0.7 mm wide, dorsally rounded with 5–8 lumpy transverse ridges, sometimes discontinuous and/or sometimes



NATIONAL HERBARIUM OF VICTORIA (MEL), AUSTRALIA

National Herbarium of Victoria (MEL)
LECTYPE
L. heterophylla Labill
subsp. *centralis* N.G. Walsh
Determinavit N.G. Walsh 10-1-2010

MEL 2263334

EX NORTHERN TERRITORY HERBARIUM
ALICE SPRINGS (NT) AUSTRALIA
Lobelia heterophylla Labill.
KataJuta-Docker R.Rd.56km WSW of KataJuta t/o
STATE/DIST.: NT / CS 25°07'20"S 130°11'26"E
Erect herb with white sap; leaves dull green, concave above, toothed or occasionally entire, pedicels wavy. Corolla light blue with yellow patch at base (below sinus). Veins prominent on underside of lobes. Common on burnt & unburnt lower dune slope
Albrecht, D.E. 10008 28 Sep 2001
CAMPANULACEAE
MEL NT
A0102416

DEA / 008

Figure 3: Isotype of *Lobelia heterophylla* subsp. *centralis*.

weakly anastomosing, ventrally with 2 shallow pits bordering the raised central rib; testa dull, smooth to minutely colliculate. Fig. 5.

Flowering period: Flowers and fruits August–November.

Specimens examined: WESTERN AUSTRALIA. SE of of Coolcalalaya Station, A.H. Burbidge 4511 (PERTH); 38 km S of Mt Magnet, W. Greuter 22609 (PERTH); Gascoyne Junction – Pimbee Rd intersection, G.J. Keighery & N. Gibson 1440 (PERTH); 30 km SE Mt Keith, Wanjarri Native Reserve, G.J. Keighery 13016 (PERTH); 452 miles [732 km from Perth] near Billabong on Carnarvon Rd, F. Lullfitz, 4269 (CANB, PERTH); 56 km from Meekatharra toward Wiluna, A. Strid 20207 (PERTH); 11.8 km W Yamarna, L.S.J. Sweedman 2987 (KPBG); 45 km on Gascoyne Jn Rd East, L.S.J. Sweedman 51232 (KPBG); 35.7 km N of Mullewa Rd on Vermin Fence, L.S.J. Sweedman 52437 (KPBG); Great Northern Hwy, 36–36.5 km S of Mt Magnet, N.G. Walsh 6359 (CANB, MEL2295997, 2295998, PERTH).

Distribution: Endemic in Western Australia and occurring from near Gascoyne Junction south to near Paynes Find, and approaching the Great Victoria Desert near Yamarna at the south-east of its known range. IBRA regions CAR, GAS, MUR, YAL (DEWHA 2009–).

Habitat: Recorded mostly from sandy substrates supporting e.g. *Triodia* grassland, *Eucalyptus gongylocarpa*, *E. loxophleba*, *E. leptopoda*–*Acacia roycei* mallee associations, *Acacia ramulosa*–*A. aneura* shrublands. Also noted from sandstone breakaway country, and red loam soils over granite.

Etymology: The epithet, from the Latin *simulans* = imitating or resembling, refers to the resemblance of *L. simulans* to *L. winifrediae*.

Conservation status: Considering the restricted range and relative paucity of collections (a total of only 11 known from herbaria) of this species, *Lobelia simulans* is provisionally regarded as Vulnerable (VU) applying the criteria of the IUCN (2001), although targeted surveys may prove this to be an overly precautionary assessment.

Notes: *Lobelia simulans* appears to be most closely related to *L. rhytidosperra* and *L. winifrediae* on the basis of the strongly wrinkled, adaxially pitted seeds (which are unique in section *Holopogon*) and general habit. In its short, semi-succulent habit, it often strongly resembles *L. winifrediae* and has been named as such in most herbarium collections. It is readily distinguished from that species by the absence of the falcate or

thumb-shaped lobe on each of the dorsal petals. *Lobelia rhytidosperra* is usually a much lankier plant, and lacks succulence, has a corolla that is less deeply cleft dorsally, seeds that are smaller and relatively narrower with a testa that is usually microscopically tuberculate (as well as the larger scale rugose texturing). Like *L. winifrediae*, plants of *L. simulans* retain moisture in a plant press for days or weeks, and often continue to grow therein whereas specimens of *L. rhytidosperra* wither soon after picking and dry conventionally in a press without further growth.

5. *Lobelia tenuior* R.Br., *Prodr.* 564 (1810).

Type: Western Australia. King George's Sound, Dec. 1801, R. Brown (R. Brown, Dec 1801), lecto (here chosen): BM!; isolecto: BM! CANB (photo seen)!

Erect *annual*, (10–)15–40 cm high, arising from a short taproot. *Plants* usually branched from the base or above, rarely simple. *Stems* glabrous to hispid or pilose, rarely densely so, terete to weakly angular, not succulent and withering soon after being uprooted. Lower *leaves* mainly cauline, obovate or spatulate in outline, becoming linear toward inflorescence, (4–)8–60 mm long, (1–)5–40 mm wide, (bi)pinnatissect, lobed or toothed, rarely entire (except near inflorescence) with up to 4 linear or narrowly obovate lobes or teeth on each side, glabrous, hispid or pilose, acute or obtuse at apex, concolorous or the lower surface paler, usually the midvein and lateral veins apparent. *Inflorescence* cymose or single-flowered, pedicels to c. 11 cm long, with a reduced, leaf-like bracteole at about (usually slightly above) midway. *Hypanthium* glabrous to pilose or hispid, rarely densely so, narrowly obconical to narrowly obovoid or nearly narrowly ellipsoid, (3–)4–7 mm long, 2–3 mm wide. *Calyx-lobes* erect, narrowly triangular, (3–)5–8 mm long. *Corolla* (8–)18–26 mm long, blue, mauve or purple, white and/or yellow in throat, extending for a short distance on the central or all 3 ventral lobes; tubular part of corolla (3–)6–10 mm long, slit dorsally to within 0.5 mm of the hypanthium, glabrous externally, sparsely pilose within; upper 2 lobes reflexed, oblanceolate-arcuate, 2.5–4 mm long, entire, margins (and often apical lamina) lightly fringed, not or weakly clasped over the anther tube; lower 3 lobes spreading, central lobe broadly obovate, broadly spatulate or obcordate, (6–)10–15 mm long,



Figure 4: Holotype of *Lobelia heterophylla* subsp. *pilbarensis*.



Figure 5: Isotype of *Lobelia similans*.

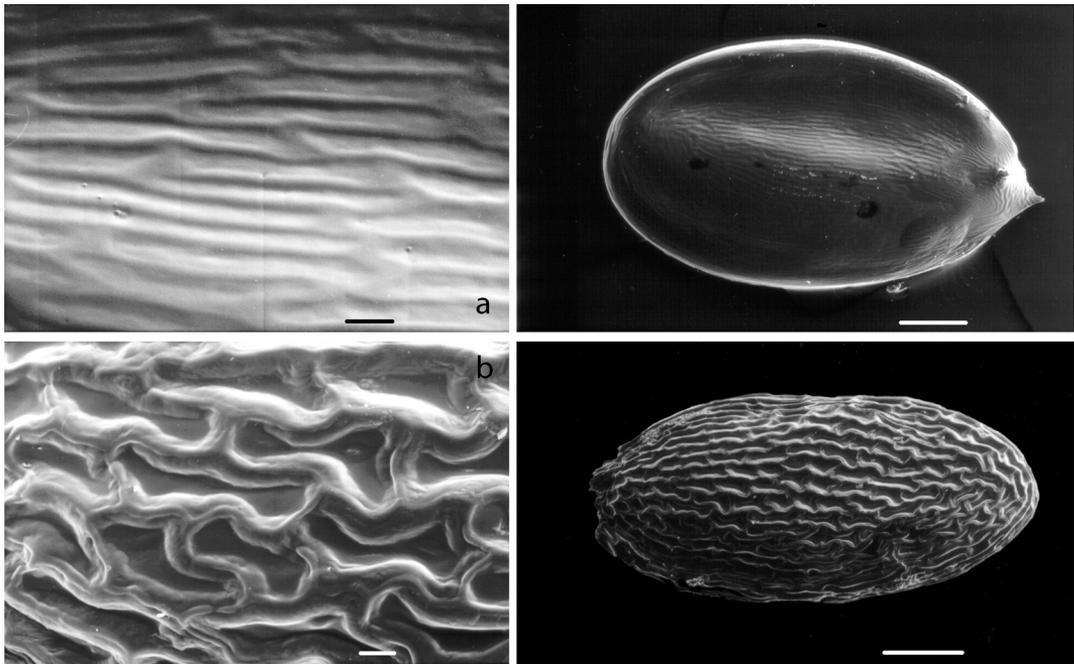


Figure 6: Scanning electron micrographs of *Lobelia tenuior* seed. 6a: subsp. *tenuior* (from Orchard 4260 (AD)); 6b: subsp. *dictyosperma* (from the holotype). (scale bars of seed = 100 μ m; scale bars of testa detail = 10 μ m)

(8–)12–18 mm wide, obtuse, truncate or shallowly emarginate, sometimes shortly apiculate, lateral lobes similarly shaped to the central lobe but the midrib arcuate and strongly eccentric, 7–13 mm long, 5.5–9 mm wide; *staminal filaments* (3–)4.5–5.5 mm long, glabrous (occasionally weakly pilose near base), adnate to corolla for up to 2 mm, distally connate for up to 1 mm below anther tube; anther tube 1.8–2.5(–3) mm long, glabrous except for minute, even hairs at orifice (0.2–)0.3–0.5 mm long. *Capsule* narrowly obconical, obovoid or ellipsoid, 6–20 mm long, 3–5 mm diam. *Seeds* oblong to broadly ellipsoid, stramineous to dark brown, 0.4–0.7 mm long, 0.3–0.5 mm wide, virtually flat, quite smooth or finely elongate-reticulate.

Two subspecies are recognised.

5a. *Lobelia tenuior* subsp. *tenuior*

Plants to 40(–60) cm high, usually with vegetative parts sparsely to moderately hispid, hairs sometimes confined to lower leaves, rarely quite glabrous. *Hypanthium* 4–7 mm long; calyx lobes 5–8 mm long; corolla 18–26 mm long; *staminal filaments* 4.5–5.5 mm long, all but the dorsal one adnate to the corolla

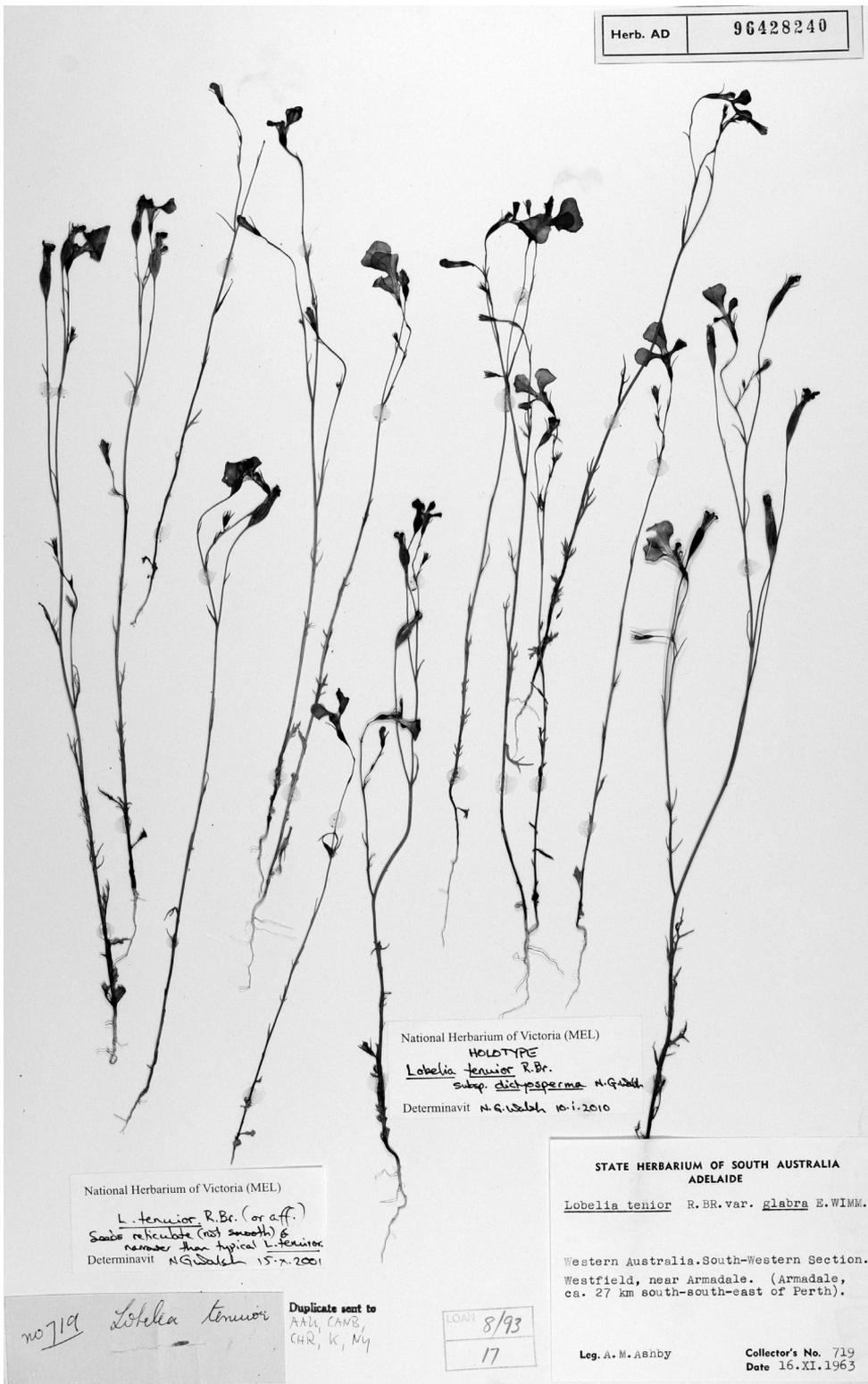
for 1–2 mm; anther tube 2–2.5(–3) mm long. *Capsule* narrowly obconical or almost cylindrical. *Seeds* broadly ellipsoid, 0.6–0.7 mm long, 0.4–0.5 mm wide, smooth, stramineous. Fig. 6a.

Flowering period: Flowers and fruits mostly October to January.

Selected specimens examined (total 62): **WESTERN AUSTRALIA.** Cape Naturaliste, M.G. Corrick 9016 (MEL662368); Albany area, road to Correctional Centre, J.C. Reid & N. duPreez 1100, (MEL2097692); Wanneroo, H. Demarz 8643 (KPBG); Fish Creek, 26 km ESE of Windy Harbour, R.W. Hearn, ARA 5258, (PERTH); Kings Park, L. Lelle 5126, (KPBG); Kelmscott (Perth suburb), 20.xi.1897, A. Morrison s.n. (BRI); Claremont, 18.xii.1897, A. Morrison s.n. (CANB); Welshpool area near Perth, 1946, W.H. Nicholls, s.n. (MEL); 23 km W of Gin Gin, A.E. Orchard 4260 (AD, AK); William Bay National Park, N.G. Walsh 5454 (IND, MEL2123054, 2123055, PERTH); City Beach, 7.5 miles W of Perth, 14.ix.1947, J.H. Willis s.n. (MEL2306957).

Distribution: Occurs mostly within c. 20 km from the coast from just north of Perth (Gin Gin area), south and east to Albany. IBRA regions ESP, GS, JF, SWA, WA (DEWHA 2009–).

Habitat: Occupies a variety of habitats, but mainly heathland and heathy woodland on sandy soils.



Herb. AD	96428240
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National Herbarium of Victoria (MEL)
HOLOTYPE
Lobelia tenuior R.Br.
 subsp. *dictyosperma* N.G.Walsh
 Determinavit N.G.Walsh 10-1-2010

National Herbarium of Victoria (MEL)
L. tenuior R.Br. (or aff.)
 Scape reticulate (not smooth) &
 narrower than typical *L. tenuior*.
 Determinavit N.G.Walsh 15-X-2001

STATE HERBARIUM OF SOUTH AUSTRALIA
 ADELAIDE
Lobelia tenuior R.Br. var. *glabra* E.WIMM.

Western Australia. South-Western Section.
 Westfield, near Armadale. (Armadale,
 ca. 27 km south-south-east of Perth).

no 719 *Lobelia tenuior*

Duplicate sent to
 AAM, CANB,
 CHR, K, NY

LOAN 8/93
 17

Leg. A. M. Ashby

Collector's No. 719
 Date 16.XI.1963

Figure 7: Holotype of *Lobelia tenuior* subsp. *dictyosperma*.

Collectors' notes include comments such as '*Eucalyptus gomphocephala* woodland', 'white sand around dam', 'over limestone', 'interdune peat swamp', 'low coastal heathland, deep sand'.

Notes: *Lobelia tenuior* subsp. *tenuior* is not currently regarded to be at risk, and is well represented in several conservation reserves, but its restriction to the coastal fringe means that it may become at least locally rare through coastal development in much of its current area of occurrence.

**5b. *Lobelia tenuior* subsp. *dictyosperma*
N.G. Walsh subsp. nov.**

A subspecies typica seminibus angustioribus elongato-reticulatis atrobrunneis differt.

Type: Western Australia. South-western section. Westfield near Armadale, 16.xi.1963, A.M. Ashby 719. holo: AD!; iso: AAU, CANB, CHR, K, NY.

Plants 10–25 cm high, vegetative parts wholly glabrous. *Hypanthium* 3–5 mm long; calyx lobes 3–6 mm long; corolla 8–17 mm long; *staminal filaments* 4.5–5.5 mm long, all but the dorsal one adnate to the corolla for up to 0.5 mm; anther tube 1.8–2.2 mm long. *Capsule* narrowly obovoid (distinctly broadest below apex). *Seeds* rather narrowly elliptic, 0.4–0.6 mm long, 0.3–0.4 mm wide, finely elongate-reticulate, patterned by series of fine anastomosing ridges, dark brown or dark reddish-brown. Figs. 6b, 7.

Flowering period: Flowers and fruits October–December.

Specimens examined: WESTERN AUSTRALIA. Wanneroo, H. Demarz 3559 (PERTH) Bayswater, Lower Swan River, A. Morrison 394 (K); Lower Swan River, A. Morrison 385 (K); Bayswater to Perth, A. Morrison 395 (K); Bayswater, Kelmscott, Canning River, A. Morrison 20059 (K);

Distribution: Known only from the greater Perth area. IBRA regions SWA (DEWHA 2009–).

Habitat: Largely unknown. Demarz 3559 notes 'new pine plantation, sand'.

Etymology: The epithet, from the Greek *dictyon* = a net and *sperma* = seed, refers to the reticulate pattern of the seed surface in contrast to the nearly smooth surface of the typical subspecies' seed.

Conservation status: The subspecies is known from only 5 herbarium collections, and only 2 of these since

1950. All collections are from within the greater Perth area, and most of its former habitat has very likely been lost to urban development. It is regarded as Critically Endangered (CR), but may conceivably be extinct (EX) according to IUCN Red List criteria (IUCN 2001).

Notes: As well as the reticulate, darker and narrower seed, this subspecies usually differs from subsp. *tenuior* in the floral parts being smaller, but there is some overlap in these dimensions. Specimens of subsp. *dictyosperma* seen to date are entirely glabrous vegetatively whereas there is *usually* some indumentum apparent on subsp. *tenuior* (but see comment about var. *glabra* below). The degree of adnation of the 4 lateral staminal filaments appears to be consistently smaller. Also, capsules of subsp. *dictyosperma* tend to be distinctly, if narrowly, obovoid or ellipsoid, whereas those of subsp. *tenuior* are more or less straight-sided, either cylindrical or narrowly obconical.

Wimmer cited a specimen here referred to *Lobelia tenuior* subsp. *dictyosperma* (Morrison, Bayswater) under *L. tenuior* var. *glabra* E. Wimmer (syn *L. adscendens* de Vriese, *L. longepedunculata* de Vriese). This variety is not maintained as distinct in the present study, but the type, and all other specimens cited by Wimmer for var. *glabra* that we have seen [e.g. Pritzel n. 12 (G), Preiss 1425, 1433, 1445, 1452 (all G, MEL)] are all smooth-seeded, thus not subsp. *dictyosperma*. Like subsp. *dictyosperma*, occasional plants of the typical subspecies are entirely or virtually glabrous.

Although contrary to the commonly upheld position that subspecies be, at least largely, allopatric, subspecies status is given here. The entire known range of subsp. *dictyosperma* is contained within that of the typical subspecies. Although based primarily on seed characters only, the distinction between the two subspecies, when seen, is quite unmistakable. A status higher than subspecies may be warranted, but, with only limited material available, no entirely discontinuous vegetative or floral characters could be found to further separate the two entities. Further searches in remnant native vegetation around Perth are encouraged so that a wider selection of material may provide sufficient information to be confident about the correct rank of this entity.

Key to members of *Lobelia* section *Holopogon* in Australia

- 1 Inflorescences racemose, one-sided, unbranched or sometimes with up to c. 5 (rarely more) ± erect branches 2
- 1: Inflorescences cymose, paniculate or of solitary flowers..... 13
- 2 Leaves ovate to orbicular, truncate or cordate at base; vegetative stems prostrate or decumbent; Qld, NSW..... *L. trigonocaulis*
- 2: Leaves linear to elliptic, gradually tapered at base; vegetative stems erect..... 3
- 3 Corolla with mid-lobe of lower lip distinctly obovate to spatulate, length less than 3 (usually less than 2) times width, mostly wider than 3 mm 4
- 3: Corolla with mid-lobe of lower lip linear to elliptic (occasionally oblanceolate), length more than 3 times width, rarely (in *L. dentata*) wider than 3 mm wide..... 9
- 4 At least lower leaves ovate to elliptic, more or less regularly dentate; Qld, NSW *L. andrewsii*
- 4: Leaves linear to obovate, entire, remotely or irregularly toothed or pinnatifid; WA, NT, SA 5
- 5 Corollas <9.5 mm long; WA, SA *L. cleistogamoides*
- 5: Corollas >9.5 mm long 6
- 6 Seeds ±plano-convex, with 3–6 conspicuous transverse grooves or ridges on the dorsal surface; lower 3 corolla lobes as wide as long or wider; WA *L. simulans*
- 6: Seeds trigonous, usually winged, smooth; lower 3 corolla lobes generally longer than wide 7 (*L. heterophylla*)
- 7 Mid-lobe of lower lip of flower 3(–5) mm wide or less, obtuse to subacute, widest near middle; seed (including wing) 1.5 mm long or more; leaves glabrous, lanceolate to oblanceolate or linear, entire or shallowly toothed, never pinnatifid; central Australia (WA, NT, SA)..... *L. heterophylla* subsp. *centralis*
- 7: Mid-lobe of lower lip of flower 6 mm wide or more, broadest near apex where often almost truncate except for apiculate mid point; seeds to 1.5 mm long; leaves glabrous to hispid, often pinnatifid; within 500 km of WA coast 8
- 8 Leaves (except sometimes the very basal ones) deeply pinnatifid with linear lobes and rachis <3 mm wide, or entire and linear and less than 3 mm wide, often rather fleshy *in vivo*, soon drying and margins becoming strongly inrolled, entire leaf often tightly coiling; ovary obovoid to obconical post-anthesis; mostly south from Carnarvon area, WA..... *L. heterophylla* subsp. *heterophylla*
- 8: Leaves entire, shallowly pinnatifid (with lobes broader than linear) to lacerate with rachis >3 mm wide, or if entire, lamina >3 mm (up to c. 15 mm) wide; leaves membranous, drying more or less flat; ovary globose post-anthesis; mostly north from Carnarvon, WA..... *L. heterophylla* subsp. *pilbarens*
- 9 Seeds strongly 3-angled, 0.45–0.7 mm long; SA, NSW, Vic., Tas..... *L. simplicicaulis*
- 9: Seeds not strongly 3-angled, 0.1–0.25 mm long 10
- 10 Lower leaves oblanceolate to obovate or spatulate, 2–12 mm or more wide, the widest leaves less than 5 times as long as wide; NSW, Vic. *L. dentata*
- 10: Lower leaves linear to narrowly oblanceolate, at least 5 times as long as wide..... 11
- 11 Corolla 4–6.5 mm long; anther tube 1.2–1.5 mm long; known only from Esperance area, WA..... *L. archeri*
- 11: Corolla >8 mm long; anther tube >1.8 mm long; various states..... 12
- 12 Anther tube 2.5–4 mm long; corolla 10–20 mm long (very rarely as small as 2 mm and 8 mm respectively in WA only); central corolla lobe ±narrowly elliptic, acute; leaves entire; ovary not strongly gibbous, widest near the apex; all states *L. gibbosa*
- 12: Anther tube 1.8–2.3 mm long; corolla 8–14 mm long; central corolla lobe oblanceolate to oblong, usually obtuse, apiculate; leaves usually toothed, occasionally entire; ovary strongly gibbous, widest near midpoint; SA, Qld, NSW, Vic., Tas. *L. browniana* (see note below key)
- 13 Leaves linear to narrowly lanceolate, entire or minutely toothed..... 14
- 13: At least the basal leaves elliptic to rhombic or obovate, variously incised 15
- 14 Corolla slit dorsally to within 1.5–2.5 mm of calyx; lateral lobes of lower lip of corolla distinctly falcate; WA *L. rarifolia*
- 14: Corolla slit dorsally to the calyx; lateral lobes of lower lip of corolla not or indistinctly falcate; WA..... *L. fissiflora*

- 15** Mid-lobe of lower lip of corolla narrowly elliptic to narrowly obovate; plants often many-branched; seeds smooth, <0.4 mm long; WA, SA, Vic., Tas.....**L. rhombifolia**
- 15:** Mid-lobe of lower lip of corolla broadly obovate, spatulate or obcuneate; plants unbranched or with few branches, rarely many-branched; seeds deeply wrinkled on at least one face, or, if smooth, >0.5 mm long..... **16**
- 16** Each of the upper, reflexed, pair of corolla lobes with a distinct falcate lobe longer than it is wide from the ventral margin; WA.....**L. winifrediae**
- 16:** Upper pair of corolla lobes entire, or if ever somewhat lobed (rarely, in *L. rhytidosperma*), then the lobe neither falcate nor longer than wide..... **17**
- 17** Seeds smooth or finely reticulate; upper and lower surfaces similar; WA..... **18 (L. tenuior)**
- 17:** Seeds with 3–6 conspicuous transverse ridges or grooves on the dorsal surface; lower surface deeply pitted..... **19**
- 18** Seeds pale brown, smooth, about 3/4 as wide as long; plants usually hispid, at least on lowest leaves.....**L. tenuior** subsp. **tenuior**
- 18:** Seeds dark brown, patterned by series of fine anastomosing ridges, about 1/2 as wide as long; plants glabrous on all vegetative parts.....**L. tenuior** subsp. **dictyosperma**
- 19** Corolla slit dorsally to within 2.5–7 mm of calyx; plants usually >15 cm tall, not or hardly succulent, withering soon after uprooted; at least some plants in populations ±hispid on leaves, stems and hypanthium; WA..... **L. rhytidosperma**
- 19:** Corolla slit to the calyx or to within 2 mm of it; plants usually <15 cm tall, ±succulent, remaining turgid and often continuing to grow for days after being uprooted; plants essentially glabrous, but leaves and hypanthium sometimes minutely scabrous-papillose; WA.....**L. simulans**

Although *Lobelia browniana* Schult. was originally described as a distinct species, it has been treated for the past century as a variety of the closely related *L. gibbosa*. However, there are distinctive morphological features that recommend retaining this taxon at specific rank.

Acknowledgements

We are grateful to the staff of Australian herbaria for the provision of loans, to ABLOs Peter Bostock, Juliet Wege, Annette Wilson and Tony Orchard for locating types and providing information of holdings of Australian *Lobelia* in European herbaria, and to staff at BM, F and G for their hospitality and access to historical collections in those institutions when visited by NGW in 2009. We are very grateful to people who have collected or who have arranged for the collection of specimens on our behalf, in particular, William Archer of Esperance and Juliet Wege (PERTH).

This work was supported in part by a grant to EBK from the US National Science Foundation (DEB-0074354).

References

- Bentham, G. (1868). '*Lobelia*' in *Flora Australiensis* 4: 123–128. L. Reeve & Co: Covent Garden, UK.
- DEWHA (2009–), Australia's Bioregions. Department of Environment, Water, Heritage and the Arts <http://www.environment.gov.au/parks/nrs/science/ibra.html> [accessed 14 December 2009]
- IUCN (2001). 2001 IUCN Red List Categories and Criteria, version 3.1. International Union for the Conservation of Nature: Gland, Switzerland.
- Lammers, T.G. (2001). Further nomenclatural innovations in world Campanulaceae. *Novon* **11**, 67–68.
- Lammers, T.G. (2007). World checklist and bibliography of Campanulaceae. Royal Botanic Gardens, Kew, UK.
- Lammers, T.G. (in press). Revision of the infrageneric classification of *Lobelia* L. (Campanulaceae: Lobelioideae). *Annals of the Missouri Botanical Garden* **97**.
- Walsh, N.G. and Albrecht, D.E. (2007). *Lobelia cleistogamoides* (Campanulaceae, subfamily Lobelioideae, *Lobelia* sect. *Holopogon*), a new species related to *L. heterophylla* from Western Australia and South Australia. *Nuytsia* **17**, 397–402.
- Warcup, J.H. (1988). Mycorrhizal associations and seedling development in Australian Lobelioideae (Campanulaceae). *Australian Journal of Botany* **36**, 461–472.
- Western Australian Herbarium (1998–). FloraBase – The Western Australian Flora. Department of Environment and Conservation, <http://florabase@dec.wa.gov.au> [accessed 14 December 2009].
- Wimmer, F.E. (1956). Campanulaceae-Lobelioideae, Sect. *Holopogon*. *Das Pflanzenreich*:**4**, **276B**, 553–600.