

## New species of *Leucopogon s. str.* (Ericaceae: Epacridoideae: Styphelieae) from the Geraldton Sandplains

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### Abstract

Hislop, M. New species of *Leucopogon s. str.* (Ericaceae: Epacridoideae: Styphelieae) from the Geraldton Sandplains. *Nuytsia* 27: 217–242. Six new species of *Leucopogon* R.Br. (*L. foliosus* Hislop, *L. grammatus* Hislop, *L. inflexus* Hislop, *L. prolatus* Hislop, *L. simulans* Hislop and *L. stenophyllus* Hislop) are described, illustrated and their distributions mapped. Aspects of the morphology and taxonomy of the informal Northern Group of species are discussed and a comparison is made, in tabular form, between this group and two other informal groups, the *L. pulchellus* Sond. and *L. carinatus* R.Br. groups. A key to the species of *Leucopogon s. str.* from the Geraldton Sandplains bioregion is provided.

### Introduction

The Geraldton Sandplains bioregion (Department of the Environment 2013), in particular its southern half, is recognised as having the highest level of plant endemism within the Southwest Botanical Province of Western Australia (Hopper & Gioia 2004). This is well-illustrated in the case of the genus *Leucopogon* R.Br. Of the 20 taxa of *Leucopogon s. str.* that are currently recognised as occurring in that bioregion (Western Australian Herbarium 1998–), all but six are endemic or near-endemic (i.e. any occurrence in a neighbouring bioregion is limited to within about 20 km of the boundary). Eight of the twenty have been hitherto known only by informal phrase names. The current paper provides formal descriptions for six of these. All are endemic or near-endemic to the bioregion.

In addition to the 20 members of *Leucopogon s. str.* that occur in the Geraldton Sandplains bioregion, there are another 43 taxa in the bioregion that are currently assigned to the genus but which do not belong to *Leucopogon* in the strict sense. Recently completed research (Puente-Lelièvre *et al.* 2016) has foreshadowed the transfer of these species to the genus *Styphelia* Sm.

### Notes on the species described in this paper

Five of the six species described below, *L. foliosus* Hislop, *L. inflexus* Hislop, *L. prolatus* Hislop, *L. simulans* Hislop and *L. stenophyllus* Hislop, belong to a tightly-knit group of species referred to as the Northern Group in a recent key to the informal groups of *Leucopogon s. str.* in Western Australia (Hislop 2014: 74–76). The short-range endemic *L. nitidus* Hislop, restricted to an area east of Geraldton, is an earlier-named species also belonging to the group.

Members of the Northern Group have a combination of morphological features that could be interpreted as intermediate between the *L. pulchellus* Sond. group (Group C) and the *L. carinatus* R.Br. group (Group D) as delineated by Hislop and Chapman (2007). The three groups have in common a drupe with an insignificant mesocarp (i.e. more or less dry when fresh, with no raised reticulum when dried) and the presence of a gynophore between the receptacle and the fruiting locules. A comparison between the groups is given in Table 1 below. Two species, *L. squarrosus* Benth. and *L. maritimus* Hislop, from the northern half of the adjoining Swan Coastal Plain bioregion (Department of the Environment 2013), also share a number of critical taxonomic features with the Northern Group. These two species differ in having generally smaller fruit, that are distinctly shorter than the sepals and in which the apical rim is relatively indistinct or absent. Exactly how the groups relate to each other must await future molecular research into subgeneric relationships within *Leucopogon s. str.*

One of the more interesting features of the Northern Group is that it comprises species that have a regular 5-partite nectary as well as some in which it is entire. The form of the nectary is a usually reliable character in the subgeneric taxonomy of *Leucopogon s. str.* (i.e. whether entire or regularly 5-partite), and the Northern Group is the only one in which it is not uniform across the group members. In fact in at least two species (as discussed below under the notes heading for *L. simulans*), while the nectary is usually partite it may occasionally be entire.

Differences between species of the Northern Group in terms of their inflorescence, floral or fruiting character are few and often subtle. However, there are usually clear and consistent distinctions in their foliar morphologies such that it is mostly possible to identify species on that basis alone. This high degree of reliance on foliar characters is also a feature of the alpha taxonomy of Group C and, to an even greater extent, of Group D (as discussed in Hislop 2014: 72–73).

**Table 1.** A comparison of significant morphological and other features of the Northern Group with those of Groups C and D.

| Group                 | Nectary           | Ovarian hairs  | Locule number                           | Drupe apex  | Flowering time   | Distribution   |
|-----------------------|-------------------|--|---|---|--|--|
| <b>Northern Group</b> | Partite or entire | Always with appressed hairs in lower half              | Usually 2, less often 3 in some species | Truncate, with angular shoulders and usually with a narrow rim                        | Flowers may be present any month of the year, soil moisture allowing                       | Mostly Geraldton Sandplains, and adjacent parts of neighbouring bioregions |
| <b>Group C</b>        | Entire            | Glabrous or hairy, but if hairy rarely as above        | 2–5                                     | Truncate, usually with angular shoulders, or sometimes the shoulders rounded or lobed | Flowering usually strongly seasonal, from mid- winter to late spring, depending on species | Throughout the South-west Botanical Province                               |
| <b>Group D</b>        | Partite           | Glabrous, except in one variant of <i>L. glabellus</i> | 2                                       | Shoulders always smoothly rounded   | Flowers may be present any month of the year soil moisture allowing                        | Mostly southern, 2 or 3 species as far north as the Perth region           |

The new species *L. grammatus* Hislop belongs to the large Group C, where its closest affinities are thought to lie with *L. obtusatus* Sond. and allied species. It is the only member of this small-leaved subgroup of Group C that occurs north of Perth.

### Methods

This study was based on an examination of dried specimens housed at PERTH together with extensive field observations of the species described and their putative relatives. The details of the methods used to measure plant parts and make other morphological observations are as described in a recent paper (Hislop 2014). Where there was considerable leaf curvature, leaf width measurements were taken from flattened leaves. The distribution maps are based on PERTH specimen data, and distribution statements reference IBRA7 bioregions (Department of the Environment 2013).

As fruit of species from the Northern Group are apparently indistinguishable, only one, *L. stenophyllus*, is illustrated below.

### Key to species of *Leucopogon s. str.* from the Geraldton Sandplains bioregion

1. Anthers lacking sterile tips, straight; unit inflorescences densely aggregated into a capitate confluence; sepals very narrowly ovate, long-acuminate, the upper half terete, and densely hairy on all surfaces (Lesueur National Park) ..... **L. plumuliflorus**
- 1: Anthers always with  $\pm$  pale, sterile tips, although these sometimes short and rather inconspicuous, recurved in the upper half; unit inflorescences usually well-separated, never capitate; sepals variously shaped and indumented but never as above
2. Nectary partite, usually comprising 5 separate scales, very occasionally with 2 or 3 scales only
3. Inflorescence axes and branchlets always glabrous; leaves variously ovate, variously orientated from antrorse to sharply retrorse, but always with some leaves on lower stems widely spreading to retrorse (Arrowsmith River–Watheroo National Park) ..... **L. simulans**
- 3: Inflorescence axes hairy although sometimes sparsely so, with hairs restricted to the apex, branchlets usually sparsely hairy on young growth, sometimes  $\pm$  glabrous; leaves variously shaped, including ovate, always strongly antrorse, never widely spreading or retrorse
4. Leaves linear, narrowly elliptic or narrowly ovate, 0.6–1.3 mm wide, most < 1 mm, adaxially convex with recurved or revolute margins or occasionally some leaves flat (Lake Indoon–Cataby area) ..... **L. stenophyllus**
- 4: Leaves variously ovate, elliptic, obovate or  $\pm$  circular, 0.8–3.8 mm wide, usually adaxially concave, or if some leaves flat or slightly convex then > 1.2 mm wide
5. Leaves depressed-ovate, ovate to  $\pm$  orbicular, 1.2–3.3 mm long, 1.2–3.8 mm wide, L: W ratio of longest leaves 0.8–1.4: 1, stem-clasping in the lower half, at least on the older branchlets; leaf base cordate or rounded, rarely cuneate; all leaf apices, or at least those immediately below the inflorescence, distinctly inflexed (Yardanogo Nature Reserve–Eneabba–Arrino) ..... **L. inflexus**
- 5: Leaves variously ovate, elliptic or obovate, 2.8–7.0 mm long, 0.8–2.2 mm wide, L: W ratio of longest leaves (1.5–)1.8–4.5: 1, rarely  $\pm$  stem-clasping; leaf base attenuate or cuneate; leaf apices straight to slightly incurved (Eneabba–Warradarge) ..... **L. prolatus**
- 2: Nectary annular, truncate or  $\pm$  lobed

6. Ovary usually 2- or 3-, sometimes 4-locular<sup>1</sup>
7. Inflorescence axes and branchlets always glabrous; leaves variously ovate, variously orientated from antrorse to sharply retrorse, but always with some leaves widely spreading to retrorse, at least on the lower stems (Arrowsmith River–Watheroo National Park) ..... **L. simulans**
- 7: Inflorescence axes and often also branchlets hairy; leaves variously shaped, but if ovate then never widely spreading or retrorse
8. Leaves adaxially convex, with recurved to revolute margins
9. Leaf adaxial surface with a short indumentum of stiff patent hairs throughout; upper leaves and lower fertile bracts clearly dimorphic, with the bracts all < 2 mm long; sepal abaxial surface manifestly hairy throughout; ovary glabrous; drupe 1.6–1.8 mm long, 1.2–1.4 mm wide, apex with smoothly rounded shoulders (Moresby Range) ..... **L. borealis**
- 9: Leaf adaxial surface glabrous or sometimes with a few basal hairs; fertile bracts all foliose or foliose on the lower axis becoming progressively smaller and more ‘bract-like’ towards the apex, mostly > 2 mm long; sepal abaxial surface mostly glabrous, or sometimes very minutely hairy towards the centre; ovary hairy; drupe 2.1–2.8 mm long, 0.9–1.2 mm wide, apex truncate, with a narrow terminal rim
10. Fertile bracts all foliose, largely concealing the inflorescence axis; grooves on leaf abaxial surface deep and narrow, hairy within the grooves (Lesueur National Park–Cataby) ..... **L. foliosus**
- 10: Fertile bracts foliose on the lower inflorescence axis becoming progressively smaller and more ‘bract-like’ towards the apex, the axis always clearly visible; grooves on leaf abaxial surface usually shallower and wider, glabrous throughout (Lake Indoon–Cataby area) ..... **L. stenophyllus**
- 8: Leaves adaxially concave, ± flat or plano-convex
11. Flowers densely arranged along very short inflorescence axes (to c. 3 mm long), the axes shorter than subtending leaves; leaves subtending the inflorescences markedly petiolate with the lamina sharply inflexed above the petiole; filaments inserted in the corolla tube well below the sinuses (Arrowsmith River–Boonanning Nature Reserve) ..... **L. oliganthus** & allied taxa<sup>2</sup>
- 11: Character combination not as above
12. Leaf adaxial surface conspicuously hairy
13. Leaf abaxial surface ± smooth; flowers shortly pedicellate below bracteoles (occasionally the uppermost in an inflorescence ± sessile) (restricted distribution NE of Dongara) ..... **L. navicularis**
- 13: Leaf abaxial surface shallowly to deeply grooved; flowers always sessile below the bracteoles
14. Leaves 1.2–3.2 mm long, antrorse-appressed, with the adaxial surface completely concealed; ovary 2- or occasionally 3-locular (E of Walkaway–Arrino area) ..... **L. grammatus**

- 14: Leaves 2.5–12.0 mm long, but always with some leaves > 3.5 mm long, variously antrorse, but always with the adaxial surface at least partially visible; ovary 3- or 4-locular
15. Fruit apex with well-defined angular shoulders; vegetative indumentum (on branchlets and both leaf surfaces) uniformly of dense, short, patent hairs (eastern Moresby Range–Nabawa) ..... **L. sp. Nabawa**
- 15: Fruit apex smoothly rounded, without well-defined, angular shoulders; vegetative indumentum various, but not as above (Eneabba–Carnamah–Moora–Cataby)..... **L. oldfieldii<sup>3</sup>**
- 12: Leaf adaxial surface glabrous, or sometimes with a few hairs towards the base
16. Leaf abaxial surface deeply grooved between the veins, hairy or glabrous within the grooves
17. Leaves linear or very narrowly elliptic, < 1 mm wide, abaxial surface with two grooves, one each side of the broad midrib; style 0.4–0.5 mm long (restricted distribution E of Geraldton) ..... **L. nitidus**
- 17: Leaves narrowly ovate to narrowly elliptic, always at least 1 mm wide, usually > 1.2 mm, abaxial surface with at least four grooves, two or more on each side of the midrib; style at least 0.6 mm long (Eneabba–Carnamah–Moora–Cataby) ..... **L. oldfieldii<sup>3</sup>**
- 16: Leaf abaxial surface flat or shallowly and broadly grooved between the veins, glabrous
18. Leaves straight or gently incurved along longitudinal axis, ± linear, narrowly ovate, narrowly elliptic or narrowly obovate
19. Leaves very narrow, 0.5–0.8 mm wide; ovary glabrous (S of Cataby and Dandaragan)..... **L. gracillimus<sup>4</sup>**
- 19: Leaves wider, always with some at least 1.2 mm wide; ovary long-hairy (Eneabba–Carnamah–Moora–Cataby)..... **L. oldfieldii<sup>3</sup>**
- 18: Leaves usually markedly recurved along longitudinal axis, although the tip often incurved, obovate, elliptic or ovate, or narrowly so (S of Cataby and Dandaragan) ..... **L. sprengelioides**
- 6: Ovary 5- or occasionally 4-locular<sup>1</sup>
20. Longest leaves at least 15 mm long, abaxial surface smooth, flat between the veins; fruit apex smoothly rounded, fleshy mesocarp present (appearing as raised reticulum when dry), gynophore absent (S of Dongara, strictly coastal) ..... **L. parviflorus**
- 20: Longest leaves usually much less than 15 mm long, or if occasionally as long as that, then abaxial surface broadly grooved between the veins; fruit apex truncate with defined shoulders, fleshy mesocarp absent, fruit surface smooth or sometimes with indistinct longitudinal striations, gynophore present
21. Leaves tapering markedly towards a well-defined petiole, abaxial surface shallowly and broadly grooved between the veins; upper leaves and lower fertile bracts clearly dimorphic (NW of Northampton–Allanooka) ..... **L. psammophilus**
- 21: Leaves tapering only slightly, or not at all, towards a broad base, petiole poorly defined, abaxial surface either deeply and narrowly grooved, smooth or sometimes shallowly and broadly grooved between the veins; upper leaves and lower fertile bracts not dimorphic, at least on main axes, grading from one to the other over several nodes

22. L: W ratio of longer leaves 2.7–7.0: 1; leaf surfaces usually variously hairy (rarely  $\pm$  glabrous), not stem-clasping, narrowly ovate to narrowly elliptic, mostly straight or gently incurved along longitudinal axis, occasionally gently recurved, abaxial surface usually deeply and narrowly grooved between the veins (S of Coolimba, usually near-coastal in Geraldton Sandplains) ..... **L. polymorphus**
- 22: L: W ratio of longer leaves 1.2–2.8: 1; leaf surfaces glabrous (except for a few obscure hairs at the base of the adaxial surface), strongly concave and usually  $\pm$  stem-clasping in the lower two thirds, obovate, elliptic or ovate, or narrowly so, usually markedly recurved along longitudinal axis, although the tip often inflexed, abaxial surface flat or openly grooved between the veins (S of Cooljarloo and Dandaragan) ..... **L. sprengeioides**

<sup>1</sup>Most species of *Leucopogon* have a standard locule number of 2, 3 or 5. In the case of those that are usually 3- or 5-locular, 4-locular ovaries do sometimes occur. Consistently 4-locular ovaries however are a feature of some variants of *L. oldfieldii* Benth., and also occur, less commonly, in the flowers of other species. For the purposes of using this key it is recommended that, where the first dissected flower of a specimen has a 4-locular ovary, others should be examined. If the next couple of flowers checked are also found to have 4-locular ovaries then proceed along the first lead at couplet 6.

<sup>2</sup>In addition to the two described species, *L. oliganthus* E.Pritz. and *L. cochlearifolius* Strid, there is at least one (*L. sp.* Three Springs (M. Hislop 2504)) and possibly two other related taxa occurring in the Geraldton Sandplains. Further research is needed to ascertain the species boundaries in this close-knit group and at this stage it is also quite possible that *L. cochlearifolius* will be found to be conspecific with *L. oliganthus*.

<sup>3</sup>*Leucopogon oldfieldii* is a very variable species in relation to several characters that are usually of taxonomic significance in the genus. It is therefore likely that future research into the pattern of variation in this species will result in the recognition of segregate taxa.

<sup>4</sup>*Leucopogon gracillimus* DC. is a widespread and variable species, the northern variant of which may not represent the species in the strict sense.

## Descriptions

### **Leucopogon foliosus** Hislop, *sp. nov.*

*Typus*: Badgingarra National Park, Western Australia [precise locality withheld for conservation reasons], 13 November 2004, *M. Hislop* 3347 (*holo*: PERTH 07202938; *iso*: CANB, NSW).

*Leucopogon* sp. Cataby (F. Hort 1638), Western Australian Herbarium, in *FloraBase*, <https://florabase.dpaw.wa.gov.au/> [accessed 7 July 2016].

Low, spreading *shrubs* to *c.* 40 cm high and 40 cm wide, usually single-stemmed at ground level from an apparently fire-sensitive rootstock but occasionally multi-stemmed and potentially with some fire-tolerance. Young *branchlets* with a sparse to moderately dense indumentum of very short, patent hairs, to *c.* 0.05 mm long. *Leaves* helically arranged, steeply antrorse, linear, narrowly ovate or narrowly elliptic, 5–11 mm long, 0.8–1.8 mm wide; petiole 0.4–0.8 mm long, glabrous or sparsely hairy on adaxial surface and/or margins; base attenuate to cuneate; apex acute, straight; lamina 0.2–0.3 mm thick, adaxially convex with recurved to revolute margins, but usually with at least some of the abaxial surface visible, the longitudinal axis gently incurved or  $\pm$  straight; surfaces discolorous; adaxial surface shiny, glabrous or sometimes with a few basal hairs, venation not evident or very obscure; abaxial surface paler, matt, with 5–7 primary veins, the midrib rather thicker than the others, deeply and narrowly grooved between the veins, shortly hairy in the grooves; margins  $\pm$  glabrous or coarsely and

minutely ciliolate with hairs < 0.05 mm long. *Inflorescence* erect, terminal, with little upper-axillary development; axis 3–6 mm long, with 3–8 flowers; axis glabrous or with a sparse indumentum to *c.* 0.05 mm long; flowers erect and sessile. *Fertile bracts* all foliose, narrowly elliptic or narrowly ovate, acute. *Bracteoles* ovate or narrowly ovate, 1.7–2.7 mm long, 1.0–1.2 mm wide, acute or acuminate, keeled; abaxial surface glabrous or with a few hairs towards the base; margins ciliolate. *Sepals* narrowly ovate, 3.2–5.0 mm long, 1.0–1.3 mm wide, acute or acuminate; abaxial surface glabrous, or occasionally very minutely hairy towards the centre, green throughout or flushed purple towards the apex, the venation obscure, with only the midrib usually evident; margins ciliolate with hairs to *c.* 0.1 mm long. *Corolla tube* white, narrowly campanulate, much shorter than the sepals, 1.8–2.8 mm long, 1.2–1.6 mm wide, glabrous externally, internal surface with a sparse tuft of reflexed hairs at the apex, glabrous below. *Corolla lobes* white,  $\pm$  flushed pink, longer than the tube, erect in the basal 1/4–1/3 and then spreading and recurved, (2.6–)3.2–3.8 mm long, 0.7–0.8 mm wide at base, glabrous externally, internal surface densely bearded in the upper half with straight hairs, much less densely so below with crinkled hairs or with hairs confined to margins; indumentum white, 1.3–2.0 mm long near apex. *Anthers* partially exerted from tube (by 1/4–1/3 of length), 1.6–2.1 mm long, including the sterile tips, distinctly recurved at apex. *Filaments* terete, 0.4–0.5 mm long, adnate to tube a little below, to well below, the sinuses, attached to anther 2/3–3/4 above base. *Ovary* depressed-obovoid, 0.4–0.5 mm long, 0.5–0.6 mm wide, with antrorse-appressed hairs in lower half, 2-locular. *Style* 0.5–0.7 mm long, well-differentiated from ovary apex, included within the corolla tube; stigma not or scarcely expanded. *Nectary* annular, 0.35–0.50 mm long, shallowly lobed, glabrous. *Fruit* shorter than the calyx, *c.* 2.6–2.8 mm long and 1 mm wide (but refer comment under notes below), narrowly ellipsoid, sparsely hairy, smooth above the gynophore; apex truncate, forming a narrow rim, the shoulders angular; surface between the shoulders and the style base descending; style persistent. (Figure 1)

*Diagnostic characters.* Within the Geraldton Sandplains *L. foliosus* is distinguished by the following character combination: leaves linear, narrowly ovate or narrowly elliptic, with recurved margins; leaf undersurfaces deeply and narrowly grooved, hairy in the grooves; inflorescence bracts uniformly foliose; nectary entire; ovary 2-locular with antrorse-appressed hairs in the lower half; fruit apex truncate, angular, with a narrow rim.



Figure 1. *Leucopogon foliosus*. Photograph of flowering branchlet from M. Hislop 3347. Scale bar = 1 cm.

*Other specimens examined.* WESTERN AUSTRALIA: [localities withheld for conservation reasons] 6 Dec. 1979, *E.A. Griffin* 2697 (PERTH); 5 Nov. 1988, *E.A. Griffin* 5457 (PERTH); 22 Nov. 1992, *E.A. Griffin* 7947 (PERTH); 7 Dec. 1992, *E.A. Griffin* 8346 (PERTH); 7 Dec. 1992, *E.A. Griffin* 8362 (PERTH); 8 Dec. 2001, *M. Hislop* 2492 (CANB, MEL, NSW, PERTH); 15 Nov. 2001, *F. Hort* 1638 (CANB, MEL, NSW, PERTH); 5 Feb. 2004, *F. & J. Hort* 2194 (PERTH); 18 Nov. 2002, *S. Patrick* 4513 (PERTH); 1 Nov. 2011, *V. Westcott & B. Todd* 13 (PERTH).

*Distribution and habitat.* Endemic to the Geraldton Sandplains bioregion between Mt Lesueur and a little south of Cataby (Figure 2). Usually occurs on lateritic uplands in shallow gravelly soils over laterite and in association with low, species-rich heath.

*Phenology.* Peak flowering is probably between October and December. The only specimen with mature fruit was collected in early December. Although there are currently no specimens at the Western Australian Herbarium collected during the autumn–winter period, this species has not been as well-collected as the other members of the Northern Group described here, and it may well be the case that in common with those it will also produce a flush of flowering after the first rains of autumn.

*Etymology.* The Latin epithet (*foliosus*: leafy, many-leaved) refers to the distinctive, leafy character of the inflorescence.

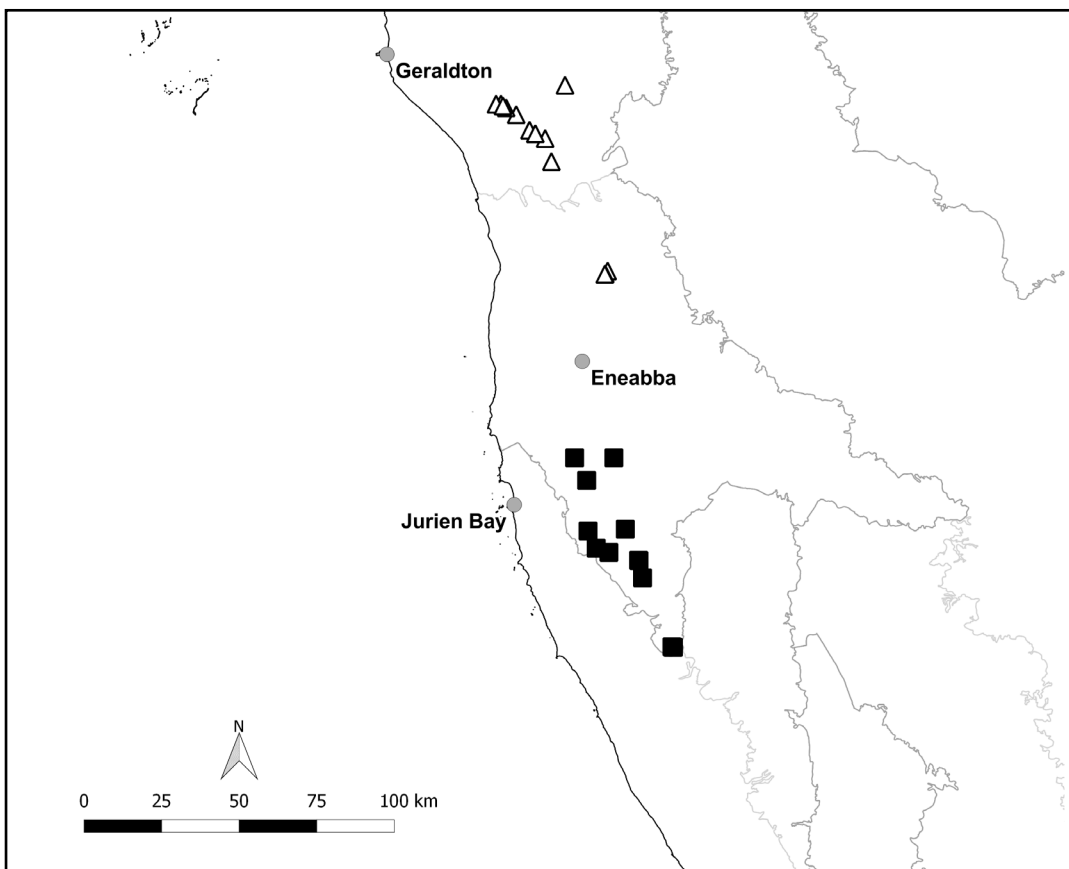


Figure 2. Distribution of *Leucopogon foliosus* (■) and *L. grammatus* (△) in Western Australia.



*Conservation status.* Department of Parks and Wildlife Conservation Codes for Western Australian Flora: to be listed as Priority Three (M. Smith pers. comm.). Although geographically restricted, most of the recorded populations are from national parks or nature reserves. The fact that there is only a single collection from Lesueur National Park may be an indication that it is uncommon in the north of its range. Most of the other collections are from Badgingarra National Park or Coomallo Nature Reserve where it is often locally common in suitable habitat.

*Affinities.* A member of the Northern Group, *L. foliosus* is most likely to be confused with *L. stenophyllus* (described below), which also has narrow leaves with recurved margins. The most useful macro character to distinguish between the two species is the presence in *L. foliosus* of large, uniformly foliose inflorescence bracts, which give the inflorescence a distinctive, leafy quality when compared to that of *L. stenophyllus*, which appears relatively bare by comparison. A difference in growth habit is also apparent in the field with *L. foliosus* being lower and more compact, in comparison to the taller, open habit of *L. stenophyllus*. Although the leaves of the two species are superficially similar, close examination of the abaxial surfaces reveals a significant difference. While both species are grooved abaxially, in *L. foliosus* the grooves are deep and hairy, whereas in *L. stenophyllus* they are usually shallower, more open and always glabrous. The nectary is usually also different, being always annular in *L. foliosus* and mostly partite in *L. stenophyllus*. The two species are sympatric over the entire range of *L. foliosus* and sometimes grow in close proximity to one another, for instance *M. Hislop* 4318 and *M. Hislop* 4319 (*L. foliosus* and *L. stenophyllus* respectively) from Coomallo Nature Reserve.

*Notes.* Because the fruit description was based on just two mature fruit found on a single specimen, the given measurements cannot be regarded as definitive. It is noteworthy that fruit of this species are particularly difficult to locate because the inflorescence is usually few-flowered and its leafy character effectively obscures them.

### ***Leucopogon grammatus* Hislop, sp. nov.**

*Typus:* west of Three Springs, Western Australia [precise locality withheld for conservation reasons], 12 July 2006, *M. Hislop* & *F. Obbens* MH 3611 (*holo:* PERTH 07516142; *iso:* CANB, K, MEL, NSW).

*Leucopogon* sp. Burma Road (M. Hislop 2032), Western Australian Herbarium, in *FloraBase*, <https://florabase.dpaw.wa.gov.au/> [accessed 7 July 2016].

Erect *shrubs* to c. 100 cm high and 80 cm wide, single-stemmed at ground level from a fire-sensitive rootstock. Young *branchlets* with a moderately dense to dense indumentum of variously orientated,  $\pm$  straight to prominently curled hairs (sometimes  $\pm$  matted), to c. 0.5 mm long. *Leaves* helically arranged, antrorse-appressed, ovate or narrowly ovate, 1.2–3.2 mm long, 0.6–1.5 mm wide; petiole very short and indistinct, to c. 0.3 mm long, usually hairy abaxially; base cuneate to rounded; apex variable, from obtuse to acute; lamina 0.25–0.35 mm thick, strongly concave adaxially, the longitudinal axis straight or gently recurved in the lower half, becoming strongly incurved towards the apex; surfaces  $\pm$  concolorous (ignoring the hairs); adaxial surface sparsely to densely hairy with antrorse to patent hairs, the midrib, and sometimes 2 lateral veins often visible beneath the hairs, grooved between the veins; abaxial surface usually variously hairy and/or scabrous, sometimes glabrous and  $\pm$  shiny, with 7–9 conspicuous, pale, primary veins, the midrib clearly thicker than the others, shallowly to deeply (but openly) grooved between the veins; margins ciliate with hairs to c. 0.3 mm long. *Inflorescence* erect, terminal and terminating short lateral branchlets; axis 2.5–7 mm long with 3–15 densely arranged flowers; axis indumentum of dense hairs 0.2–0.5 mm long; flowers erect and sessile. *Fertile bracts* all foliose, ovate, obtuse. *Bracteoles* ovate, 1.3–2.1 mm long, 0.7–1.2 mm wide, acute, keeled;

abaxial surface hairy, although sometimes hairs restricted to the keel; margins ciliate. *Sepals* ovate to narrowly ovate, 1.8–2.5 mm long, 0.8–1.2 mm wide, obtuse to subacute; abaxial surface hairy, often densely so, pale greenish or straw-coloured, sometimes flushed pink, the venation not evident; margins prominently ciliate with crinkled and straight hairs to 0.5 mm long. *Corolla tube* white, campanulate to broadly campanulate, shorter than sepals, 0.9–1.4 mm long, 1.0–1.5 mm wide, glabrous externally and internally. *Corolla lobes* white, longer than the tube, erect in *c.* the basal 1/3 then spreading and recurved, 2.1–2.8 mm long, 0.7–0.9 mm wide at base, glabrous externally, internal surface densely bearded with straight or gently curved hairs in the upper half, less densely so below with crinkled hairs; indumentum white, 0.6–0.8 mm long near apex. *Anthers* partially exerted from tube (by at least 3/4 of their length), 1.0–1.5 mm long, including sterile tips, distinctly recurved close to apex. *Filaments* terete, 0.6–0.7 mm long, adnate to tube just below the sinuses, attached to anther *c.* 2/3 above base. *Ovary* ellipsoid or globose, 0.5–0.6 mm long, 0.5–0.6 mm wide, hairy in lower half, 2- or, less often, 3-locular. *Style* 0.4–0.5 mm long, tapering smoothly from ovary apex, included within the corolla tube; stigma not or scarcely expanded. *Nectary* annular, 0.2–0.5 mm long, truncate or shallowly lobed, glabrous. *Fruit c.* as long as, to slightly longer than, the calyx, 1.7–2.3 mm long, 0.8–1.0 mm wide, narrowly ellipsoid, antrorse hairy in the lower half, several  $\pm$  raised longitudinal lines extending from the style base, otherwise smooth above the gynophore; apex tapering  $\pm$  smoothly to style base; style persistent. (Figures 3, 4A)

*Diagnostic characters.* Within the Geraldton Sandplains *L. grammatus* is readily distinguished by the following character combination: leaves ovate to narrowly ovate, short (to 3.2 mm, but usually < 2.5 mm long), antrorse-appressed, with hairy adaxial surfaces; sepals hairy abaxially and with prominently ciliate margins; ovary hairy in lower half and 2(3)-locular; nectary entire; fruit apex tapering  $\pm$  smoothly to style base.

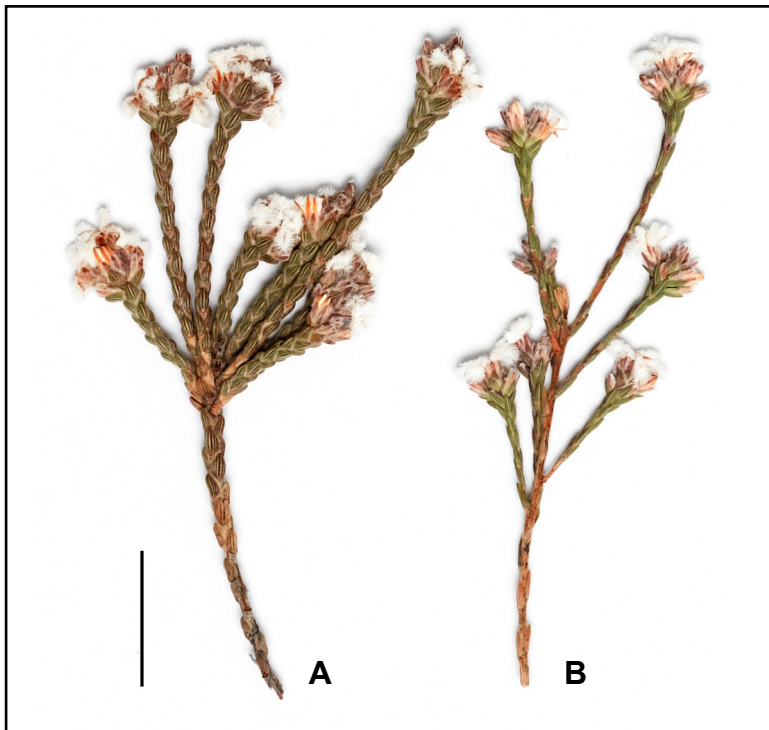


Figure 3. *Leucopogon grammatus*. Photograph of flowering branchlets from M. Hislop 3809 (A) and M. Hislop 4119 (B). Scale bar = 1 cm.

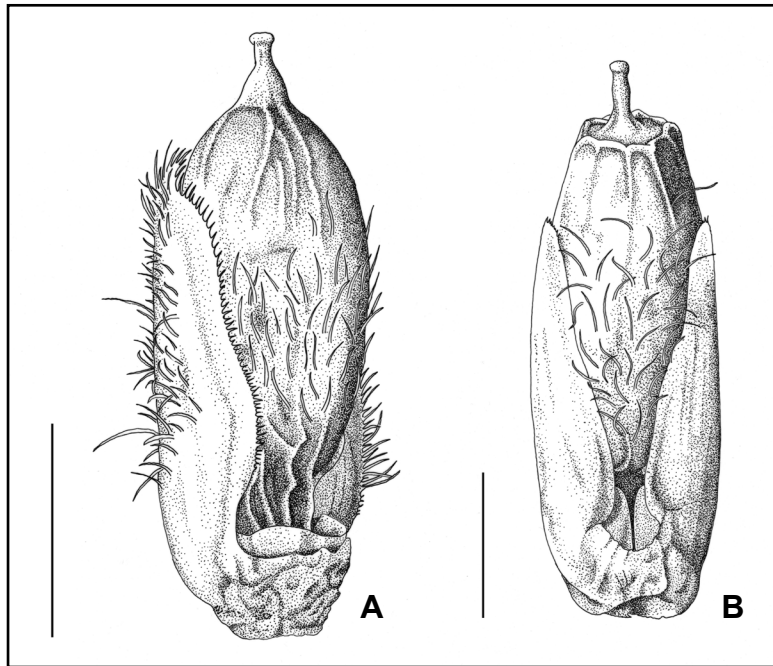


Figure 4. *Leucopogon* fruit. A – *Leucopogon grammatus*; B – *L. stenophyllus*. Scale bars = 1 mm. Drawn by Skye Coffey from *J.M. Powell* 2468 (A), *M. Hislop* 3472 (B).

*Other specimens examined.* WESTERN AUSTRALIA: [precise localities withheld for conservation reasons] 15 July 2000, *M. Hislop* 2032 (CANB, MEL, PERTH); 17 Aug. 2008, *M. Hislop* 3809 (CANB, MEL, NSW, PERTH); 11 June 2011, *M. Hislop* 4119 (CANB, NSW, PERTH); 12 June 2011, *M. Hislop* 4123 (CANB, K, MEL, PERTH); 13 Aug. 1986, *J.M. Powell* 2461 (NSW, PERTH); 13 Aug. 1986, *J.M. Powell* 2463 (CANB, NSW, NY, PERTH); 13 Aug. 1986, *J.M. Powell* 2468 (NSW, PERTH); 9 Nov. 2005, *G. Woodman* SC 9–4 (PERTH).

*Distribution and habitat.* Endemic to the Geraldton Sandplains bioregion from east of Walkaway to the Arrino district (Figure 2). Grows on upland sites in shallow, sandy soils over laterite, sometimes in proximity to breakaways. Associated vegetation is low, species-rich heath.

*Phenology.* Peak flowering is between June and August. Some mature fruit is present on collections made in the second half of July and August and it could be expected that fruiting would continue through September and at least into early October.

*Etymology.* The Latin epithet (*grammatus*: striped, with raised lines) is a reference to the conspicuous, pale venation of the abaxial leaf surfaces.

*Conservation status.* Department of Parks and Wildlife Conservation Codes for Western Australian Flora: to be listed as Priority Three (M. Smith pers. comm.). The extent of the known distribution of *L. grammatus* is about 75 km along a rather narrow north-west to south-east axis. Most collections are from Burma Road Nature Reserve, with the others from roadside populations, Unallocated Crown Land or private property.

*Affinities.* There do not appear to be any close relatives of *L. grammatus* in the Geraldton Sandplains and it should not be confused with any other species growing there. Its affinities are thought to lie with Group C (as delineated in Hislop 2014) and especially a subgroup of those characterised by 2- or 3-locular ovaries, small leaves, and with little morphological difference between the leaves and the fertile bracts.

Among this subgroup it shows marked similarities to *L. ozothamnoides* Benth., an uncommon species from eastern parts of the Jarrah Forest bioregion (Department of the Environment 2013). The two share antrorse-appressed leaves, with pale, raised abaxial venation and conspicuously ciliate margins. In addition they both have abaxially hairy and long-ciliate sepals. The most significant differences between the two relate to their ovary and fruit characters. In *L. ozothamnoides* the ovary is 3- or occasionally 4-locular with dense, evenly distributed hairs, while *L. grammatus* has a 2- or occasionally 3-locular ovary with a much sparser indumentum restricted to the basal half. And whereas the drupe of *L. ozothamnoides* has distinct, rounded shoulders, in *L. grammatus* the fruit apex tapers more or less smoothly to the style base. The flowers of *L. ozothamnoides* are also larger: sepals 2.7–3.5 mm long (cf. 1.8–2.5 in *L. grammatus*), corolla lobes 2.8–3.3 mm long (cf. 2.1–2.8 mm), style 0.6–0.7 mm long (cf. 0.4–0.5 mm).

The measurements given for *L. ozothamnoides* in the above comparison do not include the southernmost collection of that species (*C. Lewis* CML 5), which differs from the type form in several ways. Not only does it have smaller floral parts (that would fall within the given range for *L. grammatus*), but the leaves are not appressed and have more or less straight rather than distinctly crinkled cilia and long, spreading hairs on the abaxial surfaces. It will be necessary to see more collections of this morphotype before its future taxonomic status can be properly assessed.

***Leucopogon inflexus* Hislop, sp. nov.**

*Typus:* VCL [= UCL or Unallocated Crown Land], Correy Road, 1.8 km east of Robb Road, north of Eneabba, Western Australia, 12 July 2006, *M. Hislop & F. Obbens* MH 3609 (*holo:* PERTH 07516126; *iso:* CANB, MEL, NSW).

*Leucopogon* sp. Arrowsmith (*M. Hislop* 2509), Western Australian Herbarium, in *FloraBase*, <https://florabase.dpaw.wa.gov.au/> [accessed 7 July 2016].

Erect, open shrubs to *c.* 80 cm high and 60 cm wide, single-stemmed at ground level from a fire-sensitive rootstock. Young *branchlets* glabrous or with a sparse to moderately dense indumentum, the hairs to *c.* 0.05 mm long. *Leaves* helically arranged, steeply antrorse, depressed-ovate to ovate or  $\pm$  orbicular, 1.2–3.3 mm long, 1.2–3.8 mm wide; petiole  $\pm$  absent or very short, to *c.* 0.5 mm long; base usually cordate or rounded, occasionally cuneate; apex acute or subacute; lamina 0.20–0.35 mm thick, always strongly concave adaxially, stem-clasping in lower half, at least on older branchlets, the longitudinal axis recurved in the lower half, and then becoming incurved, often sharply so, just below the apex; surfaces  $\pm$  concolorous, or with the abaxial surface a little paler; adaxial surface glabrous except for a small patch of hairs at the base, the venation not evident; abaxial surface shiny with *c.* 9–17 primary veins, the midrib thicker than the others, shallowly to deeply grooved between the veins, glabrous throughout or sparsely hairy within the grooves; margins glabrous to very shortly and coarsely ciliate (sometimes  $\pm$  denticulate). *Inflorescence* erect, terminal and terminating short, lateral branchlets; axis 2.5–7 mm long with 3–11 flowers; axis indumentum very sparse to moderately dense, to *c.* 0.05 mm long, sometimes present only towards the apex; flowers erect and sessile. *Fertile bracts* foliose throughout (i.e. with little difference between the upper leaves and any of the bracts),

broadly ovate to depressed-ovate, acute. *Bracteoles* ovate, 1.5–2.0 mm long, 0.9–1.1 mm wide, acute, keeled; abaxial surface glabrous; margins minutely ciliolate or  $\pm$  glabrous. *Sepals* narrowly ovate, 2.2–3.0 mm long, 0.9–1.2 mm wide, acute; abaxial surface glabrous, pale greenish or straw-coloured, often flushed purple in the upper half, the venation usually conspicuous; margins usually minutely ciliolate in the upper half with hairs  $< 0.05$  mm long or sometimes  $\pm$  glabrous. *Corolla tube* white, campanulate, shorter than the sepals, 1.3–1.8 mm long, 1.2–1.5 mm wide, glabrous externally and internally. *Corolla lobes* white, sometimes flushed pink, longer than tube, erect in *c.* basal 1/4 and then spreading and recurved, 2.0–2.5(–3.0) mm long, 0.7–0.8 mm wide at base, glabrous externally, internal surface densely bearded with straight hairs in the upper half, less densely so below with crinkled hairs; indumentum white, 1.0–1.3 mm long near apex. *Anthers* partially exerted from tube (by 1/2–2/3 of their length), 1.2–1.7 mm long, including sterile tip, distinctly recurved close to apex. *Filaments* terete, 0.5–0.6 mm long, adnate to tube a little below, to well below, the sinuses, attached to anther 2/3–3/4 above anther base. *Ovary* depressed-obovoid to obovoid, 0.4–0.5 mm long, 0.4–0.5 mm wide, with antrorse-appressed hairs in lower half, 2-locular. *Style* 0.35–0.50 mm long, abruptly differentiated from ovary apex, included within the corolla tube; stigma not or scarcely expanded. *Nectary* 5-partite or very occasionally irregularly 3- or 4-partite, the scales 0.25–0.40 mm long, 0.25–0.35 mm wide, glabrous. *Fruit* a little shorter than, to distinctly longer than, the calyx, 2.2–2.7 mm long, 1.0–1.3 mm wide, narrowly ellipsoid, sparsely hairy, smooth above the gynophore; apex truncate, forming a narrow rim, the shoulders angular; surface between the shoulders and style base descending; style persistent. (Figure 5)

*Diagnostic characters.* Within the Geraldton Sandplains *L. inflexus* is distinguished by the following character combination: leaves small, depressed-ovate, ovate or  $\pm$  orbicular, to 3.3 mm long and 3.8 mm wide, strongly concave, stem-clasping in lower half, at least on older branches, apex distinctly inflexed; inflorescence axis hairy, although sometimes sparsely so and only towards the apex; nectary partite; ovary 2-locular with antrorse-appressed hairs in the lower half; fruit apex truncate, angular, with a narrow rim.



Figure 5. *Leucopogon inflexus*. Photograph of flowering branchlet from M. Hislop 2670. Scale bar = 1 cm.

*Other specimens examined.* WESTERN AUSTRALIA: Hydraulic Rd, 2 km E of Bunney Rd [NW of Three Springs], 30 July 1992, *A. Carr* 66 (PERTH); road to Mt Adams, 10 km from Brand Hwy, 28 May 1997, *R. Davis* 3255 (PERTH); 100 m along road running E from intersection of Mt Adams and Tomkins Rd, 18 June 1997, *R. Davis* 3369 (PERTH); Brand Hwy (truck stop), 32 km N of Eneabba turnoff, 19 June 1997, *R. Davis* 3394 (PERTH); grounds of Western Flora Caravan Park [c. 20 km N of Eneabba], walk trail to Arrowsmith River, c. 150 m from camp area, 11 Dec. 2001, *M. Hislop* 2509 (CANB, PERTH); S end of Sundalara Rd, NE of Eneabba, 8 June 2002, *M. Hislop* 2682 (PERTH); Natta Rd, 3.8 km N of Tomkins Rd, W of Three Springs, 14 Nov. 2004, *M. Hislop & A. Tinker* MH 3355 (PERTH); 5.8 km SW on Tootbardie Rd towards Brand Hwy (15 km E of Brand Hwy), 10 Aug. 1986, *J.M. Powell* 2309 (CANB, MEL, NSW, NY, PERTH); 5.8 km SW on Tootbardie Rd towards Brand Hwy (15 km E of Brand Hwy), 10 Aug. 1986, *J.M. Powell* 2309 B (BRI, NSW, PERTH); Yardanogo Nature Reserve, 2 Apr. 2008, *V. Westcott* S.D. 29 a (PERTH); Skipper Track [W of Brand Highway, c. 20 km N of Eneabba], 8 Apr. 2008, *V. Westcott* S.D. 35 a (PERTH); site 60, Beekeeper Reserve Collection [Beekeepers Nature Reserve, c. 3.5 km due W of Arrowsmith railway siding], 16 Jan. 1985, *R.T. Wills s.n.* (PERTH).

*Distribution and habitat.* Endemic to the Geraldton Sandplains bioregion with the main centre of distribution from Yardanogo Nature Reserve (SE of Dongara), to a little north of Eneabba and then east as far as the Arrino district (Figure 6). There is also an apparent outlying population to the south-east of Warradarge, about 50 km to the south of the southernmost populations in the main distribution node. Grows on deep sand, shallow sand over laterite or shallow sand over limestone, as a component of various heath or low woodland communities.

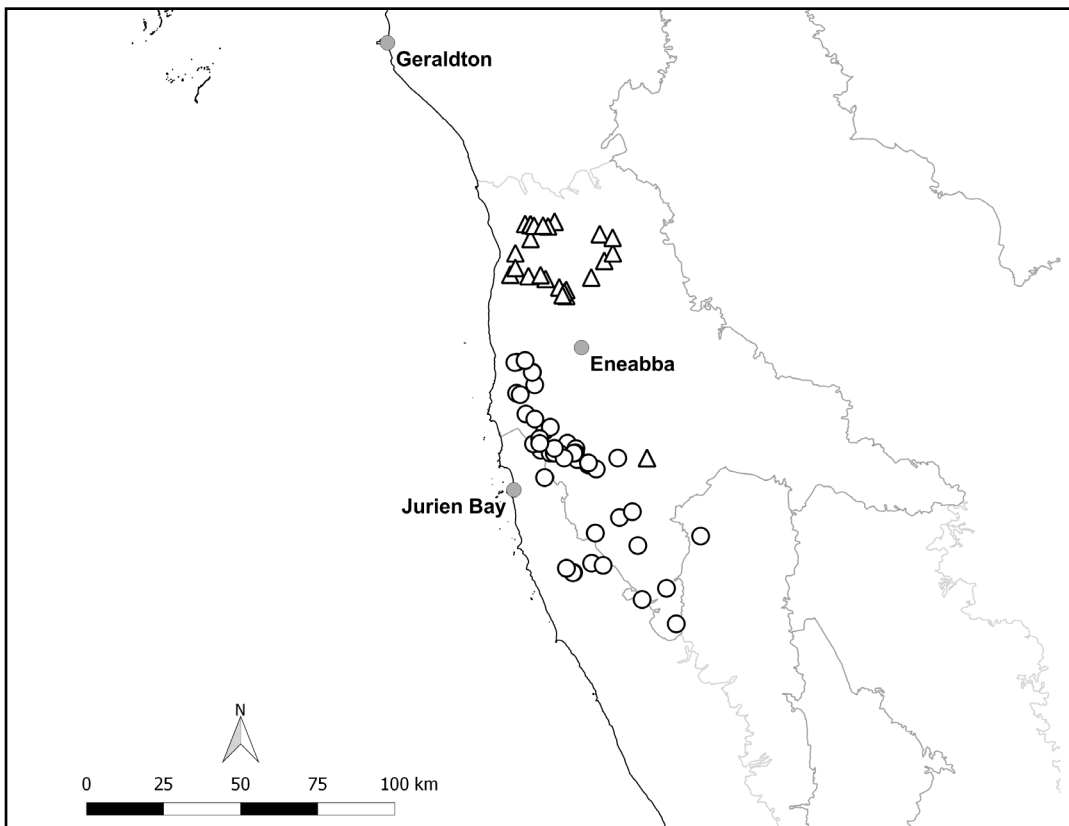


Figure 6. Distribution of *Leucopogon inflexus* ( $\Delta$ ) and *L. stenophyllus* ( $\circ$ ) in Western Australia.

*Phenology.* Flowering occurs over many months of the year, with an apparent peak in late spring to early summer and then again in autumn to early winter. Fruit can similarly be expected over many months of the year. This appears to be the typical phenological pattern for members of the Northern Group, with the possible exception of *L. foliosus*.

*Etymology.* The Latin epithet (*inflexus*: bent inwards) is a reference to the orientation of the leaf tips on dried specimens.

*Conservation status.* *Leucopogon inflexus* is locally common across its rather restricted geographic range and is currently known from two nature reserves.

*Affinities.* Among the Northern Group, *L. inflexus* is only likely to be confused with *L. simulans* or *L. prolatus*. From the former it differs in having a hairy (although hairs often sparse), rather than glabrous, inflorescence axis and smaller, always antrorse, leaves with characteristically inflexed apices. Differences between *L. inflexus* and *L. prolatus* are given under the Affinities heading for that species.

*Notes.* The southern outlying population occurs in an area in which *L. simulans* is generally common. J.M. Powell made three collections of the species from this site, Powell 2309, 2309 A and 2309 B, presumably from three different plants. The first in that series has unusually long corolla lobes (c. 3 mm long compared to a maximum of 2.5 mm otherwise recorded for the species) but is in other respects typical. The other two specimens are typical in all regards.

The distributions of *L. inflexus* and *L. simulans* also approach each other closely in the west Arrino district (e.g. *R.J. Cranfield & P.J. Spencer* 7936 and *A. Carr* 66; *L. simulans* and *L. inflexus* respectively) but there are no documented examples of sympatry. *A. Carr* 66, which is from the south-eastern edge of the range of *L. inflexus*, is typical for the latter in all regards. The leaves of *R.J. Cranfield & P.J. Spencer* 7936 are more erect than is usual for *L. simulans*, but their consistently larger size, tendency to glaucous surfaces and more or less straight apices, in addition to the glabrous inflorescence axes, are all indicative of that species.

A number of older collections of *L. inflexus* had been referred to the very variable *L. sprengelioides* Sond., which occurs as far north as the Cataby area. This member of Group C has a superficially similar foliar morphology but is readily distinguished by its annular nectary and 3–5-locular ovary.

### ***Leucopogon prolatus* Hislop, sp. nov.**

*Typus:* Eneabba township area, Western Australia, 1 September 1979, *J.M. Powell* 1362 (*holo:* PERTH 01559532; *iso:* CANB, K, L, MEL, NSW).

*Leucopogon* sp. South Eneabba (*E.A. Griffin* 8027), Western Australian Herbarium, in *FloraBase*, <https://florabase.dpaw.wa.gov.au/> [accessed 7 July 2016].

Erect, open shrubs to c. 90 cm high and 70 cm wide, single-stemmed at ground level from a fire-sensitive rootstock. Young branchlets glabrous or with a sparse to moderately dense indumentum to c. 0.08 mm long. *Leaves* helically arranged, steeply antrorse, variably shaped from ovate, through elliptic to obovate, 2.8–7.0 mm long, 0.8–2.2 mm wide; petiole absent or very short, to c. 0.5 mm long; base attenuate or cuneate; apex obtuse to acute; lamina 0.3–0.4 mm thick, usually adaxially concave, less often flat or slightly convex, the longitudinal axis variable, straight, gently incurved, gently recurved

or recurved in the lower half and becoming incurved in the upper; surfaces  $\pm$  concolorous, or with the abaxial surface a little paler; adaxial surface glabrous except for a small patch of hairs at the base, the venation not evident; abaxial surface with 7–11 primary veins, the midrib clearly thicker than the others, deeply grooved between the veins, glabrous throughout or sparsely hairy within the grooves, sometimes sparse hairs also arising from the veins; margins glabrous or very shortly and coarsely ciliolate. *Inflorescence* erect, terminal and terminating short, lateral branchlets; axis 3–10 mm long with 3–14 flowers; axis indumentum sparse to moderately dense, to *c.* 0.08 mm long; flowers erect and sessile. *Fertile bracts* foliose at lower axils, becoming progressively smaller and more bract-like towards the apex, narrowly ovate to narrowly elliptic, acute. *Bracteoles* ovate, 1.3–2.2 mm long, 0.9–1.2 mm wide, acute, keeled; abaxial surface glabrous, or  $\pm$  scabrous towards the apex; margins minutely ciliolate or  $\pm$  glabrous. *Sepals* narrowly ovate, 2.3–3.2(–3.5) mm long, 1.0–1.2 mm wide, acute or occasionally subacute; abaxial surface glabrous, pale greenish or straw-coloured, often flushed purple in the upper half, the venation usually conspicuous; margins minutely ciliolate, with hairs  $<$  0.05 mm long. *Corolla tube* white, campanulate or narrowly campanulate, shorter than the sepals, 1.5–2.2(–2.5) mm long, 1.0–1.7 mm wide, glabrous externally and internally. *Corolla lobes* white, sometimes flushed pink, longer than the tube, erect in *c.* the basal 1/4 and then spreading and recurved, 2.1–3.2(–3.5) mm long, 0.6–0.8 mm wide at base, glabrous externally, internal surface densely bearded with straight hairs in the upper half, less densely so below with crinkled hairs; indumentum white, 1.2–1.5 mm long near apex. *Anthers* partially exerted from tube (by 2/3–3/4 of their length), 1.1–2.0 mm long, including sterile tips, distinctly recurved close to apex. *Filaments* terete, 0.5–0.6 mm long, adnate to tube a little below, to well below, the sinuses, attached to anther *c.* 2/3 above base. *Ovary* obovoid to depressed-obovoid, 0.4–0.5 mm long, 0.4–0.5 mm wide, with antrorse-appressed hairs in lower half, 2-locular. *Style* 0.35–0.55 mm long, abruptly differentiated from ovary apex, included within the corolla tube; stigma not or scarcely expanded. *Nectary* 5-partite or very occasionally, irregularly 3- or 4-partite, the scales 0.30–0.45 mm long, 0.25–0.30 mm wide, glabrous. *Fruit*  $\pm$  as long as, to distinctly longer than, the calyx, 2.2–2.6 mm long, 0.9–1.0 mm wide, narrowly ellipsoid, sparsely hairy,  $\pm$  smooth above the gynophore; apex truncate, forming a narrow rim, the shoulders angular; surface between the shoulder and style base descending; style persistent. (Figure 7)

*Diagnostic characters.* Within the Geraldton Sandplains *L. prolatus* is distinguished by the following character combination: leaves variously ovate, elliptic or obovate, to 7.0 mm long and 2.2 mm wide, mostly concave, but sometimes flat or slightly convex, not or barely stem-clasping in lower half, apex straight to slightly incurved; inflorescence axis hairy, although sometimes sparsely so and only towards the apex; nectary partite; ovary 2-locular with antrorse-appressed hairs in the lower half; fruit apex truncate, angular, with a narrow rim.

*Other specimens examined.* WESTERNAUSTRALIA: between Lake Logue and Eneabba, 3 Nov. 1974, *J.S. Beard* 7320 (PERTH); 5 km SE of Eneabba, 14 June 1978, *R.J. Cranfield* 1263 (PERTH); Brand Highway, 5 km N of Eneabba, 30 July 1985, *R.K. Crowden* 171 (HO, PERTH); corner Brand Hwy and Eneabba–Coolimba Rd, 19 June 1997, *R. Davis* 3399 (PERTH); Reserve 27886 [South Eneabba Nature Reserve], 8 km S of Eneabba, 5 Feb. 1977, *E.A. Griffin* 831 (CANB, PERTH); Breakaway property (J. & J. Browne) Warradarge, northern boundary, firebreak adjacent Green Head–Coorow Rd [now included in Nature Reserve 46713], 30 Apr. 2000, *M. Hislop* 1998 (PERTH); South Eneabba Nature Reserve, W side of Brand Hwy, 9.1 km N of Coorow–Greenhead Rd, 5 Dec. 2002, *M. Hislop* 2893 (PERTH); corner Ding [Rd] and Beekeeper Rd, NE of Eneabba, 18 July 2004, *M. Hislop* 3271 (PERTH); remnant bushland on private property (known locally as Brandy Flats), adjacent to Iluka minesite, N of Eneabba, 14 July 2006, *M. Hislop & F. Obbens* MH 3613 (CANB, NSW, PERTH); 5 km SE of Lake Indoon, 16 Dec. 1976, *R. Hnatiuk* 761431 (PERTH); Coomallo Creek campsite, 13 Sep. 1977, *R. Hnatiuk* 770901 (PERTH); 12 km N of Eneabba, 12 Sep. 1978, *R. Hnatiuk* 780127 (PERTH);



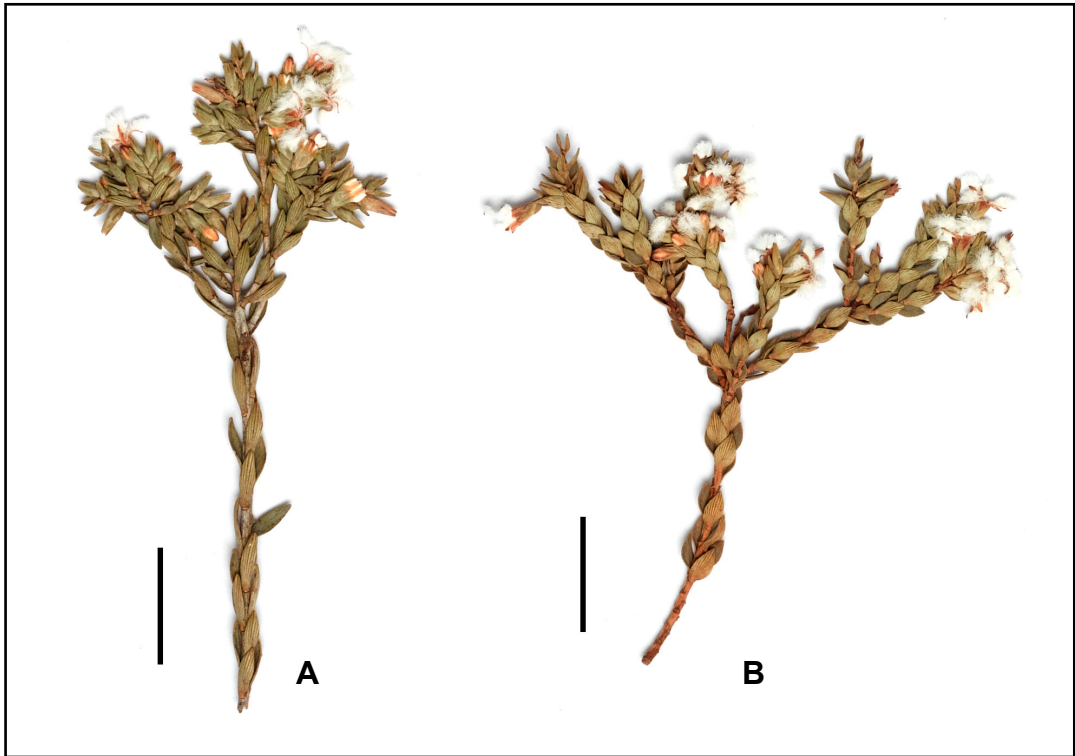


Figure 7. *Leucopogon prolatus*. Photograph of flowering branchlets from M. Hislop 3399(A) and M. Hislop 1998(B). Scale bars = 1 cm.

8 km S of Eneabba, 28 Sep. 1979, R. Hnatiuk 790074 (CANB, PERTH); 45 miles [c. 72 km] SW of Three Springs, 30 Aug. 1965, K.R. Newbey 2283 (PERTH); Brown Farm, Depot Hill, c. 3.5 km NE of Eneabba on N side of Three Springs Rd, 3 July 2003, F. Obbens & C. Godden s.n. (PERTH); 21.7 km E of Coolimba on road to Brand Hwy, 1 Sep. 1979, J.M. Powell 1355 (CANB, K, L, MEL, NSW, PERTH); Lake Logue Nature Reserve, 18 Mar. 2008, V. Westcott S.D. 16 a (PERTH); Beekeepers Nature Reserve, 9 Apr. 2008, V. Westcott S.D. 54 (PERTH).

*Distribution and habitat.* Endemic to the Geraldton Sandplains bioregion; *L. prolatus* is distributed from north of Eneabba to the Warradarge area and west to near Stockyard Gully (Figure 8). There is also an apparent outlying population about 19 km south of Warradarge in Coomaloo Nature Reserve. Occurs in deep white or yellow sand, or shallow sand over laterite, and is associated with heath or low, open woodland communities.

*Phenology.* As for *L. inflexus*.

*Etymology.* The Latin epithet (*prolatus*: lengthened, extended) is a reference to the species' longer leaves relative to the otherwise similar *L. inflexus*.

*Conservation status.* This species is locally common within a geographically restricted area. Populations are known to occur in South Eneabba, Lake Logue and Coomaloo Nature Reserves.

*Affinities.* *Leucopogon prolatus* is considered narrowly distinct from *L. inflexus* with the two having parapatric distributions. They can be distinguished by the following foliar characters (those of *L. inflexus*

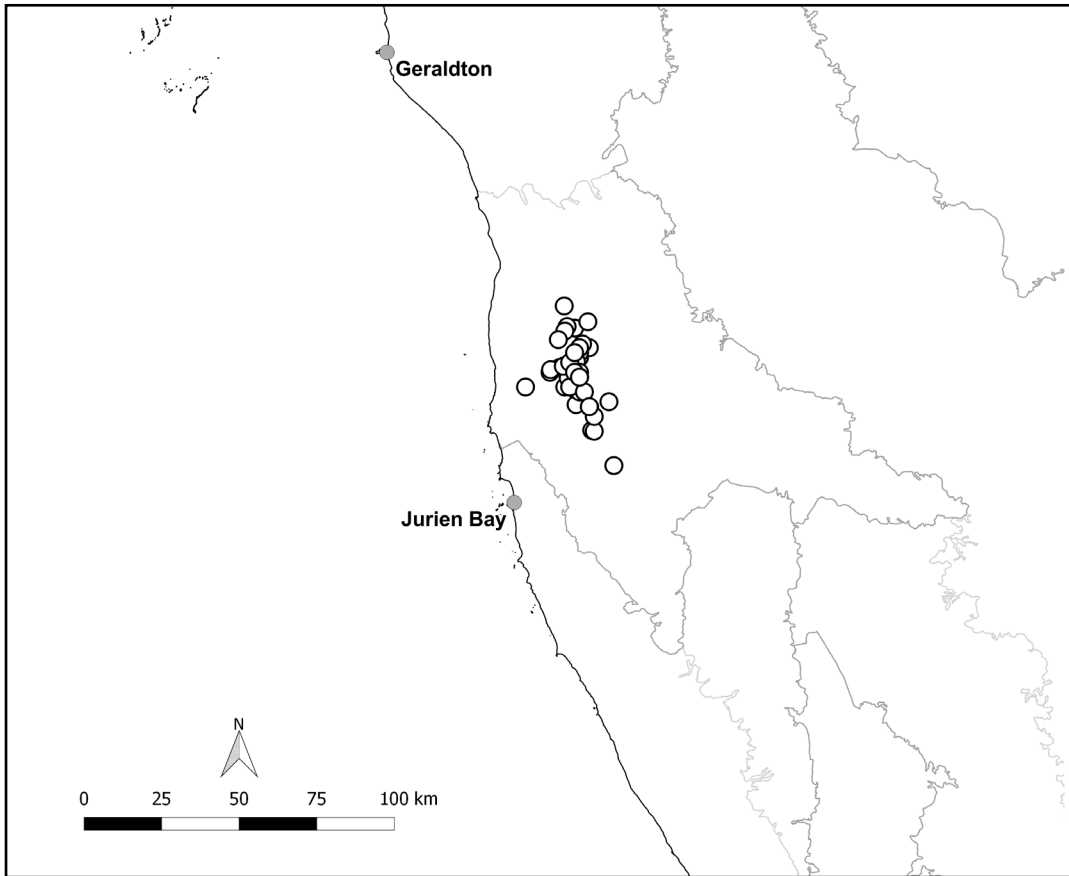


Figure 8. Distribution of *Leucopogon prolatus* in Western Australia.

in brackets): leaves variously ovate, elliptic or obovate, 2.8–7.0 mm long, 0.8–2.2 mm wide, the L: W ratio of the longest leaves (1.5–)1.8–4.5: 1 (*cf.* leaves depressed-ovate, ovate to ± orbicular, 1.2–3.3 mm long, 1.2–3.8 mm wide, L: W ratio of the longest leaves 0.8–1.4: 1); leaf bases attenuate or cuneate (*cf.* leaf bases mostly cordate or rounded, occasionally cuneate); leaves not or rarely ± stem-clasping (*cf.* leaves all, or at least those on the older branchlets, stem-clasping); all leaves with apices straight to slightly incurved (*cf.* all leaves distinctly inflexed, or at least those on inflorescence-bearing branchlets).

Although the foliar morphology of *L. prolatus* is quite dissimilar to that of *L. inflexus* across most of its range, two collections (*V. Westcott* S.D. 26 a and *V. Westcott* S.D. 33) are somewhat intermediate in leaf character, suggesting that there may be some introgression between them where the two come into contact north of Eneabba. Given the presence of these intermediates and the absence of correlating floral or fruiting differences, a case could be made that the two are better treated at the infraspecific level. In preferring to recognise them as separate species I have been influenced by the often critical role of foliar characters in the circumscription of species in *Leucopogon*, notably in Groups D and C as well as the Northern Group to which these two belong. The pattern of distribution of the two taxa also seems relevant here. Although *L. inflexus* generally has a more northerly distribution than that of *L. prolatus*, the apparent outlying population of *L. inflexus*, south-east of Warradarge, occurs to the south and east of *L. prolatus* (excluding the outlying population of that species at Coomallo). This disjunction seems consistent with the recognition of separate species rather subspecies.

*Leucopogon prolatus* may be distinguished from *L. stenophyllus* by its generally wider leaves, mostly > 1.2 mm wide (*cf.* mostly 1 mm or less) which are adaxially concave rather than convex and with recurved margins. Note that some specimens of *L. prolatus* may have some leaves flat or slightly concave and similarly *L. stenophyllus* may also have some flat leaves. The southernmost, possibly outlying population of *L. prolatus* in Coomallo Nature Reserve, occurs in an area where *L. stenophyllus* is generally common. It is not known how close the species approach each other there, but the specimens of *L. prolatus* from that area are typical in all respects. Similarly, where the two species occur in close proximity off the Coolimba–Eneabba road towards the northern extent of the distribution of *L. stenophyllus* and the southern edge for *L. prolatus* (e.g. *R. Wills* 161 and *V. Westcott* S.D. 16 a respectively), the differences are maintained.

*Notes.* Members of the Northern Group typically have glabrous sepal surfaces, and branchlets that are glabrous or with a sparse or occasionally moderately dense indumentum. Similarly their leaves are either glabrous, with a few basal hairs adaxially or with hairs restricted to the grooves abaxially. In this context a collection of *L. prolatus* (*F. Obbens* & *C. Godden* I 172) is noteworthy. It comprises three separate pieces. One of these has the normal indumentum for the species, the other two, presumably from a neighbouring plant, have a dense indumentum on the branchlets, both leaf surfaces, bracteoles and sepals, with hairs to about 0.2 mm long. The latter is here considered to be an anomalous variant of *L. prolatus* but because of its apparent rarity it is not included in the description of that species presented here.

***Leucopogon simulans* Hislop, *sp. nov.***

*Typus:* South Eneabba Nature Reserve, Beros Road, 1.8 km from Brand Highway, Western Australia, 11 April 2010, *M. Hislop* 4000 (*holo:* PERTH 08270996; *iso:* CANB, MEL, NSW).

*Leucopogon* sp. Watheroo (R.D. Royce 9616), Western Australian Herbarium, in *FloraBase*, <https://florabase.dpaw.wa.gov.au/> [accessed 7 July 2016].

*Leucopogon phyllostachys* *auct. non* Benth.: Western Australian Herbarium, in *FloraBase*, <https://florabase.dpaw.wa.gov.au/> [before August 2010]; G. Paczkowska & A.R. Chapman, *West. Aust. Fl.: Descr. Cat.*: 239 (2000).

Erect, open *shrubs* to *c.* 80 cm high and 70 cm wide, single-stemmed at ground level from a fire-sensitive rootstock. Young *branchlets* glabrous. *Leaves* helically arranged, variously orientated (usually on the same plant), from antrorse to sharply retrorse, usually ovate or depressed-ovate, occasionally narrowly ovate, 2.5–6.5 mm long, 2.0–6.0 mm wide; petiole variably developed, to 0.5 mm long, but often ± absent, sparsely hairy on adaxial surface; base usually stem-clasping, cordate, rounded or sometimes cuneate; apex usually acute or acuminate, sometimes ± obtuse; lamina 0.25–0.35 mm thick, curvature variable, adaxially concave, at least towards the base and sometimes throughout, or else becoming flat or distinctly convex above the base, the longitudinal axis recurved in the lower 1/3 and then either straight or ± incurved towards the apex; surfaces glaucous, ± concolorous, or with the abaxial surface a little paler; adaxial surface glabrous except for a small patch of hairs at the base, the venation not evident or very obscure; abaxial surface glabrous with *c.* 11–19 primary veins, the midrib rather thicker than the others, ± flat to openly grooved between the veins; margins glabrous. *Inflorescence* erect, terminal and terminating short, lateral branchlets; axis glabrous, 4–12 mm long with 4–13 flowers; flowers erect and sessile. *Fertile bracts* foliose on the lower axis, becoming progressively smaller and more ‘bract-like’ towards the apex, broadly to narrowly ovate, acute. *Bracteoles* ovate, 1.3–2.0 mm

long, 0.8–1.0 mm wide, acute, keeled; abaxial surface glabrous; margins  $\pm$  glabrous. *Sepals* narrowly ovate, 2.5–3.3 mm long, 0.8–1.1 mm wide, acute or acuminate; abaxial surface glabrous, pale greenish or straw-coloured, usually with some purple tinges in the upper half, the venation usually obscure apart from the midrib; margins glabrous or minutely and irregularly ciliolate with hairs  $< 0.05$  mm long. *Corolla tube* white, campanulate or narrowly campanulate, shorter than the sepals, 1.3–2.0 mm long, 1.0–1.4 mm wide, glabrous externally and internally. *Corolla lobes* white, sometimes flushed pink, longer than the tube, erect in *c.* basal 1/4 and then spreading and recurved, 2.2–3.0 mm long, 0.5–0.8 mm wide at base, glabrous externally, internal surface densely bearded with straight hairs in the upper half, less densely so below with crinkled hairs; indumentum white, 1.0–1.4 mm long near apex. *Anthers* partially exerted from tube (by 2/3–3/4 of their length), 1.2–2.0 mm long, including sterile tips, distinctly recurved close to apex. *Filaments* terete, 0.5–0.8 mm long, adnate to tube a little below, to well below, the sinuses, attached to anther 2/3–3/4 above base. *Ovary* obovoid to depressed-obovoid, 0.40–0.50 mm long, 0.45–0.55 mm wide, with antrorse-appressed hairs in lower half, 2-locular. *Style* 0.4–0.6 mm long, abruptly differentiated from ovary apex, included within the corolla tube; stigma not or scarcely expanded. *Nectary* usually 5-partite, less often irregularly partite, or annular (refer Notes below), the scales 0.25–0.45 mm long, 0.20–0.30 mm wide,  $\pm$  truncate, glabrous. *Fruit* about as long as to distinctly longer than calyx, 2.5–3.0 mm long, 1.0–1.2 mm wide, narrowly ellipsoid, sparsely hairy,  $\pm$  smooth above the gynophore, sometimes with dark longitudinal stripes; apex truncate, forming a narrow rim, the shoulders angular; surface between the shoulders and style base descending; style persistent. (Figure 9)

*Diagnostic characters.* Within the Geraldton Sandplains *L. simulans* is distinguished by the following character combination: leaves usually depressed-ovate to ovate, less often narrowly ovate, variously orientated, usually on the same plant, from shallowly antrorse to sharply retrorse, always with some widely spreading to retrorse; inflorescence axes and branchlets glabrous; nectary usually partite, very occasionally entire; ovary 2-locular, with antrorse-appressed hairs in the lower half; fruit apex truncate, angular, with a narrow rim.

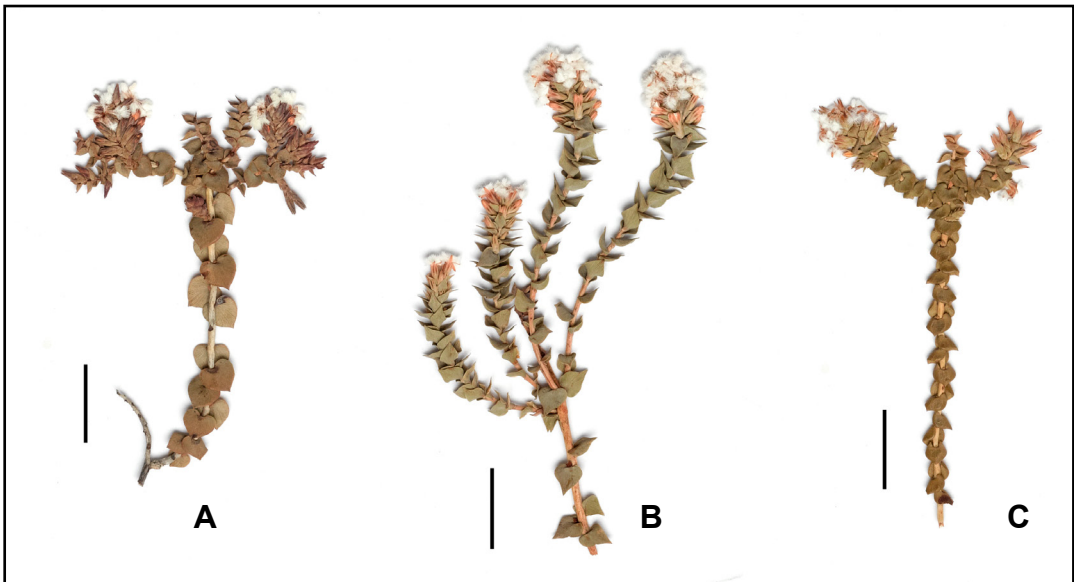


Figure 9. *Leucopogon simulans*. Photograph of flowering branchlets from *J.M. Powell* 2474 (A), *M. Hislop* 4002 (B) and *M. Hislop* 1042 (C). Scale bars = 1 cm.

*Other specimens examined.* WESTERN AUSTRALIA: Tathra National Park, c. 7 km W of Turkey Flat Rd and 400 m N of Carnamah–Eneabba Rd along a graded firebreak, 20 Aug. 2008, *G. Byrne* 3628 (CANB, PERTH); Big Soak Plain, c. 6.8 km S of Coorow–Green Head Rd on track opposite the end of Chatfield Clarke Rd, W of Coorow, 6 Nov. 2007, *A. Crawford* 1478 (PERTH); Coorow Rd, 7.5 km from Brand Hwy, 31 July 1985, *R.K. Crowden* 184 (HO, PERTH); 16.5 km N of Badgingarra, 31 Jan. 1996, *R. Davis* 472 (PERTH); layby off Brand Hwy, 4 km S of Green Head turnoff, 27 May 1997, *R. Davis* 3204 (PERTH); Hi Vallee property (D. & J. Williams), Warradarge, track along E side of main valley, 16 May 1998, *M. Hislop* 1042 (PERTH); Wilson Reserve, W of Three Springs, E side of Passinto Rd, c. 200 m W of junction with Bunney Rd, 8 June 2002, *M. Hislop* 2678 (PERTH); E side of Rose Thompson Rd, 3.5 km S of Carnamah–Eneabba Rd, 15 July 2006, *M. Hislop* 3615 (NSW, PERTH); Reserve 28606, E side of Chatfield Clarke Rd, 100 m N of Hughes Rd, SW of Carnamah, 11 Apr. 2010, *M. Hislop* 4002 (CANB, PERTH); W boundary of Boothendarra Nature Reserve, NE of Badgingarra, 30 June 2014, *M. Hislop* 4333 (CANB, PERTH); 2.4 km onto Nebru Rd from Three Springs, 23 Sep. 1968, *M.E. Phillips* 1503 (CANB, PERTH); Tathra National Park, near Willis Rd turnoff, 28 km by road E of Eneabba, 8 July 1982, *J.M. Powell* 1721 (CANB, K, L, NSW, PERTH); Alexander Morrison National Park, c. 40 km SW of Coorow, 10 Aug. 1986, *J.M. Powell* 2300B (HO, K, L, NSW, PERTH); Dookanooka Rd turnoff from Turkey Flat Rd, 1.7 km SW of Three Springs–Eneabba Rd, 13 Aug. 1986, *J.M. Powell* 2472 (NSW, PERTH); Coalara Rd, 6.8 km S from Marchagee Track, Watheroo National Park, 14 Aug. 1986, *J.M. Powell* 2489 (NSW, NY, PERTH); Watheroo National Park, 6 Oct. 1971, *R.D. Royce* 9616 (PERTH).

*Distribution and habitat.* Mostly restricted to the Geraldton Sandplains bioregion with limited occurrence in adjoining parts of the Swan Coastal Plain and Avon Wheatbelt bioregions. Occurs between the Arrowsmith River south to Watheroo National Park, generally to the east of Brand Highway and west of Midlands Road (Figure 10). Grows in shallow, sandy soils over laterite, less often in deep sand, and in association with heath or low, open woodland.

*Phenology.* As for *L. inflexus*.

*Etymology.* The Latin epithet (*simulans*: imitating, resembling) refers to the generally similar appearance the species bears to several others with broad leaves (refer under Affinities below), that occur further to the south.

*Conservation status.* A common species in the south of the Geraldton Sandplains bioregion, where it is occurs in a number of national parks and nature reserves.

*Affinities.* In gross morphology *L. simulans* closely resembles *L. glabellus* R.Br. and *L. phyllostachys* Benth., indeed for many years it had been referred to the latter species at the Western Australian Herbarium. As typical members of Group D (*sensu* Hislop & Chapman 2007) however, both *L. phyllostachys* and *L. glabellus* have glabrous ovaries and a drupe apex that is smoothly rounded rather than truncate. *Leucopogon glabellus* is widely distributed in the wetter parts of the south-west from the Darling Range south-east of Perth to the Albany area, and *L. phyllostachys* is endemic to the Stirling Range.

*Leucopogon squarrosus*, which occurs on the Swan Coastal Plain as far north as the Gingin area, is also a potentially confusing species. It can be distinguished from *L. simulans* by its hairy inflorescence axis (glabrous in *L. simulans*), smaller fruit (1.3–1.9 mm long vs. 2.5–3.0 mm), and differently shaped leaves (usually variously obovate or elliptic, only occasionally ovate vs. always variously ovate in *L. simulans*).

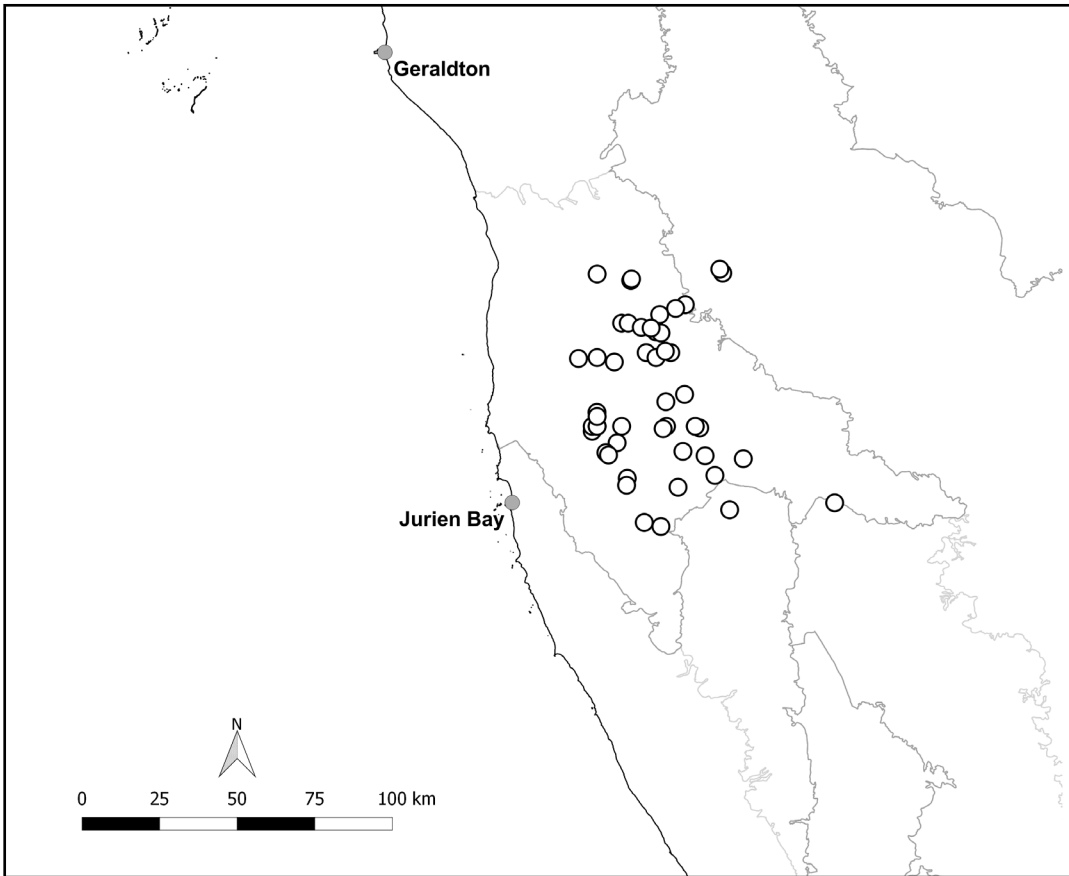


Figure 10. Distribution of *Leucopogon simulans* in Western Australia.

Within the Northern Group of species described here *L. simulans* is only likely to be confused with *L. inflexus*. The differences between them are given under the Affinities heading for that species. Although generally *L. prolatus* is readily distinguished from *L. simulans*, in the Warradarge area where both are common, a couple of anomalous specimens (*M. Hislop* 281 and *R.K. Crowden* 179) suggest possible hybridisation between the two. These specimens have totally glabrous branchlets and inflorescence axes in the manner of *L. simulans* but the leaves are consistently erect and narrower than is usual for that species.

*Notes.* While the flowers of *L. simulans* and *L. stenophyllus* usually have a regular 5-partite nectary, occasionally they may be irregularly partite (i.e. divided into 3 or 4 scales) or entire. Irregularly partite nectaries were also recorded in a few specimens of *L. inflexus* and *L. prolatus*, the other two species in the group that usually have partite nectaries, and it may well be the case that those species too will very occasionally be found to have entire nectaries.

***Leucopogon stenophyllus* Hislop, *sp. nov.***

*Typus:* Minyulo Nature Reserve, Walyering Road, Cataby: 100 m south-west of the Dampier to Bunbury Gas Pipeline, Western Australia, 5 May 2007, *F. Hort & J. Hort* 3001 (*holo:* PERTH 07708513; *iso:* CANB, MEL, NSW).

*Leucopogon* sp. Lesueur (B. Evans 530), Western Australian Herbarium, in *FloraBase*, <https://florabase.dpaw.wa.gov.au/> [accessed 7 July 2016].

Erect, open *shrubs* to *c.* 90 cm high and 70 cm wide, single-stemmed at ground level from a fire-sensitive rootstock. Young *branchlets* glabrous or with a sparse indumentum of very short, patent hairs, to *c.* 0.05 mm long. *Leaves* helically arranged, steeply antrorse, linear, narrowly ovate or narrowly elliptic, 3–8(–12) mm long, 0.6–1.3 mm wide; petiole variably developed, to *c.* 0.5 mm long or absent, glabrous or sparsely hairy on adaxial surface and/or margins; base attenuate or cuneate; apex usually acute or subacute, occasionally obtuse, straight; lamina 0.2–0.3 mm thick, usually adaxially convex with recurved to revolute margins, occasionally some leaves  $\pm$  flat, the longitudinal axis incurved; surfaces shiny, discolourous and the abaxial surface paler or  $\pm$  concolorous; adaxial surface glabrous or sometimes with a few hairs towards the base, venation not evident; abaxial surface glabrous, with 5–7 primary veins, the midrib rather thicker than the others, grooved between the veins; margins glabrous or coarsely and minutely ciliate, with hairs  $<$  0.05 mm long. *Inflorescence* terminal and terminating numerous short, lateral branchlets; axis 4–14 mm long, with 3–17 flowers; axis indumentum very short and sparse to *c.* 0.05 mm long; flowers erect and sessile. *Fertile bracts* foliose on the lower axis becoming progressively smaller and more ‘bract-like’ towards the apex, narrowly ovate or narrowly elliptic, acute. *Bracteoles* ovate, 1.3–2.4 mm long, 0.8–1.3 mm wide, mostly acute, sometimes obtuse, keeled; abaxial surface glabrous; margins minutely ciliate or  $\pm$  glabrous. *Sepals* ovate or narrowly ovate, 2.3–3.6(–4) mm long, 1.0–1.3 mm wide, acute; abaxial surface glabrous, green throughout, or partially flushed purple towards the apex, the venation quite prominent with 3 or 5 veins evident; margins minutely ciliate, with hairs  $<$  0.05 mm long or  $\pm$  glabrous. *Corolla tube* white, campanulate or occasionally narrowly campanulate, shorter than sepals, 1.3–2.1 mm long, 1.3–1.7 mm wide, glabrous externally and internally. *Corolla lobes* white, usually  $\pm$  flushed pink, longer than tube (ratio = 1.1–1.8: 1), erect in *c.* the basal 1/4 and then spreading and recurved, 2.0–2.8 mm long, 0.7–1.0 mm wide at the base, glabrous externally, internal surface densely bearded in the upper half with straight hairs, less densely so with crinkled hairs below; indumentum white, 1.0–1.6 mm long near apex. *Anthers* partially exerted from tube (by 1/2–2/3 of length), 1.5–2.2 mm long, including the sterile tips, distinctly recurved at apex. *Filaments* terete, 0.4–0.6 mm long, adnate to tube a little below, to well below, the sinuses, attached to anther 2/3–3/4 above base. *Ovary* depressed-obovoid to obovoid, 0.4–0.5 mm long, 0.4–0.6 mm wide, with antrorse-appressed hairs in lower half, 2- or 3-locular. *Style* 0.5–0.7 mm long, well-differentiated from ovary apex, included within the corolla tube; stigma not or scarcely expanded. *Nectary* usually 5-partite, or very occasionally, irregularly 3- or 4-partite or annular, glabrous, the scales 0.20–0.50 mm long, 0.20–0.35 mm wide, apex  $\pm$  truncate or jagged. *Fruit* distinctly shorter than, to a little longer than, the calyx, 2.1–2.8 mm long, 0.9–1.2 mm wide, narrowly ellipsoid or narrowly ovoid, sparsely hairy, smooth above the gynophore; apex truncate forming a narrow rim, the shoulders angular; surface between the shoulders and style base descending; style persistent. (Figures 4B, 11)

*Diagnostic characters.* Within the Geraldton Sandplains *L. stenophyllus* is distinguished by the following character combination: leaves linear, narrowly ovate or narrowly elliptic, to 1.3 mm wide, with recurved margins; leaf undersurfaces grooved and glabrous; nectary partite; ovary 2- or 3-locular, with antrorse-appressed hairs in the lower half; fruit apex truncate, angular, with a narrow rim.

*Other specimens examined.* WESTERN AUSTRALIA: Coomallo Pool property (A. & A. Bellman), 7 km W of Brand Hwy on Jurien Rd, W boundary, Dec. 2001, *A. Bellman* 69 (PERTH); Lesueur National Park, Mt Peron summit, 29 Nov. 1992, *B. Evans* WE 403 (PERTH); 11 miles [*c.* 17.6 km] N of Badgingarra homestead, 25 Apr. 1961, *A.S. George* 2340 (CANB, PERTH); S side of Bibby Rd, 7.3 km E of junction with Munbinea Rd, Jurien Bay, 26 May 2004, *H.J. Hayes* 114 (PERTH); Lesueur



Figure 11. *Leucopogon stenophyllus*. Photograph of flowering branchlet from *B. Evans* 530. Scale bar = 1 cm.

National Park, Cockleshell Gully Rd, 13 km N of Jurien Rd, 11 June 2005, *M. Hislop* 3472 (CANB, PERTH); Lesueur National Park, off Brumby Track, 4.9 km E of Cockleshell Gully Rd, 17 Nov. 2008, *M. Hislop* 3862 (CANB, NSW, PERTH); *c.* 7 km W of Lake Indoon, 7 Jan. 1977, *R.J. Hnatiuk* 770011 (PERTH); Smoke Bush Reserve, Jurien Rd, Jurien: 4.6 km W of Nylagarda Rd, at rest stop on N side of the road, 18 Mar. 2003, *F. Hort* 1947 (CANB, K, PERTH); 1.1 km W of Brand Hwy then 0.6 km S to S of gravel excavation site, Badgingarra National Park, Cervantes–Jurien Rd [Bibby Rd], 5 Feb. 2004, *F. & J. Hort* 2195 (PERTH); Banovich Rd, 1.8 km N of Jurien Rd, track E for 0.4 km, Coomallo Nature Reserve, 6 Feb. 2004, *F. & J. Hort* 2196 (PERTH); Yandin Nature Reserve, Cataby: at junction of Yandin Rd and the track to the tourist lookout, 5 May 2007, *F. & J. Hort* 3000 (CANB, PERTH); 9.1 km NNW of Jurien Rd on road to Cockleshell Gully, *c.* 17.5 km NE of Jurien, 20 Jan. 1996, *B.J. Lepschi & T.R. Lally* 2445 (AD, BRI, CANB, HO, PERTH); site 23, 2.25 km E along Wongonderrah Rd from the turn-off to Nambung Homestead, then due S along track for 2 km, site is 250 m E of track at this point, 29 Oct. 1999, *C. MacPherson s.n.* (PERTH); Pearsons Track, Beekeepers Nature Reserve, 6 May 2008, *V. Westcott* L.D. 18 a (PERTH); Beekeepers Nature Reserve (TR08), 1 May 2008, *V. Westcott* L.D. 20 a (PERTH).

*Distribution and habitat.* Mostly restricted to the Geraldton Sandplains bioregion with limited occurrence in the northern parts of the adjoining Swan Coastal Plain bioregions, from Lake Indoon to the Cataby area (Figure 6). Grows in a variety of low woodland or heath communities, either in shallow sand over laterite, shallow sand over limestone or deep sand.

*Phenology.* As for *L. inflexus*.



*Etymology.* From the Greek *stenos* (narrow) and *-phyllus* (-leaved), a reference to the narrow leaves of this species.

*Conservation status.* This is one of the commonest species of *Leucopogon s. str.* in the southern part of the Geraldton Sandplains bioregion and is well-represented in conservation reserves.

*Affinities.* A member of the Northern Group. The narrow, recurved leaves readily separate this species from all congeners occurring in the Geraldton Sandplains, other than *L. foliosus*. The characters distinguishing these two are given under the Affinities heading for that species.

Before the phrase name *L. sp.* Lesueur was installed on Western Australia's vascular plant census (Western Australian Herbarium 1998–) most collections of this species had been referred either to *L. carinatus* or *L. striatus* R.Br. In retrospect the reason for this confusion is not clear, as there are several strong morphological differences between *L. stenophyllus* and those two species. Most obviously neither *L. carinatus* nor *L. striatus* have recurved leaf margins and while *L. stenophyllus* has a hairy ovary and a drupe with a truncate apex, the former species (in common with the other members of Group D, *sensu* Hislop & Chapman 2007) have a glabrous ovary and a drupe apex with smoothly rounded shoulders. In addition there is a geographical disjunction of many hundreds of kilometres between the Geraldton Sandplains and the Esperance Plains bioregion where *L. carinatus* and *L. striatus* occur.

*Notes.* There are three unusually hairy collections tentatively assigned to this species at the Western Australian Herbarium. The distribution and length of the indumentum on these specimens is very much as described above for the aberrant variant of *L. prolatus* (refer to the Notes heading under that species). One of these specimens is old (*C.A. Gardner* 12775) and with a very vague locality (probably between Gunyidi and Mogumber), while the other two (*M. Hislop* 3990 and *M. Hislop* 4336) are 20–30 km east of Badgingarra. These localities are to the east of the known range of *L. stenophyllus*, which is otherwise not recorded east of Brand Highway. Whereas the anomalous collection of *L. prolatus* was known to be growing with the typical, much less hairy variant, at least in the case of the above-mentioned populations east of Badgingarra, plants were apparently uniform in the detail of their indumentum. The leaves were also slightly broader (to about 1.5 mm wide) than in typical *L. stenophyllus*. More collections of this morphotype are needed before its taxonomic significance can be properly assessed. At this stage it is not included in the species description given above.

### Acknowledgements

I would like to thank the following people who assisted in the preparation of this paper: Skye Coffey for the fruit illustrations, Steve Dillon for generating the distribution maps, Julia Percy-Bower for assisting with the specimen photographs and Kelly Shepherd for formatting the images to best effect.

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