

New species of Western Australian *Styphelia* (Ericaceae: Epacridoideae: Styphelieae) from the *S. pendula* and *S. conostephioides* groups

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Abstract

Hislop, M. New species of Western Australian *Styphelia* (Ericaceae: Epacridoideae: Styphelieae) from the *S. pendula* and *S. conostephioides* groups. *Nuytsia* 32: 199–238 (2021). Eight new species and one new subspecies are described and illustrated. Six of these, *S. caudata* Hislop, *S. globosa* Hislop, *S. graniticola* Hislop, *S. intermediana* Hislop, *S. intricata* Hislop and *S. madida* Hislop belong to the *S. pendula* (R.Br.) Spreng. group (also known as Group V), and the other two, *S. carolineae* Hislop and *S. exarata* Hislop, are from the *S. conostephioides* (DC.) F.Muell. group (also known as Group VIII). *Styphelia madida* includes the subspecies *hirtigera* Hislop. A key is provided to species of the *S. pendula* group occurring in the south-west corner of Western Australia (i.e. west of a line between Perth and Albany), this being the main region of diversity for the group. Five of the new species have conservation coding.

Introduction

Recent publications have added 18 new species of *Styphelia* Sm. to the epacrid flora of Australia: 14 for Western Australia (Hislop & Puente-Lelièvre 2017, 2019; Hislop 2019, 2020a, 2020b) and four for Queensland (Crayn *et al.* 2019; Bean 2020). However, much taxonomic work remains to be done in the genus, especially in Western Australia, where several dozen phrase-named taxa are listed on *Florabase* (Western Australian Herbarium 1998–), most of these still formulated in *Leucopogon* R.Br. (refer to Hislop 2021 for details). A significant proportion of these undescribed taxa either already have conservation coding or are of restricted distribution and in need of conservation assessment. The current paper provides formal names for eight species and one subspecies, with an emphasis on those of conservation significance.

Of the 12 phylogenetic groups resolved in *Styphelia* by Puente-Lelièvre *et al.* (2016), nine occur in Western Australia. Most species of Western Australian *Styphelia* have been placed in one of these nine groups either because of their inclusion in the published phylogeny, or by extrapolation of critical morphological features. Six of the species described below belong to the *S. pendula* (R.Br.) Spreng. group (or Group V) and the other two are from the *S. conostephioides* (DC.) F.Muell. group (or Group VIII). A recent short paper (Hislop 2021) provided an interim key to the infrageneric groups in Western Australia together with lists of their included taxa, including those with phrase names.

While the morphological circumscription of two of the small, exclusively Western Australian groups has now been documented (i.e. Hislop & Puente-Lelièvre 2019; Hislop 2020a), this is not the case for those larger groups, including Group V and Group VIII, that are known to have, or considered likely to have, trans-Australian distributions. Further research into the affinities of some eastern Australian species is required before the morphological boundaries of these groups can be defined.

Methods

This study was based on an examination of dried specimens housed at the Western Australian Herbarium, together with field observations of the species described (excluding *S. exarata* Hislop) and their relatives in Western Australia.

Foliar measurements and observations were taken from dried specimens in natural posture. Care was taken to confine observations to mature leaves. Leaf lamina length is inclusive of the mucro. A separate measurement for the mucro is also given. Inflorescence length was measured from the point of attachment in the axil to the tip of the bud-rudiment. Floral measurements were taken from rehydrated flowers in natural posture, with the exception of the corolla lobes, which were uncurled to their fullest length before measuring. Observations of the floral indumentum were taken from dried material at x 50 magnification. Fruit length is inclusive of a gynophore, if present.

Bioregions referred to in the text and shown on distribution maps follow *Interim Biogeographic Regionalisation for Australia* (IBRA) v. 7 (Department of the Environment 2013).

Taxonomy

Notes relating to inflorescence orientation in Group V

Inflorescence orientation is an important character in the taxonomy of Group V. There are three basic character states in the Group: inflorescences erect (to about 45°), spreading (from about 45°–120°) or strictly pendulous. The differences between the erect (Figure 1) and spreading (Figure 2) states is to some extent arbitrary with some potential overlap between them. Pendulous inflorescences (Figure 3) are qualitatively different however, even from those spreading inflorescences that are held at angles greater than 90°. This is because, as the descriptor suggests, at maturity pendulous inflorescences apparently hang under the influence of gravity alone, and so regardless of their whereabouts on the plant the flowers will be directed downwards. Those with spreading inflorescences, on the other hand, are held by the plant at wide angles against the influence of gravity. These differences are best observed in live plants, and it is on more or less erect branchlets where they are most obvious. Where branchlets are widely spreading however the differences may no longer be evident because both the spreading and pendulous inflorescences will then appear to be held at a wide angle relative to the axis. For this reason, the character is sometimes not easily interpreted on dried specimens. Ideally therefore collectors should carefully record the inflorescence orientation at the time of collection.

Presumably, these differences in inflorescence orientation are an adaptation to different pollen vectors, and this may also be implicated in a substantially correlating difference in the stigma and upper style. With very few exceptions those species with a strictly pendulous inflorescence also have a stigma that is not, or barely, enlarged at anthesis (sometimes the stigma is more noticeably enlarged post-anthesis) and a completely smooth style. In those with erect or spreading inflorescences the stigmas are always distinctly enlarged and the upper portion of the style is usually more or less scabrous.



Figure 1. *Styphelia stricta*. Showing erect inflorescences. Photograph by Fred and Jean Hort.



Figure 2. *Styphelia erubescens*. Showing spreading inflorescences. Photograph by Fred and Jean Hort.



Figure 3. *Styphelia nitens*. Showing pendulous inflorescences. Photograph by Rob Davis.

Key to *Styphelia* species belonging to Group V (the *S. pendula* group) from the south-west corner of Western Australia¹

¹ The key includes all taxa occurring west of a line between Perth and Albany as well as two (*S. woodsii* and *S. madida* subsp. *hirtigera*) that are known to occur close to the eastern boundary of that region and may also occur just inside it. The area encompasses the main centre of diversity for Group V in Western Australia and with this publication all currently recognised members of the group occurring there are now formally described.

1. Inflorescences strictly pendulous (see notes on inflorescence orientation above); stigma usually not, or barely expanded at anthesis (distinctly expanded only in *S. filifolia*); style usually smooth throughout
2. Leaves adaxially concave, the margins not recurved; leaf apex a broad, innocuous callus tip (Porongurup and Stirling Range–Israelite Bay).....**S. woodsii**
- 2: Leaves adaxially convex, the margins recurved to revolute (occasionally ± flat in *S. inframediana*); leaf apex usually strongly mucronate, often pungent (sometimes with an innocuous callus tip in *S. concinna*)
3. Corolla lobes shorter than the tube
 4. Longest leaves per specimen to 5 mm long (very rarely to 6 mm), leaf margins usually gently recurved, longitudinal axis of leaves usually variously recurved; ovary 3- or 4-locular; fruit cylindrical or very narrowly ellipsoid (widespread; New Norcia–Lake Muir–Gibson, and inland in the south of its range to Kojonup and Lake Magenta)..... **S. concinna**
 - 4: Longest leaves per specimen > 5 mm long, or if occasionally no more than 5 mm then leaf margins strongly recurved to revolute, longitudinal axis of leaves usually ± straight; ovary 5-locular; fruit variously shaped, never as above
 5. Leaf margins strongly recurved to revolute, the leaf apical mucro usually innocuous, occasionally sharply pungent; fruit narrowly obovoid (widespread; SE of Armadale–Augusta–Mount Manypeaks, and inland in the south of its range to Boyup Brook and Mount Barker)..... **S. pendula** (typical variant)
 - 5: Leaf margins usually gently recurved, very occasionally moderately recurved in *S. graniticola*, the leaf apical mucro always sharply pungent; fruit ovoid, ellipsoid, narrowly ovoid, narrowly ellipsoid or occasionally (*S. graniticola*) narrowly obovoid
 6. All, or at least some leaves retrorse; style 6.5–9.0 mm long; filaments attached to anthers 1/3–1/2 above anther base; fruit usually ovoid or narrowly ovoid, occasionally ellipsoid or narrowly ellipsoid, at least 3 mm wide (mostly Darling Range; N of Bindoon–Boyup Brook)..... **S. nitens**
 - 6: Leaves variously antrorse; style 3.5–5.3 mm long; filaments attached to anthers 2/3–3/4 above anther base; fruit narrowly ellipsoid to narrowly obovoid, 1.7–2.0 mm wide (restricted; SW to NE of Walpole)..... **S. graniticola**
- 3: Corolla lobes longer than the tube
 7. Longest leaves per specimen to 5 mm long (very rarely to 6 mm), leaf margins usually gently recurved, longitudinal axis of leaves usually variously recurved; ovary 3- or 4-locular; fruit cylindrical or very narrowly ellipsoid (widespread; New Norcia–Lake Muir–Gibson, and inland in the south of its range to Kojonup and Lake Magenta)..... **S. concinna**

- 7: Longest leaves per specimen > 5 mm long, or if occasionally no more than 5 mm then leaf margins strongly recurved to revolute, longitudinal axis of leaves usually \pm straight; ovary 5-locular; fruit variously shaped, never as above
8. Leaf apices shortly mucronate (the mucros 0.1–0.6 mm long) and innocuous, or very occasionally sub-pungent
9. Sepals and bracteoles shortly and densely hairy; fruit actinomorphic, globose or occasionally broadly ellipsoid (Busselton–Scott River–Donnybrook, with an apparent outlier in the Yarloop area).....**S. globosa**
- 9: Sepals and bracteoles glabrous; fruit strongly zygomorphic or if actinomorphic, narrowly obovoid
10. Adaxial leaf surfaces with 3–5 sunken longitudinal lines evident; stigma distinctly expanded; fruit strongly zygomorphic, bilaterally compressed (sporadically from N of Eneabba–Harvey)**S. filifolia**
- 10: Adaxial leaf surfaces smooth, lacking sunken lines; stigma not, or barely, expanded; fruit actinomorphic, circular in transverse section, narrowly obovoid (Walpole–Albany–Stirling Range)**S. pendula** (short-tube variant)
- 8: Leaf apices long-mucronate (the mucros 0.4–2.0 mm long) and sharply pungent
11. Tangled, spreading shrubs; leaves linear or very narrowly ovate, 0.5–1.7 mm wide, \pm patent to strongly retrorse; inflorescence axes glabrous; filaments 0.3–0.6 mm long; fruit ellipsoid to obovoid (SE of Margaret River–E of Augusta) **S. intricata**
- 11: Erect shrubs, never tangled; leaves variously shaped, but if linear or very narrowly ovate, then wider leaves > 1.7 mm wide, mostly variously antrorse (sometimes retrorse in *S. inframediana*); inflorescence axes hairy (sometimes \pm glabrous in *S. madida* subsp. *madida*); filaments 0.5–1 mm long; fruit globose, broadly ellipsoid, broadly obovoid or (sometimes in *S. inframediana*) ellipsoid
12. Leaves 3.5–9.0 mm long, including a mucro 0.4–0.8 mm long; bracteoles 0.8–1.0 mm long, including a mucro 0.1–0.2 mm long; inflorescence axes 2.0–5.2 mm long; fruit broadly obovoid to ellipsoid (Denmark–Albany–Stirling Range).....**S. inframediana**
- 12: Leaves 8.0–21 mm long, including a mucro 0.7–2.0 mm long; bracteoles 1.0–1.6 mm long, including a mucro 0.2–0.7 mm long; inflorescence axes 3.0–10 mm long; fruit globose or broadly ellipsoid
13. Young branchlets with sparse to moderately dense indumentum of short, straight hairs to c. 0.1 mm long; leaves 0.8–2.0 mm wide, the widest usually 1.8 mm or less; bracteole mucros 0.2–0.4 mm long; sepals 1.8–2.7 mm long (NW of Walpole–William Bay).....**S. madida** subsp. **madida**
- 13: Young branchlets with a dense indumentum of straight or wavy hairs 0.1–0.4 mm long; leaves 1.5–3.8 mm wide, the widest usually at least 2.2 mm; bracteole mucros 0.4–0.7 mm long; sepals 2.5–3.0 mm long (just E of Albany–Bald Island)**S. madida** subsp. **hirtigera**
- 1: Inflorescences erect to spreading (see notes on inflorescence orientation above); stigma distinctly expanded at anthesis; style usually scabrous in the upper half

14. Sepals equal to, or longer than, the corolla tube
15. Sepals acute, prominently mucronate; leaves strongly antrorse, very narrowly elliptic, very narrowly obovate or linear, longest leaves per specimen, 16–30 mm long (widespread; Warradarge–Augusta–Cape Riche, and inland to Narrogin and the Stirling Range) **S. propinqua**
- 15: Sepals obtuse, not mucronate; leaves spreading, varying from shallowly antrorse to shallowly retrorse, narrowly elliptic to narrowly ovate, if linear-oblong then longest leaves per specimen 9–16 mm long (near-coastal and islands; Dongara–Mandurah) **S. insularis**
- 14: Sepals shorter than the corolla tube
16. Leaves strongly glaucous, margins obviously ciliate with stiff, spreading hairs, 0.1–0.2 mm long; inflorescences erect (mostly Darling Range; John Forrest N.P. –Darkan area) **S. stricta**
- 16: Leaves not glaucous, margins glabrous or minutely ciliolate with hairs < 0.05 mm long; inflorescences spreading
17. Inflorescence axis glabrous; leaves mostly long-linear or less often very narrowly ovate, very narrowly elliptic or very narrowly obovate, longest leaves per specimen 15–35 mm long; fruit strongly zygomorphic, bilaterally compressed (somewhat disjunct; Lancelin–Yalgorup; Margaret River–Two Peoples Bay) **S. racemulosa**
- 17: Inflorescence axis hairy; leaves usually wider than above, ovate to narrowly ovate, elliptic to narrowly elliptic or obovate to narrowly obovate, if linear-oblong the longest leaves per specimen 7–16 mm long; fruit actinomorphic, circular in transverse section
18. Corollas white or pink to red; corolla tube hairy on internal surfaces; sepal margins ciliolate not obviously translucent; fruit ellipsoid, narrowly ellipsoid, obovoid or narrowly obovoid, mesocarp not, or poorly, developed (widespread; Moore River N.P.–Augusta–W of Bremer Bay, and inland to York and the Stirling Range) **S. erubescens**
- 18: Corollas always white; corolla tube glabrous below the lobes on internal surfaces; sepal margins glabrous, translucent; fruit globose or broadly ovoid, mesocarp well developed, obviously fleshy (near-coastal and islands; Dongara–Mandurah) **S. insularis**

New species from Group V

Styphelia caudata Hislop, *sp. nov.*

Typus: south of Wongan Hills, Western Australia [precise locality withheld for conservation reasons], 2 April 2000, *M. Hislop* 1984 (*holo*: PERTH 05556333; *iso*: CANB, CNS, HO, K, MEL, NSW).

Leucopogon sp. Bungulla (R.D. Royce 3435), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 30 July 2021]

Spreading *shrubs*, to *c.* 100 cm high and 100 cm wide, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with sparse indumentum of short hairs, < 0.05 mm long. *Leaves* spirally arranged, antrorse, usually steeply so, the first leaves produced during a growth flush with noticeably paler margins than later leaves; apex obtuse to acute, with a blunt, callus tip to *c.* 0.1 mm long; base cuneate; petiole conspicuous, 0.5–1.0 mm long, adaxial surface hairy, abaxial surface

glabrous, margins glabrous or ciliolate; lamina elliptic to obovate, or narrowly so, 2.4–4.3 mm long, 1.1–2.4 mm wide, concave adaxially, longitudinal axis gently incurved throughout or sometimes tending to recurve slightly towards the apex; surfaces \pm concolorous, matt or slightly shiny; adaxial surface mostly glabrous, but with some hairs towards the base, venation not, or barely, evident; abaxial surface glabrous, with 5–7 raised primary veins (the midrib slightly broader than the others); margins often irregularly ciliate, at least when young, but usually glabrescent on older leaves, sometimes \pm erose or crenulate. *Inflorescence* axillary, spreading at *c.* 45°–90°, but often \pm erect in early flower; axis 1.3–1.8 mm long, 1- or occasionally 2-flowered, densely hairy, \pm terete below the uppermost fertile bract, compressed and \pm narrowly winged above, terminating in a bud-rudiment; flowers spreading, subsessile or very shortly pedicellate below the bracteoles with a pedicel to *c.* 0.3 mm long. *Fertile bracts* ovate to broadly ovate, 0.5–0.8 mm long, 0.4–0.8 mm wide, and with usually 2(3) sterile bracts below the lowest fertile bract. *Bracteoles* depressed-ovate to \pm orbicular, 0.8–1.2 mm long, 0.8–1.2 mm wide, not keeled, obtuse, mucronate (the mucro 0.05–0.2 mm long); abaxial surface glabrous, not striate; margins ciliolate. *Sepals* narrowly ovate, (1.5–)1.7–2.3 mm long, (0.7–)0.8–1.0 mm wide, obtuse to acute, and usually with a prominent, often recurved, flexible mucro (very occasionally absent); abaxial surface glabrous, straw-coloured, venation obscure, only the mid-vein evident; adaxial surface glabrous or with a few hairs towards the apex; margins densely ciliolate, with hairs to *c.* 0.1 mm long. *Corolla tube* white, narrowly ellipsoid to cylindrical, longer than the sepals, 2.5–3.5 mm long, 1.6–2.0 mm wide, glabrous on both surfaces. *Corolla lobes* white, shorter than, or rarely \pm equal to the tube, (1.8–)2.0–2.5 mm long, (0.6–)0.7–1.0 mm wide at base, erect in basal 1/2–2/3 of their length, and then spreading and recurved to revolute, external surface glabrous, internal surface with a dense, white indumentum of flattened, twisted and ornamented hairs. *Anthers* partially exerted (by 7/8 of their length) or fully exerted from the tube, but not exerted beyond the erect basal portion of the corolla lobes, 0.8–1.5 mm long, apex emarginate. *Filaments* terete, 0.7–1.1 mm long, attached to the anther 2/3–3/4 above base or occasionally a little higher, adnate to the tube just below the sinuses. *Nectary* annular, 0.3–0.4 mm long, glabrous, \pm truncate to shallowly lobed. *Ovary* narrowly ellipsoid or occasionally ellipsoid, 0.6–1.0 mm long, 0.4–0.5 mm wide, glabrous, 5-locular, dark green. *Style* usually glabrous and smooth or occasionally faintly scabrous towards the apex, 3.4–4.9 mm long, exerted from the corolla tube to a point just beyond the erect corolla lobe bases, tapering smoothly from ovary apex; stigma distinctly expanded. *Fruit* narrowly ellipsoid, *c.* 2.2–2.3 mm long and 1.3–1.4 mm wide (but see comment under *Notes* below), much longer than the sepals, circular in transverse section, gynophore absent; surface glabrous, shallowly rugose at maturity; apex rounded to subacute; style shed before maturity. (Figures 4, 5)

Diagnostic characters. Within Group V, *S. caudata* is distinguished by the following character combination: leaves elliptic to obovate, or narrowly so, adaxially concave, terminating in a blunt callus tip to *c.* 0.1 mm long; inflorescences spreading at *c.* 45°–90°, 1- or 2-flowered; sepals glabrous, obtuse to acute, usually terminating in a prominent, often recurved, flexible mucro (very occasionally absent); corolla tube longer than the sepals and corolla lobes; ovary 5-locular, glabrous; style usually glabrous and smooth or occasionally faintly scabrous towards the apex; stigma distinctly expanded; fruit narrowly ellipsoid, circular in transverse section, shallowly rugose, gynophore absent.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 21 May 1970, *K.M. Allan* 248 (CANB, MEL, PERTH); 30 Apr. 2008, *J.M. Collins* 456 (PERTH); 12 June 2008, *J.M. Collins* 461 (PERTH); 3 July 2008, *J.M. Collins* 466 (PERTH); 25 May 1922, *C.A. Gardner* 1711 (PERTH); 7 May 2005, *M. Hislop* 3441 (CANB, CNS, NSW, PERTH); 8 May 2005, *M. Hislop* 3442 (CNS, NSW, PERTH); 8 May 2005, *M. Hislop* 3443 (CNS, PERTH); 24 Sep. 2005, *M. Hislop* 3523 (PERTH); 22 June 1996, *B.J. Lepschi & T.R. Lally* BLJ 2629 (CANB, PERTH); 2 June 1986, *S. Patrick* 258 (PERTH); 2 July 2002, *S. Patrick* 4116 (PERTH); 23 July 2001, *S. Patrick*



Figure 4. *Styphelia caudata* – flowering plant *in situ*. Voucher *M. Hislop* 3442. Photograph by Michael Hislop.

SP 3920A (PERTH); 1 May 1951, *R.D. Royce* 3435 (PERTH); 23 June 1983, *B.H. Smith* 221 (CANB, MEL, NSW, PERTH); 4 July 2007, *S. Thomas* 5 (PERTH).

Distribution and habitat. Recent collections of this species are all from a restricted part of the Avon Wheatbelt bioregion from Wongan Hills and Cadoux in the north, southwards to Dowerin. There is also a 50-year-old record from the Yerecoin area, to the west of the above distribution, and several

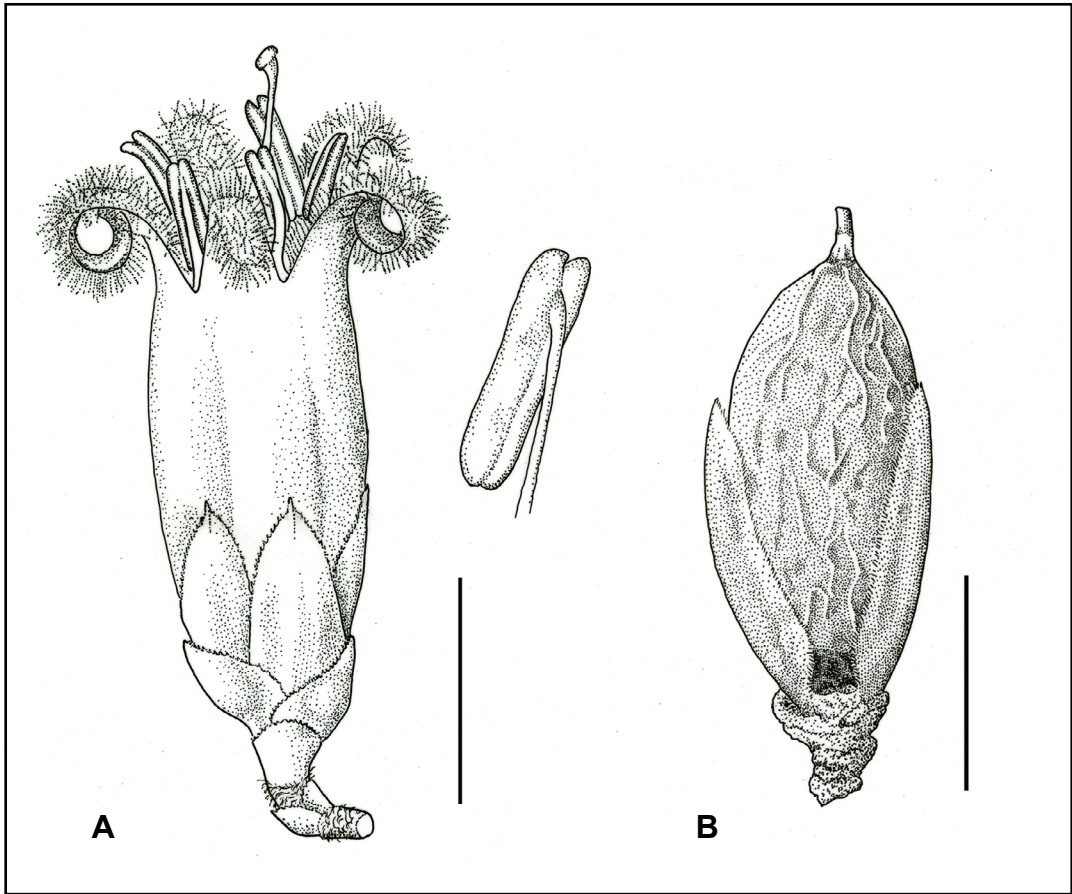


Figure 5. *Styphelia caudata*. A – 1-flowered inflorescence, stamen; B – fruit. Scale bars = 1 mm. Vouchers *M. Hislop* 3442 (A), *M. Hislop* 3523 (B). Drawings by Skye Coffey.

even older collections made in the Kellerberrin–Yorkrakine area to the east. The species grows in sand or light loamy soils, sometimes over laterite, in heath or open mallee woodland. Commonly associated species include *Eucalyptus pyriformis*, *Allocasuarina campestris*, *Hakea scoparia*, *Styphelia serratifolia* and *Ecdeiocolea monostachya*.

Phenology. Flowers between April and July, with the onset of flowering probably determined by the first significant rains of autumn. The only specimen with mature fruit present was collected in late September.

Etymology. From the Latin *caudatus* (ending with a narrow, tail-like appendage), a reference to the usually prominent and often recurved sepal mucros.

Conservation status. Listed as Priority Three (Smith & Jones 2018) under Conservation Codes for Western Australian Flora under the name *Leucopogon* sp. Bungulla (R.D. Royce 3435). *Styphelia caudata* has a restricted distribution in a heavily cleared part of the wheatbelt. As indicated under the distribution heading above it seems likely that it was formerly more widespread, but with no collections from the east of its range in the last 70 years it may no longer be extant in that area.

Affinities. *Styphelia caudata* was not included in the phylogeny of Puente-Lelièvre *et al.* (2016) but critical morphological attributes strongly indicate that it belongs in Group V (or the *S. pendula* group). The combination of widely spreading inflorescences, annular nectaries, dark green ovaries and anthers that are either partially exerted from the corolla tube or if fully exerted, then not exerted beyond the erect corolla lobe bases, would see the species key out at the second lead of couplet 11 in the key to infrageneric groups (Hislop 2021).

Before the species was recognised by the phrase name *L. sp. Bungulla*, older collections had mostly been assigned to either *S. woodsii* (F.Muell.) F.Muell. or *S. leptantha* (Benth.) F.Muell. This is understandable because, like *S. caudata*, those species have adaxially concave leaves with non-pungent apices, while by far the majority of species in Group V have convex leaves with pungent apices.

Styphelia woodsii is restricted to the south coast of Western Australia, but in any case, it can be readily distinguished from *S. caudata* by its strictly pendulous inflorescence (*cf.* spreading at *c.* 45°–90° in *S. caudata*), glabrous inflorescence axis (*cf.* hairy), eciliate sepal margins (*cf.* ciliate) and sepals equal to, or longer than, the corolla tubes (*cf.* shorter than the tubes).

Styphelia leptantha, from the Geraldton Sandplains and far north of the Swan Coastal Plains bioregion, could certainly be confused with *S. caudata*, at least when fruit is not available. A useful macroscopic distinguishing feature is that the leaves of *S. leptantha* are always distinctly glaucous compared to the mid-green aspect of *S. caudata*. Other differences observable on flowering specimens are associated with the style surfaces (more or less smooth or occasionally very faintly scabrous towards the apex in *S. caudata*, strongly scabrous in *S. leptantha*) and sepal apex (usually with a prominent mucro in *S. caudata*, smoothly rounded in *S. leptantha*). The most significant difference between the two species however is in their fruit: circular in section, shallowly rugose (i.e. with a well-developed mesocarp) and lacking a gynophore in *S. caudata*; strongly angular, smooth (mesocarp not, or barely developed), with gynophore present in *S. leptantha*.

Notes. Note that this species is not included in the key above because its distribution lies well outside of the area covered by that key.

The fruit measurements are based on a single fruiting collection and therefore cannot be regarded as definitive.

While there is little doubt that the Yerecoin specimen (*K.M. Allan* 248) mentioned above is referable to this species it differs from all other collections in its relatively longer and narrower leaves. It is also one of very few specimens in which the sepal mucro is very obscure or absent.

In the Marchagee district of the Geraldton Sandplains bioregion, to the north-west of the known distribution of *S. caudata*, there occurs a plant with a similar morphology, but which differs in ways that are likely to be taxonomically significant. This morphotype has a consistently erect inflorescence axis that is a little shorter than in typical *S. caudata*. Its leaves tend to be wider (to at least 3 mm) and the leaf tips may either be very shortly mucronate with a blunt mucro *c.* 0.2 mm long (e.g. *M. Hislop* 4325a) or long-mucronate and sharply pungent with mucros *c.* 0.5 mm long (e.g. *M. Hislop* 4325b). It is known only from two populations a few kilometres apart, one of which is apparently no longer extant. Further research is desirable before a decision is taken regarding its taxonomic status; in particular, it would be especially valuable to see fruiting material. Because the only known, extant population co-occurs with Threatened Flora at its roadside habitat it is at least afforded some protection, whether or

not it is ultimately assessed to be a distinct taxon. In the meantime, these specimens will be referred to *S. aff. caudata* and are excluded from the above description of *S. caudata*.

***Styphelia globosa* Hislop, sp. nov.**

Typus: Mowen Nature Reserve, Great North Road, 3 km south of Mowen Road, west of Nannup, Western Australia, 20 May 2006, M. Hislop 3597 (*holo*: PERTH 07515987; *iso*: CANB, CNS, MEL, NSW).

Leucopogon sp. Margaret River (J. Scott 207), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 30 July 2021]

Erect, open *shrubs*, to c. 1.5 m high and 1.2 m wide, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a moderately dense indumentum of short hairs, to c. 0.1 mm long. *Leaves* spirally arranged, mostly steeply antrorse; apex mucronate, innocuous or rarely sub-pungent, the mucro usually \pm straight, occasionally slightly deflexed or slightly inflexed, 0.2–0.6 mm long; base attenuate to cuneate; petiole 0.4–1.2 mm long, the adaxial surface hairy and the margins either glabrous throughout or with a few hairs towards the base, the abaxial surface glabrous; lamina linear, very narrowly elliptic or very narrowly obovate, 6–20 mm long, 1.0–2.7 mm wide, convex adaxially with the margins varying from slightly recurved to revolute, longitudinal axis \pm straight, usually slightly twisted; surfaces \pm concolorous or the abaxial surface slightly paler; adaxial surface shiny, glabrous, apart from a few hairs towards the base, with 3–5 obscure veins evident, at least towards the base; abaxial surface matt or slightly shiny, glabrous, with 5–7 primary veins (the midrib slightly broader than the others, at least towards the apex), \pm flat or shallowly and broadly grooved between the veins; margins glabrous, except sometimes for a few short, antrorse hairs towards the apex. *Inflorescence* axillary, pendulous; axis 4.0–9.5 mm long, 1- or 2(3)-flowered, with a sparse to moderately dense indumentum, terete below the uppermost fertile bract, plano-convex and often shortly winged above, terminating in a bud-rudiment; flowers pendulous, pedicellate below the bracteoles, with a pedicel 0.6–1.5(–2.0) mm long. *Fertile bracts* ovate to broadly ovate, 0.7–0.9(–1.5) mm long, 0.5–0.7 mm wide, with 2–5 sterile bracts below the lowest fertile bract. *Bracteoles* depressed-ovate, 0.9–1.5 mm long, 1.2–1.6 mm wide, keeled, though often rather obscurely, obtuse, shortly mucronate (the mucro 0.1–0.2 mm long); abaxial surface shortly and densely hairy, not or scarcely striate; margins minutely ciliolate. *Sepals* ovate to narrowly ovate, 2.0–2.8 mm long, 1.2–1.5 mm wide, subacute to acute, sometimes shortly mucronate; abaxial surface shortly and densely hairy, straw-coloured, venation very obscure; adaxial surface hairy in the upper half; margins minutely ciliolate with hairs < 0.05 mm long. *Corolla tube* white, obovoid to depressed-obovoid, usually c. equal to the sepals, occasionally slightly longer, 1.5–2.2 mm long, 1.8–2.3 mm wide, external surface glabrous, internal surface glabrous. *Corolla lobes* white, longer than the tube, 4.0–4.8 mm long, 1.0–1.3 mm wide at base, erect in basal 2/3–3/4 of their length, and then spreading and revolute to \pm coiled abaxially, external surface glabrous, internal surface with a dense, white indumentum of flattened to \pm terete, twisted and ornamented hairs. *Anthers* fully exerted from the corolla tube, but not exerted beyond the erect basal portion of the corolla lobes, 2.5–3.5 mm long, distinctly narrowed towards apex and often \pm filiform, \pm entire to shortly emarginate. *Filaments* terete, 1.2–1.8 mm long, attached to anther 1/3–1/2 above anther base, adnate to the tube just below the sinuses. *Nectary* annular, 0.3–0.5 mm long, glabrous, \pm truncate to very shallowly lobed. *Ovary* ovoid to ellipsoid, 0.8–1.1 mm long, 0.6–0.8 mm wide, glabrous, 5-locular, dark green to almost black. *Style* 5.2–6.2 mm long, glabrous and smooth, exerted from the corolla tube well beyond the erect corolla lobe bases, tapering smoothly from ovary apex; stigma not, or barely, expanded. *Fruit* globose or occasionally broadly ellipsoid, 3.8–5.5 mm long, 3.8–5.5 mm wide, much longer than the sepals, circular in transverse section, gynophore absent; surface glabrous, strongly rugose at maturity; apex rounded; style shed before maturity. (Figures 6, 7)



Figure 6. *Styphelia globosa*. A – flowering plant *in situ*; B – flowering branchlet. Vouchers M. Hislop 1292 (A), K.R. Thiele 3521 (B). Photographs by Michael Hislop (A), Kevin Thiele (B).

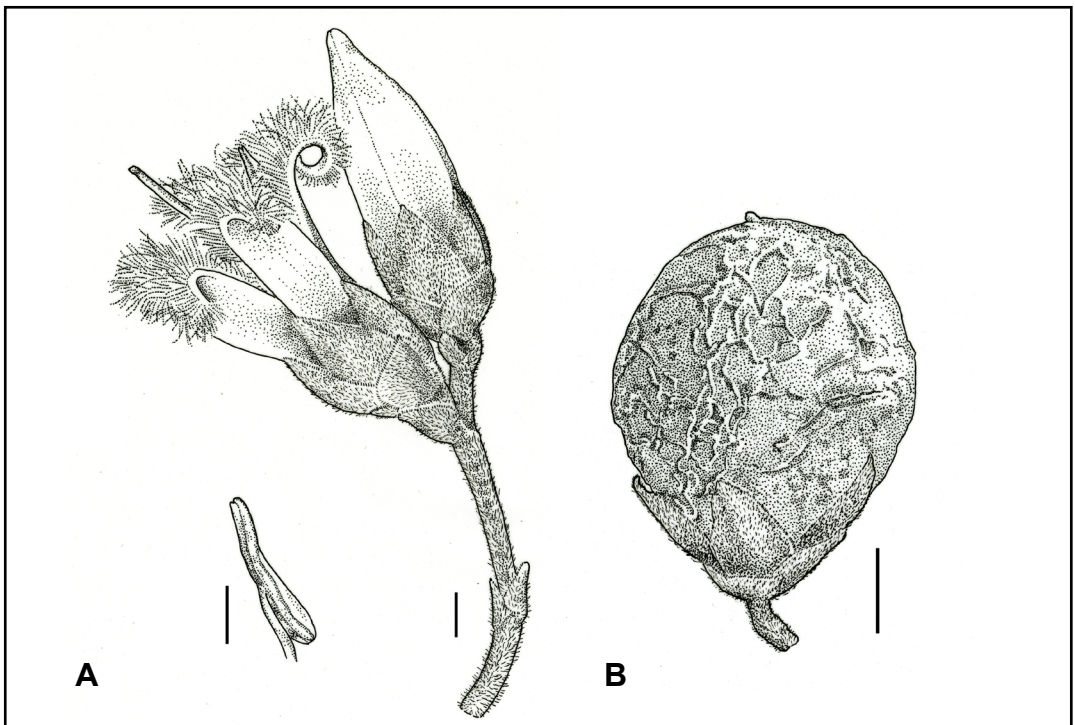


Figure 7. *Styphelia globosa*. A – 2-flowered inflorescence, stamen; B – fruit. Scale bars = 1 mm. Vouchers M. Hislop 3596 (A), R. Davis 4343 (B). Drawings by Skye Coffey.

Diagnostic characters. Within Group V, *S. globosa* is distinguished by the following character combination: leaves linear, very narrowly elliptic or very narrowly obovate, usually steeply antrorse, 1.0–2.7 mm wide, adaxially convex, the margins slightly recurved to revolute, leaf apices mucronate, usually innocuous and 0.2–0.4 mm long (occasionally sub-pungent and to 0.6 mm); inflorescences pendulous, 1- or 2(3)-flowered; sepals densely and shortly hairy, subacute to acute, sometimes shortly mucronate; corolla tube about equal to the sepals or occasionally slightly longer, shorter than the corolla lobes; ovary 5-locular, glabrous; style glabrous and smooth; stigma not, or barely, expanded; fruit globose or occasionally broadly ellipsoid, circular in transverse section, strongly rugose, gynophore absent.

Other specimens examined. WESTERN AUSTRALIA: 500 m S of Williamson Rd on Quilergup Rd [SE of Busselton], 23 May 2001, *R.J. Cranfield* 16407 (PERTH); 5 km WNW of Bibilup [NW of Nannup], 11 June 1996, *R. Davis* 1189 (PERTH); corner of Capel–Donnybrook Rd and Camp Gully Rd, SW of Donnybrook, 21 Oct. 1997, *R. Davis* 4343 (CNS, PERTH); Cell 7, Site 167, corner Blackwood Rd and Great North Rd, 50 m E on Blackwood Rd, bearing N [NE of Augusta], 21 Oct. 1998, *R. Davis* 7660 (PERTH); 4 miles [6.4 km] SW of Donnybrook, 20 Apr. 1966, *A.S. George* 7715 (CANB, CNS, PERTH); State forest near corner of Mowen Rd and Jalbarragup Rd, W of Nannup, 24 May 1998, *M. Hislop* 1052 (CANB, NSW, PERTH); c. 8 km NW of Nannup on W side of Vasse Hwy, 23 May 1999, *M. Hislop* 1292 (NSW, PERTH); corner Vasse Hwy and Cundinup South Rd, N of Nannup, 20 May 2006, *M. Hislop* 3596 (CANB, CNS, MEL, NSW, PERTH); Blackwood Conservation Park, Sues Rd, at intersection with Blackwood Rd, W of Nannup, 29 Apr. 2021, *M. Hislop* 4852 (CNS, K, MEL, PERTH); Site 92, 14 km NE of Margaret River, 19 Sep. 1997, *P.A. Jurjevich* 46 (PERTH); Ambergate Reserve [SW of Busselton], 11 Apr. 1992, *B.J. Keighery & N. Gibson* 1082 (PERTH); Whicher Range, Sabina Rd, just past St. Josephs Rd, 17 May 1991, *G.J. Keighery* 14179 (PERTH); Bancell Road reserve, 2 km N of Yarloop, 23 Nov. 2004, *G.J. Keighery & B.J. Keighery* 755 (PERTH); Bramley National Park [E of Margaret River], 12 May 2007, *G.J. Keighery & B.J. Keighery* 998 (PERTH); Acton Park Hall, Reserve 18918, Acton Park Rd [S of Busselton], 11 May 2007, *G.J. Keighery & B.J. Keighery* 1000 (K, MEL, PERTH); Site: MTC_RO50, Milyeannup Coast Rd, near powerline, close to intersection with South Coast Rd [E of Augusta], 24 Nov. 2008, *R. Orifici, R. Butler & P. Anderson* RO 253 (PERTH); Scott River National Park, 23 Oct. 1990, *C.J. Robinson* 253 (PERTH); Boronia State Forest, near corner of Baker Rd and Mowen Rd, 9 May 2000, *L.W. Sage* 2363 (PERTH); Davis Rd/McLean Rd, 5 km E of Witchcliffe, 19 Mar. 2000, *J. Scott* 207 (PERTH); Davis Rd, 4.2 km E of Bussell Hwy, 1 km S of Witchcliffe, 14 Oct. 2000, *J. Scott* 260 (PERTH).

Distribution and habitat. Occurs from Busselton south to the Scott River area and east to near Donnybrook, in the far west of the Warren, far south of the Swan Coastal Plain and far south-west of the Jarrah Forest bioregions. There is also an apparently outlying population further north, near Yarloop. The species is mostly recorded from sandy soils, often over laterite and most frequently in Jarrah-Marri woodland. Other commonly associated species are *Banksia grandis*, *Allocasuarina fraseriana*, *Podocarpus drouynianus*, *Taxandria parviceps*, *Acacia extensa*, *Hovea elliptica* and *Xanthorrhoea preissii*.

Phenology. Peak flowering is between April and June and most collections with mature fruit have been made in October and November. In regard to flowering time, the outlying collection from near Yarloop (*G.J. Keighery & B.J. Keighery* 755) is an interesting exception in that it is in full flower in late November. Despite the geographical disjunction and anomalous flowering time this specimen is morphologically typical for the species in all respects.

Etymology. From the Latin *globosus* (spherical), a reference to the usual shape of the fruit.

Conservation status. Although the distribution of this species is not extensive, it is locally common and well represented on the conservation estate, as well as in state forest. No conservation coding is recommended.

Affinities. *Styphelia globosa* belongs in Group V of Puente-Lelièvre *et al.* (2016). In the published phylogenetic tree, it was placed (as *Leucopogon* sp. Margaret River) in the same polytomy as *S. graniticola* Hislop (refer affinities heading under that species for details).

Styphelia globosa is broadly sympatric with two related species, *S. pendula* and *S. intricata* Hislop. It can be distinguished from the former by its densely, shortly hairy sepals and bracteoles (*cf.* glabrous in *S. pendula*) and, at least across the part of the far south west where the two co-occur, by the corolla tubes of *S. globosa* being distinctly shorter than the corolla lobes (*cf.* usually distinctly longer, occasionally \pm equal to) and about equal to or slightly longer than the sepals (*cf.* distinctly longer). As noted under *S. inframediana* Hislop there is a variant of *S. pendula* that has proportionally shorter corolla tubes, about the same length as the sepals, but this plant occurs to the east of the range of *S. globosa*.

In addition to the hairy rather than glabrous sepals and bracteoles, *S. globosa* is distinguished from *S. intricata* by its wider, consistently antrorse leaves (*cf.* more or less patent to strongly retrorse in *S. intricata*) with innocuous or scarcely pungent leaf tips to 0.6 mm long, but usually 0.2–0.4 (*cf.* sharply pungent 0.6–1.0 mm long). The large, globose or occasionally broadly ellipsoid fruit of *S. globosa* provides a further distinction from both *S. pendula* (narrowly obovoid fruits) and *S. intricata* (ellipsoid to obovoid).

Another somewhat similar taxon, *Styphelia madida* Hislop subsp. *madida*, occurs in forest country to the east of the distribution of *S. globosa* in the Walpole–Denmark area. It differs from *S. globosa* in having glabrous rather than hairy sepals, longer and sharply pungent leaf mucros (*cf.* innocuous or rarely sub-pungent in *S. globosa*) and shorter anthers (1.8–2.6 mm long *cf.* 2.5–3.5).

Notes. Although *S. globosa* typically has innocuous leaf mucros, 0.2–0.4 mm long, there are a very few collections in which the mucro is longer (to 0.6 mm) and sub-pungent. In all other respects these specimens match the typical form of the species. It is noteworthy that a similar pattern of variation also occurs in *S. pendula*, which like *S. globosa* usually has short, innocuous leaf mucros, but in which they are occasionally longer and pungent or sub-pungent.

Two specimens from the south-eastern edge of the species range (*J.M. Powell* 2634 and *A.R. Chapman* 361 & *J.M. Powell*) suggest the possibility of hybridisation between *S. globosa* and another member of Group V, with *S. pendula* maybe the most likely candidate. Both specimens have the bracteole and sepal hairs of *S. globosa* (although these somewhat sparser than in that species), in combination with corolla tubes that are longer than the lobes. In *Powell* 2634 the leaf margins are barely recurved and the apices are strongly pungent, whereas *Chapman* 361 has strongly recurved margins and shorter sub-pungent apices.

Styphelia graniticola Hislop, *sp. nov.*

Typus: north of Walpole, Western Australia [precise locality withheld for conservation reasons], 1 September 2005, *M. Hislop* 3503 (*holo:* PERTH 07357877; *iso:* CANB, CNS, MEL, NSW 832203).

Leucopogon sp. Southern Granite (E.D. Middleton EDM 266), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 30 July 2021]

Spreading *shrubs*, to *c.* 80 cm high and 80 cm wide, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a sparse to moderately dense indumentum of short hairs, < 0.05 mm long. *Leaves* spirally arranged, shallowly to steeply antrorse; apex long-mucronate, pungent, the mucro \pm straight, 0.7–1.2 mm long; base cuneate to attenuate; petiole 0.7–1.2 mm long, glabrous, apart from a few hairs on the adaxial surface; lamina narrowly elliptic to narrowly obovate, 7–12 mm long, 1.9–3.6 mm wide, convex adaxially with the margins usually barely recurved, very occasionally moderately recurved, longitudinal axis \pm straight (gently incurved to gently recurved), usually slightly twisted; surfaces slightly discoloured; adaxial surface shiny, glabrous, apart from a few hairs towards the base, with 3–5 obscure veins usually evident, at least towards the base; abaxial surface slightly paler, matt, glabrous, with 5–7 primary veins (the midrib slightly broader than the others, at least towards the apex), \pm flat to very shallowly and broadly grooved between the veins; margins glabrous. *Inflorescence* axillary, pendulous; axis 1.5–5.5 mm long, 1- or 2-flowered, with a sparse to moderately dense indumentum, terete below the uppermost fertile bract, plano-convex and narrowly winged above, terminating in a bud-rudiment; flowers pendulous, pedicellate below the bracteoles, with a pedicel 0.4–0.8 mm long. *Fertile bracts* broadly ovate to depressed-ovate, 0.3–0.6 mm long, 0.5–0.7 mm wide, and with (3)4–5 sterile bracts below the lowest fertile bract. *Bracteoles* depressed ovate to \pm orbicular, 1.0–1.2 mm long, 1.2–1.3 mm wide, obscurely keeled in the upper half, obtuse, shortly mucronate (the mucro to *c.* 0.1 mm long); abaxial surface glabrous, not or scarcely striate; margins minutely ciliate. *Sepals* ovate or narrowly ovate, 1.8–2.2 mm long, 1.2–1.4 mm wide, obtuse to acute, often shortly mucronate; abaxial surface glabrous, straw-coloured, sometimes with pink tinges, venation very obscure; adaxial surface sparsely hairy in the distal half; margins minutely ciliate, with hairs < 0.05 mm long. *Corolla tube* white, obovoid to broadly obovoid, longer than the sepals, 3.0–4.1 mm long, 2.2–3.0 mm wide, external surface glabrous, internal surface glabrous. *Corolla lobes* white, shorter than the tube, 2.0–2.8 mm long, 1.2–1.8 mm wide at base, erect in basal 2/3–3/4 of their length, and then spreading and recurved to revolute, external surface glabrous, internal surface with a dense, white indumentum of flattened, twisted and ornamented hairs. *Anthers* partially exerted (by at least 7/8 of their length), or fully exerted from the corolla tube, but not exerted beyond the erect basal portion of the corolla lobes, 1.0–1.5 mm long, apex emarginate. *Filaments* terete, 0.9–1.2 mm long, attached to the anther 2/3–3/4 above base, adnate to the tube just below the sinuses. *Nectary* annular, 0.3–0.5 mm long, glabrous, variably lobed. *Ovary* ellipsoid or broadly ellipsoid, 0.9–1.1 mm long, 0.7–0.8 mm wide, glabrous, 5-locular, dark green to almost black. *Style* glabrous and smooth, 3.5–5.3 mm long, exerted from the corolla tube to a point just beyond the erect corolla lobe bases, tapering smoothly from ovary apex; stigma not, or barely, expanded. *Fruit* narrowly ellipsoid to narrowly obovoid, 3.4–4.3 mm long, 1.7–2.0 mm wide, much longer than the sepals, circular in transverse section, gynophore absent; surface glabrous, mostly \pm smooth or shallowly rugose, but more deeply rugose towards the base at maturity; apex rounded; style shed before maturity. (Figures 8, 9)

Diagnostic characters. Within Group V, *S. granitcola* is distinguished by the following character combination: leaves narrowly elliptic to narrowly obovate, variably antrorse, 1.9–3.6 mm wide, adaxially convex, the margins usually barely recurved, leaf apices long-mucronate, pungent, the mucro 0.7–1.2 mm long; inflorescences pendulous, 1- or 2-flowered; sepals glabrous, obtuse to acute, often shortly mucronate; corolla tube longer than the sepals and corolla lobes; ovary 5-locular, glabrous; style glabrous and smooth; stigma not or barely expanded; fruit narrowly ellipsoid to narrowly obovoid, circular in section, mostly \pm smooth or shallowly rugose, but more deeply rugose towards the base at maturity, gynophore absent.



Figure 8. *Styphelia graniticola* – flowering plant *in situ*. Voucher M. Hislop 3507. Photograph by Michael Hislop.

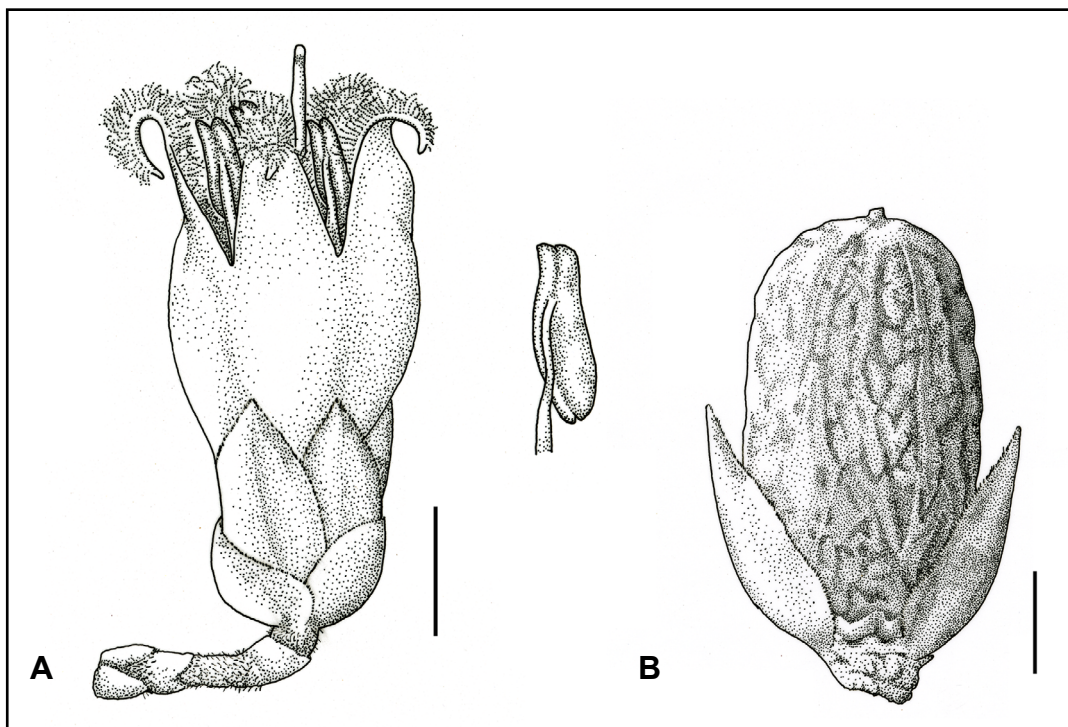


Figure 9. *Styphelia graniticola*. A – 1-flowered inflorescence, stamen; B – fruit. Scale bars = 1 mm. Vouchers M. Hislop 3507 (A), M. Hislop 3563 (B). Drawings by Skye Coffey.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 18 Sep. 1966, *E.M. Bennett* 1173 (PERTH); 2 Sep. 2005, *M. Hislop* 3507 (CANB, CNS, PERTH); 29 Dec. 2005, *M. Hislop* 3563 (CANB, CNS, PERTH); 27 Aug. 2000, *E.D. Middleton* EDM 266 (PERTH); 10 Oct. 2000, *E.D. Middleton* EDM 304 (PERTH); 28 Aug. 2002, *E.D. Middleton* EDM 505 (PERTH); 15 Aug. 1979, *J.M. Powell* 1173 (CANB, H, K, L, NSW, PERTH); 13 Nov. 1985, *A.N. Rodd* 4955 & *G. Fenson* (NSW, PERTH); 22 Sep. 1992, *J.R. Wheeler* 3247 (PERTH).

Distribution and habitat. *Styphelia graniticola* has an apparently restricted distribution, extending from south-west to north-east of Walpole, in the Warren bioregion. It is restricted to shallow, sandy loam soils, in heathland communities, on the slopes of granitic hills. Associated species include *Dodonaea ceratocarpa*, *Eutaxia myrtifolia*, *Taxandria conspiciua*, *Acacia myrtifolia* and *Melaleuca croxfordiae*.

Phenology. The main flowering period is between August and October. Collections with mature fruit have been made in November and December.

Etymology. From the Latin *graniticus* (granitic) and *-cola* (inhabiting), in reference to the species' habitat preference.

Conservation status. Currently known from just four populations, all on the conservation estate. Recently listed as Priority Two (Western Australian Herbarium 1998–) under Conservation Codes for Western Australian Flora under the name *Leucopogon* sp. Southern Granite (E.D. Middleton EDM 266).

Affinities. *Styphelia graniticola* belongs in Group V of Puente-Lelièvre *et al.* (2016). In the published phylogenetic tree, as *Leucopogon* sp. Southern Granite, it was one of sixteen species (including another three described in this paper: *S. inframediana*, *S. intricata* and *S. madida*) that were placed in a well-supported subclade of Group V.

Most older collections of *S. graniticola* had been referred to *S. erubescens* F.Muell., a species to which it bears a strong similarity in its vegetative morphology. The two can be distinguished by the following character differences: inflorescence pendulous in *S. graniticola* (*cf.* widely spreading in *S. erubescens*); inner corolla tube glabrous (*cf.* hairy); style glabrous and smooth, with a more or less filiform stigma (*cf.* style scabrous in the upper half, with a greatly expanded stigma).

Styphelia graniticola is usually readily distinguished from other members of Group V that occur in the Warren bioregion because of a different foliar morphology. In comparison to the relatively broad, convex (the margins usually barely recurved) leaves of *S. graniticola*, those of the widespread *S. pendula* are always noticeably narrower (0.5–1.6 mm wide, *cf.* 1.9–3.6 mm in *S. graniticola*) with strongly recurved to revolute margins. There is also a difference in leaf apex. In *S. graniticola* the mucro is always long (0.7–1.2 mm long) and sharply pungent whereas in *S. pendula* it is usually much shorter (mostly 0.1–0.5 mm long) and non-pungent. Occasionally however, *S. pendula* may have a longer (to 0.8 mm long), sharply pungent mucro. One such population is known to occur in close proximity to *S. graniticola* (refer *M. Hislop* 3508 and 3507 respectively), but with the two species always readily distinguishable. Indeed because *S. pendula* is such a common species in the Walpole area it is likely to be present within a short distance of all populations of *S. graniticola*, giving ample opportunity for potential hybridisation. Whether past hybridisation with one of the related pungent-leaved species, *S. graniticola*, *S. madida* or *S. inframediana* Hislop, is the reason for occasional atypical populations of *S. pendula* is a question worthy of further exploration.

Another member of Group V with pendulous inflorescences that is common in the Walpole area is *S. madida* subsp. *madida*. That taxon differs from *S. graniticola* in its narrower leaves (0.8–2.0 mm wide *cf.* 1.9–3.6 mm in *S. graniticola*), corolla lobes that are longer than, rather than shorter than, the tube and in having globose or broadly ellipsoid fruit (*cf.* narrowly ellipsoid to narrowly obovoid fruit).

Styphelia inframediana Hislop, *sp. nov.*

Typus: Stirling Range National Park, close to corner of Chester Pass Road and Formby Road South, Western Australia, 23 May 2017, M. Hislop 4707 (*holo*: PERTH 09092986; *iso*: CANB, CNS, MEL).

Styphelia sp. Albany (M. Hislop 2218), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 30 July 2021]

Leucopogon ovalifolius auct. non Sond.: Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [before March 2018].

Erect *shrubs*, to *c.* 90 cm high and 70 cm wide, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a sparse to moderately dense indumentum of short hairs, < 0.05 mm long. *Leaves* spirally arranged, variously antrorse to strongly retrorse; apex long-mucronate, pungent, the mucro ± straight, to slightly inflexed, 0.4–0.8 mm long; base cuneate; petiole 0.4–0.6 mm long, the adaxial surface hairy, the abaxial surface glabrous and the margins either glabrous or very sparsely hairy; lamina narrowly obovate to narrowly elliptic or occasionally narrowly ovate, 3.5–9.0 mm long, 1.0–2.5 mm wide, convex adaxially, the margins slightly recurved, or occasionally ± flat, longitudinal axis ± straight to distinctly recurved; surfaces slightly discolorous; adaxial surface shiny, glabrous apart from a few hairs towards the base, with 3–5 obscure veins usually evident, at least towards the base; abaxial surface slightly paler, ± matt, glabrous, with 5–7 primary veins (the midrib slightly broader than the others, at least towards the apex), ± flat to very shallowly and broadly grooved between the veins; margins coarsely and minutely ciliolate with antrorse hairs, < 0.05 mm long. *Inflorescence* axillary, pendulous; axis 2.0–5.2 mm long, 1- or 2(3)-flowered, with a very short, sparse indumentum, terete below the uppermost fertile bract, plano-convex and narrowly winged above, terminating in a bud rudiment; flowers pendulous, pedicellate below the bracteoles, with a pedicel 0.4–0.8 mm long. *Fertile bracts* ovate, 0.5–0.8 mm long, 0.5–0.6 mm wide, with 2–4(6) sterile bracts below the lowest fertile bract. *Bracteoles* broadly ovate to depressed ovate, 0.8–1.0 mm long, 0.8–1.2 mm wide, obscurely keeled in the upper half, obtuse to acute, mucronate (the mucro 0.1–0.2 mm long); abaxial surface glabrous, ± striate; margins minutely ciliolate. *Sepals* ovate or narrowly ovate, 1.8–2.4 mm long, 0.7–1.0 mm wide, acute, often shortly mucronate (the mucros sometimes recurved or incurved); abaxial surface glabrous, straw-coloured, venation very obscure; adaxial surface hairy in the distal half; margins ciliolate, with hairs < 0.05 mm long. *Corolla tube* white, obovoid or broadly obovoid, slightly shorter to distinctly longer than the sepals, 1.6–2.2(–2.5) mm long, 1.5–2.0 mm wide, external surface glabrous, internal surface glabrous or with a few hairs immediately below the lobes. *Corolla lobes* white, longer than the tube, 2.5–4.0 mm long, 0.8–1.0 mm wide at base, erect in the basal 1/2–3/4 of their length, and then spreading and revolute to partially coiled, external surface glabrous, internal surface with a dense, white indumentum of flattened, twisted hairs and ± ornamented hairs. *Anthers* partially exserted (by at least 7/8 of their length), or fully exserted from the corolla tube, but not exserted beyond the erect basal portion of the corolla lobes, 1.8–3.2 mm long, distinctly narrowed towards the apex and often ± filiform, variously emarginate or sometimes ± entire. *Filaments* terete, 0.5–1.0 mm long, attached to the anther 1/3–1/2 above the anther base, adnate to the tube just below the sinuses. *Nectary* annular, 0.3–0.5 mm long, glabrous, very shallowly to deeply lobed. *Ovary* ovoid to ellipsoid, 0.7–1.0 mm long, 0.4–0.6 mm long, glabrous, 5-locular, dark green to almost black.

Style 3.5–5.4 mm long, glabrous and smooth, exerted from the corolla tube well beyond the erect corolla lobe bases, tapering smoothly from ovary apex; stigma not, or barely, expanded. *Fruit* broadly obovoid to ellipsoid, 3.0–3.3 mm long, 2.2–2.5 mm wide, much longer than the sepals, circular in transverse section, gynophore absent; surface glabrous, rugose at maturity; apex rounded; style shed before maturity. (Figures 10, 11)

Diagnostic characters. Within Group V, *S. inframediana* may be distinguished by the following character combination: leaves narrowly obovate to narrowly elliptic (occasionally narrowly ovate), 1.0–2.5 mm wide, adaxially convex, the margins slightly recurved or occasionally ± flat, leaf apices long-mucronate, pungent, the mucro 0.4–0.8 mm long; inflorescences pendulous, 1- or 2(3)-flowered; sepals glabrous, acute, often shortly mucronate; corolla tube slightly shorter than to distinctly longer than the sepals, shorter than the corolla lobes; ovary 5-locular, glabrous; style glabrous and smooth; stigma not, or barely expanded; fruit broadly obovoid to ellipsoid, circular in transverse section, rugose, gynophore absent.

Other specimens examined. WESTERN AUSTRALIA: 28 km W along Stirling Range Drive from junction with Chester Pass Rd, Stirling Range National Park, 25 Oct. 1997, *E.A. Brown* 97/417, *P.G. Wilson & N. Lam* (NSW, NY, PERTH); King George's Sound, Sep. 1900, *B.T. Goadby* 131 (PERTH); E slope of Little Lindesay on track W from Stan Rd [N of Denmark], 19 Apr. 1995, *B.G. Hammersley* 1340 (PERTH); E side Red Gum Pass, 5.4 km S of Salt River Rd, Stirling Range National Park, 3 June 2001, *M. Hislop* 2218 (PERTH); Millbrook Rd, 3.6 km E of Albany Hwy, N of Albany, 9 May 2009, *M. Hislop* 3877 (CANB, PERTH); Stirling Range National Park, Mount Trio walk trail, 23 May 2017, *M. Hislop* 4705 (PERTH); Down Road Nature Reserve, E central part of reserve, 31 Aug. 2017, *M. Hislop* 4719 (PERTH); Mt Lindesay National Park, walk trail to Mt Lindesay, N of Denmark, 19 Oct. 2017, *M. Hislop* 4729 (CNS, PERTH); Red Gum Springs, Stirling Range, 13 May 1967, *F.W. Humphreys s.n.* (PERTH); 600 m, ridgeline hill, SW slopes of Ellen Peak [Stirling Range], 11 May 1982, *G.J. Keighery* 4941 (PERTH); lookout area on Baby Barnett Hill, off Stirling Range Drive, 9 Feb. 1980, *J.M. Powell* 1468 (CANB, NSW, PERTH); Yungemere track, c. 1.5 km E from Chester Pass Rd, Stirling Range National Park, 30 Aug. 1986, *J.M. Powell* 2738 (NSW, PERTH); ARVS Site L192. Down Road Nature Reserve, NW of Albany, 30 Apr. 2008, *E.M. Sandiford & D.A. Rathbone* 1616 (PERTH); site SRNP d26JAN, Murray Site, 1.39 km N of West Pillenorup Track on Hostellers Track, N from road [Stirling Range National Park], 26 Jan. 1989, *R.T. Wills* 1171 (PERTH); 16 km N of Albany on road to Borden, 9 May 1969, *P.G. Wilson* 8302 (CANB, K, NSW, PERTH).

Distribution and habitat. *Styphelia inframediana* is distributed rather sporadically between Denmark and Albany and north to the Stirling Range, in the far south of the Jarrah Forest and far west of the Esperance Plains bioregions. It grows in sandy or light loam soils, usually high in the landscape, over quartzite, laterite or granite and in species-rich heath or open woodland. Commonly associated species include *Eucalyptus marginata*, *E. staeri*, *Agonis theiformis*, *Taxandria spathulata*, *Hakea trifurcata*, *H. cucullata* and *H. ambigua*.

Phenology. The main flowering period is between April and June. Mature fruit has been collected in October and November.

Etymology. From the Latin *infra* (below) and *medianus* (the middle), a reference to the usual point of attachment of the anther to the filament. The name is intended to highlight a difference between the new species and *S. retrorsa* Hislop, Crayn & Puente-Lel. (formerly *Leucopogon ovalifolius* Sond.), the species with which it had until recently been confused. In the latter, the usual point of attachment is above the middle.



Figure 10. *Styphelia inframediana* – flowering plant *in situ*. Voucher M. Hislop 2218. Photograph by Michael Hislop.

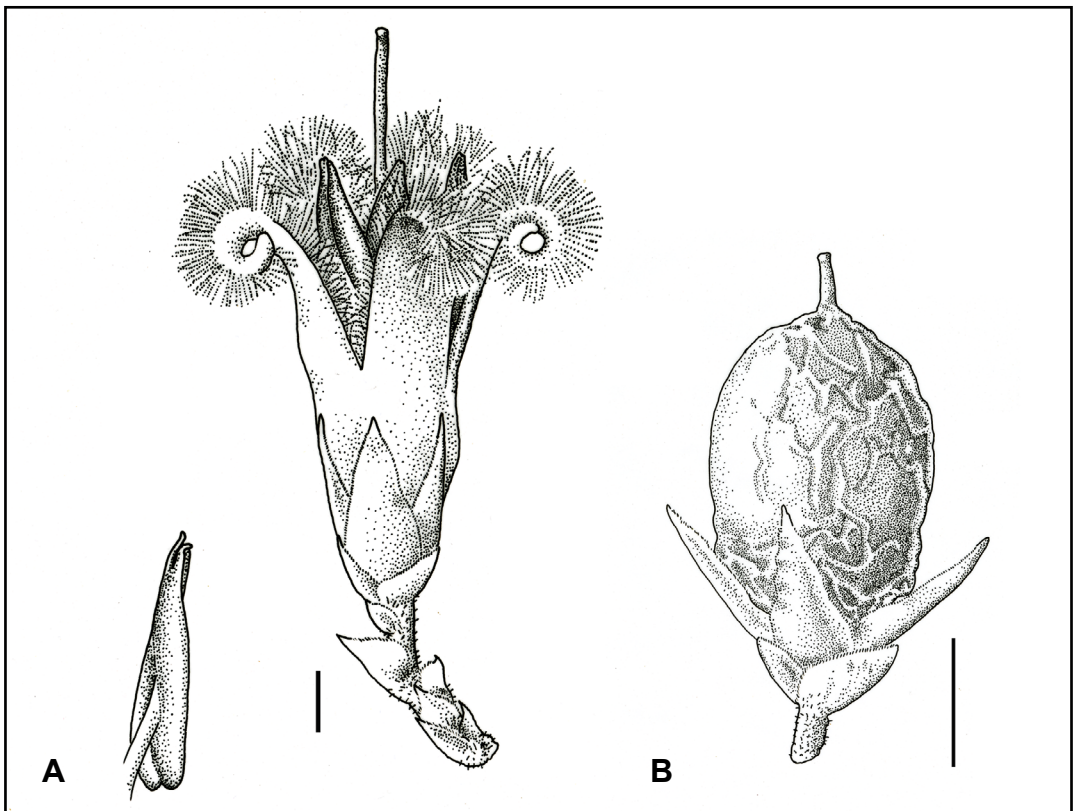


Figure 11. *Styphelia inframediana*. A – 1-flowered inflorescence, stamen; B – fruit. Scale bars = 1 mm. Vouchers M. Hislop 4707 (A), E.A. Brown 97/417, P.G. Wilson & N. Lam (B). Drawings by Skye Coffey.

Conservation status. Most of the known populations of this species occur on the conservation estate where it is often locally common. No conservation coding is recommended here.

Affinities. *Styphelia inframediana* belongs in Group V of Puente-Lelièvre *et al.* (2016). In the published phylogenetic tree, it was placed (as *Leucopogon ovalifolius*) in the same polytomy as *S. graniticola* (refer affinities heading under that species for details).

Styphelia inframediana was for a number of years treated as *Leucopogon ovalifolius* (now *S. retrorsa*) at the Western Australian Herbarium. However, that species occurs north and east of Perth, well to the north of the range of *S. inframediana*, from Cataby and Moora south to Bindoon, and east to Clackline. It differs from *S. inframediana* in at least the following ways: inflorescences 2–4-flowered (*cf.* 1- or 2-flowered in *S. inframediana*); corolla tube always longer than the sepals and usually longer than, or occasionally equal to the lobes (*cf.* tube shorter than, to longer than the sepals and always shorter than the corolla lobes); filaments usually attached to the anthers above the middle (*cf.* usually below the middle). In addition, the leaves of *S. retrorsa* are noticeably larger (e.g. widest leaves per specimen 2.5–4.5 mm wide, usually at least 3 mm *cf.* 1.5–2.5 mm wide, usually less than 2.2 mm in *S. inframediana*).

Within its geographical range *S. inframediana* is most likely to be mistaken for either *S. concinna* (Benth.) F.Muell. or *S. pendula*, two of the most variable species in Group V. *Styphelia concinna* is sympatric with *S. inframediana* in the Stirling Range, where the two have often been confused. It can be distinguished from *S. inframediana* by its shorter leaves, rarely more than 5 mm long, that are usually non-pungent, by its 3- or 4-locular ovary (*cf.* 5-locular in *S. inframediana*), obtuse or occasionally subacute sepals (*cf.* acute) and in having fruit that are cylindrical to very narrowly ellipsoid, to about 1.4 mm wide (*cf.* broadly obovoid to ellipsoid and 2.2–2.5 mm wide in *S. inframediana*).

Styphelia pendula always differs from *S. inframediana* in having strongly recurved or revolute leaf margins (*cf.* slightly recurved or occasionally \pm flat) and narrowly obovoid fruit (*cf.* broadly obovoid to ellipsoid). Typical *S. pendula* also differs in having non-pungent leaf tips, but as noted under *S. graniticola*, occasionally they may be sharply pungent.

A distinctive variant of *S. pendula* with short corolla tubes (referred to as the ‘short-tube variant’ in the above key), about as long as the sepals and distinctly shorter than the corolla lobes (e.g. *M. Hislop* 3428), is distributed sporadically between Walpole, Albany and the Stirling Range. This character clearly puts it at variance with the typical form of *S. pendula*, in which the tube is always longer than the sepals and usually longer than (or occasionally \pm equal to) the lobes. This variant may be more likely to be confused with *S. inframediana*. Apart from the distinguishing characters given in the preceding paragraph the short-tube variant of *S. pendula* also differs from *S. inframediana* in always having strongly antrorse leaves and apparently also in never having pungent leaf tips.

The case for a taxonomic recognition of the short-tube variant of *S. pendula* appears quite strong and is given support by a substantially different, although apparently overlapping flowering period, with the short-tube variant coming into flower well before the typical variant. However, given that there is apparently no difference in fruit shape (frequently a useful distinguishing character in Group V) further research seems advisable. Field observations would be particularly valuable to ascertain whether the difference in corolla proportions is consistent within populations. It would also be relevant to study the detail of the relative distributions of the two forms given that typical *S. pendulus* is broadly sympatric with the short-tube variant across the latter’s geographical range, excluding the Stirling Range, where apparently only the short-tube variant occurs.

Styphelia intricata* Hislop, *sp. nov.

Typus: east of Augusta, Western Australia [precise locality withheld for conservation reasons], 21 May 2006, M. Hislop 3599 (*holo*: PERTH 07441045; *iso*: CANB, CNS, H, K, MEL, NSW 832194).

Leucopogon sp. Gingilup (N. Gibson & M. Lyons 590), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 30 July 2021]

Tangled, spreading *shrubs*, to c. 80 cm high and 150 cm wide, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a sparse indumentum of short hairs, < 0.05 mm long, or ± glabrous. *Leaves* spirally arranged, ± patent to strongly retrorse; apex long-mucronate, pungent, the mucro ± straight or slightly inflexed, 0.6–1.0 mm long; base cuneate to rounded; petiole rather indistinct, to c. 0.5 mm long, glabrous, apart from a few hairs on the adaxial surface; lamina linear to very narrowly ovate, 6–12 mm long, 0.5–1.7 mm wide, convex adaxially with the margins strongly recurved to revolute, longitudinal axis ± straight to distinctly recurved; surfaces ± concolorous; adaxial surface shiny, glabrous, apart sometimes for a few hairs towards the base, with 3–5 obscure veins usually evident, at least towards the base; abaxial surface matt or slightly shiny, glabrous, with 5–7 primary veins (the midrib slightly broader than the others, at least towards the apex), shallowly and broadly grooved between the veins; margins glabrous. *Inflorescence* axillary, pendulous; axis 2.8–7.5 mm long, 1- or 2-flowered, glabrous, terete below the uppermost fertile bract, plano-convex above, terminating in a bud-rudiment; flowers pendulous, pedicellate below the bracteoles, with a pedicel 0.7–1.5 mm long. *Fertile bracts* ovate to broadly ovate, 0.3–0.7 mm long, 0.3–0.5 mm wide, with 2–4 sterile bracts below the lowest fertile bract. *Bracteoles* ± orbicular to depressed-ovate, 0.7–1.0 mm long, 0.8–1.0 mm wide, obscurely keeled in the upper half, obtuse to subacute, mucronate (the mucro 0.1–0.3 mm long); abaxial surface glabrous, not or scarcely striate; margins minutely ciliolate. *Sepals* ovate or narrowly ovate, 1.6–2.3 mm long, 0.8–1.0 mm wide, acute, often shortly mucronate; abaxial surface glabrous, or sometimes very shortly and sparsely hairy, straw-coloured, sometimes with pink tinges, venation very obscure; adaxial surface sparsely hairy in the distal half; margins minutely ciliolate, with hairs < 0.05 mm long. *Corolla tube* white, obovoid to depressed-obovoid, a little longer than the sepals, 1.6–2.2 mm long, 1.7–2.3 mm wide, external surface glabrous, internal surface glabrous. *Corolla lobes* white, longer than the tube, 2.3–2.8 mm long, 1.0–1.2 mm wide at base, erect in basal 1/3–1/2 of their length, and then spreading and revolute to ± coiled, external surface glabrous, internal surface with a dense, white indumentum of flattened, twisted and ± ornamented hairs. *Anthers* partially exerted (by 3/4–7/8 of their length) from the corolla tube, 1.5–2.2 mm long, emarginate. *Filaments* terete, 0.3–0.6 mm long, attached to the anther 1/3–1/2 above the base, adnate to the tube just below the sinuses. *Nectary* annular, 0.4–0.5 mm long, glabrous, very shallowly lobed. *Ovary* ovoid or ellipsoid, 0.7–0.9 mm long, 0.5–0.6 mm wide, glabrous, 5-locular, dark green to almost black. *Style* glabrous and smooth, 3.0–4.2 mm long, exerted from the corolla tube well beyond the erect corolla lobe bases, tapering smoothly from the ovary apex; stigma not, or barely, expanded. *Fruit* ellipsoid to obovoid, 4.0–4.8 mm long, 2.0–2.8 mm wide, much longer than the sepals, circular in transverse section, gynophore absent; surface glabrous, ± dry and smooth (mesocarp apparently not, or poorly developed); apex rounded; style shed before maturity. (Figures 12, 13)

Diagnostic characters. Within Group V, *S. intricata* is distinguished by the following character combination: leaves linear to very narrowly ovate, ± patent to strongly retrorse, 0.5–1.7 mm wide, adaxially convex, the margins strongly recurved to revolute, leaf apices long mucronate, pungent, the mucro 0.6–1.0 mm long; inflorescences pendulous, 1- or 2-flowered; sepals glabrous, acute, often shortly mucronate; corolla tube slightly longer than the sepals, shorter than the corolla lobes;



Figure 12. *Styphelia intricata* – scanned image of flowering branchlets. Voucher *M. Hislop* 3599.

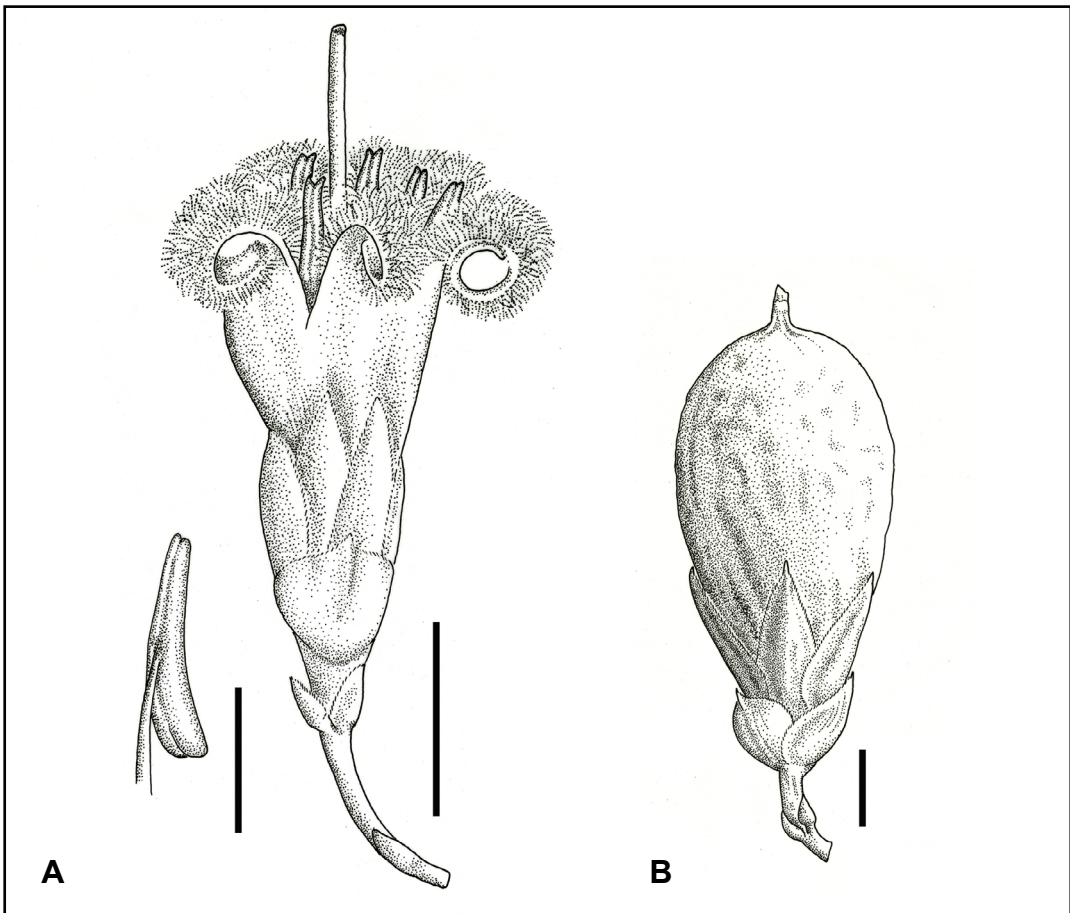


Figure 13. *Styphelia intricata*. A – 1-flowered inflorescence, stamen; B – fruit. Scale bars = 1 mm. Vouchers *M. Hislop* 3599 (A), *M. Hislop* 3681 (B). Drawings by Skye Coffey.

ovary 5-locular, glabrous; style glabrous and smooth; stigma not, or barely, expanded; fruit ellipsoid to obovoid, circular in section, \pm dry and smooth, gynophore absent.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 19 Apr. 1991, N. Gibson & M. Lyons 590 (CANB, PERTH); 26 Nov. 2006, M. Hislop 3681 (CANB, CNS, PERTH); 28 Apr. 2021, M. Hislop 4851 (CANB, CNS, MEL, PERTH); 2 June 1995, B.J. Lepschi 1893 (CANB, NSW, PERTH); 31 Mar. 2003, A. Webb AW 2250 (PERTH); 11 Jan. 2008, A. Webb 09008 (PERTH); 8 Oct. 2020, A. Webb AW 09126 (PERTH).

Distribution and habitat. *Styphelia intricata* has an apparently restricted distribution in the far south-west of the Jarrah Forest and the far west of the Warren bioregions, from south-east of Margaret River to east of Augusta. It occurs in seasonal wetlands in open woodland or heath. Associated species include *Melaleuca preissiana*, *Taxandria* spp., *Beaufortia sparsa*, *Aotus intermedia* and numerous restiads and sedges.

Phenology. The main flowering period is between April and June. Mature fruit have been recorded in October and November.

Etymology. From the Latin *intricatus* (entangled), a reference to the species' distinctive growth habit.

Conservation status. Listed as Priority Two (Smith & Jones 2018) under Conservation Codes for Western Australian Flora under the name *Leucopogon* sp. Gingilup (N. Gibson & M. Lyons 590). Known from two nature reserves and from a population in state forest. Restricted as it is to a wetland habitat in one of the wettest districts of Western Australia, this species is likely to be particularly vulnerable to the warming and drying effects of ongoing climate change. The damp habitat is also likely to make it especially susceptible to the root-rot pathogen, *Phytophthora cinnamomi* Rands. Populations of this species should accordingly be monitored on a regular basis.

Affinities. *Styphelia intricata* belongs in Group V of Puente-Lelièvre *et al.* (2016). In the published phylogenetic tree, it was placed (as *Leucopogon* sp. Gingilup) in the same clade of sixteen as *S. graniticola*, *S. inframediana*, and *S. madida*.

The tangled growth habit, very narrow, more or less patent to strongly retrorse leaves, together with a wetland habitat make *S. intricata* a distinctive species that is not easily confused with others. Most congeners in the Warren and southern Jarrah Forest bioregions have either uniformly antrorse, or broader, leaves (usually both). Only *S. inframediana* (described above) does frequently have retrorse leaves but it occurs well to the east of the range of *S. intricata* and is a plant of dry habitats on upland sites. In any case that species can be distinguished by its generally wider leaves (widest leaves per specimen 1.5–2.5 mm long *cf.* 1.0–1.7 mm in *S. intricata*) with more gently recurved margins, smaller fruit (3.0–3.3 mm long *cf.* 4.0–4.8 mm), hairy rather than glabrous inflorescence axes and longer filaments (0.5–1.0 mm long *cf.* 0.3–0.6 mm).

The northernmost collection of *S. intricata* differs from the others in having a very short, sparse abaxial sepal indumentum. These hairs are similar in character, but much sparser, than those seen on the sepals of *L. globosa*. Another collection (A. Webb 09060) from the same area has a denser sepal indumentum and leaves that are patent to shallowly antrorse. These specimens suggest the possibility that hybridisation does, or has, occurred between these taxa. Generally, there is a distinct difference in habitat preference between the two species, with *L. globosa* occurring in dry habitats. This would presumably mitigate against the likelihood of such hybridisation events.

Styphelia madida Hislop, *sp. nov.*

Typus: 21.7 km north-west of Walpole on road to Manjimup, Western Australia, 5 February 1980, J.M. Powell 1449 (*holo*: PERTH 02996014; *iso*: BISH, CANB 333114.1, K, L, MEL 0611332A, NSW 403068).

Leucopogon sp. Walpole (R.J. Cranfield 10940), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 30 July 2021]

Erect open *shrubs*, to *c.* 1.5 m high and 1.5 m wide, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a sparse to dense indumentum of hairs, to 0.4 mm long. *Leaves* spirally arranged, from shallowly to steeply antrorse, rarely some shallowly retrorse; apex long-mucronate, pungent, the mucro slightly deflexed to slightly inflexed, 0.7–2.0 mm long; base attenuate to cuneate; petiole 0.5–1.2 mm long, adaxial surface hairy, abaxial surface glabrous and the margins glabrous or ciliate; lamina linear, very narrowly elliptic, narrowly obovate to obovate, or very occasionally very narrowly ovate, 8–21 mm long, 0.8–3.8 mm wide, convex adaxially with the margins varying from slightly recurved to revolute, longitudinal axis shallowly recurved to shallowly incurved; surfaces \pm concolorous or the abaxial surface distinctly paler; adaxial surface shiny, glabrous, apart from sparse hairs in the lower half, with 3–5 obscure veins evident, at least towards the base; abaxial surface matt or slightly shiny, glabrous, with 5–7 primary veins (the midrib slightly broader than the others, at least towards the apex), \pm flat or very shallowly and openly grooved between the veins; margins glabrous, or sparsely ciliate towards the base. *Inflorescence* axillary, pendulous; axis 3.0–10 mm long, 1–3-flowered, with a sparse to dense indumentum or sometimes \pm glabrous, terete below the uppermost fertile bract, plano-convex and often shortly winged above, terminating in a bud-rudiment; flowers pendulous, pedicellate below the bracteole, with a pedicel 0.5–1.5 mm long. *Fertile bracts* ovate, 0.7–0.9 mm long, 0.5–0.6 mm wide, with 2–3(4) sterile bracts below the lowest fertile bract. *Bracteoles* broadly ovate, 1.0–1.6 mm long, 1.0–1.5 mm wide, keeled, obtuse, mucronate (the mucro 0.2–0.7 mm long); abaxial surface glabrous, not or scarcely striate, margins minutely ciliolate. *Sepals* ovate to narrowly ovate, 1.8–3.0 mm long, 1.0–1.3 mm wide, acute or subacute, often mucronate; abaxial surface glabrous, straw-coloured, venation obscure; adaxial surface hairy in the upper half, margins ciliolate with hairs to 0.08 mm long. *Corolla tube* white, obovoid or broadly obovoid, *c.* equal to, to distinctly longer than the sepals, 1.8–2.7(–3.0) mm long, 1.6–2.4 mm wide, external surface glabrous, internal surface glabrous throughout or with hairs immediately beneath the lobes, and then glabrous below that. *Corolla lobes* white, longer than the tube, 3.2–4.5 mm long, 1.0–1.3 mm wide at base, erect in basal 1/2–2/3 of their length, and then spreading and revolute to partially coiled, external surface glabrous, internal surface with a dense, white indumentum of flattened to \pm terete, twisted and ornamented hairs. *Anthers* partially exerted (by at least 7/8 of their length), or fully exerted from the corolla tube, but not exerted beyond the erect basal portion of the corolla lobes, (1.6–)1.8–2.6 mm long, only slightly narrowed towards the shortly emarginate apex. *Filaments* terete, 0.6–1.0 mm long, attached to anther *c.* 1/2 above anther base, a little above or a little below, adnate to tube just below the sinuses. *Nectary* annular, 0.3–0.5 mm long, glabrous, distinctly lobed, often with longitudinal grooves below the sinuses. *Ovary* ellipsoid to broadly ellipsoid, or ovoid to broadly ovoid, 0.8–1.1 mm long, 0.5–0.7 mm wide, glabrous, 5-locular, dark green to almost black. *Style* (3.5–)4.0–6.2 mm long, glabrous and smooth, exerted from the corolla tube well beyond the erect corolla lobe bases, tapering smoothly from ovary apex; stigma not, or barely, expanded. *Fruit* globose or broadly ellipsoid, 3.2–5.0 mm long, 3.2–5.0 mm wide, much longer than the sepals, circular in section, gynophore absent; surface glabrous, rugose at maturity; apex rounded; style shed before maturity.

Diagnostic characters. Within Group V, *S. madida* is distinguished by the following character combination: leaves linear, very narrowly elliptic, narrowly obovate to obovate, or very occasionally very narrowly ovate, shallowly to steeply antrorse, rarely some shallowly retrorse, 0.8–3.8 mm wide, adaxially convex, the margins slightly recurved to revolute, leaf apices long-mucronate, pungent, the mucro 0.7–2.0 mm long; inflorescences pendulous, 1–3-flowered; sepals glabrous, acute to subacute, often mucronate; corolla tube about equal to, to distinctly longer than, the sepals, shorter than the corolla lobes; ovary 5-locular, glabrous and smooth; stigma not, or barely, expanded; fruit usually globose, less often broadly ellipsoid, circular in section, strongly rugose, gynophore absent.

Etymology. From the Latin *madidus* (moist, wet, soaked), a reference to the fact that the species occurs in the wettest parts of south-west Australia.

Affinities. *Styphelia madida* belongs in Group V of Puente-Lelièvre *et al.* (2016). In the published phylogenetic tree, it was placed (as *Leucopogon* sp. Walpole) in a moderately supported polytomy with *S. pendulus* and *S. woodsii* within the larger clade of sixteen (that also includes other species described herein, namely *S. graniticola*, *S. inframediana*, and *S. intricata*). It should be noted that it was the typical subspecies of *S. madida* that was sequenced for the phylogeny.

Two allopatric subspecies are recognised based, in large part, on indumentum differences together with leaf width and shape.

Styphelia madida* Hislop subsp. *madida

Young *branchlets* with a sparse to moderately dense indumentum of short, straight hairs, to *c.* 0.1 mm long. *Leaf lamina* usually linear or very narrowly elliptic, very occasionally very narrowly ovate or very narrowly obovate, 0.8–2.0 mm wide, the widest leaves usually 1.8 mm or less. *Inflorescence axes* with a sparse, or occasionally with a moderately dense indumentum, or sometimes \pm glabrous. *Bracteole* mucro 0.2–0.4 mm long. *Sepals* 1.8–2.7 mm long, mucronate or not. *Fruit* globose or broadly ellipsoid, 3.5–5.0 mm long, 3.2–4.6 mm wide. (Figures 14–16)

Other specimens examined. WESTERN AUSTRALIA: Point 48 hilltop, Walpole-Nornalup National Park, 21 Feb. 1989, *A.R. Annels* 703 (PERTH); Fernhook Falls [NW of Walpole], 16 Mar. 2006, *G. Byrne* 1784 (PERTH); 41 km N of Walpole, 4 Feb. 1997, *R.J. Cranfield* 10940 (NSW, PERTH); 1.5 km from South Coast Hwy along Nut Rd, E of Walpole, 10 Oct. 2003, *D.M. Crayn* 708, *K.A. Kron & A.J. Perkins* (NSW, PERTH); 2.3 km along Pool Rd from junction with Jones Rd, 30 m to the E of road on edge of river [N of Walpole], 13 Feb. 1997, *P. Ellery & C. Godden* W 46.4 (PERTH); Denmark Shire. Kordabup Rd. Forest Reserve 214 on N boundary, 24 Mar. 2000, *B.G. Hammersley* 2421 (PERTH); Denmark Shire. Forest Reserve 179-25, on the west bank of the Kent River, *c.* 0.5 km N from South Coast Hwy, 6 Oct. 2000, *B.G. Hammersley* 2680 (CANB, PERTH); environs of Fernhook Falls campsite on the Deep River, NW of Walpole, 2 Sep. 2005, *M. Hislop* 3505 (CNS, PERTH); Walpole-Nornalup National Park, environs of Circular Pool, 16 Nov. 2020, *M. Hislop* 4845 (CANB, CNS, K, MEL, PERTH); Mount Frankland National Park, Thompson Rd, *c.* 2.2 km N of Mt Frankland Rd, N of Walpole, 31 Mar. 2021, *M. Hislop* 4849 (CANB, CNS, MEL, PERTH); Mount Frankland National Park, Thompson Rd, *c.* 1 km S of Johnston Rd, N of Walpole, 31 Mar. 2021, *M. Hislop* 4850 (CANB, K, NSW, PERTH); Champion Drive (off Harewood Rd), Harewood State Forest, Denmark, 19 Apr. 2003, *F. & J. Hort* 1967 (CANB, CNS, NSW, PERTH); William Bay National Park, Apr. 1984, *C.V. Malcolm s.n.* (PERTH); 9.1 km W of Nichol Rd and Thompson Rd intersection, 40 m S of Nicol Rd [Mt Frankland National Park], 12 Feb. 1997, *C. McChesney & C. Day* W 18.7 (PERTH);



Figure 14. *Styphelia madida* subsp. *madida*. A, B – flowering branchlets *in situ*. Vouchers G. Byrne 1784 (A, B). Photographs by Geoff Byrn.

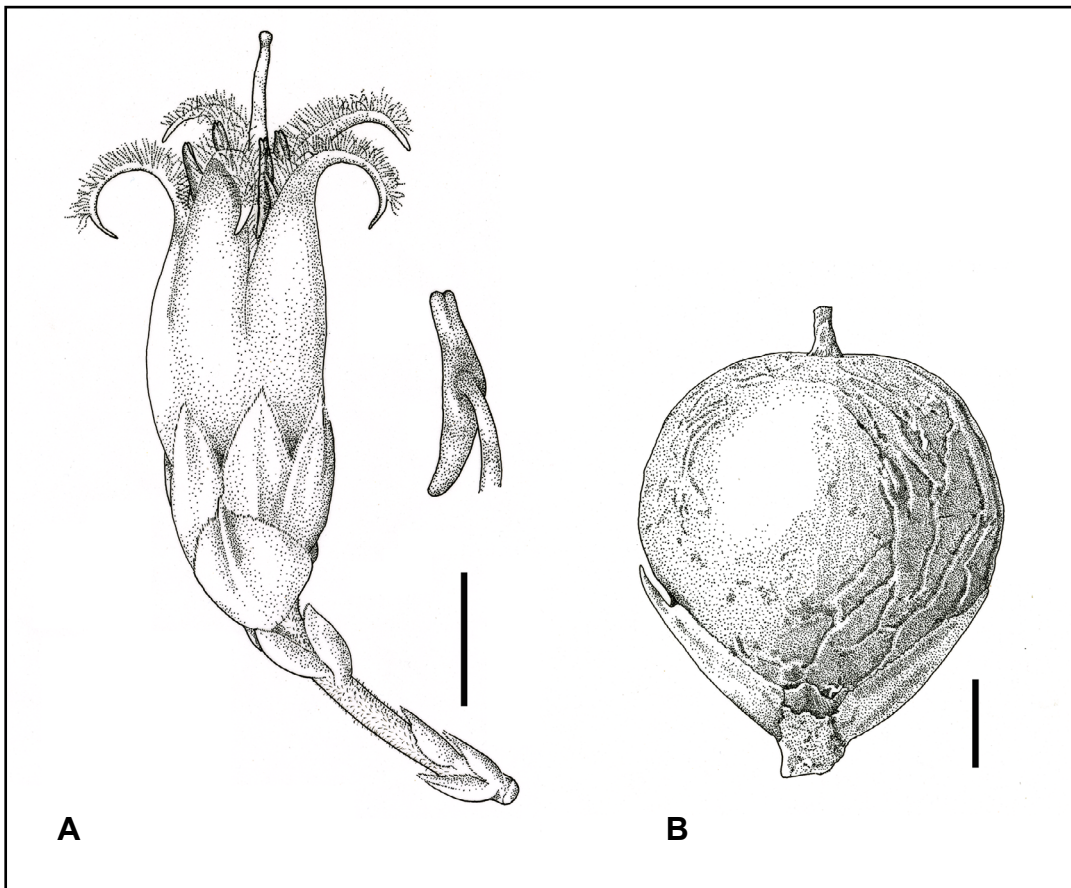


Figure 15. *Styphelia madida* subsp. *madida*. A – 1-flowered inflorescence, stamen; B – fruit. Scale bars = 1 mm. Vouchers G. Byrne 1784 (A), M. Hislop 3505 (B). Drawings by Skye Coffey.



Figure 16. *Styphelia madida* subsp. *madida*. Scanned image of flowering branchlet. Voucher G. Byrne 1784.

Walpole, junction of Rest Point Rd and Sandy Beach Rd, opposite golf course, 27 Jan. 1987, *S. Patrick* 405 (PERTH); Site 135, ENE off Angove Rd [N of Walpole], 24 Aug. 1997, *K.A. Redwood* 394 (PERTH); Walpole-Nornalup National Park, 2.8 Mile Rd, 1 km N of [South Coast] Hwy, 28 Jan. 1993, *J.R. Wheeler* 3839 & *S. Patrick* (PERTH).

Distribution and habitat. Distributed in the wettest part of south-western Australia from north-west of Walpole to the William Bay area, west of Denmark, in the east of the Warren and far south of the Jarrah Forest bioregions. The taxon grows in sand or sandy loam soils, often over laterite, in dry or winter-damp habitats, mostly in Jarrah and Marri woodland or forest. Some of the more commonly associated species are *Taxandria parviceps*, *T. linearifolia*, *Beaufortia sparsa*, *Podocarpus drouynianus* and *Dasypogon bromeliifolius*.

Phenology. Peak flowering is between January and April. Most fruiting collections have been made between August and November.

Conservation status. Although the distribution of this taxon is rather restricted it is locally common in several national parks and nature reserves. No conservation coding is recommended here.

Affinities. Before its recognition as *Leucopogon* sp. Walpole in 1999, the typical subspecies had mostly been confused either with *S. propinqua* (R.Br.) Spreng. or *S. racemulosa* (DC.) F.Muell., presumably because those species also have pungent and relatively long, narrow leaves. Subsp. *madida* can be distinguished from *S. propinqua* by its strictly pendulous, rather than erect or spreading, inflorescences

and in having a smooth style with an unexpanded, or barely expanded, stigma (*cf.* style scabrous in the upper half with a greatly expanded stigma in *S. propinqua*). The same combination of spreading inflorescences, scabrous style and expanded stigma also serve to distinguish *S. racemulosa* from the typical subspecies of *S. madida*. In addition, there is a significant difference in the fruit of *S. racemulosa*, that species being one of only three in Group V (along with *S. allittii* (F.Muell.) F.Muell. and *S. filifolia* Hislop & Puente-Lel.) in which the drupe is strongly zygomorphic and bilaterally compressed.

In her treatment of *Leucopogon* for the *Flora of the South West*, Wheeler (Wheeler *et al.* 2002) was apparently referring to specimens of *S. madida* subsp. *madida* when she made the comment that ‘some collections from the south coast appear intermediate between this [*L. pendulus*] and *L. propinquus* and may belong to *L. pendulus* var. *cuspidatus* Benth.’ The latter taxon is now treated as a distinct species, *S. psilopus* (Stschegl.) Hislop, Crayn & Puente-Lel., which is restricted to the eastern peaks of the Stirling Range. It is distinguished from *S. madida* by its non-pungent leaf tips and narrowly ellipsoid drupes.

***Styphelia madida* Hislop subsp. *hirtigera* Hislop, subsp. nov.**

Typus: Bettys Beach Road, c. 150 m east of start of rough track running east of Boulder Hill, north of Two Peoples Bay, Western Australia, 14 February 2004, *M. Hislop* 3165 (*holo*: PERTH 07027656; *iso*: CANB, CNS).

Young *branchlets* with a dense indumentum of straight or wavy hairs 0.1–0.4 mm long. *Leaf lamina* usually very narrowly obovate to obovate, occasionally narrowly elliptic, 1.5–3.8 mm wide, the widest leaves usually at least 2.2 mm. *Inflorescence axes* with a moderately dense to dense indumentum. *Bracteole* mucro 0.4–0.7 mm long. *Sepals* 2.5–3.0 mm long, always strongly mucronate. *Fruit* globose, 4.0–5.0 mm long, 4.0–5.0 mm wide. (Figure 17)

Diagnostic characters. Distinguished from the typical subspecies by its longer and denser indumentum on branchlets and inflorescence axes and in having wider leaves that are usually very narrowly obovate to obovate.

Other specimens examined. WESTERN AUSTRALIA: Plot 5456, Boulder Hill, Two Peoples Bay area, 27 May 1992, *A.R. Annels & G. Wardell-Johnson* ARA 2157 (PERTH); Bald Island, 16 Oct. 2003, *J.A. Cochrane & S. Comer* 52 (PERTH); Beside track to water weir on Black Cat Creek, W of Two Peoples Bay, 20 Apr. 1996, *E.J. Croxford* 7395 (PERTH); Mt Gardner, Two Peoples Bay, 8 Mar. 1967, *A.S. George s.n.* (PERTH); Waychinicup National Park, granite hill between Waychinicup Inlet and Mermaid Point, 27 Jan. 2002, *M. Hislop* 2542 (PERTH); Waychinicup National Park, c. 600 m E of Waychinicup Inlet, 27 Jan. 2002, *M. Hislop* 2543 (CNS, PERTH); access road to Waychinicup Inlet at crossing of Waychinicup Creek, 27 Jan. 2002, *M. Hislop* 2544A&B (PERTH); Mt Martin Botanical Park, trackside between turnoffs to Mt Martin and Dick Renshaw Lookout, 20 Apr. 2003, *M. Hislop* 2941 (PERTH); Mt Martin Botanical Park, Mary Sherwood trail, c. 800 m W of Ledge Beach carpark, 20 Apr. 2003, *M. Hislop* 2942 (MEL, PERTH); S slopes of Mt Manypeaks, 17 July 1986, *G.J. Keighery* 8155 (CANB, CNS, PERTH); Mt Manypeaks, E ridge track and plateau area, 27 Aug. 1986, *J.M. Powell* 2654 (MEL, NSW, NY, PERTH).

Distribution and habitat. Occurs from a little east of Albany to Bald Island in the far south of the Jarrah Forest and far west of the Esperance Plains bioregions. Subspecies *hirtigera* grows in sand or sandy loam soils, often over granite or laterite, in heath, thicket or open woodland. Associated species



Figure 17. *Styphelia madida* subsp. *hirtigera*. Scanned image of fructing branchlet. Voucher J.M. Powell 2654B.

include *Corymbia calophylla*, *Banksia formosa*, *Hakea elliptica*, *H. cucullata*, *Agonis theiformis* and *Taxandria marginata*.

Phenology. As for the typical subspecies.

Etymology. From the Latin *hirtus* (hairy, shaggy) and *-ger* (bearing), a reference to the noticeably longer hairs on branchlets and inflorescence axes relative to those of the typical subspecies.

Conservation status. As with the typical subspecies, while subsp. *hirtigera* is not widespread, it is often locally common and well represented on the conservation estate. No conservation coding is therefore recommended here.

Affinities. Presumably because of its relatively wide leaves, earlier collections of subsp. *hirtigera* were most often confused with *Styphelia erubescens* (previously *Leucopogon oxycedrus* Sond.). While the leaf morphology can certainly be similar in the two taxa, flowering specimens of *S. erubescens* are easily distinguished by the widely spreading rather than pendulous inflorescences, a strongly scabrous style with a much-expanded stigma (*cf.* smooth style with an unexpanded or scarcely expanded stigma in *S. madida* subsp. *hirtigera*) and obtuse sepals (*cf.* acute or subacute and distinctly mucronate).

New species from Group VIII

Styphelia carolineae Hislop, *sp. nov.*

Typus: north-east of Jurien Bay, Western Australia [precise locality withheld for conservation reasons], 7 June 2010, *M. Hislop* 4034 (*holo*: PERTH 08290997; *iso*: CANB, CNS, K, MEL, NSW).

Leucopogon sp. Cockleshell Gully (J.M. Powell 1749), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 30 July 2021]

Erect, spreading *shrubs*, to *c.* 30 cm high and 40 cm wide, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* glabrous. *Leaves* spirally arranged, steeply antrorse; apex long-mucronate, pungent, the mucro straight, 0.3–0.7 mm long; base cuneate to attenuate; petiole 0.4–1.0 mm long, glabrous throughout or with a few short hairs on the adaxial surface; lamina narrowly ovate to narrowly elliptic, 6–11 mm long, 1.2–2.2 mm wide, concave adaxially, longitudinal axis gently incurved; surfaces discolorous; adaxial surface shiny, glabrous or with a few short hairs towards the base, venation not evident; abaxial surface paler, ± glaucous, matt on younger leaves, sometimes becoming ± shiny with age, glabrous, with 5–7 primary veins, the midrib not, or scarcely broader than the others, shallowly to moderately deeply grooved between the veins; margins glabrous or minutely ciliolate with stiff, antrorse hairs, < 0.05 mm long. *Inflorescence* axillary, pendulous; axis 3.2–6.5 mm long, 1- or 2-flowered, usually sparsely to moderately densely hairy or sometimes ± glabrous, ± terete below the uppermost fertile bract, narrowly winged above, terminating in a bud-rudiment; flowers pendulous, pedicellate below the bracteoles, with a pedicel to 1.0 mm long. *Fertile bracts* ovate in outline, ± clasping the pedicel and therefore usually strongly folded lengthways, 1.2–2.0 mm long, 0.7–0.9 mm wide, and with 4–5 sterile bracts below the lowest fertile bract. *Bracteoles* ovate to ± elliptic, 2.5–4.2 mm long, 1.7–2.0 mm wide, not keeled, obtuse to acute, often prominently mucronate; abaxial surface shortly hairy to ± glabrous, striate, various shades of pink or purple; margins minutely ciliolate, at least towards the apex. *Sepals* narrowly ovate, 4.8–6.5 mm long, 1.4–1.8 mm wide, acuminate with an apical mucro; abaxial surface glabrous or shortly hairy, straw-coloured, but usually conspicuously tinged with pink, venation very obscure; adaxial surface with a few short hairs towards the apex, otherwise glabrous; margins minutely ciliolate with hairs < 0.05 mm long. *Corolla tube* white, obovoid or narrowly obovoid, shorter than the sepals, 3.0–3.5 mm long, 1.9–2.3 mm wide, external surface glabrous, internal surface glabrous or occasionally with a few hairs in the upper half. *Corolla lobes* white, or very pale pink, longer than the tube, 5.7–7.4 mm long, 1.2–1.4 mm wide at base, erect in the basal 2/3–3/4 of their length, and then revolute to partially coiled, external surface glabrous, internal surface with a dense, white indumentum comprising hairs of two kinds: straight, antrorse, clearly ornamented hairs over most of the lobe length, with a zone of more obviously flattened, twisted, scarcely ornamented hairs towards the apex. *Anthers* fully exerted from the tube, but not exerted beyond the erect basal portion of the corolla lobes, 3.1–4.0 mm long, apex entire and filiform or very shortly emarginate. *Filaments* terete, 2.2–3.1 mm long, attached to the anther 1/3–1/2 above base, adnate to the tube just below the sinuses. *Nectary* partite, the scales 0.4–0.5 mm long, 0.3–0.5 mm wide, glabrous. *Ovary* narrowly ellipsoid to narrowly obovoid, 1.0–1.3 mm long, 0.5–0.7 mm wide, glabrous, 2- or 3-locular, pale green. *Style* glabrous and non-scabrous, 7.6–10.4 mm long, exerted from the corolla tube to a point well beyond the erect bases of the corolla lobes, arising from a depression at ovary apex (clearly discontinuous with the ovarian tissue); stigma not, or scarcely, expanded. *Fruit* narrowly ellipsoid to narrowly obovoid, 3.6–4.6 mm long, 1.8–2.1 mm wide, shorter than the sepals, angular in transverse section with prominent longitudinal ribs, gynophore absent; surface glabrous, ± dry, smooth (mesocarp not, or poorly, developed); apex rounded; style usually shed at or before maturity. (Figures 18, 19)



Figure 18. *Styphelia carolineae* – flowering branchlet. Photograph by Lochman Transparencies.

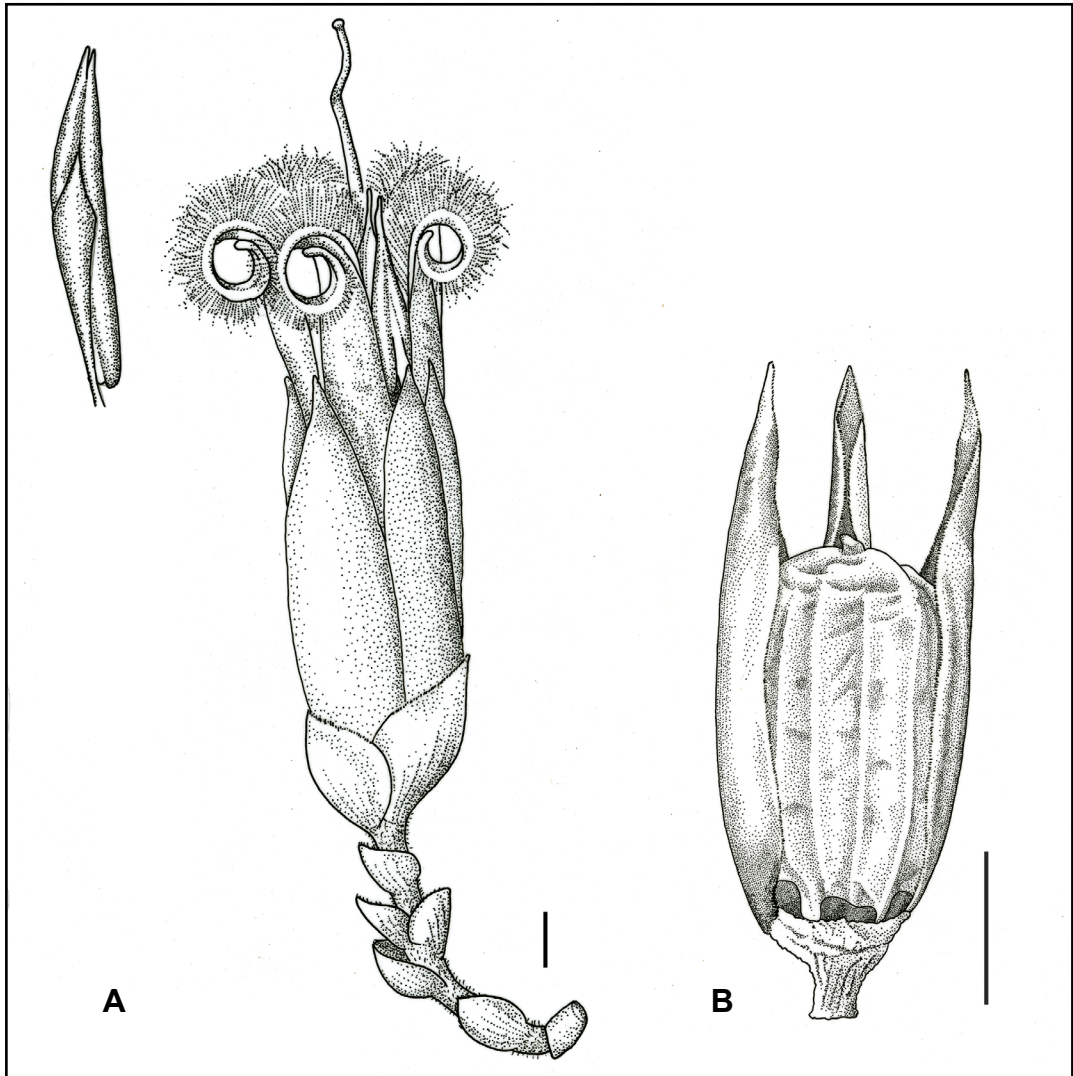


Figure 19. *Styphelia carolineae*. A – 1-flowered inflorescence, stamen; B – fruit. Scale bars = 1 mm. Vouchers *M. Hislop* 4034 (A), *E.A. Brown* 97/143 & *G. Taaffe* (B). Drawings by Skye Coffey.

Diagnostic characters. Within Group VIII, *S. carolineae* is distinguished by the following character combination: leaves narrowly ovate to narrowly elliptic, adaxially concave, the apices long-mucronate, pungent; inflorescences pendulous, 1- or 2-flowered; bracteoles and sepals conspicuously tinged pink or purple; sepals large, 4.8–6.5 mm long, longer than the corolla tube; corolla tube shorter than the sepals; corolla lobes very long, 5.7–7.4 mm, hairs on inner surface noticeably dimorphic consisting of straight, antrorse, clearly ornamented hairs over most of the lobe length, with a zone of more obviously flattened, twisted, scarcely ornamented hairs towards the apex; nectary partite; ovary pale green, glabrous, 2- or 3-locular; style very long (7.6–10.4 mm), arising from a depression at ovary apex (clearly discontinuous with the ovarian tissue); fruit narrowly ellipsoid to narrowly obovoid, ± dry.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 21 May 1969, *E.M. Bennett* 2921 (NSW, PERTH); 1 Oct. 1997, *E.A. Brown* 97/143 & *G. Taaffe* (NSW, PERTH); 9 Sep. 2004, *R.K. Brummitt*, *A.S. George* & *E.G.H. Oliver* 21179 (PERTH); 15 July 1980,

R.J. Cranfield 1478 (PERTH); 1 May 1991, *R.J. Cranfield* 7991 (PERTH); 17 June 1977, *A.S. George* 14594 (NSW, PERTH); 7 June 2010, *M. Hislop* 4033 (HO, K, PERTH); 11 July 1982, *J.M. Powell* 1749 (CANB, K, L, NSW, PERTH); 10 July 2010, *C. Puente-Lelièvre, M. Hislop & E.A. Brown* CPL 71 (NSW, PERTH); 23 July 2011, *J.E. Wajon* 2422 (PERTH).

Distribution and habitat. Restricted to a small area in the southern Geraldton Sandplains bioregion. Grows in white sand over laterite in dense, species-rich heath. Associated species include *Allocasuarina humilis*, *Banksia armata*, *Hakea ruscifolia*, *H. conchifolia* and *Daviesia angulata*.

Phenology. Flowers between May and July. Mature fruit have been collected in September and October.

Etymology. Named in honour of botanist and molecular biologist, Dr Caroline Puente-Lelièvre, whose meticulous research into the phylogeny of the *Styphelia*–*Astroloma* clade (Puente-Lelièvre 2013; Puente-Lelièvre *et al.* 2016) led to the acceptance of a broad circumscription for *Styphelia* and culminated a decades-long series of investigations into this complex subject.

Conservation status. Recently listed as Priority Two (Western Australian Herbarium 1998–) under Conservation Codes for Western Australian Flora under the name *Leucopogon* sp. Cockleshell Gully (*J.M. Powell* 1749). All collections, with one possible exception, have been made in a single national park, where *S. carolineae* appears to be quite localised. The given locality statement on *R.J. Cranfield* 1478 suggests the possibility that the species also occurs in a nature reserve well to the north of its confirmed area of occurrence, but the wording is too ambiguous to put the question beyond doubt.

Affinities. A member of the *S. conostephioides* group (or Group VIII) of Puente-Lelièvre *et al.* (2016). Although *S. carolineae* did not appear in the published phylogeny in that paper, it was included (as *L. sp.* Cockleshell Gully) in a separate study into the relationship between four members of Group VIII, which formed part of Puente-Lelièvre's original thesis (Puente-Lelièvre 2013).

The morphology of *S. carolineae* conforms well with that of the other members of Group VIII (the group is keyed out in Hislop 2021), although it is one of a minority (with *S. hispida* (E.Pritz.) Sleumer and *S. exarata* Hislop, described below) that has a consistently glabrous ovary. Two other members of the group are known to occur in the same national park in the vicinity of *S. carolineae*: *S. conostephioides* and *Leucopogon* sp. short style (*S. Barrett* 1578).

Styphelia carolineae is readily distinguished from *S. conostephioides* by its larger floral parts, e.g. sepals 4.8–6.5 mm long (*cf.* 2.5–3.8 mm long in *S. conostephioides**), corolla lobes 5.7–7.4 mm long (*cf.* 2.5–4.5 mm long*), style 7.6–10.4 mm long (*cf.* 3.5–5.6 mm long*), glabrous branchlets (*cf.* branchlets with a moderately dense to dense indumentum) and glabrous ovary (*cf.* very shortly hairy in the Geraldton Sandplains, refer notes below). There is another significant difference in the corolla lobe indumentum. In *S. carolineae* it is of two kinds, the hairs being straight, antrorse and clearly ornamented over most of the lobe length, but with a zone of more obviously flattened, twisted, scarcely ornamented hairs towards the apex. In *S. conostephioides* by contrast the hairs are similarly twisted and ornamented across the entire lobe length. The two species grow in close proximity at the type locality of *S. carolineae* but there is an apparent habitat preference with *S. conostephioides* occurring on deeper sands generally downslope from *S. carolineae*.

Leucopogon sp. short style (*S. Barrett* 1578) can be easily distinguished from all other members of Group VIII by its distinctly shorter style with the stigma presented at the top of the tube rather than long-exserted beyond the tube which is otherwise the norm for the group.

Notes. A notable feature of *S. carolineae* is the strong tendency for the bracteoles and sepals, and often also the corolla lobes, to be tinged various shades of pink or purple. In the case of both the bracteoles and sepals this coloration darkens as the fruit matures. Although very pronounced in *S. carolineae*, this attribute is not restricted to the species but is sometimes also apparent in collections of *S. conostephioides* from the Geraldton Sandplains.

Across most of its wide distribution, including the Geraldton Sandplains, *S. conostephioides* has a very shortly hairy ovary, which provides one of the differences between it and *S. carolineae*. However, in the south of its range (in the far south-west corner) there occurs a variant that may have a glabrous ovary. The consistency with which this feature occurs, and whether it correlates with other differences, are questions that require further investigation, as the presence/absence of ovarian hairs is frequently a character of taxonomic importance in the genus.

*The floral measurements for *S. conostephioides* used here were obtained from specimens collected from the Geraldton Sandplains only. Preliminary assessment suggests a similar size range for these floral parts across the remainder of the species' range and that the given size differences between the two species are unlikely to be significantly eroded with further research.

Styphelia exarata* Hislop, *sp. nov.

Typus: north of Cascade, Western Australia [precise locality withheld for conservation reasons], 26 May 2013, *W. R. Archer* 2605132 A (*holo:* PERTH 08489378; *iso:* CANB, CNS, K, MEL, NSW).

Leucopogon sp. Lake Tay (W.R. Archer 2104138), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 30 July 2021]

Erect *shrubs*, to *c.* 40 cm high, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a moderately dense to dense indumentum of patent to retrorse, straight or curved hairs to *c.* 0.2 mm long. *Leaves* spirally arranged, steeply antrorse; apex long-mucronate, the mucro \pm straight, fine and brittle, scarcely pungent, 0.4–1.2 mm long; base cuneate; petiole 0.2–0.5 mm long, usually variously hairy on all surfaces or sometimes the abaxial surface glabrescent; lamina narrowly ovate to ovate, 2.5–5.5 mm long, 1.0–1.7 mm wide, concave adaxially, longitudinal axis gently incurved; surfaces \pm concolorous or the abaxial surface slightly paler; adaxial surface shiny, sparsely hairy, at least towards the base, venation not evident; abaxial surface slightly shiny, with 5–7(9) raised primary veins (the midrib not, or scarcely broader than the others), shortly and densely hairy in the deep grooves between, the raised vein surfaces hairy or \pm glabrescent; margins ciliolate, with stiff, antrorse hairs, to 0.2 mm long. *Inflorescence* axillary, pendulous; axis 2.7–4.5 mm long, 1- or occasionally 2-flowered, densely hairy, \pm terete below the uppermost fertile bract, narrowly winged above, terminating in a bud-rudiment; flowers pendulous, pedicellate below the bracteoles, with a pedicel to *c.* 0.6 mm long. *Fertile bracts* ovate to broadly ovate, 0.6–1.0 mm long, 0.6–0.8 mm wide, and with 3–5 sterile bracts below the lowest fertile bract. *Bracteoles* ovate to elliptic, 1.5–2.0 mm long, 1.3–1.5 mm wide, not keeled, obtuse to acute, \pm mucronate; abaxial surface hairy or glabrous, striate; margins minutely ciliolate, at least towards the apex. *Sepals* narrowly ovate, 3.2–4.2 mm long, 1.1–1.3 mm wide, acute with or without a short, apical mucro; abaxial surface glabrous or sparsely hairy, straw-coloured, often with some pink tinges post-anthesis, venation very obscure; adaxial surface with a few hairs towards the apex, otherwise glabrous; margins minutely ciliolate, mostly towards the apex, with hairs < 0.05 mm long. *Corolla tube* white, obovoid, shorter than the sepals, 1.5–2.3 mm long, 1.4–1.8 mm wide, external surface glabrous, internal surface glabrous, or with a very few hairs immediately below

the lobes. *Corolla lobes* white, longer than the tube, 3.2–4.1 mm long, 0.7–0.9 mm wide at base, erect in basal 1/2–2/3 of their length, and then spreading and revolute to \pm coiled abaxially, external surface glabrous, internal surface with a dense, white indumentum of flat, twisted hairs, not or barely ornamented. *Anthers* fully exerted from the tube, but not exerted beyond the erect basal portion of the corolla lobes, 1.7–2.7 mm long, apex entire, filiform. *Filaments* terete, 1.0–1.3 mm long, attached to the anther 1/3–1/2 above base, adnate to the tube just below the sinuses. *Nectary* usually partite, the scales 0.3–0.5 mm long, 0.3–0.4 mm wide, glabrous, or sometimes appearing annular with the scales weakly cohering. *Ovary* narrowly ellipsoid, 0.7–1.0 mm long, 0.4–0.5 mm wide, glabrous, 2-locular, pale green. *Style* glabrous and non-scabrous, 4.0–5.6 mm long, exerted from corolla tube to a point well beyond the erect corolla lobe bases, tapering smoothly from ovary apex; stigma not, or scarcely, expanded. Mature *fruit* not seen; somewhat immature fruit narrowly ellipsoid to narrowly ovoid, \pm circular in transverse section, with obscure longitudinal ribs, gynophore absent; surface glabrous, \pm dry, smooth (mesocarp not, or poorly, developed); apex rounded. (Figures 20, 21)



Figure 20. *Styphelia exarata* – flowering branchlet. Voucher *W. R. Archer* 2605132. Photograph by William Archer.

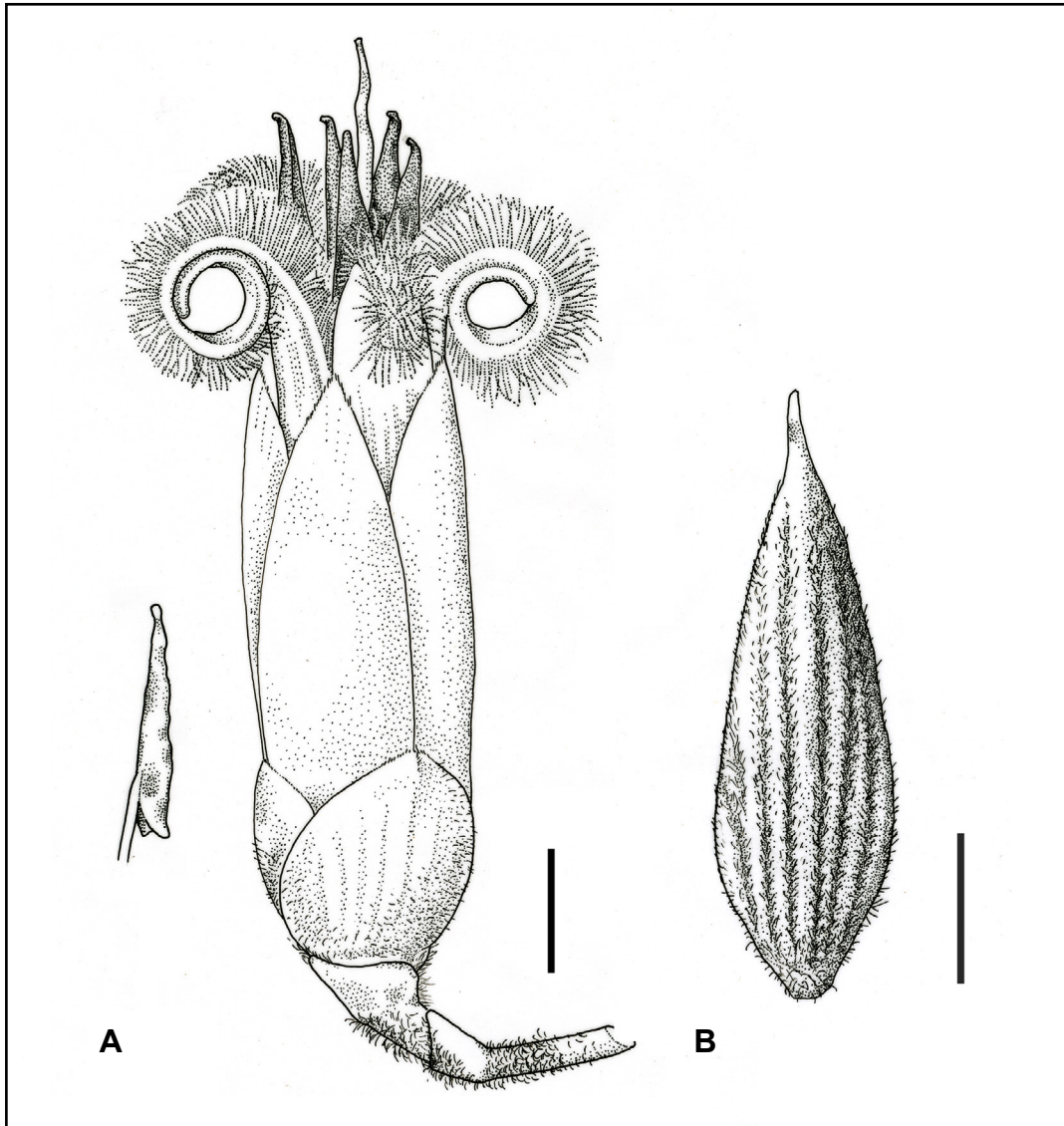


Figure 21. *Styphelia exarata*. A – 1-flowered inflorescence, stamen; B – leaf, abaxial surface. Scale bars = 1 mm. Voucher *W. R. Archer* 2605132. Drawings by Skye Coffey.

Diagnostic characters. Within Group VIII, *S. exarata* is distinguished by the following character combination: leaves narrowly ovate to ovate, adaxially concave, apices long-mucronate with fine, rather brittle mucros, abaxial surfaces hairy, deeply and narrowly grooved; inflorescences pendulous, 1(2)-flowered; corolla tube shorter than the sepals; corolla lobes longer than the tube; anthers with entire, filiform apices; nectary partite, or occasionally the scales weakly cohering; ovary pale green, glabrous, 2-locular; style well-exserted, tapering smoothly from ovary apex.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 21 Apr. 2013, *W.R. Archer* 2104137 (PERTH); 21 Apr. 2013, *W.R. Archer* 2104138 (CNS, MEL, CANB, PERTH); 22 Apr. 2013, *W.R. Archer* 22041310 (PERTH); 25 May 2013, *W.R. Archer* 2605131 (CANB, PERTH); 26 May 2013, *W.R. Archer* 2605132 B (PERTH); 26 May 2013 *W.R. Archer* 2605133

(PERTH); 26 Apr. 2013, *W.R. Archer* 2605134 (PERTH); 9 June 2013, *W.R. Archer* 906135 (PERTH); 16 Aug. 2015, *W.R. Archer* 1608153 (PERTH).

Distribution and habitat. Known only from a small area well to the north of the settlement of Cascade in the central part of the Mallee bioregion. Grows in deep, white sand under mallee woodland.

Phenology. Flowering specimens have been collected between April and June. A collection from the middle of August has immature fruit present.

Etymology. From the Latin *exaratus* (furrowed), a reference to the deep, abaxial leaf grooves.

Conservation status. Listed as Priority One (Smith & Jones 2018) under Conservation Codes for Western Australian flora under the name *Leucopogon* sp. Lake Tay (*W.R. Archer* 2104138). Currently known from a very restricted area in a remote part of Western Australia. This part of the state is largely uncleared however, and it seems probable that new populations will come to light over time as the area becomes better known botanically.

Affinities. *Styphelia exarata* was not included in the molecular analysis of Puente-Lelièvre *et al.* (2016) but the combination of pendulous inflorescence, pale green, 2-locular ovary, partite nectary and sepals longer than the corolla tube provides strong morphological evidence that it is a member of Group VIII. Its closer relationships within that group, however, are not obvious. In particular, it is the only species within the group that has deep, hairy abaxial leaf grooves. It is also one of only three to have a consistently glabrous ovary, the others being *S. hispida* (E.Pritz.) Sleumer and *S. carolineae* (described above), both from the Geraldton Sandplains bioregion.

Two other members of Group VIII occur in the Mallee bioregion, *Leucopogon* sp. Coujinup (M.A. Burgman 1085) and *L.* sp. Newdegate (M. Hislop 3585). Both are easily distinguished from *S. exarata* by their more or less glabrous, flat or shallowly grooved abaxial leaf surfaces (*cf.* hairy, with narrow, deep grooves in *S. exarata*) and hairy rather than glabrous ovaries.

Although not a member of Group VIII, *S. sulcata* Hislop & Puente-Lel., also from the Mallee bioregion, bears a strong similarity in its foliar morphology to that of *S. exarata*. When flowering the two should not be confused as *S. sulcata* has an erect rather than pendulous inflorescence and a corolla that is hairy, rather than glabrous, on its external surface. In the absence of the inflorescence character however the two are very similar indeed, with the generally shorter leaves (2.5–5.5 mm long *cf.* 4.0–8.2 mm) and shorter mucros (0.4–1.2 mm long *cf.* 1.0–2.4 mm) of *S. exarata* providing the best means of distinguishing between them.

Acknowledgements

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