

## A taxonomic review of the *Styphelia tamminensis* subgroup (Ericaceae: Epacridoideae: Styphelieae)

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### Abstract

Hislop, M. & Nguyen, H.K., A taxonomic review of the *Styphelia tamminensis* subgroup (Ericaceae: Epacridoideae: Styphelieae). *Nuytsia* 33: 275–320 (2022). Within the heterogeneous *Styphelia* Sm. Group X, a distinctive Western Australian subgroup is recognised based on morphological and molecular data. A morphological synopsis of the subgroup is provided and the following 13 new species are described and illustrated: *S. annulata* Hislop, *S. bracteolosa* Hislop, *S. echinulata* Hislop, *S. exilis* Hislop, *S. hyalina* Hislop, *S. incerta* Hislop, *S. pallens* Hislop, *S. papillosa* Hislop, *S. platyneura* Hislop, *S. recurva* Hislop, *S. roseola* Hislop, *S. scabrella* Hislop and *S. subglauca* Hislop. Nine of the novel species are conservation-listed. A key to all 19 members of the subgroup is included.

### Introduction

Of the 12 phylogenetic groups resolved in *Styphelia* Sm. 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 through their placement in the published phylogeny or by extrapolation of critical morphological features. A recent short paper (Hislop 2021) provided an interim key to the infrageneric groups in Western Australia together with lists of their included taxa, both the formally described and phrase-named. The species described below have all previously been recognised by phrase names in *Leucopogon* R.Br. and belong to Group X. This is the most heterogeneous of the groups and likely also the most speciose; it is well represented in both eastern and western Australia. Despite the morphological diversity across the group, it forms a well-supported clade in the phylogeny (Puente-Lelièvre *et al.* 2016). It is significant, however, that in comparison with the other large groups occurring in Western Australia the sampling density in Group X was lower, and some critical branch values were very weak, meaning that our understanding of infra-group relationships is relatively less well developed. Further molecular research within Group X is therefore desirable before a formal infrageneric classification is finalised.

Within the western members of the group several morphological elements are evident; these mostly correspond to well-supported terminal subclades within the phylogenetic tree. The species described in this paper belong to a particularly distinctive subclade that is informally referred to herein as the *S. tamminensis* subgroup.

## Methods

This study was based on an examination of dried specimens housed at the Western Australian Herbarium (PERTH), together with field observations of all members of the *S. tamminensis* subgroup.

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, or to the flower base in those species where the bud-rudiment is lacking. Floral measurements were taken from rehydrated flowers in natural posture except for the corolla lobes, which were uncurled to their fullest length before measuring. Observations of the floral indumentum were taken from dried material at  $\times 50$  magnification. Fruit length is inclusive of a gynophore, if present.

Relative to the ovarian locules of other *Styphelieae*, those of the *S. tamminensis* subgroup are very narrow and obscure. The best method by which to observe these is to make a transverse section with a very sharp scalpel close to the ovary base of rehydrated flowers and use a magnification of at least  $\times 50$ .

Distribution maps are available on *Florabase* (Western Australian Herbarium 1998–). Bioregions follow the *Interim Biogeographic Regionalisation for Australia* (IBRA) v. 7 (Department of Climate Change, Energy, the Environment and Water 2021).

## Taxonomy of the *Styphelia tamminensis* subgroup

The following seven taxa from the *S. tamminensis* subgroup form a well-supported subclade (Punkte-Lelièvre *et al.* 2016): *Leucopogon tamminensis* var. *australis* E.Pritz. (now *S. decussata* Hislop, Crayn & Punkte-Lel., see Crayn *et al.* 2020), *L.* sp. Warradarge (now *S. williamsiorum* Hislop & Punkte-Lel., see Hislop & Punkte-Lelièvre 2017), *L.* sp. Great Southern (now *S. annulata* Hislop, described below), *L.* sp. Wandering (now *S. recurva* Hislop, described below), *L.* sp. Gunapin (now *S. bracteolosa* Hislop, described below), *L.* sp. Tathra (now *S. pallens* Hislop, described below), and *L.* sp. Yandanooka (now *S. hyalina* Hislop, described below). There are another twelve species that can be placed in this subgroup by morphological extrapolation, four of which were published in the nineteenth or early twentieth century, namely *S. crassifolia* (Sond.) F.Muell., *S. cymbiformis* (DC.) F.Muell., *S. pogonocalyx* (Benth.) F.Muell. and *S. tamminensis* (E.Pritz.) Sleumer. The remaining eight are described below as new species: *S. echinulata* Hislop, *S. exilis* Hislop, *S. incerta* Hislop, *S. papillosa* Hislop, *S. platyneura* Hislop, *S. roseola* Hislop, *S. scabrella* Hislop and *S. subglauca* Hislop.

## Morphological synopsis

*Leaves* opposite or helically arranged; apex usually mucronate, the mucro pungent, less often sub-pungent or non-pungent, occasionally absent; lamina usually adaxially concave, rarely convex or plano-convex; abaxial surface flat or variously grooved between the veins, glabrous or variously hairy. *Inflorescence* arising from the axils of regular, mature leaves, 1–7-flowered, flowers sessile; axis erect, either terminating in a bud-rudiment (all species with spiral phyllotaxis) or bud rudiment absent (most species with opposite phyllotaxis). *Bracteoles* not striate, keeled (species with helical phyllotaxis) or not (opposite phyllotaxis). *Sepals* not striate, with usually obscure venation (only the mid-vein evident), shorter than the corolla tube in most species,  $\pm$  equal to or longer than the tube in a few. *Corolla* white, pink, red, purple, pale yellow or cream. *Corolla tube* internal surface variously

hairy at least in the upper half, external surface glabrous or hairy. *Corolla lobes* spreading from close to the base in most species (erect for about a third of their length in *S. recurva*); outer surface usually glabrous, very occasionally sparsely hairy; inner surface densely hairy with  $\pm$  terete, almost completely smooth and usually  $\pm$  straight, hairs. *Filaments* terete, very short, to 0.2 mm long, attached at or very close to the anther apices, adnate to corolla tube just below the sinuses or in some species well down within the tube. *Anthers* wholly included within the corolla tube or occasionally very shortly exerted by up to 1/4 of length. *Ovary* glabrous or variously hairy, 3-locular (very rarely 4-locular), pale green, yellow-green or straw-coloured. *Nectary* partite. *Style* glabrous or papillose, always included within the corolla tube and usually <0.4 mm long (1.4–1.8 mm in *S. incerta*), usually smoothly attenuated from (and with the base not clearly differentiated from) an acute ovary apex (abruptly differentiated from an obtuse ovary apex in *S. exilis* and *S. incerta*). *Drupe*  $\pm$  dry (mesocarp not, or poorly developed), often with a well-defined gynophore, cylindrical, very narrowly ovoid, very narrowly obovoid or  $\pm$  fusiform, with prominent, slightly raised, pale ribs.

*Notes.* A combination of distinctive morphological features makes the recognition of the *S. tamminensis* subgroup relatively straightforward, in most cases. All members, with the exception of *S. incerta*, key out at the first lead of couplet 18 in the recently published interim key to species groups (Hislop 2021).

The most diagnostic characters relate to the gynoeceium. All species in the subgroup have a 3-locular ovary, with the locules narrow and obscure. Other western members of Group X have a 5-locular ovary except for *Leucopogon* sp. outer wheatbelt (M. Hislop 30), which has a consistently 3-locular ovary, and *L.* sp. Mount Heywood (M.A. Burgman 1211) and *L.* sp. Lort River (M. Golding 3) in which the ovary is either 2- or 3-locular. In addition, all species in the subgroup have a style that is included within the corolla tube; in most cases it is very short and often not clearly differentiated from the acute ovary apex (Figures 1D, 7D). The posture of the corolla lobes is also important: in all but one species these spread directly from, or very close to, their base rather than being erect in the lower 1/3–2/3 before spreading, which is the most common configuration in Group X and elsewhere in *Styphelia*. Very short filaments (to 0.2 mm long) and anthers that are either included in the corolla tube or with just the tips exerted are other floral characters by which the subgroup can be recognised. In several species the filaments are inserted well below the throat of the corolla tube rather than a little below the lobe sinuses, which is the usual point of attachment. This is another very unusual feature rarely seen elsewhere in western *Styphelia*. It is noteworthy that across the entire genus, species with consistently opposite leaves are restricted to this subgroup, although a majority have a helical phyllotaxis.

The interpretation of the obscure ovarian locules in this subgroup evidently caused Bentham (1868) some problems. In his treatment of *Leucopogon cymbiformis* (actually *Styphelia annulata*, see description of that species below) he commented ‘I have had the greatest difficulty in ascertaining the structure of the ovary’ and concluded that in the ‘more than a dozen different specimens’ examined the ovaries were ‘diseased’. He was only confident of the locule count in one specimen which he recorded as ‘distinctly 2-celled, but the ovules were still imperfect’. This seems unlikely, however, as a 2-locular ovary has never been observed for any member of *S. tamminensis* subgroup.

Species of the *S. tamminensis* subgroup form part of the ‘*Gynoconus*’ segregate proposed by Powell *et al.* (1997) as one of several new generic groupings within *Leucopogon* s. lat. based on morphological data. As originally conceived, ‘*Gynoconus*’ included both eastern and western Australian taxa. Subsequent molecular research (Taaffe *et al.* 2001; Quinn *et al.* 2003) did not support the recognition of ‘*Gynoconus*’ as so constituted, but the phylogeny obtained by Puente-Lelièvre *et al.* (2016) indicates that at least the Western Australian members of that grouping are monophyletic.

### Key to species of the *S. tamminensis* subgroup

Note that corolla colour refers to the tube and lobe surfaces, ignoring the always white lobe hairs.

1. Leaves opposite, decussate
  2. Fertile bracts and bracteoles with uncinat apices; bracteoles foliose, 2.6–4.2 mm long, as long as or more often longer than the sepals; inflorescence axes usually multi-flowered, 2.5–10 mm long (Darling Range; NW of York–W of Beverley) ..... **S. bracteolosa**
  - 2: Fertile bracts and bracteoles without uncinat apices; bracteoles not foliose, 0.7–1.6 mm long, shorter than the sepals; inflorescence axes reduced, usually 1- or very rarely 2-flowered and 0.2–0.8 mm long, up to 4-flowered and 1.5–3.5 mm long in *S. exilis*
  3. Inflorescence axes 1.5–3.5 mm long, 1–4-flowered, terminating in a bud-rudiment; leaves to 1 mm wide, leaf apices non-mucronate, narrowly obtuse; external corolla tubes glabrous; ovary apex obtuse, style distinct and abruptly differentiated from ovary (Manypeaks–Wellstead) ..... **S. exilis**
  - 3: Inflorescence axes 0.2–0.8 mm long, 1- or very rarely 2-flowered, apparently terminating in a flower or bract-like point rather than a bud-rudiment; wider leaves >1 mm wide or if less then apex clearly mucronate; ovary apex acute, style not or scarcely differentiated from ovary
  4. Corolla tube externally glabrous
    5. Sepals glabrous abaxially, margins glabrous; filaments adnate to tube just below sinuses; ovary glabrous (S of Mingenew–W of Three Springs) ..... **S. hyalina**
    - 5: Sepals hairy abaxially, occasionally the hairs very sparse, margins ciliate or lacinate at least in the distal half or very occasionally ± glabrous; filaments adnate to tube well below sinuses (i.e. 2/3–3/4 the length of the tube above the base); ovary hairy, especially towards the base (New Norcia–Yerecoin–Bindoon–ulimar State Forest) ..... **S. roseola**
  - 4: Corolla tube variously hairy externally
    6. Filaments adnate to tube just below the sinuses; sepals hairy adaxially at apex and/or base (usually both), apices acute to acuminate, often filiform, darkly pigmented and not recurved (Corrigin–Boxwood Hill–Munglinup) ..... **S. decussata**
    - 6: Filaments adnate to tube well below the sinus (i.e. 2/3–3/4 the length of the tube above the base); sepals glabrous adaxially, apices obtuse or if acute (*S. williamsiorum*) then recurved and not darkly pigmented
    7. Corolla uniformly pink; sepal margins broadly hyaline; filaments attached to anthers just below the anther apex (New Norcia–Yerecoin–Bindoon–Julimar State Forest) ..... **S. roseola**
    - 7: Corolla uniformly purple or pale yellow to cream, sometimes partially flushed red; sepal margins not noticeably hyaline; filaments attached to anthers 1/2–3/4 above anther base
      8. Corolla uniformly purple; leaves flat to shallowly grooved abaxially between the veins; sepals glabrous abaxially or very occasionally with a few antrorse hairs, apices obtuse to acute and usually recurved (South Eneabba Nature Reserve–Badgingarra–Alexander Morrison National Park) ..... **S. williamsiorum**
      - 8: Corolla pale yellow to cream, sometimes partially flushed red; leaves moderately to deeply grooved abaxially between the veins; sepals with spreading hairs abaxially, apices obtuse or subacute and not recurved (E & NE of Eneabba) ..... **S. pallens**

**1:** Leaves helically arranged

- 9.** Ovary hairy in some part, never papillose; sepals with conspicuous, thickened, green apices
- 10.** Ovary with a well-defined basal ring of hairs, glabrous above at flowering; leaves 1.4–6.0 mm long; corolla tube 2.5–3.8 mm long; corolla lobes 1.3–1.7 mm long (Widespread: Muchea–Bolgart–Dowerin southwards to SW of Mt Barker–Ongerup) ..... **S. annulata**
- 10:** Ovary shortly hairy in the upper 1/3–2/3, without a basal hair ring; leaves 0.8–2.3 mm long; corolla tube 1.8–2.5 mm long; corolla lobes 0.8–1.2 mm long (Bruce Rock–Wogarl–Kulin–Varley) ..... **S. scabrella**
- 9:** Ovary glabrous throughout, sometimes papillose; sepals lacking conspicuous, thickened, green apices (except for *S. scabrella*)
- 11.** Leaf tip without a clearly defined mucro, not pungent (rarely with a short mucro to 0.2 mm long in *S. crassifolia* and *S. cymbiformis*)
- 12.** Leaves obovate to depressed-obovate, ovate to depressed-ovate or narrowly ovate, or broadly elliptic to transversely elliptic; longest leaves <2.5 mm long
- 13.** Style 1.4–1.8 mm long; filaments adnate to tube 1/2–2/3 the length of the tube above the base; longitudinal leaf axis always very strongly recurved, the leaf tip acute and usually pungent or sub-pungent (S of Hyden–SW of Lake King) ..... **S. incerta**
- 13:** Style 0.1–0.5 mm long; filaments usually adnate to tube just below the sinuses, but if lower always at least 3/4 the length of the tube above the base; longitudinal leaf axis various but if recurved, the leaf tip obtuse to subacute and not pungent or sub-pungent
- 14.** Leaves ovate or narrowly ovate, acute, usually scabrous abaxially; sepals usually ± scabrous (sometimes glabrous), with conspicuous, thickened, green apices (Bruce Rock–Wogarl–Kulin–Varley)..... **S. scabrella**
- 14:** Leaves ovate to depressed ovate or obovate to depressed obovate, obtuse to subacute or occasionally acute, never scabrous; sepals never scabrous, without thickened, green apices
- 15.** Leaves 1.3–2.0 mm long, 1.0–1.6 mm wide, obovate to ovate or broadly so, usually distinctly longer than wide; abaxial surface with a very prominent midvein, deeply and openly grooved between veins, often with short, stiff hairs on the veins; sepals shortly hairy, at least in the upper half; bracteoles shortly hairy, at least in the upper half, 1.3–1.7 mm long, 1.0–1.2 mm wide, ovate (Forrestania–Frank Hann National Park) ..... **S. platyneura**
- 15:** Leaves 1.2–2.0 mm long, 1.2–2.0 mm wide, broadly ovate or depressed-ovate to broadly obovate or depressed-obovate, frequently wider than long; abaxial surface with a less prominent midvein, more shallowly grooved between the always glabrous veins; sepals glabrous; bracteoles glabrous, 1.0–1.3(1.5) mm long, 0.8–1.2 mm wide, broadly ovate or ± orbicular (Merredin–E of Hyden)..... **S. subglauca**
- 12:** Leaves narrowly obovate to narrowly elliptic, rarely narrowly ovate; longest leaves at least 3 mm long
- 16.** Sepal apices obtuse, appressed to corolla tube; external corolla glabrous; ovary papillose (Porongurup Range–South Stirling with apparent outliers at Albany & Waychinicup)..... **S. cymbiformis**
- 16:** Sepal apices acute, subacute or occasionally obtuse, recurved or ± spreading on some or all flowers; corolla tube and often lobes variously hairy externally (rarely ± glabrous throughout); ovary not papillose (apparently disjunct: Fitzgerald River

- National Park and Cape Riche area, with outliers at Chillinup & N of Cheyne Beach)..... **S. crassifolia**
- 11:** Leaf tip with a well-defined, pungent or occasionally sub-pungent mucro 0.2–1.0 mm long
- 17:** Abaxial leaf surfaces deeply and very narrowly grooved between the veins (the bottom of the grooves not visible), with very short hairs present in the grooves, and either glabrous or with very sparse, longer hairs outside of the grooves
- 18:** Longitudinal leaf axes strongly recurved; filaments adnate to the corolla tube just below the sinuses; anthers partially exerted from the corolla tube, by 1/8–1/4 of their length (Bonnie Rock–Diemals)..... **S. echinulata**
- 18:** Longitudinal leaf axes markedly incurved; filaments adnate to the corolla tube well below the sinuses; anthers fully included within the corolla tube (disjunct: Marchagee–Watheroo; Wongan Hills area; Tammin area)..... **S. tamminensis**
- 17:** Abaxial leaf surfaces variously grooved between the veins, from shallow, open grooves to deeper, narrow grooves, but if the latter then the bottom of the grooves visible, hairs absent or present but if hairy within the grooves then with hairs of similar length and density across the surface
- 19:** Longitudinal leaf axis strongly recurved throughout; style 1.4–1.8 mm long, the base abruptly differentiated from the obtuse ovary apex (S of Hyden–SW of Lake King)..... **S. incerta**
- 19:** Longitudinal leaf axis gently incurved to gently recurved; style to 0.4 mm long, the base smoothly attenuated from the acute ovary apex
- 20:** Longest leaves <2.5 mm long; leaves usually scabrous abaxially; sepals usually ± scabrous (sometimes glabrous), with conspicuous, thickened, green apices (Bruce Rock–Wogarl–Kulin–Varley)..... **S. scabrella**
- 20:** Longest leaves >4 mm long; leaves glabrous or hairy but not scabrous; sepals glabrous or hairy but not scabrous, without thickened, green apices
- 21:** Sepals acuminate, the apices usually recurved, occasionally almost straight but if so then not appressed to corolla tube (W of York–Narrogin district)..... **S. recurva**
- 21:** Sepals obtuse or occasionally subacute, the apices appressed to corolla tube
- 22:** Style clearly differentiated from ovary apex, 0.3–0.4 mm long; filaments adnate to tube just below sinuses; anther tips slightly exerted from corolla tube, easily visible in the throat (Stirling Range, an old record from Mt Manypeaks)..... **S. pogonocalyx**
- 22:** Style poorly differentiated from ovary apex, 0.1–0.2 mm long; filaments adnate to tube well below sinuses (± 3/4 the length of the tube above the base); anthers held well within the tube, not visible in the throat (NE of Wickepin–Woodanilling–Tarin Rock)..... **S. papillosa**

### Species of the *S. tamminensis* subgroup

*Styphelia annulata* Hislop, *sp. nov.*

*Typus:* Souness Farm (Paper Collar Grazing Co., East Block), near Stirling Range National Park, Western Australia, 31 October 1986, *R.S. Cowan* A-586 (*holo:* PERTH 04442164; *iso:* CANB, CNS, K, MEL).

*Leucopogon* sp. Great Southern (R.S. Cowan A 586), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 17 June 2022].

[*Leucopogon cymbiformis* auct. non A.Cunn. ex DC.: G. Bentham, *Fl. Austral.* 4: 200 (1868); W.E. Blackall & B.J. Grieve, *How to Know W. Austral. Wildfl.* IIIB: 332; 337 (1981); J.R. Wheeler in N.G. Marchant *et al.*, *Fl. Perth Region*: 185 (1987); G. Paczkowska & A.R. Chapman, *West. Aust. Fl.: Descr. Cat.*: 237 (2000).]

Low, usually rather compact *shrub*, mostly <40 cm high and 60 cm wide, occasionally to 70 cm high, multi-stemmed from close to base of plant but single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a sparse to moderately dense indumentum of straight or decurved hairs to c. 0.2 mm long, occasionally  $\pm$  glabrous. *Leaves* helically arranged, steeply antrorse to antrorse-appressed; apex long-mucronate, pungent, the mucro straight to slightly inflexed, 0.2–0.6 mm long; base attenuate to cuneate; petiole 0.2–0.5 mm long, glabrous or with a few marginal hairs; lamina narrowly ovate or ovate, 1.4–6.0 mm long, 0.5–1.5 mm wide,  $\pm$  concolorous, concave adaxially, longitudinal axis straight or gently recurved in the lower half and becoming incurved in the upper half or incurved throughout; adaxial surface not or very slightly shiny, glabrous or sparsely hairy mostly in the lower half, venation not evident; abaxial surface shiny, glabrous or sparsely and shortly hairy, with 5–7 pale, primary veins, flat or very shallowly grooved between the veins; margins  $\pm$  glabrous or with coarse, antrorse hairs <0.05 mm long. *Inflorescence* axillary, erect, usually grouped together in a contracted conflorescence; axis 2.2–5.5(7.5) mm long, (1)2–5(7)-flowered, usually with moderately dense to dense indumentum, occasionally  $\pm$  glabrous, compressed below the lowest fertile bract, angular above, terminating in a bud-rudiment; flowers erect, sessile. *Fertile bracts* narrowly ovate to ovate, 1.2–3.0(4.0) mm long, 0.7–1.0 mm wide, subtended by 3 sterile bracts, the basal 2 opposite. *Bracteoles* narrowly ovate or ovate, 1.4–3.2 mm long, 0.6–1.0 mm wide, keeled, acute, mucronate; abaxial surface glabrous or sometimes slightly scabrous; margins glabrous. *Sepals* narrowly ovate, 2.3–3.2(3.5) mm long, 0.7–1.0 mm wide, acute and often mucronate; abaxial surface glabrous or sometimes slightly scabrous, straw-coloured or yellow-green, sometimes with pink tinges in the lower half, with conspicuous, thickened, green apices, only the mid-vein evident; adaxial surface glabrous apart from a zone of sparse hairs towards the apex; margins with coarse, antrorse hairs <0.05 mm long or glabrous. *Corolla tube* white, narrowly ellipsoid, narrowly ovoid, or occasionally  $\pm$  cylindrical, longer than or rarely  $\pm$  equal to the sepals, 2.5–3.8 mm long, 0.8–1.2(1.5) mm wide, glabrous externally, internal surface with an apical band of hairs (often rather sparse) projecting into the tube, the remainder glabrous. *Corolla lobes* white, often flushed pink or pink-purple towards their apices, shorter than the tube, 1.3–1.7 mm long, 0.5–0.6 mm wide at base, spreading from the base and recurved, glabrous externally, internal surface with a dense, white indumentum of terete, usually  $\pm$  straight and essentially unornamented hairs. *Anthers* fully included within the corolla tube, 0.8–1.5 mm long, apex rounded to scarcely emarginate. *Filaments* terete, 0.1–0.2 mm long, attached to the anther at least 7/8 above base, adnate to tube a little or sometimes distinctly below the sinuses. *Nectary* partite, the scales 0.3–0.5 mm long, 0.2–0.3 mm wide, glabrous. *Ovary* narrowly or very narrowly ovoid, 1.2–1.7 mm long, 0.3–0.4 mm wide, with a basal ring of straight, antrorse hairs, glabrous above (at flowering), 3-locular, straw-coloured or yellow-green (very occasionally mid-green). *Style* scarcely differentiated from ovary apex in either flower or fruit, 0.2–0.3 mm long, slightly scabrous, included within the corolla tube; stigma expanded. *Fruit*  $\pm$  fusiform, usually curved, 3.2–4.2 mm long (inclusive of gynophore), 0.8–1.0 mm wide, much longer than the sepals, circular in section, with a well-defined gynophore; surface rather sparsely hairy in the lower 1/2–2/3, with a  $\pm$  spreading indumentum of 0.2–0.3 mm long hairs,  $\pm$  dry, smooth (mesocarp poorly developed), with pale, longitudinal ribs; apex acute, tapering smoothly to the base of the persistent style. (Figure 1)

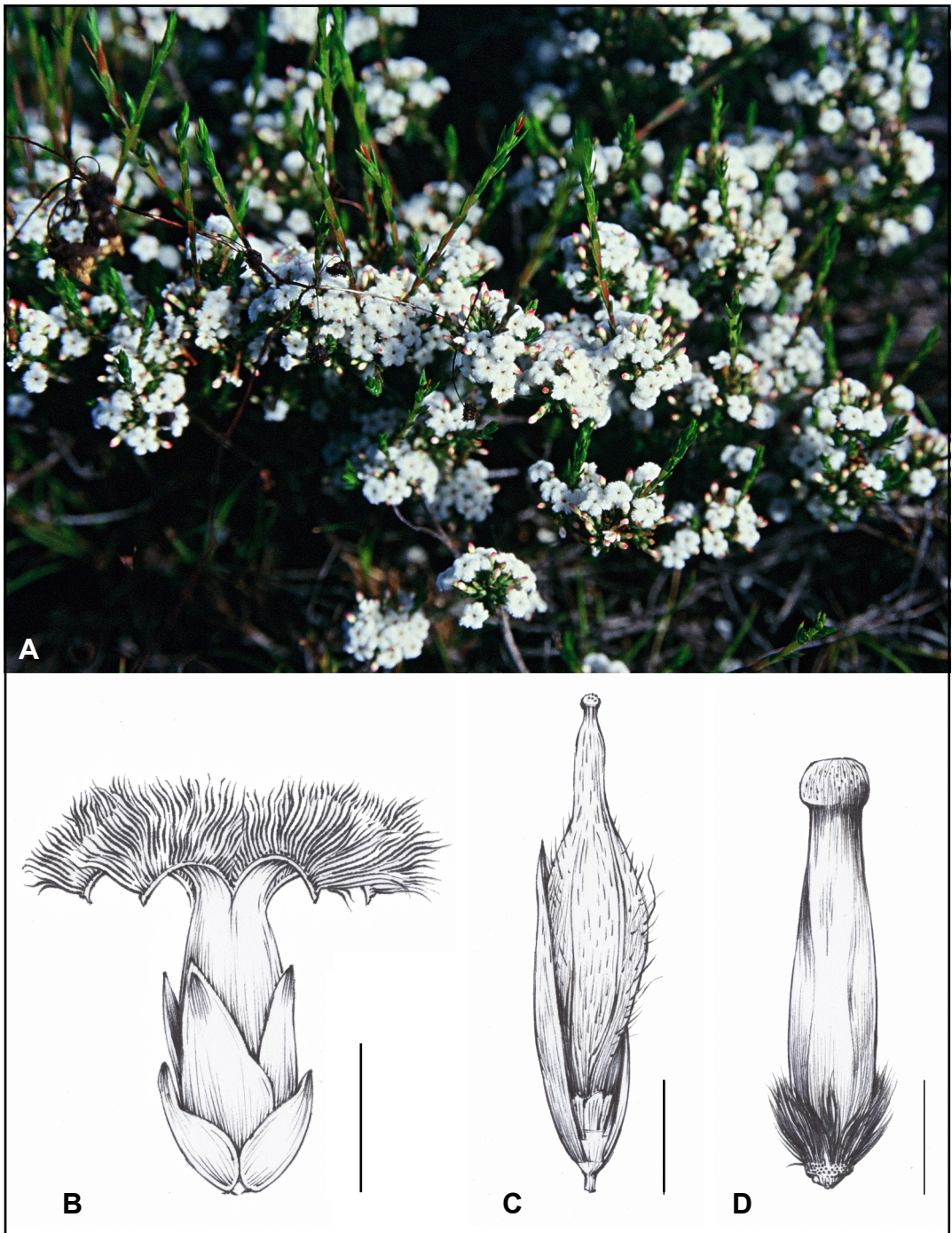


Figure 1. *Styphelia annulata*. A – flowering plant *in situ*; B – flower, external view; C – fruit, with 3 sepals removed; D – ovary at flowering. Scale bars B = 2 mm; C = 1 mm; D = 0.5 mm. Vouchers *M. Hislop* 2848 (A), *R.S. Cowan* A-586 (B), *R.J. Cranfield* 14419 (C, D). Photograph by Michael Hislop. Drawings by Hung Ky Nguyen.



*Diagnostic characters.* Within the *S. tamminensis* subgroup distinguished by the following character combination: leaves helically arranged, narrowly ovate or ovate, with the longitudinal axes straight or gently recurved in the lower half and becoming incurved in the upper half or incurved throughout; abaxial leaf surfaces not grooved or very shallowly grooved between the veins, glabrous or sparsely and shortly hairy; adaxial leaf surfaces glabrous or sparsely hairy mostly in the lower half; leaf apex long-mucronate, pungent; inflorescences (1)2–5(7)-flowered, usually grouped together in a contracted corymbose; sepals acute and often mucronate, with well-demarcated green apices; anthers fully included within the corolla tube; filaments attached to anther at least 7/8 above base, adnate to tube a little or sometimes distinctly below the sinuses; ovary with basal ring of hairs, otherwise glabrous; style scarcely differentiated from the ovary apex in flower or fruit; fruit ± dry, ± fusiform, usually curved with an acute apex, sparsely hairy in the lower 1/2–2/3 with spreading hairs.

*Other specimens examined.* WESTERN AUSTRALIA: 2.2 km N along Dilling Railway Rd from junction with Dilling Rd, Corrigin, 6 Oct. 1997, *E.A. Brown* EAB 97/210 & *G. Taaffe* (NSW, NY, PERTH, UNSW *n.v.*); unmade road running E to Tarin Rock Nature Reserve from Bladendale Rd, 7.95 km S of Tarin Rock Rd, 7 Dec. 2005, *A. Coates* 5047 (NSW, PERTH); Crown Reserve 14531, Cunderdin Cemetery, Cemetery Rd in remnant E of cemetery, N of Cunderdin, 7 Aug. 2009, *J.M. Collins* 639 (CANB, CNS, NSW, PERTH); 3 km N of Wickepin, 22 Oct. 1983, *R.J. Cranfield* 4553 (CANB, PERTH); NW edge of Sheepwash Nature Reserve [SW of Mt Barker], 18 Nov. 1999, *R.J. Cranfield* 14419 (PERTH); Wellstead, 8 Nov. 1978, *R.J. Cranfield s.n.* (CANB, K, PERTH); SW outskirts of Cranbrook, 21 Oct. 2002, *M. Hislop* 2848 (CNS, PERTH); Darling Range Regional Park (30200), Gooseberry Hill, c. 600 m N from top of the Zig Zag, 1 Nov. 2005, *B. Hort* 2670 (PERTH); Toodyay–Bindi Bindi Rd, N Bolgart, 1 km S of Wyening West Rd junction, 16 July 2003, *F. Hort* 1977 (PERTH); Barracca Nature Reserve, A 4070, Gt Northern Hwy, Muchea, in SE corner of reserve, 28 Oct. 2004, *F. Hort & L. Boyle* 2387 (CANB, NSW, PERTH); Flint State Forest, Metro Rd, 6.1 km S from Brookton Hwy then the track SW for 1.6 km, 12 Oct. 2009, *F. & J. Hort* 3479 (CNS, K, PERTH); 7 km N along Knights [Knight] Rd from Porongurup Rd [N of Porongurup], 31 Oct. 1985, *N. Hoyle* 1582 (CANB, PERTH); Beaufort River Nature Reserve, Kojonup to Arthur River, 17 Oct. 2014, *G.J. Keighery & B.J. Keighery* 2673 (K, MEL, PERTH); on S side of Salt River Rd, 8.5 km W of Yetemerup Rd, Stirling Range National Park, 19 Oct. 1999, *G.J. Keighery & N. Gibson* 5571 (CNS, PERTH); on W side of reserve track, 200 m N of Gardner Reserve Rd, Charles Gardner Reserve, S of Tammin, 3 Sep. 1997, *G.J. Keighery & N. Gibson* 5797 (PERTH); Traysurin townsite reserve, 5 km NE of Dudinin, 3 Oct. 2001, *K. Kershaw* KK 2349 (CNS, PERTH); Evan's homestead block, intersection Pound and Kulin–Dudin Rd, 23 Sep. 2001, *S. Murray* 512 (PERTH); 35.3 km NW by road towards Toompup–Ongerup Rd from Boxwood Hill junction, 16 Nov. 1985, *J.M. Powell* 3285 (NSW, PERTH); Talbot Rd Bushland Reserve, Swan View, 8 Nov. 2009, *K.R. Thiele* 3917 (PERTH); on N boundary of Haddleton Nature Reserve [SW of Darkan], c. 2.1 km E along Moodiarrup Rd West, from junction with Gibbs Rd, 21 Sep. 2016, *A. Webb* AW 09084 (PERTH).

*Distribution and habitat.* Widely distributed in an area roughly bounded by Muchea, Bolgart and Dowerin in the north, and from south-west of Mount Barker to Ongerup in the south; in the Swan Coastal Plain, Jarrah Forest, and western parts of the Avon Wheatbelt, Mallee and Esperance Plains bioregions. Occurs on deep sands or sandy soils over laterite or granite, mostly in the understorey of heath or open mallee woodland.

*Phenology.* Peak flowering is between September and November. Despite being the most frequently collected species in the *S. tamminensis* subgroup, fruiting specimens are relatively few. Those that do include mature fruit are primarily flowering collections made in the spring months, with a few others made in the early summer. This apparent anomaly is likely to be a consequence of the plant being

very inconspicuous when not flowering and it could be anticipated that fruiting would continue at least through the summer months.

*Etymology.* From the Latin *annulatus* (furnished with a ring), a reference to the ring of hairs at the base of the ovary.

*Conservation status.* Together with *S. decussata*, *S. annulata* is the most widely distributed species in the *S. tamminensis* subgroup and is well represented on the conservation estate. No conservation code applies.

*Affinities.* From Bentham's (1868) treatment of *Leucopogon* until 2005 when the error was detected, this species was mistakenly referred to *Leucopogon cymbiformis* (now *S. cymbiformis*). Bentham did not include the type of *L. cymbiformis* in his list of cited specimens and it may be that he never actually saw material of that species, instead inferring its identity from de Candolle's (1839) scant description in which ovarian hairs are not mentioned. *Styphelia cymbiformis* is a rather uncommon plant that occurs mostly between the Porongurup Range and South Stirling, with a couple of records close to the coast. Its resemblance to *S. annulata* is superficial, with the two species differing in a number of morphological characters. Two of the most distinctive features of *S. annulata* are its acute sepals with green tips, and basal ring of ovarian hairs. The sepals of *S. cymbiformis* by contrast are obtuse and without green tips, and the ovary lacks hairs but is papillose throughout.

In terms of morphological similarity, *S. annulata* is closest to *S. scabrella* and it is with that species that it is most likely to be confused. They share sepals with well-defined, green tips, which are also frequently acute in *S. scabrella*. Differences between them are given below under *S. scabrella*.

*Notes.* *Styphelia annulata* is the only species from the *S. tamminensis* subgroup that has the combination of spiral phyllotaxis and a basal ring of ovarian hairs. It is noteworthy that the latter character is not evident at the fruiting stage: as the fertilised ovary develops, the tissue expands upwards from the base carrying the hairs along with it, until at maturity the hairs cover the lower half to two thirds of the fruit surface area and the basal ring is no longer apparent (Figure 1C, D).

The above description does not accommodate three anomalous specimens from the York area. Two of these from Wandoo National Park (*F. Hort, J. Hort & M. Hislop* 810; *F. & J. Hort* 2960) differ from the usual form of the species in having rather dense, spreading hairs on both leaf surfaces as well as spreading, abaxial sepal hairs and relatively long bracteoles (almost as long as the sepals). The third specimen from near to Mount Bakewell (*C. Johnson* BS 221) has these same features in addition to sparse hairs on the external corolla tube and lobes, and ovarian hairs that extend well above the basal ring. These localities are well within the geographical range of *S. annulata*, being surrounded in all directions by populations of more or less typical morphotypes of the species. Hybridity suggests itself as a possible explanation for the discrepant morphology observed in these specimens. *Styphelia bracteolosa* is also found in the forest to the south-west of York and, while there are numerous differences between the two species, not least a different phyllotaxis, past hybridisation between the two could be a plausible explanation for the leaf and sepal indumentum and relatively long bracteoles seen in the anomalous specimens cited above. Pending further research these have been referred to *S. aff. annulata*.

***Styphelia bracteolosa* Hislop, *sp. nov.***

*Typus*: Flynn State Forest, York, Western Australia [precise locality withheld for conservation reasons], 20 November 1999, F. Hort, J. Hort & M. Hislop 808 (*holo*: PERTH 05442672; *iso*: CANB, CNS, K, MEL, NSW 506418).

*Leucopogon* sp. Gunapin (F. Hort 808), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 17 June 2022].

Low, spreading *shrub*, to *c.* 50 cm high and 60 cm wide, multi-stemmed from close to base of plant, with a fire-sensitive rootstock. Young *branchlets* with a moderately dense to dense indumentum of variously orientated, straight or curved hairs to *c.* 0.6 mm long. *Leaves* opposite, steeply antrorse, usually  $\pm$  appressed; apex mucronate, innocuous to sub-pungent, the mucro  $\pm$  straight to distinctly uncinata, 0.1–0.2 mm long; base cuneate or occasionally  $\pm$  attenuate; petiole 0.2–0.5 mm long, hairy on the abaxial surface and margins; lamina narrowly ovate to narrowly elliptic, 3–10 mm long, 0.7–2.0 mm wide,  $\pm$  concolorous, plano-convex or concave adaxially, longitudinal axis distinctly incurved; adaxial surface shiny or not, sparsely to densely hairy, venation not evident; abaxial surface shiny, with a sparse to dense indumentum of spreading hairs, sometimes  $\pm$  glabrescent, with 5–7 primary veins, the midrib distinctly broader than the others, broadly and shallowly grooved to  $\pm$  flat between the veins; margins variably ciliate with soft, flexible hairs to 0.5 mm long. *Inflorescence* axillary, erect; axis 2.5–10 mm long, (1)2–6-flowered, with spreading hairs, terminating in a rather elongate bud-rudiment; flowers erect, sessile, usually in widely spaced opposite or subopposite pairs. *Fertile bracts* narrowly ovate, leaf-like, 2.2–4 mm long, 0.7–1.0 mm wide, usually with a  $\pm$  uncinata apex, subtended at the base by 2 pairs of opposite sterile bracts. *Bracteoles* narrowly ovate, leaf-like, 2.6–4.2 mm long, 0.8–1.0 mm wide, not keeled, acute, with an uncinata apex; abaxial surface sparsely hairy with spreading hairs; margins variably ciliate. *Sepals* narrowly ovate, 2.3–2.7 mm long, 0.9–1.0 mm wide, narrowly acute to acuminate, the tips usually slightly recurved; abaxial surface with a sparse to moderately dense indumentum of spreading hairs, pale green, often becoming pink in the distal half, venation obscure, often only the mid-vein evident; adaxial surface glabrous; margins ciliate with hairs to *c.* 0.3 mm long. *Corolla tube* pink, cylindrical or very narrowly ovoid, longer than the sepals, 2.7–3.6 mm long, 1.0–1.4 mm wide, glabrous externally, internal surface hairy in the upper half, the hairs extending to a little beyond the anther bases, glabrous below. *Corolla lobes* pink, much shorter than the tube, 1.4–1.8 mm long, 0.5–0.6 mm wide at base, slightly swollen at the base, spreading from the base or a little above and recurved, glabrous externally, internal surfaces with a dense, white indumentum of terete, straight, unornamented hairs and with well-defined, basal tufts projecting into the top of the tube. *Anthers* fully included within the tube, 0.7–1.0 mm long, apex rounded or scarcely emarginate. *Filaments* terete, *c.* 0.2 mm long, attached at anther apex or just below, adnate to tube well below the sinuses. *Nectary* partite, the scales 0.3–0.5 mm long, 0.2–0.3 mm wide, glabrous. *Ovary* narrowly ovoid, 0.9–1.2 mm long, 0.3–0.4 mm wide, hairy (sometimes sparsely) except for a glabrous base, 3-locular, pale green or yellow-green. *Style* scarcely differentiated from ovary apex in flower, *c.* 0.2 mm long, glabrous, included within the corolla tube; stigma slightly expanded. Mature *fruit* not seen. (Figure 2A)

*Diagnostic characters.* Within the *S. tamminensis* subgroup distinguished by the following character combination: leaves opposite, narrowly ovate or narrowly elliptic, with a distinctly incurved longitudinal axis; abaxial leaf surfaces broadly and shallowly grooved to  $\pm$  flat between the veins; leaf apex mucronate, innocuous or sub-pungent, often uncinata; inflorescence (1)2–6-flowered, with leaf-like, uncinata bracts and bracteoles, the latter at least as long as, or more usually distinctly longer than, the sepals; sepals narrowly acute to acuminate, with ciliate margins; external corolla tube glabrous, pink; anthers fully included within the corolla tube; filaments attached at anther apex or just below, adnate

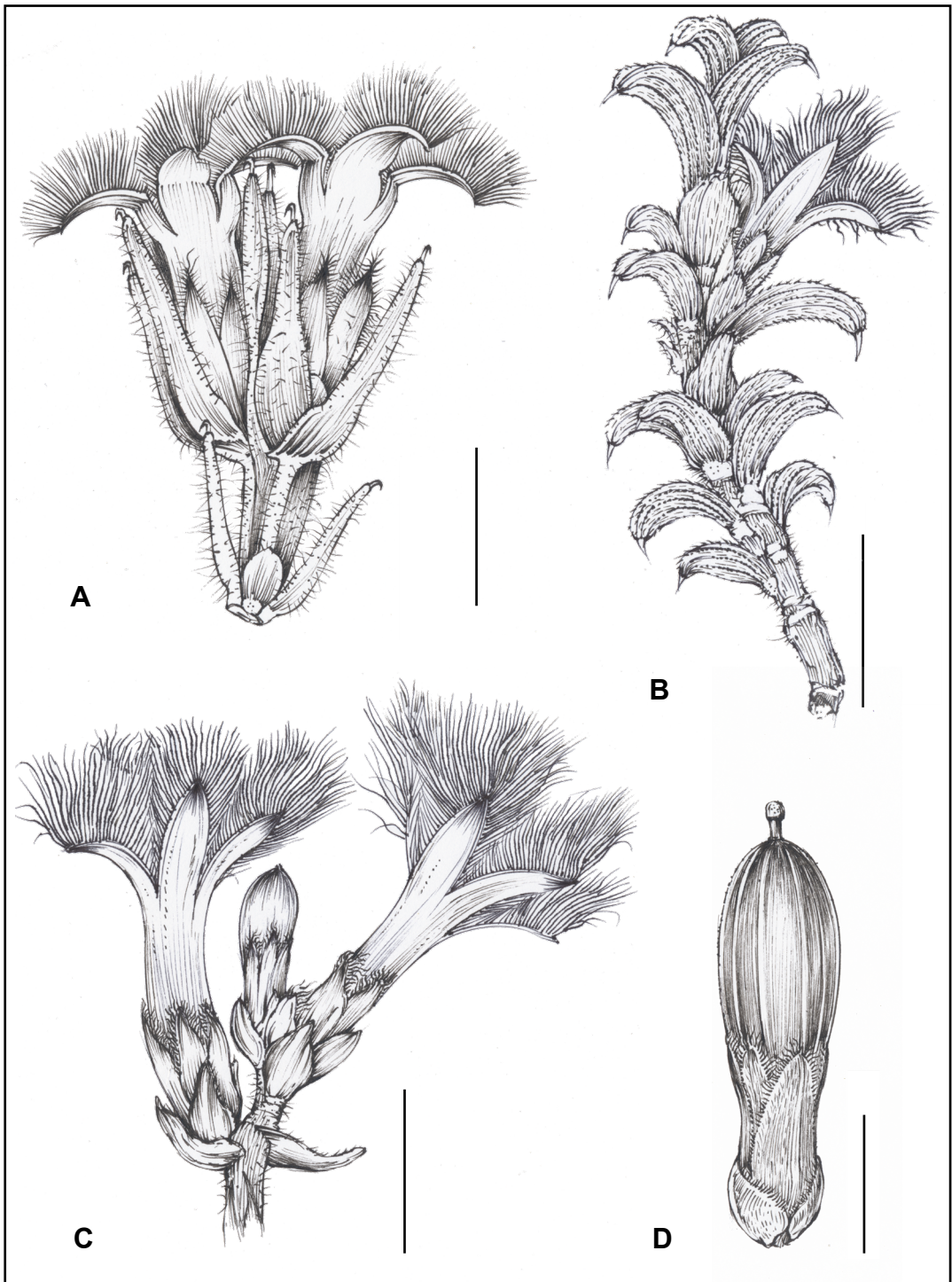


Figure 2. A – *Styphelia bracteolosa*, flowering inflorescence; B – *S. echinulata*, flowering branchlet; C – *S. exilis*, flowering inflorescence; D – *S. exilis*, fruit. Scale bars A = 2 mm; B = 3 mm; C = 2 mm; D = 1 mm. Vouchers *F. Hort* 829 (A), *M. Hislop* 4276 (B), *M. Hislop* 4813 (C), *M. Hislop* 4110 (D). Drawings by Hung Ky Nguyen.

to tube well below the sinuses; ovary hairy; style very short (c. 0.2 mm long), scarcely differentiated from ovary apex in flower.

*Other specimens examined.* WESTERN AUSTRALIA: [localities withheld for conservation reasons] 10 Dec. 2009, *M. Hislop* 3994 (CNS, K, PERTH); 2 Dec. 1998, *F. Hort* 443 (NSW, PERTH); 22 Nov. 1999, *F. Hort* 811 (PERTH); 22 Nov. 1999, *F. Hort* 812 (CANB, NSW, PERTH); 22 Nov. 1999, *F. Hort* 813 (CANB, NSW, PERTH); 26 Nov. 1999, *F. Hort* 829 (PERTH); 26 Nov. 1999, *F. Hort* 830 (PERTH); 26 Nov. 1999, *F. Hort* 831 (PERTH); 26 Nov. 1999, *F. Hort* 832 (PERTH); 26 Nov. 1999, *F. Hort* 833 (PERTH); 16 Dec. 1999, *F. Hort* 860 (PERTH); 20 Nov. 2000, *F. Hort* 1253 (CANB, PERTH); 22 Nov. 2000, *F. Hort* 1254 (CNS, PERTH); 20 Nov. 1999, *F. Hort*, *J. Hort* & *M. Hislop* 809 (CNS, NSW, PERTH); 12 Nov. 1985, *G.J. Keighery* & *J.J. Alford* 25 (PERTH); 2 July 2010, *C. Puente-Lelièvre*, *M. Hislop* & *E.A. Brown* CPL 37 (NSW, PERTH); 21 Nov. 2018, *A. Sole* & *E. Tomek* AS 334 (PERTH).

*Distribution and habitat.* Distributed in the Darling Range from north-west of York to west of Beverley, straddling the boundary between the Jarrah Forest and Avon Wheatbelt bioregions. Grows in sand or light loam soils over laterite or granite in open woodland or heath. Commonly associated species include *Eucalyptus wandoo*, *E. drummondii*, *Banksia armata*, *Hakea undulata*, *H. incrassata*, *Melaleuca aspalathoides* and *Allocasuarina humilis*.

*Phenology.* As with most other members of the *S. tamminensis* subgroup, peak flowering appears to be from late spring to early summer. Mature fruit has not been collected but is likely to be present at least between March and June.

*Etymology.* From the Latin *bracteola* (bracteole) and *-osus* (abounding in), a reference to the particularly large bracteoles, which are usually longer than the sepals.

*Conservation status.* The known distribution of *S. bracteolosa* is limited to a fairly small area in the eastern Darling Range, spanning about 30 kilometres on a north-south axis and 11 kilometres from east to west. Most populations occur in a large national park with another known from a nature reserve. Recently listed as Priority Three under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *Leucopogon* sp. Gunapin (*F. Hort* 808).

*Affinities.* *Styphelia bracteolosa* is a highly distinctive species and even within the *S. tamminensis* subgroup is unlikely to be confused with any others. The relatively long inflorescence with openly arranged flowers and foliose, uncinat bracts and bracteoles are diagnostic.

Three other members of the *S. tamminensis* subgroup grow in the Darling Range in the general vicinity of Perth. *Styphelia roseola* occurs to the north of the range of *S. bracteolosa*, beginning in the Bindoon–Julimar area. *Styphelia bracteolosa* differs from *S. roseola* in its much longer, uncinat fertile bracts (2.2–4.0 mm long *cf.* 0.3–0.7 mm in *S. roseola*) and bracteoles (2.6–4.2 mm long *cf.* 1.0–1.6 mm), much longer, multi-flowered inflorescence axes (2.5–10 mm long *cf.* 0.3–0.8 mm), acute rather than obtuse sepals, and glabrous external corolla tubes (*cf.* usually hairy).

The distribution of the widespread *S. annulata* overlaps that of *S. bracteolosa* although there are no records of the two growing together. *Styphelia bracteolosa* is easily distinguished from *S. annulata* by its opposite rather than spiral phyllotaxis, and uncinat bracteoles that are equal to or longer than the sepals (*cf.* bracteoles shorter than the sepals and with straight tips in *S. annulata*).

At the southern extent of its range the distribution of *S. bracteolosa* approaches that of *Styphelia recurva*, although again there are no records of the two species co-occurring. *Styphelia recurva* is readily distinguished from *S. bracteolosa* by its spiral, rather than opposite, phyllotaxis and sharply pungent leaves.

**Styphelia crassifolia** (Sond.) F.Muell., *Fragm.* 6(42): 33 (1867); *Leucopogon crassifolius* Sond. in J.G.C. Lehmann, *Pl. Preiss.* 1(2): 316 (1845). Type: 'In rupestribus collium Konkoberup, promontorii Cape Riche' [Western Australia], 19 November 1840, *L. Preiss* 386 (*syn:* G 00342145 image!, P 00760527 image!, LD 1062762 image!, MEL 1513026 image!, MEL 1513027!).

*Leucopogon* sp. Twertup (K.R. Newbey 10859), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [before February 2020].

*Distribution.* A somewhat disjunct distribution mostly centred on the Cape Riche area in the west and the Fitzgerald River National Park in the east, with apparent outliers north of Cheyne Beach and in the Chillinup area; all within the Esperance Plains bioregion.

*Conservation status.* The species is widespread and locally common in the Fitzgerald River National Park. No conservation code is required.

*Notes.* Although Bentham (1868) cited the type of *Leucopogon crassifolia* in his treatment of that species, he was confused by its superficial similarity to another common but currently unnamed congener from the south coast of Western Australia, now known by the informal name, *Styphelia* sp. South Coast (J.M. Powell 3374). In regard to critical aspects of his description of *S. crassifolia* (i.e. ovary locule number: 5 rather than 3; style length: 'rather long' rather than very short or  $\pm$  obsolete; fruit shape: cylindrical rather than obovoid; nectary character: truncate rather than clearly partite), there is no doubt that Bentham had mostly been studying the unnamed taxon, rather than *S. crassifolia* s. str. As noted above in the general discussion of the *S. tamminensis* subgroup, he had problems in interpreting the gynoeceum character in this species group, and again this seems the likely cause of the error here. This is made clear in the following passage: 'In several of the specimens a few flowers may be met with, probably diseased, having a longer tube to the corolla, and an elongated, apparently barren ovary, with a short style'. There seems little doubt that the 'diseased' flowers that he is describing here are in fact the normal flowers of *S. crassifolia* s. str.

All publications have followed Bentham (1868) in applying the name *S. crassifolia* to the unnamed taxon and the name was similarly misapplied in the phylogeny of Puente-Lelièvre *et al.* (2016). While *S.* sp. South Coast is also a member of Group X it does not belong in the *S. tamminensis* subgroup but is closely related to *S. corynocarpa* (Sond.) F.Muell. *Styphelia* sp. South Coast will be formally described in a forthcoming paper.

**Styphelia cymbiformis** (A.Cunn. ex DC.) F.Muell., *Fragm.* 6(42): 34 (1867); *Leucopogon cymbiformis* A.Cunn. ex DC., *Prodr.* 7(2): 750 (1839). Type: 'Ad Novae-Hollandiae oram meridionalem' [Western Australia], s. dat., *W. Baxter s.n.* (*holo:* GDC G00455446 image!; *iso:* K 000347895 image!, PERTH 01598376!).

*Distribution.* Mostly occurs in a narrow east-west band between the Porongurup Range and South Stirling, with two outlying collections close to the coast at Albany and in Waychinicup National Park; within the Esperance Plains and adjacent Jarrah Forest bioregions.

*Conservation status.* A short-range endemic that is currently listed as Priority Two under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–).

*Notes.* *Styphelia cymbiformis* was for many years confused with the common *S. annulata*, as discussed above under the treatment of that species.

In gross morphology *S. cymbiformis* is very similar to *S. crassifolia*. Apart from the distinguishing characters used in the key, *S. cymbiformis* typically has shorter leaves. The two species are allopatric with the range of *S. cymbiformis* occurring to the west of that of *S. crassifolia*.

**Styphelia decussata** Hislop, Crayn & Puente-Lel., *Austral. Syst. Bot.* 33(2): 149 (2020); *Leucopogon tamminensis* E.Pritz. var. *australis* E.Pritz., in F.L.E. Diels & E.G. Pritzel, *Bot. Jahrb. Syst.* 35(2–3): 479 (1904). *Type:* ‘In districtu Eyre interior pr. Hammersley River in fruticetis arenosis’ [Western Australia], 13 Oct. 1901, *L. Diels* 5817 (*syn:* PERTH 01598414!, PERTH 09008535!).

*Distribution.* Widespread, from Corrigin in the north, south to Boxwood Hill and east to near Munglinup; in the Avon Wheatbelt, Mallee and Esperance Plains bioregions.

*Conservation status.* Widely distributed and well represented on the conservation estate. No conservation code is required.

*Notes on type collection.* The two, small fragments housed at PERTH were obtained by C.A. Gardner during a visit to B in 1937 and are likely to represent the only extant type material, with many of Diels’ collections destroyed during the bombing of Berlin in the second world war (Gibson 2018). No additional duplicates were located on JSTOR Global Plants while researching the recently published nomenclatural paper (Crayn *et al.* 2020). According to Gibson (2018), Diels mostly collected unicates and few duplicates found their way to other herbaria.

**Styphelia echinulata** Hislop, *sp. nov.*

*Typus:* north-east of Beacon, Western Australia [precise locality withheld for conservation reasons], 9 September 2013, *M. Hislop* 4276 (*holo:* PERTH 08633649; *iso:* CANB, K, MEL, NSW).

*Leucopogon* sp. Karroun Hill (K.R. Thiele 4167), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 17 June 2022].

Compact, tangled *shrub* to *c.* 100 cm high and 100 cm wide, multi-stemmed from close to base of plant; fire-tolerance of rootstock unknown. Young *branchlets* with a sparse or moderately dense indumentum of patent or retrorse hairs to *c.* 0.1 mm long. *Leaves* helically arranged, usually variably antrorse or sometimes  $\pm$  patent; apex mucronate, pungent or sub-pungent, the mucro recurved, 0.2–0.5 mm long; base cuneate; petiole 0.1–0.3 mm long, variably hairy on both surfaces and margins; lamina ovate to elliptic or narrowly so, 1.4–2.8 mm long, 1.0–1.6 mm wide,  $\pm$  concolorous, thick, strongly concave, sometimes  $\pm$  stem-clasping in the lower half, sometimes  $\pm$  plano-convex in the upper half, longitudinal axis strongly recurved; adaxial surface slightly shiny, with a zone of long hairs towards the base and stiff, shorter hairs in the upper half, venation not evident; abaxial surface slightly shiny, with 5–7 broad, primary veins and deep, very narrow grooves between, very sparsely hairy or  $\pm$  glabrous on the outer surface of the veins, with stiff, short hairs within the grooves; margins usually with short, stiff, antrorse hairs <0.05 mm long or  $\pm$  glabrous. *Inflorescence* axillary, erect; axis 0.6–1.2

mm long, 1- or 2-flowered, subterete, with a sparse indumentum or  $\pm$  glabrous, terminating in a budrudiment; flowers erect, sessile. *Fertile bracts* ovate to broadly ovate, 0.4–0.5 mm long, 0.3–0.4 mm wide, usually subtended by 3 sterile bracts, the basal 2 opposite, occasionally only the basal bracts present. *Bracteoles* ovate or broadly ovate, 0.8–1.3 mm long, 0.7–1.0 wide, at least the inner keeled, acute or subacute; abaxial surface sparsely hairy; margins ciliolate. *Sepals* ovate or narrowly ovate, 1.4–2.0 mm long, 0.7–1.1 mm wide, obtuse to subacute; abaxial surface rather sparsely hairy with spreading hairs, green or yellow-green throughout, only the mid-vein evident; adaxial surface with a discrete hair tuft towards the base, sometimes reduced to a few hairs; margins ciliate with hairs to *c.* 0.2 mm long. *Corolla tube* white, ellipsoid to obovoid, sometimes narrowly so, a little longer than the sepals, 1.5–2.0 mm long, 1.2–1.6 mm wide, glabrous externally, internal surface with an apical band of hairs projecting into the tube (occasionally the hairs sparse), the remainder glabrous. *Corolla lobes* white, shorter than the tube, 0.8–1.2 mm long, 0.5–0.6 mm wide at base, spreading from close to the base and recurved, glabrous externally, internal surfaces with a dense indumentum of terete,  $\pm$  straight and essentially unornamented hairs. *Anthers* partially exerted from the tube by 1/8–1/4 of their length, 0.6–1.0 mm long, apex rounded or scarcely emarginate. *Filaments* terete, 0.1–0.2 mm long, attached to anther 3/4–7/8 above base, adnate to tube a little below the sinuses. *Nectary* partite, the scales 0.3–0.5 mm long, 0.3–0.4 mm wide, glabrous. *Ovary* ellipsoid or narrowly ellipsoid, 0.6–0.8 mm long, 0.4–0.5 mm wide, glabrous, 3(4)-locular, pale green or yellow-green. *Style* scarcely differentiated from the ovary apex in flower, more clearly defined in fruit, *c.* 0.2 mm long, glabrous, included within the corolla tube; stigma not or scarcely expanded. *Fruit*  $\pm$  cylindrical, 2.5–3.2 mm long (inclusive of gynophore), 1.0–1.2 mm wide, much longer than the sepals, circular in section, with a well-defined gynophore; surface glabrous,  $\pm$  dry, smooth (mesocarp poorly developed), with pale, longitudinal ribs; apex acute, tapering smoothly to the base of the persistent style. (Figure 2B)

*Diagnostic characters.* Within the *S. tamminensis* subgroup distinguished by the following character combination: leaves helically arranged, ovate to elliptic or narrowly so with a strongly recurved longitudinal axis; abaxial leaf surfaces with deep, narrow grooves and short hairs within the grooves; leaf apex mucronate, pungent or sub-pungent; inflorescence 1- or 2-flowered; anthers tips just exerted from the corolla tube; filaments attached to anther 3/4–7/8 above base, adnate to tube just below the sinuses; ovary glabrous; style very short (*c.* 0.2 mm long), scarcely differentiated from ovary apex in flower; fruit  $\pm$  dry, cylindrical, with an acute apex.

*Other specimens examined.* WESTERN AUSTRALIA: [localities withheld for conservation reasons] 9 Sep. 2013, *M. Hislop* 4277 (CANB, CNS, PERTH); 22 Sep. 1982, *K. Newbey* 9608 (PERTH); 26 June 2011, *K.R. Thiele* 4167 (CANB, PERTH).

*Distribution and habitat.* Currently known from scattered localities from the Bonnie Rock area in the west to the Diemals area in the east; in the far west of the Coolgardie bioregion and far east of the Yalgoo bioregion. It is apparently restricted to the immediate vicinity of decomposed granitic breakaways. Associated plant species include *Melaleuca hamata*, *Allocasuarina acutivalvis*, *Xerolirion divaricata* and *Acacia aneura s. lat.*

*Phenology.* The few available specimens indicate that the species has a lengthy flowering period, at least from early winter to early spring. To date the only collections have been made in June or September and all have buds, flowers and mature fruit present.

*Etymology.* From the Latin *echinulatus* (with very small prickles), a reference to the short, stout hairs of the distal, adaxial leaf surfaces and margins.



*Conservation status.* *Styphelia echinulata* is only known from three populations: one in a nature reserve, one from unallocated crown land and the third from a rather vague locality, but which seems unlikely to be on the conservation estate. While it is probable that the species is restricted to a specific landform, its known distribution encompasses remote and botanically poorly known country and so the chances of new populations coming to light over time appears high. Recently listed as Priority Two under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *Leucopogon* sp. Karroun Hill (K.R. Thiele 4167).

*Affinities.* *Styphelia echinulata* has the most inland distribution of any species within the *S. tamminensis* subgroup and is the only member of that grouping to occur in either the Coolgardie or Yalgoo bioregions. Those members of the subgroup that are closest geographically are *S. subglauca* and *S. scabrella*, both of which have distributions that extend close to the southern and eastern boundaries of the Coolgardie bioregion. The two can be easily distinguished from *S. echinulata* by their foliar morphology: *S. subglauca* has a non-mucronate, usually obtuse leaf apex (rather than mucronate, pungent or sub-pungent) and *S. scabrella* has leaf blades that are markedly incurved in their distal half (rather than distinctly recurved).

Away from the *S. tamminensis* subgroup and in terms of gross morphology, *S. echinulata* bears a strong resemblance to acute-leaved morphotypes of the variable *S. hamulosa* (E.Pritz.) Sleumer. Differences in the gynoecium provide the most reliable means of distinguishing between the two, especially if plants are in fruit: *S. echinulata* has an acute fruit apex that tapers smoothly to the base of the persistent and very short style, whereas in *S. hamulosa* the fruit apex is obtuse and the style is always shed well before maturity. In flowering-only specimens, the much shorter style (c. 0.2 mm long) of *S. echinulata*, which is barely differentiated from the ovary apex, is a clear point of difference. In *S. hamulosa* by contrast the style is at least 1 mm long, as long or longer than the corolla tube, and abruptly differentiated from the ovary apex. In addition, while *S. echinulata* has a 3(4)-locular ovary, in *S. hamulosa* it is 5-locular. It is also noteworthy that while the leaf apex may be either acute or obtuse in *S. hamulosa*, the variant of the species that occurs in the Coolgardie bioregion usually has an obtuse apex, or if occasionally acute, then a mucro is either lacking or very short (to c. 0.2 mm long). This provides an easily observed feature to assist in distinguishing between the two in the field, as does a difference in habitat preference. Whereas *S. echinulata* is apparently restricted to the environs of decomposed granitic breakaways, *S. hamulosa* in the Coolgardie bioregion (and indeed across most of its range) occurs on sand plain.

### ***Styphelia exilis* Hislop, sp. nov.**

*Typus:* north-east of Manypeaks, Western Australia [precise locality withheld for conservation reasons], 8 November 2019, M. Hislop 4813 (*holo:* PERTH 09172955; *iso:* CANB, MEL, NSW).

*Leucopogon* sp. Manypeaks (A.S. George 6488), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 17 June 2022].

Low, spreading *shrub* to c. 25 cm high and 25 cm wide, multi-stemmed from close to base of plant, with a fire-sensitive rootstock. Young *branchlets* with a sparse to moderately dense indumentum of short, patent hairs to c. 0.1 mm long. *Leaves* opposite, usually clearly decussate, steeply antrorse to antrorse-appressed; apex non-mucronate, narrowly obtuse; base attenuate to cuneate; petiole 0.1–0.3 mm long, usually glabrous, sometimes with a few marginal hairs; lamina usually very narrowly ovate or occasionally ± linear, 2.3–4.5 mm long, 0.4–1.0 mm wide, ± concolorous, usually plano-

convex or sometimes adaxially concave, longitudinal axis gently incurved; adaxial surface slightly shiny, sparsely hairy, venation not evident; abaxial surface slightly shiny, glabrous or sparsely hairy, with 5 primary veins, the mid-vein distinctly broader than the others, shallowly grooved to  $\pm$  flat between the veins; margins usually with a few short, stiff hairs  $<0.05$  mm long, less often glabrous. *Inflorescence* axillary, erect; axis 1.5–3.5 mm long, 1–4-flowered, somewhat compressed, with a sparse to moderately dense indumentum, terminating in a bud-rudiment; flowers erect, sessile. *Fertile bracts* narrowly ovate to ovate, sometimes leaf-like, 0.7–1.3 mm long, 0.4–0.5 mm wide, subtended by 3 or 4 sterile bracts (the 2 basal bracts opposite, laterally positioned, with a third on the abaxial surface inserted a little higher, and sometimes a fourth, positioned opposite on the adaxial surface). *Bracteoles* ovate, 0.8–1.0 mm long, 0.5–0.6 mm wide, obscurely keeled, acute or subacute; abaxial surface glabrous; margins ciliate. *Sepals* narrowly ovate, 1.3–1.6 mm long, 0.5–0.6 mm wide, obtuse to subacute; abaxial surface glabrous, mostly pale green but often with some pink tinges in the distal half and towards the margins, venation obscure, with only the mid-vein evident; adaxial surface with a discrete, sometimes sparse, patch of hairs towards the base; margins ciliate with hairs to *c.* 0.2 mm long. *Corolla tube* white, sometimes with pink tinges, cylindrical, much longer than the sepals, 1.8–2.3 mm long, 0.7–0.8 mm wide, glabrous externally, internal surface with an apical band of hairs projecting into the tube, the remainder glabrous. *Corolla lobes* white, often with pink tinges, much shorter than the tube, 0.8–1.3 mm long, 0.4–0.5 mm wide at base, spreading from the base and recurved, glabrous externally, internal surfaces with a dense indumentum of terete,  $\pm$  straight and essentially unornamented hairs. *Anthers* fully included within the tube (the tips  $\pm$  held at the orifice), 0.8–1.1 mm long, apex rounded. *Filaments* terete, *c.* 0.1 mm long, attached at anther apex, adnate to tube a little below sinuses. *Nectary* partite, the scales 0.2–0.3 mm long, 0.15–0.20 mm wide, glabrous. *Ovary* ellipsoid to obovoid, 0.3–0.4 mm long, 0.2–0.3 mm wide, glabrous, 3-locular, pale green or yellow-green. *Style* distinct and abruptly differentiated from ovary apex, 0.3–0.4 mm long, glabrous, included within the corolla tube; stigma slightly expanded. *Fruit* cylindrical, usually slightly curved with the style base  $\pm$  excentric, 2.2–2.5 mm long (inclusive of gynophore), 0.7–0.8 mm wide, much longer than the sepals, circular in section with a well-defined gynophore; surface glabrous,  $\pm$  dry, smooth (mesocarp poorly developed), with prominent, pale, slightly raised longitudinal ribs; apex obtuse; style either persistent or shed at, or close to, maturity. (Figure 2C, D)

*Diagnostic characters.* Within the *S. tamminensis* subgroup distinguished by the following character combination: leaves opposite, very narrowly ovate to more or less linear; leaf apex non-mucronate, narrowly obtuse; inflorescence 1–4-flowered; anthers included within the corolla tube; filaments attached at anther apex, adnate to tube just below the sinuses; ovary glabrous; style very short (0.3–0.4 mm long) but distinct and abruptly differentiated from the ovary apex; fruit  $\pm$  dry, cylindrical, with prominent, pale longitudinal ribs and an obtuse apex.

*Other specimens examined.* WESTERN AUSTRALIA: [localities withheld for conservation reasons] 19 Oct. 2017, *S. Barrett* SB 2264 (PERTH); 10 Dec. 1964, *A.S. George* 6488 (PERTH); 7 Jan. 2010, *M. Hislop* 4110 (CANB, PERTH); 16 Oct. 2018, *D.A. Rathbone* DAR 1010 (PERTH); 30 Oct. 2018, *D.A. Rathbone* DAR 1011 (PERTH); 31 Oct. 2018, *D.A. Rathbone* DAR 1012 (PERTH); 2 Nov. 2018, *D.A. Rathbone* DAR 1013 (PERTH).

*Distribution and habitat.* Currently known only from a small area between Manypeaks and Wellstead in the far west of the Esperance Plains bioregion. It occurs in white or yellow sand over granite or laterite in low open woodland or heath. Associated species include *Eucalyptus marginata*, *Taxandria spathulata*, *Melaleuca striata*, *Hakea cucullata* *Agonis theiformis* and *Banksia mucronulata*.

*Phenology.* The main flowering period is apparently between October and December. A specimen collected in early January (*M. Hislop* 4110) has fruit at various stages of maturity as well as some flowers at anthesis.

*Etymology.* From the Latin *exilis* (small, slender), a reference to the small stature of the plant and the slender leaves and floral parts.

*Conservation status.* Listed as Threatened (Endangered) in Western Australia under the name *Leucopogon* sp. Manypeaks (A.S. George 6488) (State of Western Australia 2022). *Styphelia exilis* appears restricted to a few, mostly small populations, one of which occurs in a national park.

*Affinities.* *Styphelia exilis* is morphologically typical of the *S. tamminensis* subgroup except for its fruit apex, which is obtuse rather than markedly tapered towards the style base as per the other species, excluding *S. incerta*.

The only other *Styphelia* with opposite leaves that occurs in the Esperance Plains or the adjoining Southern Jarrah Forest, and hence the only species likely to be confused with *S. exilis*, is *S. decussata*. The latter is readily distinguished by its consistently 1-flowered inflorescence, hairy ovary with style not differentiated from the apex, and strongly concave leaves with a densely hairy, adaxial surface. In *S. exilis* by contrast, the inflorescence is 1–4-flowered, the ovary is glabrous and with a clearly differentiated style 0.3–0.4 mm long, and the leaves are usually plano-convex (sometimes  $\pm$  concavo-convex in younger leaves) with the flat, adaxial surface never more than sparsely hairy.

### ***Styphelia hyalina* Hislop, *sp. nov.***

*Typus:* west of Three Springs, Western Australia [precise locality withheld for conservation reasons], 14 November 2004, *M. Hislop & A. Tinker* MH 3351 (*holo:* PERTH 07202970; *iso:* CANB, CNS, HO, K, MEL, NSW 830977).

*Leucopogon* sp. Yandanooka (*M. Hislop* 2507), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 17 June 2022].

Low, spreading *shrub*, to *c.* 40 cm high and 40 cm wide, branching close to base of plant, with a fire-sensitive rootstock. Young *branchlets* with a sparse to moderately dense indumentum of patent to retrorse, straight or curved hairs to *c.* 0.2 mm long. *Leaves* opposite, densely arranged about the inflorescence, steeply antrorse to antrorse-appressed; apex mucronate, pungent or sub-pungent, the mucro straight, 0.1–0.3 mm long; base mostly cuneate, occasionally  $\pm$  rounded; petiole 0.2–0.5 mm long, usually sparsely hairy on the abaxial surface and margins, sometimes  $\pm$  glabrous throughout; lamina ovate or narrowly ovate, 2.5–5.0 mm long, 1.2–2.2 mm wide, somewhat discolorous, strongly concave adaxially, longitudinal axis usually distinctly incurved, occasionally  $\pm$  straight; adaxial surface matt,  $\pm$  glaucous, sparsely hairy to  $\pm$  glabrous, venation not evident or with 1–3 slightly raised veins; abaxial surface usually darker, shiny, glabrous or with a sparse to moderately dense indumentum of very short, coarse hairs, with 5–7 primary veins, shallowly grooved to  $\pm$  flat between the veins; margins ciliate with stiff hairs to *c.* 0.3 mm long. *Inflorescence* axillary, erect; axis 0.2–0.4 mm long, 1-flowered, shortly hairy, apparently terminating in a flower, bud-rudiment absent; flowers erect, sessile. *Fertile bracts* ovate to depressed-ovate, 0.3–0.5 mm long, 0.3–0.5 mm wide, with a larger sterile bract on the adaxial axis surface and 2 opposite, basal bracts on the same plane as the bracteoles. *Bracteoles* ovate or broadly ovate, 0.7–1.2 mm long, 0.6–0.8 mm wide, not keeled, obtuse; abaxial surface glabrous;

margins glabrous. *Sepals* narrowly ovate, 1.8–2.5 mm long, 0.7–1.0 mm wide, obtuse; abaxial surface glabrous, pale green in the lower half often becoming pink towards the apex, venation obscure, only the mid-vein evident; adaxial surface glabrous; margins broadly hyaline, glabrous. *Corolla tube* red, ± cylindrical or very narrowly ellipsoid, longer than the sepals, 2.0–2.9 mm long, 0.8–1.1 mm wide, glabrous externally, internal surface hairy in the upper half almost to the base of the anthers, glabrous below. *Corolla lobes* red, shorter than the tube, 1.5–2.1 mm long, 0.4–0.5 mm wide at base, spreading from the base and recurved, glabrous externally, internal surfaces with a dense, white indumentum of terete, straight and unornamented hairs. *Anthers* fully included within the tube or partially exerted by up to 1/8 of their length, 0.8–1.3 mm long, apex rounded or scarcely emarginate. *Filaments* terete, 0.1–0.2 mm long, attached at anther apex or just below, adnate to tube a little below the sinuses. *Nectary* partite, the scales 0.4–0.6 mm long, 0.15–0.25 mm wide, glabrous. *Ovary* very narrowly ovoid to ± cylindrical, 1.3–1.8 mm long, 0.3–0.4 mm wide, glabrous, 3-locular, pale green or yellow-green. *Style* not or scarcely differentiated from ovary apex in flower, more clearly defined in fruit, c. 0.2 mm long, glabrous, included within the corolla tube; stigma not or scarcely expanded. *Fruit* very narrowly ovoid to ± cylindrical, 2.6–3.4 mm long, 0.8–0.9 mm wide, much longer than the sepals, circular in section with a well-defined gynophore; surface glabrous, ± dry, smooth (mesocarp poorly developed), with prominent, pale longitudinal ribs; apex acute, tapering smoothly to the base of the persistent style. (Figure 3)

*Diagnostic characters.* Within the *S. tamminensis* subgroup distinguished by the following character combination: leaves opposite, ovate or narrowly ovate, with the longitudinal axis usually distinctly incurved; abaxial leaf surfaces broadly and shallowly grooved to ± flat between the veins; leaf apex mucronate, pungent or sub-pungent; inflorescence 1-flowered; sepals entirely glabrous abaxially, with glabrous, hyaline margins; external corolla tube glabrous, red; anthers either fully included in the corolla tube or the tips just exerted; filaments attached to anther in the upper quarter of anther length, adnate to tube just below the sinuses; ovary glabrous; style very short (c. 0.2 mm long), scarcely differentiated from ovary apex in flower; fruit ± dry, very narrowly ovoid to ± cylindrical, with an acute apex.

*Other specimens examined.* WESTERN AUSTRALIA: [localities withheld for conservation reasons] 25 Oct. 1992, *E.A. Griffin* 7615 (PERTH); 3 Dec. 1992, *E.A. Griffin* 8098 (PERTH); 10 Dec. 2001, *M. Hislop* 2507 (CANB, CNS, MEL, PERTH); 9 Dec. 2001, *M. Hislop & A. Tinker* MH 2501 A (NSW, PERTH) & 2501 B (PERTH); 9 Dec. 2001, *M. Hislop & A. Tinker* MH 2503 A (PERTH) & 2503 B (CANB, PERTH); 14 Nov. 2004, *M. Hislop & A. Tinker* MH 3354 (MEL, PERTH); 7 Nov. 2011, *M. Holmes* MHB 712 (PERTH); Nov. 2002, *A. Tinker s.n.* (PERTH).

*Distribution and habitat.* Distributed from south of Mingenew to west of Three Springs, in the Geraldton Sandplains bioregion. It grows in species-rich heathland in sand or loam soils, on lateritic uplands and often in association with breakaways. Species with which it has been recorded include *Allocasuarina campestris*, *Gastrolobium plicatum*, *Melaleuca tinkeri*, *Petrophile shuttleworthiana*, *P. chrysantha* and *Dodonaea ericoides*.

*Phenology.* The main flowering period is between October and December although a flush of flowering in June has been observed in one population, apparently in response to the first rains of autumn. Curiously, the only collection with mature fruit was made in December, although presumably fruit would more usually be present in the period between March and June.

*Etymology.* From the Latin *hyalinus* (transparent), a reference to the broad, hyaline sepal margins.



Figure 3. *Styphelia hyalina*. A – flowering plant *in situ*; B – flowering branchlet; C – leaf, abaxial surface. Scale bars B = 3 mm; C = 2 mm. Vouchers M. Hislop & A. Tinker MH 2501A (A), M. Hislop & A. Tinker MH 3351 (B, C). Photograph by Michael Hislop. Drawings by Hung Ky Nguyen.

*Conservation status.* *Styphelia hyalina* is currently known from six or seven populations, one of which is in a nature reserve. While it is often locally common, its geographic range is quite restricted: about 30 kilometres on a north-south axis and 20 kilometres from east to west. Recently listed as Priority Three under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *Leucopogon* sp. Yandanooka (M. Hislop 2507).

*Affinities.* There are three other members of the *S. tamminensis* subgroup in the Geraldton Sandplain bioregion: *S. tamminensis*, *S. williamsiorum* and *S. pallens*. Of these, only *S. williamsiorum* and *S. pallens* have opposite leaves and are therefore more likely to be confused with *S. hyalina*. *Styphelia hyalina* can be distinguished from both species by its glabrous, rather than hairy, external corolla tube and ovary, glabrous sepal margins (*cf.* ciliate in *S. williamsiorum* and *S. pallens*), anthers (presented at the throat of the corolla tube *cf.* held well below the throat), and filaments (attached at or very close to the anther apex *cf.* at a point  $2/3$ – $3/4$  above the anther base).

The closest relative of *S. hyalina* seems likely to be *S. roseola*. Differences between the two are discussed under that species.

### ***Styphelia incerta* Hislop, *sp. nov.***

*Typus:* Dragon Rocks Nature Reserve [south-east of Hyden], Western Australia [precise locality withheld for conservation reasons], 10 November 2001, M. Hislop 2446 (*holo:* PERTH 05917883; *iso:* CNS, NSW 832206).

*Leucopogon* sp. Lake King (A.J.G. Wilson 65), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 17 June 2022].

Small, spreading, and often compact *shrub*, to *c.* 30 cm high and 30 cm wide, branching close to base of plant, with a fire-sensitive rootstock. Young *branchlets* with a sparse or moderately dense indumentum of short hairs <0.05 mm long. *Leaves* helically arranged, variably antrorse to  $\pm$  patent; apex acute, non-mucronate or with a sub-pungent to pungent mucro 0.1–0.5 mm long; base mostly cuneate or sometimes rounded; petiole 0.1–0.3 mm long, glabrous or with a few marginal hairs; lamina broadly ovate to depressed-ovate or broadly elliptic to transversely elliptic, 0.9–2.0 mm long, 1.0–2.2 mm wide, thick,  $\pm$  concolorous and becoming shiny at maturity but the abaxial surface somewhat paler and  $\pm$  glaucous on young growth, strongly concave, sometimes  $\pm$  stem-clasping in the lower half, longitudinal axis very strongly recurved; adaxial surface with a few hairs towards the base and glabrous or  $\pm$  scabrous above, venation not evident; abaxial surface glabrous, with 7–9 primary veins and shallow, open grooves between; margins usually glabrous, occasionally with a few, very short hairs <0.05 mm long. *Inflorescence* axillary, erect; axis 1.0–2.4 mm long, 1–3-flowered, subterete to bluntly angular, with a moderately dense indumentum of short hairs, terminating in a bud-rudiment; flowers erect, sessile. *Fertile bracts* ovate to broadly ovate, 0.6–1.0 mm long, 0.5–0.7 mm wide, subtended by 3 or 4 sterile bracts. *Bracteoles* ovate to broadly ovate, 0.9–1.3 mm long, 0.7–0.9 mm wide, keeled, obtuse to acute; abaxial surface glabrous, margins ciliolate. *Sepals* narrowly ovate to ovate, 1.6–2.3 mm long, 0.7–1.0 mm wide, obtuse to acute; abaxial surface glabrous, pale green to straw-coloured, with a reddish marginal band at least in the upper half, only the mid-vein evident; adaxial surface with sparse hairs towards the base and apex or  $\pm$  glabrous; margins ciliate with rather crinkled hairs to *c.* 0.2 mm long. *Corolla tube* white or partially flushed pink towards the apex, cylindrical or very narrowly ovoid, longer than the sepals, 2.2–2.8 mm long, 0.9–1.0 mm wide, glabrous externally, internal surface sparsely hairy to a point below the anther bases, glabrous below that. *Corolla lobes* white, variably flushed

pink, shorter than the tube, 1.1–1.5 mm long, 0.5–0.7 mm wide at base, spreading from the base and recurved, glabrous externally, internal surface with a dense indumentum of  $\pm$  straight and essentially unornamented hairs. *Anthers* fully included within the tube, 0.7–1.1 mm long, apex scarcely emarginate. *Filaments* terete, 0.1–0.2 mm long, attached to anther *c.* 3/4 above base, adnate at a point 1/2–2/3 the length of the tube above the base. *Nectary* partite, the scales 0.2–0.3 mm long, 0.2–0.3 mm wide, thick, glabrous. *Ovary* ellipsoid to ovoid, 0.4–0.5 mm long, 0.3–0.4 mm wide, glabrous, 3-locular, pale green to straw-coloured. *Style* abruptly differentiated from ovary apex, 1.4–1.8 mm long, pink-red, finely scabrous, included within the corolla tube; stigma not or scarcely expanded. *Fruit*  $\pm$  cylindrical to very narrowly obovoid, 2.7–3.1 mm long (inclusive of gynophore), 0.8–1.1 mm wide, much longer than the sepals, circular in section, with a well-defined gynophore; surface glabrous,  $\pm$  dry, smooth (mesocarp poorly developed), with pale longitudinal ribs, usually darkly pigmented towards the apex; apex obtuse to subacute; style shed before maturity. (Figure 4A, B)

*Diagnostic characters.* Within the *S. tamminensis* subgroup distinguished by the following character combination: leaves helically arranged, broadly ovate to depressed-ovate or broadly elliptic to transversely elliptic with the longitudinal axis very strongly recurved; abaxial leaf surfaces with shallow, open grooves; leaf apex mucronate or not, pungent or sub-pungent; inflorescence 1–3-flowered; anthers included within the corolla tube; filaments attached to anther in the upper quarter of anther length, adnate to tube at a point 1/2–2/3 the length of the tube above the base; ovary glabrous; style 1.4–1.8 mm long, abruptly differentiated from ovary apex; fruit  $\pm$  dry, cylindrical to very narrowly obovoid, with an obtuse to subacute apex.

*Other specimens examined.* WESTERN AUSTRALIA: 15 Apr. 2006, *G. Byrne* 1930 (CNS, PERTH); 28 Oct. 1991, *A.M. Coates* 3377 (PERTH); 14 Dec. 1960, *A.S. George* 2264 (PERTH); 25 Apr. 1969, *A.S. George* 9282 (PERTH); 4 July 2002, *C. Godden & A. Coates* DR 12.2 (PERTH); 29 Oct. 1975, *J.W. Green* 4567 (PERTH); 13 Nov. 2001, *M. Hislop* 2480 (CANB, CNS, PERTH); 22 May 2002, *M. Hislop & F. Hort* MH 2666 (NSW, PERTH); 22 May 2002, *M. Hislop & F. Hort* MH 2667 (CANB, PERTH); 24 May 2004, *M. Hislop & F. Hort* MH 3231 (CNS, MEL, PERTH); 23 Aug. 2017, *M. Hislop* 4716 (CNS, MEL, PERTH); 26 Mar. 1987, *A.J.G. Wilson* 65 (PERTH).

*Distribution and habitat.* Distributed from a little south of Hyden south and eastwards to an area south-west of Lake King, in the Mallee bioregion. Grows in sandy soils mostly over laterite, in open mallee woodland or heath. Associated species include *Eucalyptus pleurocarpa*, *Allocasuarina acutivalvis*, *Banksia sphaerocarpa*, *Beaufortia puberula*, *Eremaea pauciflora* and *Microcorys obovata*.

*Phenology.* The main flowering period is between October and December although some flowering may continue into the late autumn–early winter period. Fruit at or close to maturity has been collected in April, May and August.

*Etymology.* From the Latin *incertus* (uncertain, doubtful), an allusion to the species' somewhat problematic status within the *S. tamminensis* subgroup.

*Conservation status.* Has a fairly restricted distribution but is known to occur in three nature reserves and is often locally common. Recently listed as Priority Three under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *Leucopogon* sp. Lake King (A.J.G. Wilson 65).

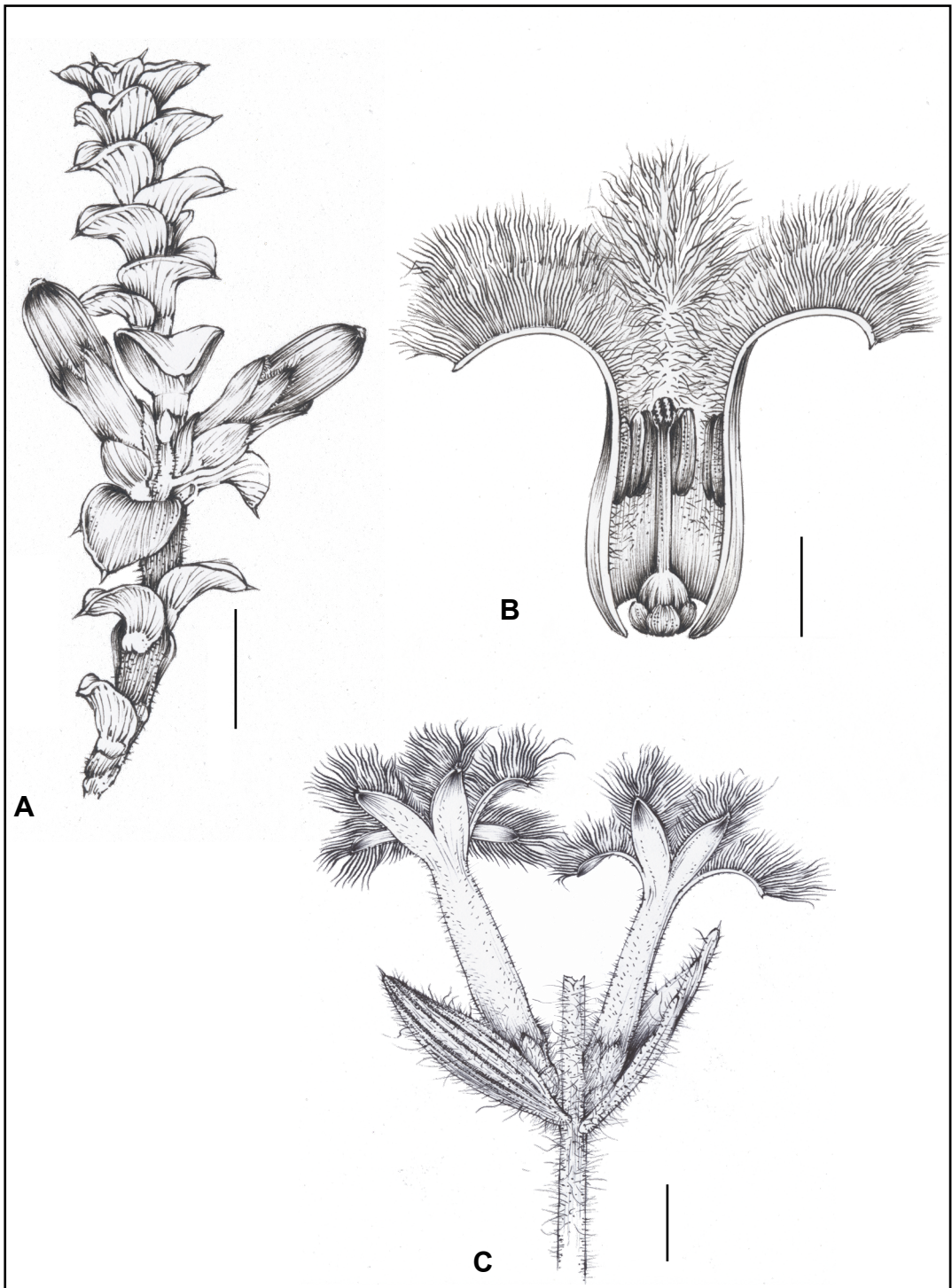


Figure 4. A – *Styphelia incerta*, flowering branchlet; B – *S. incerta*, flower, internal view; C – *S. pallida*, flowering branchlet. Scale bars A = 2 mm; B = 1 mm; C = 2 mm. Vouchers *A.M. Coates* 3377 (A), *M. Hislop* 4716 (B), *M. Hislop & R. Davis* MH 3344 (C). Drawings by Hung Ky Nguyen.



*Affinities.* *Styphelia incerta* is a distinctive species that is tentatively referred to the *S. tamminensis* subgroup in the absence of molecular data. It has the following critical morphological features that are strongly associated with that group: a cryptically 3-locular ovary; internal corolla tube hairs extending well down into the tube; included anthers; very short filaments inserted well down the corolla tube; corolla lobes spreading from the base; and corolla lobe hairs that are more or less straight and essentially unornamented. The most obviously anomalous feature though is a style that, while still included in the tube, is several times longer than any other species in the subgroup. And rather than having a style base that is not clearly differentiated from the acute ovary apex, in *S. incerta* the style is abruptly differentiated from an obtuse ovary apex. The only other species referred to the subgroup that shares the latter character is *S. exilis*, although its style is only 0.3–0.4 mm long.

Given its acute, longitudinally recurved leaves and relatively long style, it is unsurprising that many older collections of *S. incerta* were misidentified as the widespread and variable *S. hamulosa*. The latter species was not included in the phylogeny of Puente-Lelièvre *et al.* (2016) but critical features of its morphology give strong indication that it is a member of the well-supported subclade that includes *S. marginata* (W.Fitzg.) Hislop, Crayn & Puente-Lel. *Styphelia incerta* can be readily distinguished from all variants of *S. hamulosa* by its 3- rather than 5-locular ovary, included rather than exerted style, included rather than partially exerted anthers, hairy rather than glabrous internal corolla tube and always glabrous, rather than usually hairy, sepals.

As noted above there is a particular need for further molecular research into relationships within Group X and the placement of *S. incerta* should be confirmed as part of such a study.

### ***Styphelia pallens* Hislop, *sp. nov.***

*Typus:* Eneabba–Three Springs, Western Australia [precise locality withheld for conservation reasons], 9 November 2004, M. Hislop & R. Davis MH 3344 (*holo:* PERTH 07202881; *iso:* CANB, CNS, MEL, NSW 832202).

*Leucopogon* sp. Tathra (M. Hislop 2900), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 17 June 2022].

Low, spreading *shrub*, to *c.* 50 cm high and 50 cm wide, branching close to base of plant, with a fire-sensitive rootstock. Young *branchlets* with a moderately dense to dense indumentum of variously orientated, straight or curved hairs to *c.* 0.7 mm long. *Leaves* opposite, steeply antrorse to antrorse-appressed; apex mucronate, pungent or sub-pungent, the mucro usually  $\pm$  straight or sometimes distinctly recurved, 0.1–0.5 mm long; base attenuate to cuneate; petiole 0.2–0.6 mm long, usually hairy throughout or with the abaxial surface  $\pm$  glabrous; lamina usually narrowly ovate, occasionally narrowly elliptic, 3.0–7.5 mm long, 0.8–2.0 mm wide,  $\pm$  concolorous or with the abaxial surface slightly darker, strongly concave adaxially, longitudinal axis incurved; adaxial surface matt, with a moderately dense indumentum, venation not or barely evident; abaxial surface slightly shiny, with a sparse to moderately dense indumentum of spreading hairs (sometimes  $\pm$  glabrescent), with 5–7 primary veins, broadly and moderately to deeply grooved between the veins; margins ciliate with hairs to *c.* 1.0 mm long. *Inflorescence* axillary, erect; axis 0.3–0.5 mm long, 1(2)-flowered, hairy, apparently terminating in a flower, bud-rudiment absent; flowers erect, sessile. *Fertile bracts* elliptic or ovate, 0.3–0.5 mm long, 0.2–0.3 mm wide, with a larger sterile bract on the adaxial axis surface and 2 opposite, basal bracts on the same plane as the bracteoles. *Bracteoles* ovate, 1.0–1.5 mm long, 0.8–0.9 mm wide, not keeled, obtuse to subacute; abaxial surface with spreading hairs; margins ciliate. *Sepals* ovate to narrowly

ovate, 1.8–2.3 mm long, 0.8–1.0 mm wide, the apex obtuse to subacute, not recurved; abaxial surface with spreading hairs, pale green to straw-coloured, occasionally pinkish at apex, venation not evident; adaxial surface glabrous; margins ciliate with hairs to *c.* 0.4 mm long. *Corolla tube* pale yellow or cream, occasionally partially flushed red, appearing brownish on old flowers, cylindrical in upper portion, becoming  $\pm$  expanded in lower 1/3, much longer than the sepals, 4.0–6.0 mm long, 1.0–1.3 mm wide; the external surface of cylindrical portion moderately to densely hairy, the expanded basal portion glabrous; internal surface sparsely hairy in the cylindrical portion, glabrous in expanded basal portion, sometimes with poorly defined ring of retrorse hairs close the apex. *Corolla lobes* pale yellow or cream, sometimes partially flushed red, shorter than the tube, 1.4–2.0 mm long, 0.7–0.9 mm wide at base, spreading from the base and recurved, sparsely hairy externally, internal surfaces with a dense, white indumentum of terete, straight and unornamented hairs. *Anthers* fully included within the tube, 1.2–1.7 mm long, apex scarcely emarginate. *Filaments*  $\pm$  obsolete, <0.1 mm long, attached 1/2–2/3 above anther base, adnate at a point *c.* 2/3 the length of the tube above the base. *Nectary* partite, the scales 0.4–0.5 mm long, 0.2–0.3 mm wide, glabrous. *Ovary* very narrowly ovoid, 1.6–2.0 mm long, 0.4–0.5 mm wide, with a dense tuft of antrorse hairs at the base and scattered hairs above, pale green. *Style* not or scarcely differentiated from ovary apex in flower and early fruit, 0.1–0.2 mm long, included within the corolla tube; stigma usually appearing expanded and copiously covered in exudate. Mature fruit not seen. (Figure 4C)

*Diagnostic characters.* Within the *S. tamminensis* subgroup distinguished by the following character combination: leaves opposite, narrowly ovate or occasionally narrowly elliptic, with the longitudinal axis incurved; abaxial leaf surfaces moderately to deeply grooved between the veins; leaf apex mucronate, pungent or subpungent; inflorescence 1(2)-flowered; sepals hairy abaxially, margins ciliate; external corolla tube hairy, pale yellow or cream, occasionally partially flushed red; anthers fully included in the corolla tube; filaments attached to the anther just below anther apex, adnate to tube at a point *c.* 2/3 the length of the tube above the base; ovary hairy; style very short (0.1–0.2 mm long), scarcely differentiated from ovary apex in flower.

*Other specimens examined.* WESTERN AUSTRALIA: [localities withheld for conservation reasons] 18 Oct. 2003, *J. Borger* BB 193 (PERTH); 27 Oct. 2004, *J. Borger* BB 247 (PERTH); 5 Nov. 1992, *R. Cranfield & P. Spencer* 8421 (NSW, PERTH); 11 Nov. 1978, *E.A. Griffin* 1571 (PERTH); 10 Dec. 2001, *M. Hislop* 2508 (CANB, MEL, PERTH); 5 Dec. 2002, *M. Hislop* 2894 (K, PERTH); 5 Dec. 2002, *M. Hislop* 2895 (CANB, PERTH); 5 Dec. 2002, *M. Hislop* 2896 (PERTH); 6 Dec. 2002, *M. Hislop* 2900 (CANB, PERTH); 14 Nov. 2004, *M. Hislop & A. Tinker* MH 3357A (CANB, CNS, PERTH); 14 Nov. 2004, *M. Hislop & A. Tinker* MH 3357B (PERTH).

*Distribution and habitat.* Distributed to the east and north-east of Eneabba in the Geraldton Sandplains bioregion. Occurs in heathland communities, usually high in the landscape in sand or light loam over laterite. It has been recorded as growing in association with the following species: *Banksia carlinoides*, *Banksia lanata*, *Calothamnus sanguineus*, *Daviesia daphnoides*, *Allocasuarina humilis* and *Lambertia multiflora*.

*Phenology.* The main flowering period appears to be from the second half of October to early December. Mature fruit has not been seen but is likely to be present at least during the period between mid-summer and early winter.

*Etymology.* From Latin *pallens* (pale), a reference to the pale coloured corollas (pale yellow or cream, sometimes partially flushed red) relative to the other two species from the *S. tamminensis* alliance that

occur in the Geraldton Sandplains, *S. williamsiorum* and *S. hyalina*, which respectively have corollas that are dark purple or red throughout.

*Conservation status.* This species has a very restricted distribution but is locally common in one nature reserve and one national park. Recently listed as Priority Two under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *Leucopogon* sp. Tathra (M. Hislop 2900).

*Affinities.* *Styphelia pallens* forms a well-supported sister relationship with *S. williamsiorum* (Punkte-Lelièvre *et al.* 2016; as *Leucopogon* sp. Tathra and *L.* sp. Warradarge respectively), and indeed this correlates with a close similarity in their morphology. Both species have corolla tubes that are hairy on their external surfaces, an ovary with a basal hair tuft, and filaments that are adnate to the corolla tube well below the throat. Corolla colour is the most obvious difference between the two: pale yellow or cream, sometimes partially flushed red in *S. pallens*, compared to uniformly dark purple in *S. williamsiorum*. The abaxial leaf surfaces of *S. pallens* are moderately to deeply grooved between the veins whereas in *S. williamsiorum* they are flat to shallowly grooved. Other distinguishing features are to be found in the sepals: *S. pallens* has spreading hairs on the abaxial surfaces and the apices are not recurved, whereas in *S. williamsiorum* the abaxial surfaces are glabrous or very occasionally with a few antrorse hairs and the apices are usually recurved. Other more subtle differences include the strong tendency for *S. pallens* to have longer branchlet hairs (to *c.* 0.7 mm long *cf.* to *c.* 0.3 mm in *S. williamsiorum*) and longer sepal cilia (to *c.* 0.4 mm long *cf.* to *c.* 0.2 mm). The two species have allopatric distributions, with *S. pallens* occurring to the north-east of *S. williamsiorum*.

To the north of the distribution of *S. pallens* occurs another member of the *S. tamminensis* subgroup, *S. hyalina*. These two species are easily distinguished, as outlined in the treatment of the latter.

### ***Styphelia papillosa* Hislop, *sp. nov.***

*Typus:* north-east of Arthur River, Western Australia [precise locality withheld for conservation reasons], 13 February 2004, M. Hislop 3161 A (*holo:* PERTH 06756646; *iso:* CANB, CNS, HO, K, MEL, NSW 832180).

*Leucopogon* sp. Dongolocking (K. Kershaw KK 2333), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 17 June 2022].

Erect, spreading *shrub* to *c.* 50 cm high and 50 cm wide, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a sparse to moderately dense indumentum of patent to retrorse hairs to *c.* 0.2 mm long. *Leaves* helically arranged, variously antrorse, usually steeply so; apex mucronate, pungent, the mucro  $\pm$  straight to slightly inflexed, 0.2–0.6 mm long; base cuneate to attenuate; petiole 0.3–0.5 mm long,  $\pm$  glabrous or sparsely hairy on abaxial surface and margins; lamina narrowly to broadly ovate, 3.0–15 mm long, 1.4–3.0 mm wide, slightly discolorous, strongly concave adaxially, longitudinal axis distinctly incurved; adaxial surface  $\pm$  matt, usually sparsely hairy in the lower half or  $\pm$  glabrous, sometimes distinctly hairy throughout, venation not evident; abaxial surface paler, shiny, glabrous or sometimes moderately to densely hairy throughout, with 7–9 primary veins, the midvein rather broader than the others, shallowly to deeply grooved between the veins; margins minutely hairy with short, stiff, antrorse hairs <0.1 mm long or  $\pm$  glabrous. *Inflorescence* axillary, erect; axis 1.5–4.3 mm long, 1–5-flowered, subterete below the lowest fertile bract, the remainder bluntly to sharply angular, with a moderately dense indumentum of short hairs, terminating in a bud-rudiment;

flowers erect, sessile. *Fertile bracts* broadly ovate, 0.6–1.0 mm long, 0.6–0.9 mm wide, subtended by 3 sterile bracts, the basal 2 opposite. *Bracteoles* usually broadly ovate to broadly elliptic, occasionally ovate, 1.0–1.4 mm long, 0.8–1.1 mm wide, keeled, sometimes obscurely so, obtuse to subacute; abaxial surface glabrous; margins ciliolate. *Sepals* ovate to narrowly ovate, 2.0–2.7 mm long, 0.8–1.1 mm wide, obtuse or occasionally subacute, the apex appressed; abaxial surface glabrous or sometimes variably hairy, pale green to straw-coloured, sometimes with pink tinges, only the rather obscure mid-vein evident; adaxial surface usually glabrous, occasionally with a few hairs towards the apex; margins ciliolate with hairs to 0.1 mm long. *Corolla tube* white, narrowly ellipsoid, narrowly ovoid or  $\pm$  cylindrical, usually longer than or sometimes equal to the sepals, 1.7–2.5 mm long, 0.9–1.2 mm wide, glabrous externally and faintly papillose in the upper half, internal surface with an apical band of hairs in the upper 1/4 that extends below the anther bases, the remainder glabrous. *Corolla lobes* white or pale pink, shorter than the tube, 1.0–1.5 mm long, 0.5–0.6 mm wide at base, spreading from close to the base and recurved, glabrous externally, sometimes papillose at the base, internal surface with a dense indumentum of terete,  $\pm$  straight and essentially unornamented hairs, the basal hairs reflexed and forming a dense tuft which extends well into the tube. *Anthers* fully included within the tube, 0.4–0.7 mm long, apex rounded to scarcely emarginate. *Filaments* terete, *c.* 0.1 mm long, attached to the anther just below the apex, adnate to tube well below the sinuses (from a little below to a little above 3/4 the length of the tube above the base). *Nectary* partite, the scales 0.3–0.5 mm long, 0.2–0.3 mm wide, glabrous, papillose. *Ovary* narrowly ellipsoid, 0.8–1.0 mm long, 0.4–0.5 mm wide, glabrous, papillose in the upper portion, 3(4)-locular, pale green or straw-coloured. *Style* smoothly attenuated from the ovary apex but clearly differentiated, 0.1–0.2 mm long, papillose, included within the corolla tube; stigma not or scarcely expanded. *Fruit*  $\pm$  cylindrical or fusiform, 3.3–3.8 mm long (inclusive of gynophore), 0.9–1.1 mm wide, much longer than the sepals, circular in section, with a well-defined gynophore; surface glabrous, papillose,  $\pm$  dry, smooth (mesocarp poorly developed), with pale longitudinal ribs; apex acute, tapering smoothly to the base of the persistent style. (Figure 5A, B)

*Diagnostic characters.* Within the *S. tamminensis* subgroup distinguished by the following character combination: leaves helically arranged, narrowly to broadly ovate, with the longitudinal axis distinctly incurved; abaxial leaf surfaces variable, shallowly to deeply grooved between the veins, usually glabrous or occasionally densely hairy; adaxial surfaces  $\pm$  glabrous to distinctly hairy; leaf apex mucronate, pungent; sepals obtuse or occasionally subacute (apices appressed), usually glabrous or occasionally hairy; anthers short (0.4–0.7 mm long) fully included within the corolla tube; filaments attached to anther just below anther apex, adnate to tube  $\pm$  3/4 the length of the tube above the base; ovary glabrous, papillose in the upper portion; style very short (0.1–0.2 mm long), but still clearly differentiated from the ovary apex; fruit  $\pm$  dry,  $\pm$  cylindrical or fusiform, with an acute apex.

*Other specimens examined.* WESTERN AUSTRALIA: Apr. 1985, *D. Backshall s.n.* (PERTH); 2 Oct. 1999, *A.G. Gunness et al.* RICH 2/32 (PERTH); 25 May 2004, *M. Hislop & F. Hort* MH 3240 (CANB, CNS, PERTH); 21 Dec. 2014, *M. Hislop* 4382 (PERTH); 29 Apr. 2015, *M. Hislop* 4417A (CNS, PERTH); 12 Jan. 1978, *R. Hnatiuk* 780015 (PERTH); 1 May 1999, *G.J. Keighery & N. Gibson* 5565 (PERTH); 15 Apr. 2002, *K. Kershaw* KK 2333 (CANB, CNS, MEL, PERTH); 15 Apr. 2002, *K. Kershaw* KK 2335 (PERTH); 15 Apr. 2002, *K. Kershaw* KK 2338 (CNS, MEL, NSW, PERTH); 15 Apr. 2002, *K. Kershaw* KK 2339 (CANB, CNS, PERTH); 2 Apr. 2003, *K. Kershaw* KK 2385 (MEL, PERTH); 2 Apr. 2003, *K. Kershaw* KK 2387 (PERTH); 19 June 1999, *L.W. Sage & F. Obbens* LWS 1495 (NSW, PERTH).

*Distribution and habitat.* Sporadically distributed from near Wickepin south to the Woodanilling area, and from north-west of Wagin eastwards to Tarin Rock; in the south of the Avon Wheatbelt and far

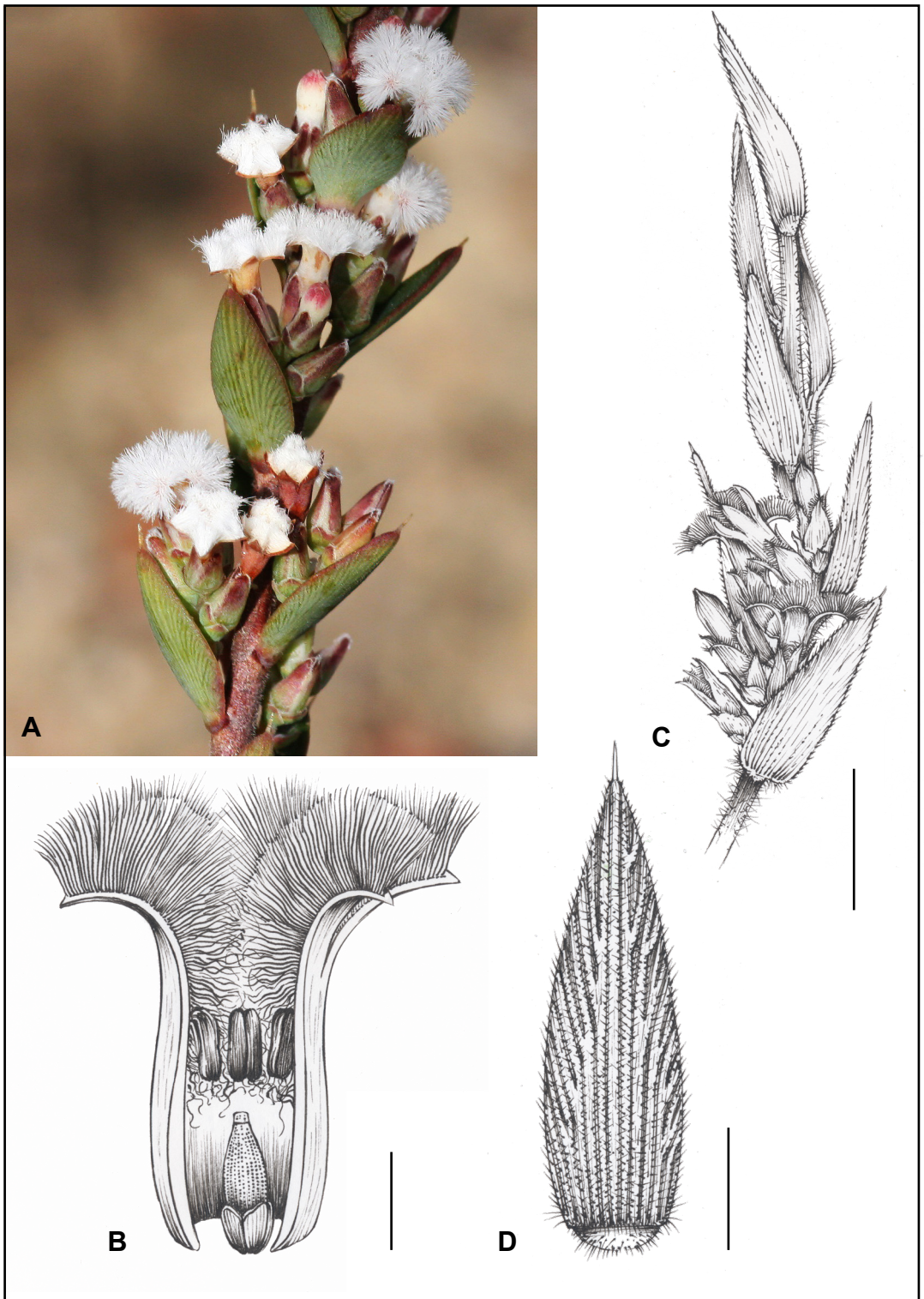


Figure 5. A – *Styphelia papillosa*, flowering branchlet *in situ*; B – *S. papillosa*, flower, internal view; C – *S. recurva*, flowering branchlet; D – *S. recurva*, leaf, abaxial surface. Scale bars B = 1 mm; C = 5 mm; D = 2 mm. Vouchers M. Hislop 3161 A (B), F. Hort 915 (C, D). Photograph by Jolanda Keeble (unvouchered). Drawings by Hung Ky Nguyen.

west of the Mallee bioregions. Grows in heath or open mallee woodland, in sandy soils, usually over laterite. Commonly associated species include *Eucalyptus dorrienii*, *Banksia armata*, *B. sphaerocarpa*, *Gastrolobium spinosum*, *Petrophile divaricata* and *Melaleuca pungens*.

*Phenology.* Most flowering collections have been made in the period from late spring to late autumn. Mature fruit has been collected in April and June but given the lengthy flowering period is likely to be present over many months of the year.

*Etymology.* From the Latin *papillosus* (bearing many small, nipple-like projections), a reference to papillose surfaces of the gynoecium.

*Conservation status.* Has a fairly restricted and scattered distribution in the southern wheatbelt but most of the known occurrences are from nature reserves. Recently listed as Priority Three under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *Leucopogon* sp. Dongolocking (K. Kershaw KK 2333).

*Affinities.* *Styphelia papillosa* is probably closest morphologically to *S. cymbiformis* and *S. recurva* (the former distributed to the south of *S. papillosa* and the latter to the north) and it is with those species that it is most likely to be confused. In comparison to *S. cymbiformis*, *S. papillosa* has smaller anthers (0.4–0.7 mm long *cf.* at least 1.1 mm in *S. cymbiformis*), filaments that are attached to the corolla tube further down the corolla tube (about 3/4 the length of the tube above the base *cf.* at or a little below the corolla lobe sinuses), and a more clearly defined style. It also has leaves with mucronate, pungent apices (*cf.* usually obtuse or if acute then non-mucronate, with a pungent mucro evident in only one gathering) and a less obvious abaxial midvein (*cf.* prominent and keel-like).

Differences between *S. papillosa* and *S. recurva* are given under the treatment of the latter species.

*Notes.* *Styphelia papillosa* varies in the degree to which the abaxial leaf surfaces are grooved and in the presence of hairs on the leaves and sepals. While most collections have glabrous leaf surfaces and sepals, a few are moderately to densely hairy on those parts. Two examples from different parts of the species' range indicate that this variation even occurs within populations (K. Kershaw KK 2333 & KK 2333A; M. Hislop 4417A & 4417B).

### ***Styphelia platyneura* Hislop, *sp. nov.***

*Typus:* south of Forrestania, Western Australia [precise locality withheld for conservation reasons], 8 August 2000, M. Hislop 2107 (*holo:* PERTH 05642256; *iso:* CANB, CNS, HO, K, MEL, NSW).

*Leucopogon* sp. Ironcaps (N. Gibson & K. Brown 3070) *p.p.*, Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 17 June 2022].

Erect, open to ± compact *shrub* to *c.* 100 cm high and 60 cm wide, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a moderately dense indumentum of patent to retrorse hairs to *c.* 0.1 mm long. *Leaves* helically arranged, antrorse; apex mostly obtuse or subacute, occasionally acute; base cuneate to rounded; petiole 0.2–0.5 mm long, glabrous throughout or with a few hairs at the base of the abaxial surface; lamina obovate to ovate or broadly so, 1.3–2.0 mm long,

1.0–1.6 mm wide, ± concolorous, thick, concave adaxially or sometimes ± planoconvex, sometimes ± stem-clasping in the lower half, longitudinal axis ± straight to distinctly recurved; adaxial surface shiny, hairy in the lower half, glabrous above, venation not evident; abaxial surface shiny, glabrous throughout or often with very short, stiff hairs on the veins, with 5–7 broad, primary veins, the midvein rather broader than the others, deeply and openly grooved between the veins; margins minutely hairy with short, stiff, antrorse hairs <0.05 mm long. *Inflorescence* axillary, erect; axis 1.3–1.8 mm long, 1- or 2-flowered, subterete below the lowest fertile bract, compressed above the uppermost, with a moderately dense indumentum, terminating in a bud-rudiment; flowers erect, sessile. *Fertile bracts* ovate, 0.8–1.4 mm long, 0.7–0.9 mm wide, subtended by 3 sterile bracts, the basal 2 opposite. *Bracteoles* ovate, 1.3–1.7 mm long, 1.0–1.2 mm wide, keeled, obtuse to subacute; abaxial surface shortly hairy at least in the upper half; margins ciliate with longer hairs towards the apex. *Sepals* narrowly ovate, 2.0–2.5 mm long, 1.0–1.2 mm wide, subacute to acute; abaxial surface shortly hairy at least in the upper half, mostly green but often becoming pink towards the apex and margins, only the rather obscure mid-vein evident; adaxial surface with hairs towards the apex and usually a discrete hair tuft at the base; margins ciliate with hairs to *c.* 0.3 mm long, the longest towards the apex. *Corolla tube* white, narrowly ellipsoid, narrowly obovoid to ± cylindrical, a little longer than the sepals, 1.8–2.4 mm long, 1.0–1.4(1.6) mm wide, glabrous externally, internal surface hairy towards the apex with hairs projecting downwards to a point level with the middle of the anthers or lower, glabrous below. *Corolla lobes* white, shorter than the tube, 1.3–1.5 mm long, 0.5–0.7 mm wide at base, spreading from close to the base and recurved, glabrous externally, internal surface with a dense indumentum of terete, ± straight and essentially unornamented hairs. *Anthers* fully included within the tube (the tips ± held at the orifice), 1.1–1.5 mm long, apex scarcely emarginate, ± recurved. *Filaments* terete, 0.1–0.2 mm long, attached to anther ± at or just below the apex, adnate to tube just or sometimes distinctly below the sinuses. *Nectary* partite, the scales 0.3–0.4 mm long, 0.2–0.3 mm wide (possibly occasionally weakly cohering), glabrous. *Ovary* narrowly ovate, 1.0–1.1 mm long, 0.4–0.5 mm wide, glabrous, 3-locular, pale green or yellow-green. *Style* smoothly attenuated from (and with the base not clearly differentiated from) the ovary apex, 0.3–0.4 mm long, papillose, included within the corolla tube; stigma not or scarcely expanded. *Fruit* ± cylindrical, fusiform or very narrowly ovoid, sometimes curved, 3.0–3.5 mm long (inclusive of gynophore), 1.0–1.3 mm wide, much longer than the sepals, circular in section, with a well-defined gynophore; surface glabrous, ± dry, smooth (mesocarp poorly developed), with pale, longitudinal ribs; apex acute, tapering smoothly to the style base; style persistent or not. (Figure 6)

*Diagnostic characters.* Within the *S. tamminensis* subgroup distinguished by the following character combination: leaves helically arranged, obovate to ovate, or broadly so with the longitudinal axis straight to distinctly recurved; abaxial leaf surfaces with deep, open grooves between the veins, often shortly hairy on the vein surfaces, glabrous within the grooves; leaf apex innocuous, non-mucronate; inflorescence 1- or 2-flowered; sepals and bracteoles shortly hairy abaxially, at least in the upper half; anther tips included within corolla tube; filaments attached to anther at or just below anther apex, adnate to tube just below (or sometimes distinctly below) the sinuses; ovary glabrous; style 0.3–0.4 mm long; fruit ± dry, ± cylindrical, fusiform or very narrowly ovoid, with an acute apex.

*Other specimens examined.* WESTERN AUSTRALIA: [localities withheld for conservation reasons] 3 Aug. 2005, *G.F. Craig* 6709 (PERTH); 7 Sep. 1996, *N. Gibson & K. Brown* 2519 (PERTH); 7 Sep. 1996, *N. Gibson & K. Brown* 3070 (PERTH); 5 Sep. 1996, *N. Gibson & K. Brown* 3071 (PERTH); 9 Aug. 2000, *M. Hislop* 2111 (CNS, PERTH); 12 Nov. 2001, *M. Hislop* 2458 (CANB, MEL, NSW, PERTH); 12 Nov. 2001, *M. Hislop* 2460 (CNS, PERTH); 21 Aug. 2001, *K. Kershaw & M. Golding* KK 2269 (CANB, CNS, K, MEL, PERTH); 4 Sep. 1970, *K.R. Newbey* 3285 (PERTH).



Figure 6. *Styphelia platyneura*. A – flowering plant *in situ*; B – fruiting branchlet. Scale bar B = 3 mm. Vouchers *M. Hislop* 2107 (A), *M. Hislop* 2111 (B). Photograph by Michael Hislop. Drawing by Hung Ky Nguyen.



*Distribution and habitat.* Distributed from the Forrestania district south and east to the eastern part of Frank Hann National Park, in the central Mallee bioregion. Grows in sand or sandy loam soils usually over laterite or ironstone, on undulating plain or sometimes ironstone hills. Associated vegetation is open mallee woodland or heath with the following among the species with which it has been commonly recorded: *Eucalyptus tenera*, *Hakea scoparia*, *Banksia elderiana*, *Melaleuca cordata*, *M. pungens*, *Allocasuarina campestris* and *A. acutivalvis*.

*Phenology.* Appears to flower sporadically over many months of the year. Most flowering collections also have fruit present at various stages of maturity. Those specimens collected in November have the largest numbers of buds and flowers present, which may indicate that late spring and early summer is the peak flowering period.

*Etymology.* From the Greek *platys* (flat, wide) and *-neurus* (-nerved), a reference to the broad midvein of the abaxial leaf surface.

*Conservation status.* *Styphelia platyneura* will be listed as Priority Two under Conservation Codes for Western Australian Flora (T. Llorens pers. comm.).

*Affinities.* The species most likely to be confused with *S. platyneura* is *S. subglauca*, which also has innocuous, non-mucronate leaf apices. Differences between the two are given under the treatment of the latter species.

*Styphelia echinulata* is another somewhat similar species, although growing well to the north of the known distribution of *S. platyneura*. In addition to having pungent, mucronate leaf apices, *S. echinulata* differs in its much narrower, ± closed and hairy abaxial leaf grooves. The floral parts of *S. echinulata* are also generally smaller: sepals 1.4–2.0 mm long (cf. 2.0–2.5 mm in *S. platyneura*), anthers 0.6–1.0 mm long (cf. 1.1–1.5 mm) and style c. 0.2 mm long (cf. 0.3–0.4 mm).

***Styphelia pogonocalyx*** (Benth.) F. Muell., *Syst. Census Austral. Pl.* 107 (1882); *Leucopogon pogonocalyx* Benth., *Fl. Austral.* 4: 222 (1868). Type: 'W. Australia. Mount Manypeak', s. dat., G. Maxwell s.n. (syn: K 000347896 image!, L 0006569 image!, MEL 1512190 image!).

*Leucopogon* sp. Mondurup (K.F. Kenneally 11445), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [before October 2005].

*Distribution.* All PERTH collections of this species are from the Stirling Range National Park or the immediately surrounding country, in the far west of the Esperance Plains and adjacent southern Jarrah bioregions. No subsequent collections have apparently been made from the type locality of Mount Manypeaks.

*Conservation status.* Currently listed as Priority Four under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–). *Styphelia pogonocalyx* is locally common in the Stirling Range National Park but if, like many epacrids, it is susceptible to the root-rot pathogen *Phytophthora cinnamomi*, which now affects much of the park, it is likely to suffer significant future decline.

***Styphelia recurva* Hislop, *sp. nov.***

*Typus*: Watershed Road, Geddes State Forest, Wandering; 0.7 km south of Ref Tree BW 84/1, at pine plot then 200 m north-west, Western Australia, 1 February 2000, *F. Hort* 915 (*holo*: PERTH 05510740; *iso*: CANB, CNS, MEL).

*Leucopogon* sp. Wandering (F. Hort 419), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 17 June 2022].

Erect or sprawling *shrub* to *c.* 80 cm high and 90 cm wide, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a moderately dense to dense indumentum of mostly patent hairs to *c.* 0.5 mm long. *Leaves* helically arranged, variously antrorse, usually steeply so; apex usually long-mucronate, pungent, the mucro  $\pm$  straight to slightly inflexed, 0.2–1.0 mm long; petiole 0.3–0.6 mm long, hairy throughout or sometimes  $\pm$  glabrous; lamina usually narrowly ovate, sometimes ovate or broadly ovate, 3.0–11 mm long, 1.3–3.4(4.0) mm wide, distinctly discolorous, concave adaxially or sometimes flat to convex, longitudinal axis strongly incurved to gently recurved; adaxial surface shiny, sparsely to moderately hairy, at least in the lower half, occasionally glabrous, venation not evident; abaxial surface paler, matt to slightly shiny, moderately to densely hairy, less often glabrous, with 5–9 primary veins, the midvein scarcely broader than the others, moderately to deeply grooved between the veins; margins usually variably ciliate with hairs to *c.* 0.5 mm long, occasionally glabrous. *Inflorescence* axillary, erect; axis 1.0–5.2 mm long, 1–6-flowered, subterete below the lowest fertile bract, the remainder  $\pm$  angular, with a moderately dense to dense indumentum, terminating in a budrudiment; flowers erect, sessile. *Fertile bracts* ovate to broadly ovate, 0.8–1.5 mm long, 0.7–0.8 mm wide, subtended by 3 or 4(5) sterile bracts, the basal 2 opposite. *Bracteoles* ovate, 1.2–2.0 mm long, 0.8–1.0 mm wide, keeled, sometimes rather obscurely so, acute and usually acuminate; abaxial surface hairy with a sparse to moderately dense indumentum, sometimes glabrous; margins ciliate. *Sepals* narrowly ovate, 2.2–3.3 mm long, 0.9–1.1 mm wide, acuminate, the apex filiform, usually  $\pm$  recurved, occasionally almost straight (but not appressed); abaxial surface usually hairy with a sparse to dense indumentum of spreading hairs, sometimes glabrous, pale green to straw-coloured, only the rather obscure mid-vein evident; adaxial surface sparsely hairy towards the apex and often also at the base; margins ciliate with hairs to 0.3 mm long. *Corolla tube* white, narrowly ellipsoid, usually shorter than, but occasionally slightly longer than, the sepals, (1.5)2.0–2.8 mm long, 0.8–1.3 mm wide, glabrous externally and papillose in the upper half, internal surface with an apical band of hairs in the upper 1/4 that extend below the anther bases, the remainder glabrous. *Corolla lobes* white, shorter than the tube, (1.3)1.5–2.1 mm long, 0.5–0.6 mm wide at base, erect for *c.* 1/3 of their length and then spreading and recurved, glabrous and papillose externally, internal surface with a dense indumentum of terete,  $\pm$  straight and essentially unornamented hairs, the basal hairs reflexed. *Anthers* usually partially exerted from the tube by 1/8–1/4 of their length (occasionally included with the tips held at the orifice), (0.6)0.7–1.0 mm long, apex scarcely emarginate. *Filaments* terete, 0.1–0.2 mm long, attached to the anther 3/4–7/8 above base, adnate to tube just below sinuses. *Nectary* partite, the scales 0.3–0.5 mm long, 0.2–0.3 mm wide, glabrous. *Ovary* narrowly ellipsoid to fusiform, 0.8–1.1 mm long, 0.3–0.5 mm wide, glabrous, papillose in the upper portion. 3-locular, pale green or straw-coloured. *Style* smoothly attenuated from the ovary apex but clearly differentiated, 0.1–0.2 mm long, papillose, stigma scarcely expanded. Mature *fruit* not seen, immature fruit  $\pm$  cylindrical, papillose. (Figure 5C, D)

*Diagnostic characters.* Within the *S. tamminensis* subgroup distinguished by the following character combination: leaves helically arranged, narrowly to broadly ovate, with the longitudinal axis strongly incurved to gently recurved; abaxial leaf surfaces moderately to deeply grooved between the veins, usually hairy, or occasionally glabrous; adaxial leaf surfaces usually sparsely to moderately hairy or

occasionally glabrous; leaf apex long-mucronate, pungent; sepals acuminate (apices usually recurved, occasionally  $\pm$  straight), usually hairy or occasionally glabrous; anthers usually partially exerted from the corolla tube, occasionally included with the tips held at the orifice; filaments attached to anther 3/4–7/8 above base, adnate to tube just below sinuses; ovary glabrous, papillose in the upper portion; style very short (0.1–0.2 mm long) but clearly differentiated from ovary apex.

*Other specimens examined.* WESTERNAUSTRALIA: firebreak at W boundary of N block of Birdwhistle Nature Reserve, NE of Narrogin, 9 Mar. 2002, *M. Hislop* 2547 (CANB, CNS, PERTH); firebreak at S boundary of N block of Birdwhistle Nature Reserve, NE of Narrogin, 9 Mar. 2002, *M. Hislop* 2548 (CNS, PERTH); Boyagin Nature Reserve, W block N of Boyagin Rd, off N–S firebreak c. 1 km N of southern boundary, 20 June 2004, *M. Hislop* 3253 (PERTH); Bouncer Rd, Shire of York, Flynn FB: from Ref Tree AS 85/1 on Bouncer Rd continue E for 200 m then track to shrubland 250 m NNE, 3 Feb. 1999, *F. Hort* 419 (CNS, PERTH); Little Darkin Swamp, Flynn State Forest, Warrigal Rd: 2.4 km N of the NE corner of the swamp, 20 Jan. 2000, *F. Hort* 909 (CANB, MEL, NSW, PERTH); Randall Rd, Geddes State Forest [N of North Bannister], 300 m W of junction with Watershed Rd, then S for 60 m, 1 Feb. 2000, *F. Hort* 916 (CANB, NSW, PERTH); c. 300 m W of junction of Watershed Rd and Schulstaad Rd, Geddes State Forest [N of North Bannister], 1 Feb. 2000, *F. Hort* 917 (PERTH); Watershed Rd, Brady State Forest [N of North Bannister], 6.9 km S of Brookton Hwy, then 300 m W, 3 Feb. 2000, *F. Hort* 920 (NSW, PERTH); Metro Rd, Gibbs State Forest, Wandering: 4.6 km S of Division Track, then 1.2 km to the ESE, 18 Jan. 2001, *F. Hort* 1265 (PERTH); Division Track, Gibbs State Forest, Wandering: 3.5 km E of Metro Rd, then 1.6 km N, 23 Jan. 2001, *F. Hort* 1266 (CNS, K, PERTH); Flynn Forest Block [SW of York], Bouncer Rd 2.2 km S of Ridley Rd, then 200 m E, 30 Mar. 1999, *F. & J. Hort* 450 (PERTH); Wearne State Forest, Barrett Rd [N of Wandering]: 300 m S of Ref. Tree CD 95/1 (at junction of Strange Rd), then c. 150 m W, 5 Mar. 2001, *F. & J. Hort* 1278 (PERTH); Lupton Conservation Park, Ricks Rd [E of North Bannister], 1.25 km E of Heartbreak Rd, then 300 m N, 20 May 2010, *F. & J. Hort* 3634 (CNS, MEL, PERTH); Nockine State Forest, Yarra Rd, W side of road, c. 100 m S from Deefor Rd [SW of York], 31 Jan. 2016, *F. & J. Hort* FH 4003 (CANB, K, PERTH); Dale West Rd, Wandoo Conservation Park, 19.9 km from Brookton Hwy, then 50 m N [E of Armadale], 6 Feb. 2000, *F. Hort, J. Hort & M. Hislop* 925 (CNS, MEL, PERTH); Deefor Rd, Flynn State Forest [SW of York]: 5.7 km E of Yarra Rd, 18 Jan. 2000, *F. Hort, J. Hort & A. Lowrie* 908 (CNS, NSW, PERTH); Monadnocks Conservation Park, Watershed Rd, 2.08 km directly NNE at 214 degrees from Pike Rd junction, W of road, 24 Mar. 2010, *F. Hort & M. Pasotti* 3632 (CANB, MEL, PERTH); Candy Block, Dryandra [State Forest], 26 km N of Narrogin, 7 July 1987, *G.J. Keighery* 9987 (CANB, CNS, PERTH); Boundain Nature Reserve, 21067 & 17115 [E of Narrogin], on track and along edge of track through centre of reserve, 27 July 2000, *K. Kershaw* 2119 (PERTH); 4.9 km W of Wandering–Narrogin Rd on Colac Rd, Dryandra State Forest, c. 20 km NW of Narrogin, 15 Jan. 1996, *T.R. Lally & B.J. Lepschi* TRL 935 (PERTH); Narrakine Block, Highbury Forestry [W of Highbury], 8 Feb. 2000, *G. Warren, K. Kershaw & G. Hansen* 126B (NSW, PERTH).

*Distribution and habitat.* Occurs mostly in the Darling Range from Wandoo National Park, west of York, to the Narrogin district; in the Jarrah Forest and western Avon Wheatbelt bioregions. Grows in sand or light loam soils over laterite or less often granite, in woodland or heath. Among the more commonly associated species are *Eucalyptus marginata*, *Corymbia calophylla*, *Hakea undulata*, *H. trifurcata*, *Banksia armata*, *Allocasuarina humilis*, *Melaleuca aspalathoides* and *Leptospermum erubescens*.

*Phenology.* The species is in full flower at the hottest time of the year, between January and March, but with some flowering continuing into late autumn and early winter. Given that this is a relatively well-collected species, it is remarkable that mature fruit has not been observed; these are likely to be present from late winter through the spring months.

*Etymology.* From the Latin *recurvus* (bent backwards), a reference to the usually recurved sepal tips.

*Conservation status.* *Styphelia recurva* occurs on a number of reserves and in state forest across its range and is often locally common. No conservation code applies.

*Affinities.* Of the three other members of the *S. tamminensis* subgroup that occur in the Darling Range north and south of Perth, both *S. bracteolosa* and *S. roseola* differ from *S. recurva* in having opposite and decussate rather than spirally arranged leaves. The third, *S. annulata*, is readily distinguished by its basal ring of ovarian hairs (*cf.* ovary glabrous in *S. recurva*) and sepals with straight, thickened, and contrasting green tips (*cf.* more or less uniformly coloured sepals with usually recurved tips).

Morphological similarity would suggest the closest relative of *S. recurva* is likely to be *S. papillosa*. In the context of the *S. tamminensis* subgroup, the two share the distinctive characters of a papillose ovary and a style that, while very short, is clearly differentiated from the ovary. Their distributions overlap slightly at the southern extent of the geographic range of *S. recurva* and, although there are no records of the two co-occurring, they are known to grow within 30 km of each other. A sepal character is the most obvious difference between the two: the tips of the sepals are attenuate and usually recurved in *S. recurva* but obtuse or occasionally subacute and appressed to the corolla tube in *S. papillosa*. The point of stamen attachment to the corolla and anther length are also important differences. Whereas in *S. recurva* the filaments are attached to the corolla tube just below the sinuses and the anthers are (0.6)0.7–1.0 mm long, in *S. papillosa* the point of filament attachment is well below the sinuses (*c.* 3/4 the length of the tube above the base) and the anthers are 0.4–0.7 mm long. Other differences are the noticeably longer sepal cilia of *S. recurva* (to 0.3 mm long, *cf.* to 0.1 mm in *S. papillosa*) and the longer corolla lobes ((1.3)1.5–2.1 mm long *cf.* 1.0–1.5 mm).

There is a tendency for the southern populations of *S. recurva* to have relatively shorter and broader leaves with a more uniformly short indumentum on their abaxial surfaces. Across most of the species range the abaxial leaf surfaces usually have a mixture of long and short hairs, but occasional glabrous forms occur. The presence of hairy and glabrous leaf forms is another feature that *S. recurva* has in common with *S. papillosa*, but interestingly while the hairy form predominates in the former, the glabrous form is far more common in the latter.

### ***Styphelia roseola* Hislop, *sp. nov.***

*Typus:* Anvil block, Julimar State Forest, south-west of Bolgart, Western Australia, 25 November 2001, M. Hislop & F. Hort MH 2486 (*holo:* PERTH 05918502; *iso:* CANB, MEL, NSW).

*Leucopogon* sp. Bolgart (M. Hislop & F. Hort MH 2486), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 17 June 2022].

Spreading *shrub*, to *c.* 70 cm high and 100 cm wide but often much smaller, multi-stemmed from close to base of plant, with a fire-sensitive rootstock. Young *branchlets* with a sparse to moderately dense indumentum of patent to retrorse, straight or curved hairs to *c.* 0.3 mm long. *Leaves* opposite, steeply antrorse to antrorse-appressed; apex mucronate, pungent, the mucro straight, 0.2–0.5 mm long; base cuneate or occasionally  $\pm$  attenuate; petiole 0.2–0.5 mm long, variously hairy or glabrous; lamina narrowly ovate to narrowly elliptic, 3.5–7.0 mm long, 1.0–2.1 mm wide,  $\pm$  concolorous, usually concave adaxially, but sometimes flat or convex towards the base, longitudinal axis distinctly incurved; adaxial surface slightly shiny, hairy, usually throughout but sometimes only at the base,

venation usually evident with 1–5 slightly raised veins; abaxial surface slightly shiny, usually variously hairy (especially in the grooves), occasionally glabrous, with 5–7 primary veins, the midrib distinctly broader than the others, grooves between the veins varying from broad and shallow to narrow and deep; margins usually irregularly ciliate with stiff hairs to 0.2 mm long, occasionally glabrous. *Inflorescence* axillary, erect; axis 0.3–0.8 mm long, usually 1- or rarely 2-flowered, hairy, terminating in a short, bract-like point (usually obscured by the fertile bract); flowers erect, sessile. *Fertile bracts* ovate to depressed-ovate, 0.3–0.7 mm long, 0.3–0.5 mm wide, with a larger sterile bract opposite (i.e. on the adaxial axis surface) and 2 opposite, basal bracts on the same plane as the bracteoles. *Bracteoles* ovate or broadly ovate, 1.0–1.6 mm long, 0.8–1.0 mm wide, not keeled, obtuse; abaxial surface usually hairy, occasionally glabrous; margins ciliate. *Sepals* narrowly ovate, 2.0–2.7 mm long, 0.8–1.2 mm wide, obtuse; abaxial surface usually hairy (the hairs occasionally very sparse), pale green in the lower half, often becoming pink towards the apex, venation very obscure; adaxial surface glabrous; margins broadly hyaline, ciliate and/or lacinate at least in the distal half, with hairs to 0.2 mm long, very occasionally  $\pm$  glabrous. *Corolla tube* pink,  $\pm$  cylindrical or very narrowly ovoid, much longer than the sepals, 2.8–4.3 mm long, 1.0–1.4 mm wide, external surface hairy in the upper half, very occasionally  $\pm$  glabrous, internal surface hairy in the upper half to near the base of the anthers, glabrous below. *Corolla lobes* pink, shorter than the tube, 1.1–1.5 mm long, 0.5–0.8 mm wide at base, spreading from the base and recurved, external surface hairy or less often  $\pm$  glabrous, internal surface with a dense, white indumentum of terete, straight and unornamented hairs, the basal hairs reflexed and forming a dense tuft which extends well into the tube. *Anthers* fully included within the tube, 0.8–1.4 mm long, apex shallowly emarginate. *Filaments* terete, 0.1–0.2 mm long, attached just below anther apex, adnate to tube well below sinuses (i.e.  $2/3$ – $3/4$  the length of the tube above the base). *Nectary* partite, the scales 0.4–0.5 mm long, 0.2–0.4 mm wide, glabrous. *Ovary* very narrowly ovoid, 1.4–2.0 mm long, 0.4–0.5 mm wide, hairy (the hairs concentrated towards the base), 3-locular, pale green or yellow-green. *Style* not or scarcely differentiated from ovary apex in flower, c. 0.2 mm long, glabrous, included within the corolla tube; stigma not or scarcely expanded. Mature *fruit* not seen. (Figure 7)

*Diagnostic characters.* Within the *S. tamminensis* subgroup distinguished by the following character combination: leaves opposite, narrowly ovate to narrowly elliptic with the longitudinal axis distinctly incurved; abaxial leaf surfaces shallowly to deeply grooved between the veins; leaf apex mucronate, pungent; inflorescence 1- or rarely 2-flowered; sepals usually hairy abaxially, with hyaline, ciliate and/or lacinate margins; external corolla tube usually hairy, pink; anthers fully included in the corolla tube; filaments attached to anther in the upper quarter of anther length, adnate to tube well below the sinuses; ovary hairy; style very short (c. 0.2 mm long), not or scarcely differentiated from ovary apex in flower.

*Other specimens examined.* WESTERN AUSTRALIA: Carani West Rd, 1.3 km E of junction with Calingiri–New Norcia Rd [SW of Yerecoin], 19 Nov. 2006, *A.S. George* 17771 (PERTH); Drummond Nature Reserve [W of Bolgart], c. halfway along W boundary then 300 m in, 25 Nov. 2001, *M. Hislop & F. Hort* MH 2485A, B, C, D (all PERTH); [Anvil block, Julimar State Forest], SW of Bolgart, 25 Nov. 2001, *M. Hislop & F. Hort* MH 2487 (CANB, PERTH); Wyening Reserve 20991, Fordham Rd (SSE of Calingiri), 19 Nov. 2003, *F. & B. Hort* 2103 (CNS, K, PERTH); Calingiri Water Reserve 17655/29461, Fordham Rd, N of Wyening East Rd, 19 Nov. 2003, *F. & B. Hort* 2104 (CANB, CNS, MEL, PERTH); Byroomanning Nature Reserve, Stephens Rd, Bindoon, 14 Jan. 2002, *F. & J. Hort* 1685 (PERTH); Wyening Reserve 20991, Fordham Rd [SSE of Calingiri], 23 Feb. 2003, *F. & J. Hort* 1937 (CNS, K, PERTH); Calingiri Water Reserve 17655/29461, Fordham Rd, N of Wyening East Rd, 23 Feb. 2003, *F. & J. Hort* 1938 (K, MEL, PERTH); Railway Reserve, Bindi Bindi Rd, Yerecoin, 2.7 km S of Yerecoin South Rd, 2 Apr. 2010, *F. & J. Hort* 3631 (CNS, PERTH); Bindoon Training

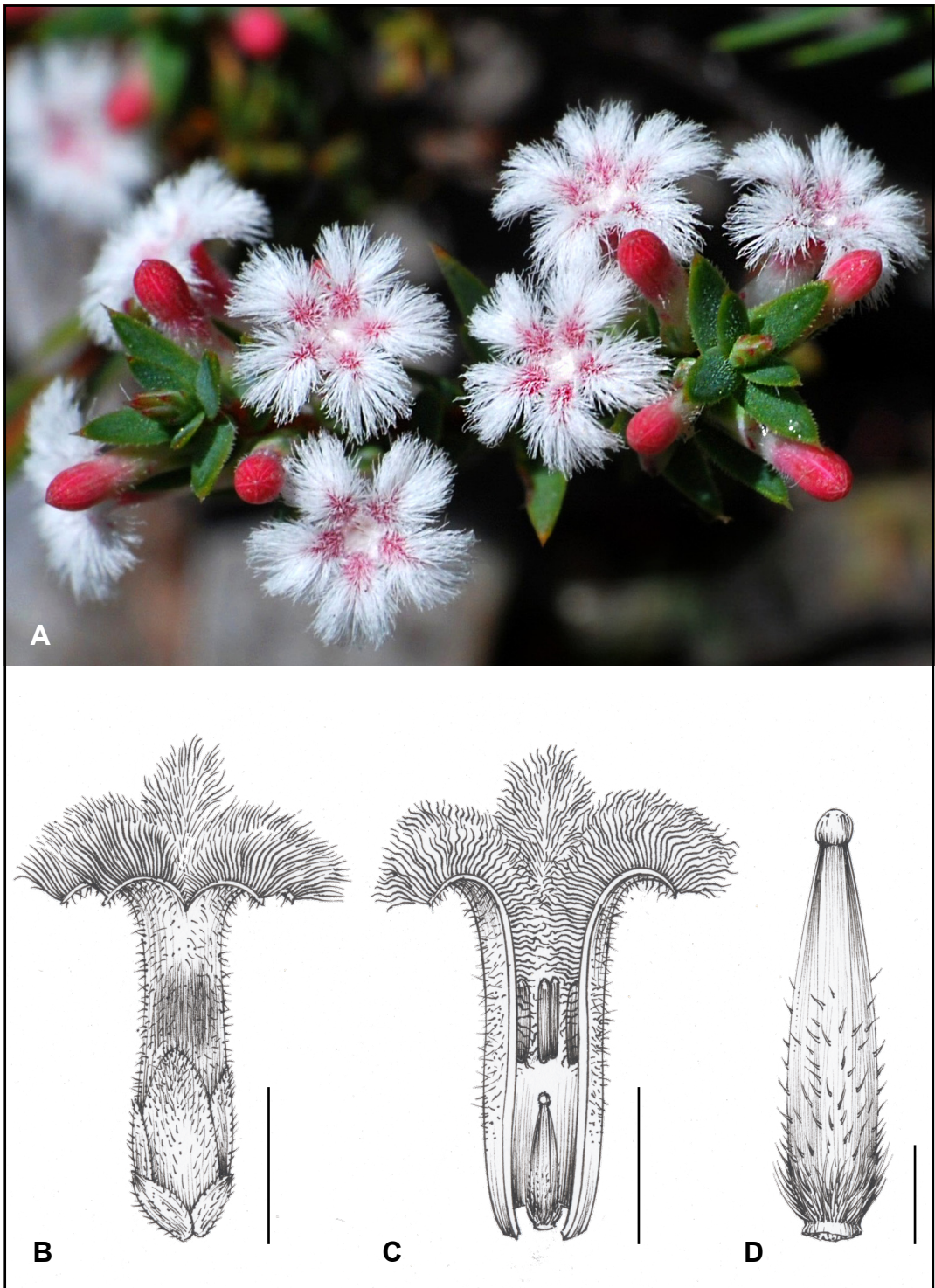


Figure 7. *Stiphelia roseola*. A – flowering branchlet *in situ*; B – flower, external view; C – flower, internal view; D – ovary at flowering. Scale bars B = 2 mm; C = 2 mm; D = 0.5 mm. Voucher *F. & B. Hort* 2103 (B, C, D). Photograph by Fred & Jean Hort (unvouchered). Drawings by Hung Ky Nguyen.

area, Wattening (Toodyay), 1.5 km NE from Fork River crossing, 9 Dec. 2009, *F. Hort, J. Hort & M. Pazotti* 3570A (CNS, PERTH); *F. Hort, J. Hort & M. Pazotti* 3570B (CNS, PERTH); Poison Paddock [Benedictine Monastery], New Norcia, 7 Dec. 2004, *K. Macey* 803 (PERTH).

*Distribution and habitat.* Distributed between New Norcia and Yerecoin in the north southwards to Bindoon and Julimar State Forest; in the northern Jarrah Forest bioregion and adjacent western part of the Avon Wheatbelt. Grows in sand or light loam soils, usually over laterite or granite, in heath or open woodland. Commonly associated species include *Eucalyptus drummondii*, *Banksia armata*, *Styphelia serratifolia*, *Hakea undulata*, *H. gilbertii* and *Isopogon divergens*.

*Phenology.* The main flowering period is in November and December, but flowering specimens have also been collected in February and March, probably in response to summer rainfall. Mature fruit has not been collected but is likely to be present from about March until June.

*Etymology.* From the Latin *roseolus* (pink), a reference to the corolla colour.

*Conservation status.* *Styphelia roseola* has a fairly restricted distribution, on current knowledge extending about 48 kilometres on a north-south axis and 35 from east to west. It is known from three nature reserves, state forest and a water reserve. No conservation coding is recommended, but with such a limited geographical range its conservation status should be revisited at intervals.

*Affinities.* In terms of general morphological similarity, the taxon closest to *S. roseola* is *S. hyalina* from the Geraldton Sandplain bioregion. That species has very similar obtuse sepals with broadly hyaline margins but the abaxial surfaces and margins are always glabrous rather than variously hairy. *Styphelia roseola* also differs from *S. hyalina* in having a hairy ovary and a usually hairy corolla tube. There are further differences in the anther presentation and point of filament attachment to the corolla tube. The anthers of *S. roseola* are presented well below the corolla throat, whereas those of *S. hyalina* are held at the throat itself, and the filaments are inserted well below the sinuses rather than immediately beneath them. While *S. roseola* has a dense ring of hairs projecting into the top of the corolla tube and completely filling the orifice, these hairs are much sparser in *S. hyalina* and the anthers remain clearly visible at the top of the tube. There is an interesting, additional distinction between the two: whereas the inflorescence axis terminates in a short, bract-like point in *S. roseola*, the axis apparently ends at the flower in *S. hyalina*.

*Styphelia roseola* may also be confused with *S. bracteolosa* (see the treatment of the latter for differences) and *S. williamsiorum*. Apart from its more northerly distribution, *S. williamsiorum* can be distinguished from *S. roseola* by its dark purple (rather than pink) corolla pigmentation and usually recurved (rather than appressed) sepal apices. There is also a difference in the position of the filament-anther attachment, with *S. williamsiorum* having the attachment about 2/3–3/4 above the anther base rather than just below the anther apex.

Most specimens of *S. roseola* have distinctly hairy abaxial leaf surfaces, sepals with hairy abaxial surfaces and margins, and hairy corolla tubes; however, there can be considerable variation in the density of these hairs within populations (e.g. *M. Hislop & F. Hort* MH 2485A, B, C, D; *F. Hort, J. Hort & M. Pazotti* 3570A, B) and even on individual specimens. In a few collections the abaxial leaf surfaces are completely glabrous. Where this occurs it usually correlates with a reduced indumentum (sometimes to just a few hairs) on the sepals and/or the corolla tube.

**Styphelia scabrella** Hislop, *sp. nov.*

*Typus*: 3.5 km west along Belka Road from Hines Hill Road, north of Bruce Rock, Western Australia, 20 September 2001, K. Kershaw KK 2287 (*holo*: PERTH 05881641; *iso*: CANB, CNS, HO, K, MEL, NSW).

*Leucopogon* sp. Corrigin (K. Kershaw KK 2091), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 17 June 2022].

Spreading, compact *shrub* to *c.* 70 cm high and 70 cm wide, multi-stemmed from close to base of plant but single-stemmed at ground level, probably with a fire-sensitive rootstock. Young *branchlets* with a moderately dense to dense indumentum of patent or retrorse hairs to *c.* 0.1 mm long. *Leaves* helically arranged, steeply antrorse and frequently antrorse-appressed; apex acute, usually mucronate, innocuous to sub-pungent, the mucro straight to slightly inflexed, 0.05–0.2 mm long; base rounded to cuneate; petiole very short, 0.1–0.2 mm long, glabrous; lamina ovate or narrowly ovate, sometimes  $\pm$  triangular, 0.8–2.3 mm long, 0.6–1.2 mm wide,  $\pm$  concolorous, strongly concave and stem-clasping, at least at the base, longitudinal axis straight to slightly recurved in the upper half, becoming incurved towards apex; adaxial surface not shiny, hairy throughout, usually densely so, venation not evident; abaxial surface shiny, very shortly hairy or scabrous throughout, occasionally  $\pm$  glabrous, with 5–7 primary veins, either not grooved or shallowly grooved between the veins; margins minutely and coarsely ciliate with antrorse hairs <0.05 mm long. *Inflorescence* axillary, erect; axis 1.5–2.8 mm long, (1)2- or sometimes 3-flowered, angular, with a dense indumentum, terminating in a bud-rudiment; flowers erect, sessile. *Fertile bracts* narrowly ovate to ovate, 1.1–1.6 mm long, 0.7–1.0 mm wide, subtended by 3 sterile bracts, the basal 2 opposite (sometimes only the basal 2 present). *Bracteoles* ovate or narrowly ovate, 1.3–2.1 mm long, 0.8–1.0 mm wide, keeled, acute and sometimes mucronate, noticeably thickened towards the apex; abaxial surface  $\pm$  scabrous; margins minutely ciliate. *Sepals* narrowly ovate, 1.8–2.5(2.8) mm long, 0.8–1.0 mm wide, acute (and sometimes mucronate), subacute or obtuse; abaxial surface  $\pm$  scabrous, occasionally glabrous, straw-coloured or pale yellow-green in the lower half (sometimes with pink tinges), with rather thickened, green apices, only the mid-vein evident; adaxial surface with a tuft of dense hairs at the apex and sometimes a few hairs towards the base; margins ciliate with hairs to *c.* 0.1 mm long. *Corolla tube* white, narrowly ellipsoid, narrowly ovoid, or  $\pm$  cylindrical, usually a little longer than, sometimes  $\pm$  equal to, the sepals, 1.8–2.5 mm long, 0.8–1.3 mm wide, glabrous externally, internal surface with an apical band of hairs projecting into the tube, the remainder glabrous. *Corolla lobes* white, sometimes flushed pink apically, shorter than the tube, 0.8–1.2 mm long, 0.5–0.6 mm wide at base, spreading from the base and recurved, glabrous externally, internal surfaces with a dense, white indumentum of terete,  $\pm$  straight and essentially unornamented hairs. *Anthers* fully included within the tube, 0.7–1.1 mm long, apex rounded to scarcely emarginate. *Filaments* terete, 0.1–0.2 mm long, attached to the anther at the apex, adnate to tube a little below sinuses. *Nectary* partite, the scales 0.3–0.5 mm long, 0.2–0.3 mm wide, glabrous. *Ovary* narrowly ovoid to narrowly ellipsoid, 0.8–1.3 mm long, 0.3–0.4 mm wide, with short hairs in the upper 1/3–2/3 or glabrous, 3-locular, pale green or yellow-green. *Style* scarcely differentiated from ovary apex in either flower or fruit, 0.1–0.2 mm long, glabrous or scabrous, included within the corolla tube; stigma scarcely expanded. *Fruit* cylindrical to  $\pm$  fusiform, usually curved, 3.3–4.2 mm long (inclusive of gynophore), 0.8–1.0 mm wide, much longer than the sepals, circular in section, with a well-defined gynophore; surface variously hairy in the upper half and glabrous below or glabrous throughout,  $\pm$  dry, smooth (mesocarp poorly developed), with pale, longitudinal ribs; apex acute, tapering smoothly to the base of the persistent style. (Figure 8A)



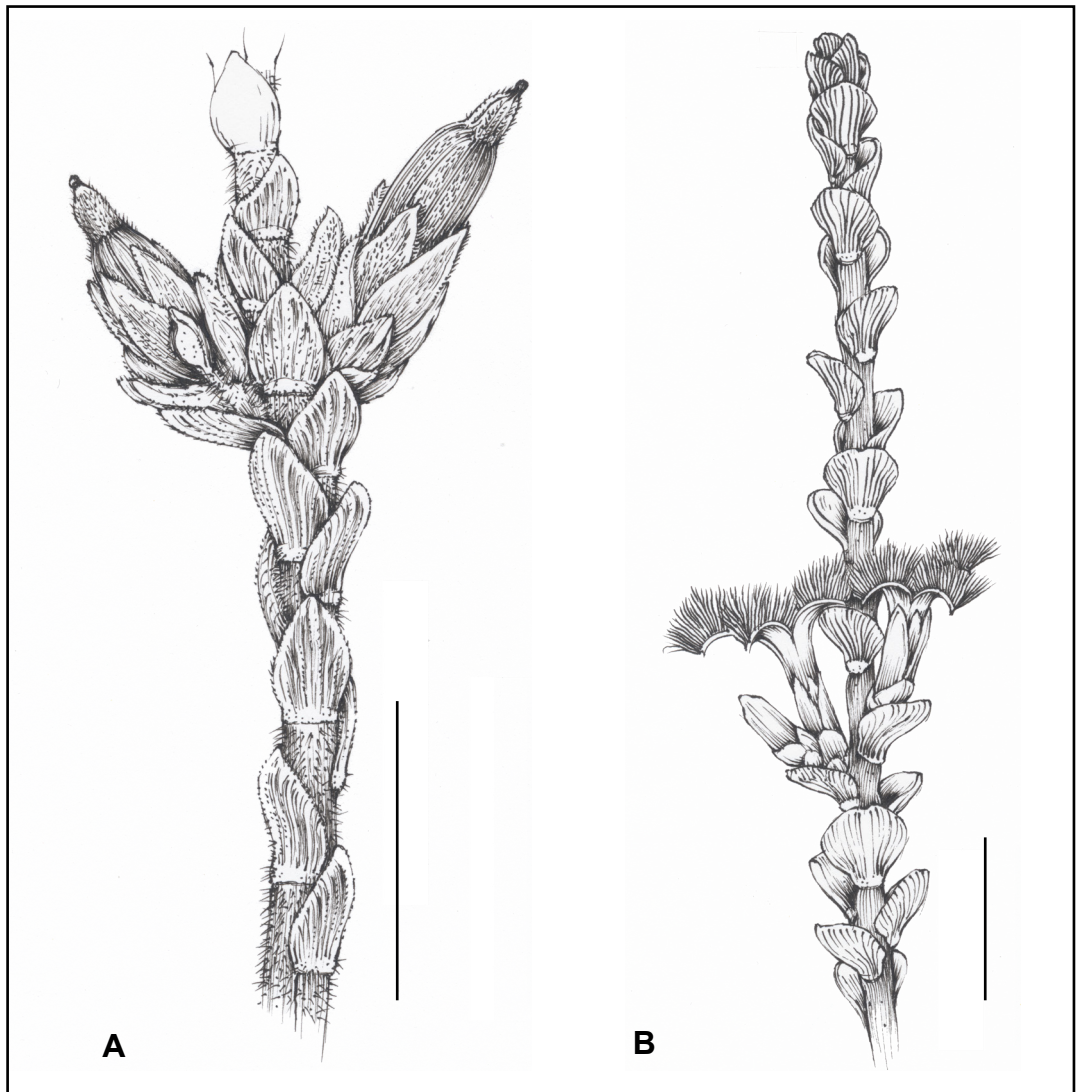


Figure 8. A – *Styphelia scabrella*, fruiting branchlet; B – *Styphelia subglauca*, flowering branchlet. Scale bars A = 3 mm; B = 4 mm. Vouchers *K. Kershaw* KK 2287 (A), *M. Hislop* 3891 (B). Drawings by Hung Ky Nguyen.

*Diagnostic characters.* Within the *S. tamminensis* subgroup distinguished by the following character combination: leaves helically arranged, ovate or narrowly ovate, with the longitudinal axis straight to slightly recurved in the upper half, becoming incurved towards apex; abaxial surfaces not grooved, or shallowly grooved between the veins, very shortly hairy or scabrous throughout or very occasionally ± glabrous; adaxial surface hairy, usually densely so; apices mucronate, pungent or sub-pungent; inflorescence (1)2- or sometimes 3-flowered; sepals acute, subacute or obtuse, with well-demarcated green apices; anthers fully included within the corolla tube; filaments attached to anther at anther apex, adnate to tube just below the sinuses; ovary shortly hairy in the upper 1/3–2/3 or glabrous; style very short (0.1–0.2 mm long), scarcely differentiated from the ovary apex in flower or fruit; fruit ± dry, cylindrical to ± fusiform, usually curved, with an acute apex.

*Other specimens examined.* WESTERN AUSTRALIA: Wogarl Reserve, 22.5 km NNE of Narembeen; W side of Wogarl–Muntagin Rd, in NE portion of reserve, 27 Aug. 2000, *K. Clarke & M. Brundrett s.n.* (PERTH); Dragon Rocks Nature Reserve, S side of Mouritz Rd, 1 km from E edge of park, 10 Nov. 2001, *M. Hislop* 2444 (CANB, PERTH); Cramphorne Rd, 12.4 km E of Bruce Rock–Merredin Rd, 26 July 2002, *M. Hislop* 2706 (CNS, PERTH); Fuchsbichler Rd, 9.7 km E of Bruce Rock–Merredin Rd, NE of Bruce Rock, 11 July 2004, *M. Hislop* 3259 (CNS, NSW, PERTH); Flat Rock Nature Reserve, S of Hyden, close to SW corner, off Kulin–Holt Rock Rd, 11 Sep. 2016, *M. Hislop* 4630 (CANB, CNS, MEL, NSW, PERTH); Carstairs Rd, 7.8 km W of Southern Cross–Forrestania Rd, 16 May 2002, *M. Hislop & F. Hort* MH 2593 (CANB, PERTH); Roach Nature Reserve [N of Narembeen], off Tank Rd, 17 July 2015, *B. Hort* NM 148 (NSW, PERTH); Pederah Nature Reserve, Karlgarin Rd, Karlgarin to Kulin, 5 July 2007, *G.J. & B.J. Keighery* 1196 (CANB, CNS, K, PERTH); on S side of Pingaring–Varley Rd, 1.4 km E of Buettner Rd junction; Dragon Rocks Nature Reserve, 22 Aug. 2000, *G.J. Keighery & N. Gibson* 5594 (CANB, PERTH); on W boundary of [Lake Hurlstone Nature Reserve], 300 m N of Di Russo Rd, c. 60 km NW of Lake King, 24 Aug. 2000, *G.J. Keighery & N. Gibson* 6695 (PERTH); near breakaway, North Karlgarin Nature Reserve [NE of Kondinin], 29 June 1999, *G.J. Keighery & N. Gibson* 7223 (PERTH); 1.5 km E along Middleton Rd from Whittington Rd, S of Corrigin, 25 May 2000, *K. Kershaw* KK 2091 (CNS, K, NSW, PERTH); NW of Hyden, Worland Rd, c. 4.7 km E of Roe Rd, on N side, 8 Mar. 2000, *K. Kershaw & G. Durell* KK 2078 (CANB, CNS, MEL, PERTH); Macrocarpa Trail, 1 km from Kulin Post Office, 0.5 km from loop division, 16 Oct. 2001, *S. Murray* 471 (PERTH); Bendering Nature Reserve (No. 25681), 8 km E of Bendering Siding, 13 July 1982, *J.M. Powell* 1770 (K, L, NSW, PERTH); reserve c. 16 km due E of South Kulin on road to Dandagin Rock [N of Lake Grace], crossroads at W end of reserve, 13 July 1982, *J.M. Powell* 1783 (CANB, K, L, MEL, NSW, PERTH); 16 km N of Lake Bidy [N of Newdegate] on road to Hyden, 7 Aug. 1986, *J.M. Powell* 2232A (CANB, NSW, PERTH); 8 km N of Holleton–Ingram roads, 75 km S of Gt Eastern Hwy, 7 Aug. 1986, *J.M. Powell* 2248 (NSW, PERTH).

*Distribution and habitat.* Distributed in an area roughly bounded by Bruce Rock and Wogarl in the north, and Kulin and Varley in the south; in the south-east of the Avon Wheatbelt and north-west of the Mallee bioregions. Grows in heath or open mallee woodland, mostly on sand or light loam soils, often over laterite, rarely on heavier soils. Commonly associated species include *Eucalyptus macrocarpa*, *Melaleuca hamata*, *Melaleuca cordata*, *Allocasuarina acutivalvis*, *Grevillea cagiana* and *Hakea cygna*.

*Phenology.* Flowers have been recorded over many months of the year with no clearly discernible seasonal peak. Similarly, a high percentage of specimens include fruit at various stages of maturity, regardless of the month of collection. It seems likely that the plant responds rapidly to rainfall events.

*Etymology.* From the Latin *scabrellus* (minutely scabrous), a reference to the more or less scabrous surfaces of the leaves, sepals and bracteoles.

*Conservation status.* Fairly widely distributed in the Western Australian wheatbelt and known from several nature reserves. No conservation code applies.

*Affinities.* *Styphelia scabrella* is similar to, and most likely to be confused with, *S. annulata*. They are the only species in the alliance with well-demarcated, green sepal tips. They have largely allopatric distributions but with a narrow area of overlap in the Corrigin–Kulin area. Gynoecium indumentum is the most reliable means of distinguishing the two species and should be emphasised if the other distinguishing characters listed below are ever ambiguous. In *S. scabrella* the ovary is either shortly hairy in the upper third to two-thirds or else is quite glabrous, while *S. annulata* always has a ring of long hairs surrounding the base of the ovary.

In general, the shorter length of the leaves and corolla of *S. scabrella* also serve to differentiate it from *S. annulata*: the leaves are 0.8–2.3 mm (*cf.* 1.4–6.0 mm in *S. annulata*), the sepals are 1.8–2.5(2.8) mm (*cf.* 2.3–3.2(3.5) mm), the corolla tube is 1.8–2.5 mm (*cf.* 2.5–3.8 mm) and the corolla lobes are 0.8–1.2 mm (*cf.* 1.3–1.7 mm). Differences in leaf and sepal indumentum also provide further aids to identification. Whereas in *S. scabrella* the abaxial sepal surfaces are usually scabrous or occasionally  $\pm$  glabrous, in *S. annulata* the sepal surfaces are usually glabrous and only sometimes slightly scabrous. Moreover, while the adaxial leaf surface of *S. scabrella* is hairy throughout (usually densely so), in *S. annulata* it is glabrous or sparsely hairy, mostly in the lower half.

A further point of difference between the two species is that in comparison to *S. annulata*, *S. scabrella* tends to be noticeably less floriferous. This is because *S. annulata* usually has more flowers per inflorescence ((1)2–5(7) *cf.* (1)2–3 in *S. scabrella*) and these are frequently clustered in the axils of short internodes to form a contracted conflorescence. In *S. scabrella*, the unit inflorescences are fewer and more spaced along the axes.

### ***Styphelia subglauca* Hislop, *sp. nov.***

*Typus*: north-east of Narembeen, Western Australia [precise locality withheld for conservation reasons], 12 July 2009, M. Hislop 3891 (*holo*: PERTH 08229287; *iso*: CANB, CNS, HO, K, MEL, NSW).

*Leucopogon* sp. Ironcaps (N. Gibson & K. Brown 3070) *p.p.* [*auct. non* N. Gibson & K. Brown 3070], Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 17 June 2022].

Erect, *shrub* to *c.* 80 cm high and 80 cm wide, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a usually sparse or occasionally moderately dense indumentum of patent hairs to *c.* 0.05 mm long. *Leaves* helically arranged, antrorse; apex usually obtuse to occasionally subacute; base cuneate to rounded; petiole often rather obscure, 0.1–0.4 mm long, glabrous; lamina broadly ovate or depressed-ovate to broadly obovate or depressed-obovate, sometimes  $\pm$  orbicular, 1.2–2.0 mm long, 1.2–2.0 mm wide, slightly discoloured, dull and slightly glaucous on young growth but becoming shiny, strongly concave, sometimes  $\pm$  stem-clasping in the lower half, longitudinal axis  $\pm$  straight to slightly recurved; adaxial surface usually  $\pm$  hairy in the lower half, glabrous above, venation not evident; abaxial surface paler, glabrous, with 7–9 primary veins, the midvein not or scarcely broader than the others, openly grooved between the veins; margins minutely hairy with short, stiff hairs <0.05 mm long. *Inflorescence* axillary, erect; axis 1.3–2.8 mm long, 1- or 2(3)-flowered, mostly subterete but  $\pm$  compressed above the uppermost fertile bract, with a moderately dense indumentum, terminating in a bud-rudiment; flowers erect, sessile. *Fertile bracts* ovate or narrowly ovate, 0.6–1.2 mm long, 0.5–0.7 mm wide, subtended by 3(4) sterile bracts, the basal 2 opposite. *Bracteoles* broadly ovate or  $\pm$  orbicular, 1.0–1.3(1.5) mm long, 0.8–1.2 mm wide, keeled, obtuse; abaxial surface glabrous; margins ciliate with longer hairs towards the apex. *Sepals* narrowly ovate, 2.2–2.5 mm long, 0.9–1.3 mm wide, obtuse; abaxial surface glabrous, pale green or straw-coloured, sometimes becoming brown and necrotic, venation very obscure, with only the mid-vein evident or not; adaxial surface with a tuft of hairs towards the base and at the apex, glabrous or sparsely hairy in between; margins ciliate with hairs to *c.* 0.3 mm long, the longest towards the apex. *Corolla tube* white, narrowly ovoid to narrowly ellipsoid, a little longer than (rarely *c.* as long as) the sepals, 1.9–2.6 mm long, 1.1–1.5 mm wide, glabrous externally, internal surface hairy towards the apex with hairs projecting downwards to a point below the middle of the anthers, glabrous below. *Corolla lobes* white, shorter than the tube, 1.0–1.6 mm long, 0.5–0.7 mm wide at base, spreading from close to the base and recurved, glabrous externally, internal surface with a dense indumentum of terete,  $\pm$  straight and essentially unornamented hairs. *Anthers* fully included within the tube, 1.0–1.3 mm long, apex rounded to scarcely emarginate.

*Filaments* terete, 0.1–0.2 mm long, attached to anther at the apex, adnate to tube just or sometimes distinctly below the sinuses. *Nectary* partite, the scales 0.3–0.5 mm long, 0.2–0.4 mm wide, glabrous. *Ovary* narrowly ellipsoid, 1.0–1.2 mm long, 0.4–0.5 mm wide, glabrous, 3-locular, yellow-green or straw-coloured. *Style* smoothly attenuated from (and with the base not clearly differentiated from) the ovary apex, 0.3–0.4 mm long, faintly papillose, included within the corolla tube; stigma not or scarcely expanded. *Fruit* ± cylindrical or fusiform, sometimes curved, 2.8–3.3 mm long (inclusive of gynophore), 0.8–1.0 mm wide, much longer than the sepals, circular in section, with a well-defined gynophore; surface glabrous, ± dry, smooth (mesocarp poorly developed), with pale, longitudinal ribs; apex acute, tapering smoothly to the style base; style persistent or not. (Figure 8B)

*Diagnostic characters.* Within the *S. tamminensis* subgroup distinguished by the following character combination: leaves helically arranged, ± glaucous, at least when young, broadly ovate or depressed-ovate to broadly obovate or depressed-obovate, sometimes ± orbicular, with the longitudinal axis straight to slightly recurved; abaxial leaf grooves open between the veins, glabrous on the vein surfaces and within the grooves; leaf apex innocuous, non-mucronate; inflorescence 1- or 2(3)-flowered; anther tips included within the tube; filaments attached to anther at anther apex, adnate to tube just below (or sometimes distinctly below) the sinuses; ovary glabrous; style 0.3–0.4 mm long; fruit ± dry, ± cylindrical or fusiform, with an acute apex.

*Other specimens examined.* WESTERN AUSTRALIA: 4 Feb. 1963, *A.S. George* 4295 (CANB, PERTH); 28 Sep. 1997, *G.J. Keighery & N. Gibson* 3757 (PERTH); 28 Sep. 1997, *G.J. Keighery & N. Gibson* 6753 (PERTH); 8 Aug. 2001, *K. Kershaw & M. Golding* KK 2255 (PERTH); 8 Aug. 2001, *K. Kershaw & M. Golding* KK 2260 (CNS, PERTH); 15 June 1994, *Merredin Herbarium* BP 02 (PERTH); 23 July 2003, *S. Patrick* 4169 (PERTH); 30 July 1986, *J.M. Powell* 2242A (NSW, PERTH).

*Distribution and habitat.* Distributed from Merredin in the north, south and eastwards to east of Hyden, in the far east of the Avon Wheatbelt and northwest of the Mallee bioregions. Grows in open mallee woodland or heath, mostly in sand over laterite. Common associated species include *Eucalyptus burracoppinensis*, *Allocasuarina acutivalvis*, *Hakea platysperma*, *Acacia rossii*, *Drummondita hassellii* and *Melaleuca calyptroides*.

*Phenology.* The most prolifically flowering collections of the species were made in July and August, but some mature fruit were also present on the same specimens suggesting that, in common with other species from the *S. tamminensis* subgroup, flowering is likely to be intermittent over many months.

*Etymology.* From the Latin *glaucus* (having a bluish-grey bloom) with the prefix *sub-* (not completely, a little), a reference to the usual appearance of the young growth. This is intended to highlight one of the differences between this species and the similar *S. platyneura*.

*Conservation status.* *Styphelia subglauca* is currently known from two nature reserves and a water reserve but has a fairly restricted distribution in a part of the state that has been subject to heavy clearing for agriculture. To be listed as Priority Three under Conservation Codes for Western Australian Flora (T. Llorens pers. comm.).

*Affinities.* As noted under *S. platyneura*, *S. subglauca* was previously included within the concept of *Leucopogon* sp. Ironcaps, but as increasing numbers of specimens became available for study it became apparent that a second, allopatric species could be recognised based on differences in indumentum, and bract and leaf morphology (Table 1).

**Table 1.** A comparison of key morphological features and distributions of *Styphelia platyneura* and *S. subglauca*.

Character	<i>S. platyneura</i>	<i>S. subglauca</i>
Sepal and bracteole indumentum	Shortly hairy, at least in the upper half	Glabrous
Bracteole size and shape	1.3–1.7 mm long, 1.0–1.2 mm wide, ovate	1.0–1.3(1.5) mm long, 0.8–1.2 mm wide, broadly ovate or ± orbicular
Leaf size and shape	1.3–2.0 mm long, 1.0–1.6 mm wide, obovate to ovate or broadly so, usually distinctly longer than wide	1.2–2.0 mm long, 1.2–2.0 mm wide, broadly ovate or depressed-ovate to broadly obovate or depressed-obovate, sometimes ± orbicular, frequently wider than long
Leaf aspect, abaxial venation and indumentum	Young leaves olive green, non-glaucous. Midvein very prominent; deeply and openly grooved between veins, often with short, stiff hairs on the veins	Young leaves ± glaucous. Midvein less prominent; more shallowly grooved between the always glabrous veins
Young branchlet indumentum	Moderately dense, with hairs to c. 0.1 mm long.	Usually sparse, occasionally moderately dense, with hairs to c. 0.05 mm long.
Distribution	From the Forrestania district, south and eastwards to the eastern part of Frank Hann National Park	From Merredin in the north, south and eastwards to east of Hyden

***Styphelia tamminensis*** (E.Pritz.) Sleumer, *Blumea* 12(1): 154 (1964); *Leucopogon tamminensis* E.Pritz., in F.L.E. Diels & E.G. Pritzel, *Bot. Jahrb. Syst.* 35(2): 479 (1904). *Typus*: In distr. Avon in planitiebus arenosis prope Tammin [Western Australia], May 1901, *E. Pritzel* 318 (*lecto*: L 0006585 image!, designated by H. Sleumer, *Blumea* 12(1): 154 (1964); *isolecto*: BM 001040169 image!, GH 00061366 image!, HBG-507606 image!, K 000348951 image!, M-0164823 image!, PERTH 01598406!, PERTH 09008551!, S 08-5912 image!, US 00113632 image!).

*Distribution.* *Styphelia tamminensis* has a significantly disjunct distribution which is grouped in three distinct clusters. The northernmost is in the Marchagee–Watheroo area of the Geraldton Sandplains bioregion, and there are two clusters in the Avon Wheatbelt, one around Wongan Hills and the most southerly around Tammin.

*Conservation status.* Currently listed as Priority Two under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–). It seems quite possible that *S. tamminensis* is no longer extant in the area that gave the species its name. Aside from the type gathering itself there is only one other collection from this heavily cleared part of the wheatbelt and that was made 90 years ago. Similarly, there are only three collections from Marchagee–Watheroo area and two of those were made 75 years ago. The last refuge of the species is in the Wongan Hills area, and even there it is not a common plant locally.

*Notes.* The morphology of plants from the Wongan Hills and Tammin clusters is comparable, but two of the three collections from the Marchagee–Watheroo area differ from the typical form in an interesting way: rather than having the usual adaxially concave leaf lamina, the leaf margins are distinctly recurved. This makes them very unusual not just within the *S. tamminensis* subgroup but

in the wider context of all Western Australian members of Group X. The only other species from the group that is known to sometimes have entirely convex leaves is *S. recurva*.

***Styphelia williamsiorum*** Hislop & Puente-Lel., *Nuytsia* 28: 110, figs 6, 8, 9 (2017). *Typus*: Badgingarra National Park, Western Australia [precise locality withheld for conservation reasons], 13 November 2004, M. Hislop 3346 (*holo*: PERTH 07202911; *iso*: CANB, NSW 940617).

*Leucopogon* sp. Warradarge (M. Hislop 1908), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [before March 2017].

*Distribution*. Occurs from south of Eneabba to the Badgingarra area and east to Alexander Morrison National Park, in the Geraldton Sandplains bioregion.

*Conservation status*. Recently listed as Priority Three under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–).

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