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Leptecophylla in Tasmania: a reassessment of four species

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Abstract: The occurrence of *Leptecophylla juniperina* (J.R.Forst. & G.Forst.) C.M.Weiller in Tasmania is reviewed. Two subspecies of this taxon are re-instated to specific rank: *L. oxycedrus* (Labill.) Jarman *comb. nov.* and *L. parvifolia* (R.Br.) Jarman *comb. nov*. *Leptecophylla juniperina* itself is excluded from the Tasmanian flora. Tasmanian plants previously identified as *L. juniperina* are mostly either *L. oxycedrus* or the newly described *L. pogonocalyx* subsp. *decipiens* Jarman *subsp. nov*. An identification key is provided for Tasmanian species of *Leptecophylla*.

Keywords: *Leptecophylla*, taxonomy, change of status, new subspecies, Tasmania

Introduction

The genus *Leptecophylla* was first described by Weiller (1999) for a group of 12 closely related species formerly included in *Cyathodes* Labill. or *Styphelia* Sm. in the Epacridaceae, a family which has since been submerged in the Ericaceae (Kron *et al.* 2002). The transfer of these species to the new genus serves to highlight the close affinities within the group and is widely accepted by botanists. However, within *Leptecophylla*, relationships among several taxa are more problematic. This present study focusses on the taxa included in Weiller's (1999) study as *L. juniperina* subsp. *juniperina*, *L. juniperina* subsp. *oxycedrus*, *L. juniperina* subsp. *parvifolia* and *L. pogonocalyx*. Our treatment proposes major nomenclatural changes, with the re-instatement to specific rank of both of the subspecies *oxycedrus* and *parvifolia*, the exclusion of *L. juniperina* from the Tasmanian flora, and the description of a new subspecies of *L. pogonocalyx*. A detailed discussion of the evidence supporting these changes is provided.

Materials

Taxonomic interpretation of all Tasmanian species was based primarily on fresh material, although the large collection of *Leptecophylla* specimens at the Tasmanian Herbarium (HO; over 800 sheets) was also consulted extensively. The New Zealand species, *L. juniperina*, was examined only as dried specimens held at HO or on loan from the National Herbarium of Victoria (MEL), Auckland Museum Herbarium (AK), Allan Herbarium, Landcare Research Manaaki Whenua, Lincoln (CHR), Museum of New Zealand Te Papa Tongarewa Herbarium, Wellington (WELT), and the Natural History Museum, London (BM).

Type material of *L. juniperina* and *L. parvifolia* was examined via loans from BM. Labillardière's specimens of *L. oxycedrus* held at Florence were viewed there by one of us (GK), as well as via digital images supplied by the Herbarium Universitatis Florentinae (FI-W). Other historical specimens collected in the late 18th and early 19th centuries were viewed as digital images on *JSTOR Global Plants* or on the individual websites of herbaria in Britain, Europe or America.

Taxonomic discussion

1. *Leptecophylla oxycedrus* (Labill.) Jarman, *comb. nov.*
Styphelia oxycedrus Labill., *Nov. Holl. Pl.* 1: 49, t. 69 (1805). — **Type:** in capite Van-Diemen, *J.J.Labillardière* (holo: FI009077!). *Cyathodes oxycedrus* (Labill.) R.Br., *Prodr.* 540 (1810).
For detailed synonomy, see Weiller (1999, p. 205), under *Leptecophylla juniperina* subsp. *oxycedrus*.

The first known European collections of *Leptecophylla oxycedrus* (Fig. 1) were made by Jacques Julien de Labillardière, naturalist with Bruni D'Entrecasteaux's expedition in the *Recherche* and *Esperance* which sailed from France in 1791 in search of the missing navigator Jean-Francois de La Perouse. The expedition visited Van Diemens Land (Tasmania) in April–May 1792, and January–February 1793 (Labillardière 1800). Material from the expedition was widely distributed, with the main plant collections being held in the Webb Herbarium in Florence.

Labillardière's precise collecting sites are not known, with the location on all his specimens simply indicating 'In capite Van-Diemen' (Van Diemens Land). However, his stay in Tasmania was confined to the south-east and south of the island, with the main anchorages being

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Fig. 1. ***Leptecophylla oxycedrus***, collected in Van Diemens Land (Tasmania) by J.J. Labillardière in 1792/1793. (Image courtesy of Herbarium Universitatis Florentinae.) Inset: magnified segment of the main image.

in Recherche Bay in the far south. The ships sailed through the D'Entrecasteaux Channel and around the northern tip of Bruny Island, with landings made in several places (Labillardière 1800). Based on the known distribution of *Leptecophylla oxycedrus*, the species is most likely to have been collected from around Recherche Bay, where it would have been one of the first species encountered after landfall in April 1792. The first description of the plant appeared in 1805 in Labillardière's *Novae Hollandiae Plantarum Specimen*.

Leptecophylla oxycedrus was originally classified in the genus *Styphelia* (Labillardière 1805) and later in *Cyathodes* (Brown 1810). It remained as a distinct species until 1868, when Bentham, in *Flora Australiensis*, synonymised it with *Cyathodes acerosa* R.Br. (= *Leptecophylla juniperina* (J.R.Forst. & G.Forst.) C.M.Weiller), a New Zealand species. Bentham's interpretation was followed by many botanists (e.g. Rodway 1903 and Curtis 1963 dealing with the Tasmanian flora; Ewart 1930, Willis 1973 and Albrecht 1996 with the Victorian flora; Cheeseman 1906, 1925 and Allan 1961 with the New Zealand flora). A dissenting view was held by Sleumer (1963), who retained the two separately within the genus *Styphelia*. In the most recent taxonomic treatment of *Leptecophylla* (Weiller 1999), the two taxa, together with *L. parvifolia*, are given subspecific rank within *L. juniperina* and all three subspecies are included in the Tasmanian flora.

Separation of *L. oxycedrus* from *L. juniperina*

Evidence from both floral and vegetative characters indicates that *Leptecophylla oxycedrus* should retain its original status as a distinct species, separate from *L. juniperina*. Weiller (1999) comments that all species in *Leptecophylla* are 'apparently functionally dioecious', and refers to the presence of 'apparently hermaphrodite and male-sterile flowers on separate plants, with only male-sterile flowers setting fruit'. In *L. oxycedrus*, dioecy is clearly evident in the dimorphic flowers, with separate plants producing either flowers with large, pollen-producing anthers or small empty anthers. Typically, the corolla tube of pollen-producing flowers is much longer than in female plants (Figs 2, 3) and is exserted well beyond the calyx. The lobes are almost always less than half the length of the tube and often less than one-third to one-quarter. In shape, the tube is slightly barrel-shaped (Fig. 3) or narrowly urceolate. In dried material, the tube often appears cylindrical to very narrowly campanulate. In female flowers, the length of the tube is shorter, but still clearly remains exserted beyond the calyx.

Dioecy occurs in *L. juniperina* (Fig. 4; Gardner 2011) but is not as obvious as in *L. oxycedrus* because of the smaller size difference between pollen-producing and female flowers. The corolla tube is shorter than in *L. oxycedrus* (cf. Figs 3, 4) and, at the shorter end of the range, can be equal to or less than the length of the calyx, a condition not encountered in *L. oxycedrus*.

Critical vegetative characters that separate *L. oxycedrus* from *L. juniperina* are related to the seasonal production of leaves and to leaf shape and venation. In the genus as a whole, leaves are produced in a single flush each year. They are pre-formed in an annual 'parcel' enclosed by bracts which are brown, scarious and increase in size from the minute lowermost bracts up to the last large bracts that reach approximately the length of the first

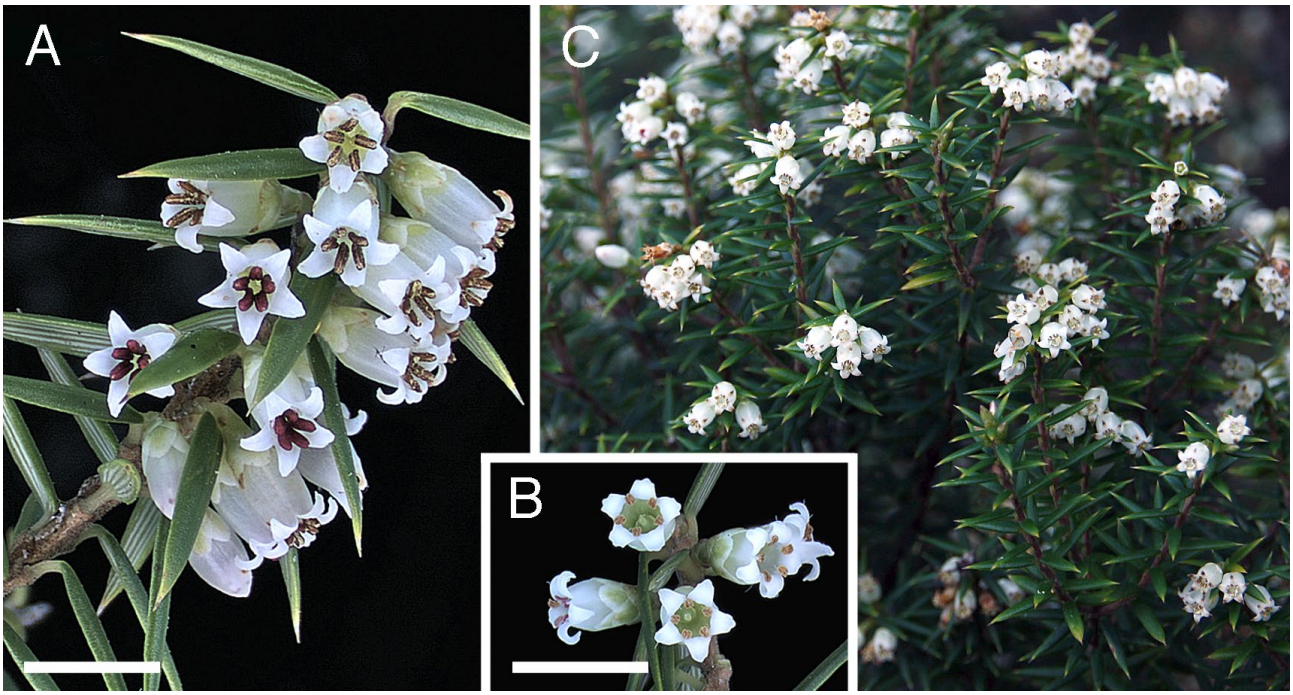

Fig. 2. *Leptecophylla oxycedrus* from Recherche Bay, Tasmania, the most likely Type locality of J.J. Labillardière's species collected in 1792/93. **A** Pollen-producing flowers; **B** female flowers with poorly formed anthers; **C** general aspect of the plant. Scale = 5 mm.

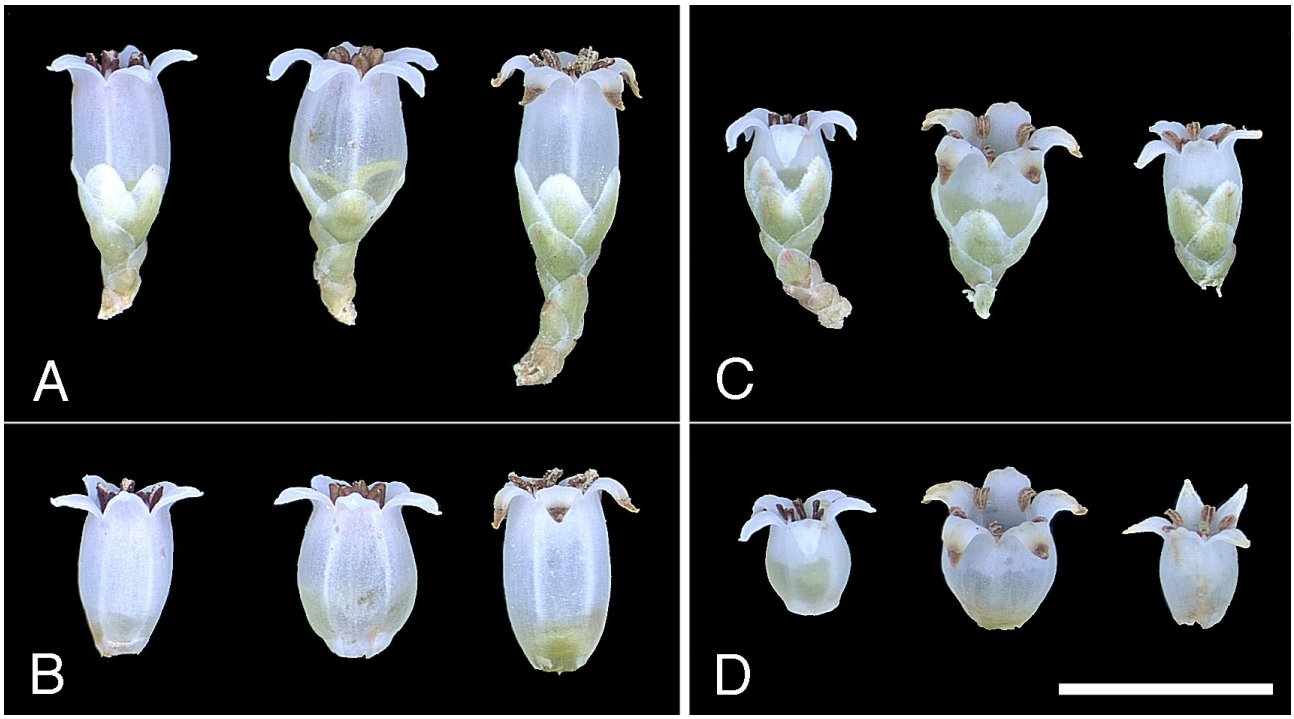

Fig. 3. Flowers of ***Leptecophylla oxycedrus*** from Recherche Bay. **A** Pollen-producing flowers from three different plants; **B** corolla of flowers shown in A. **C** Female flowers from three different plants; **D** corolla of flowers shown in C. Scale = 5 mm.

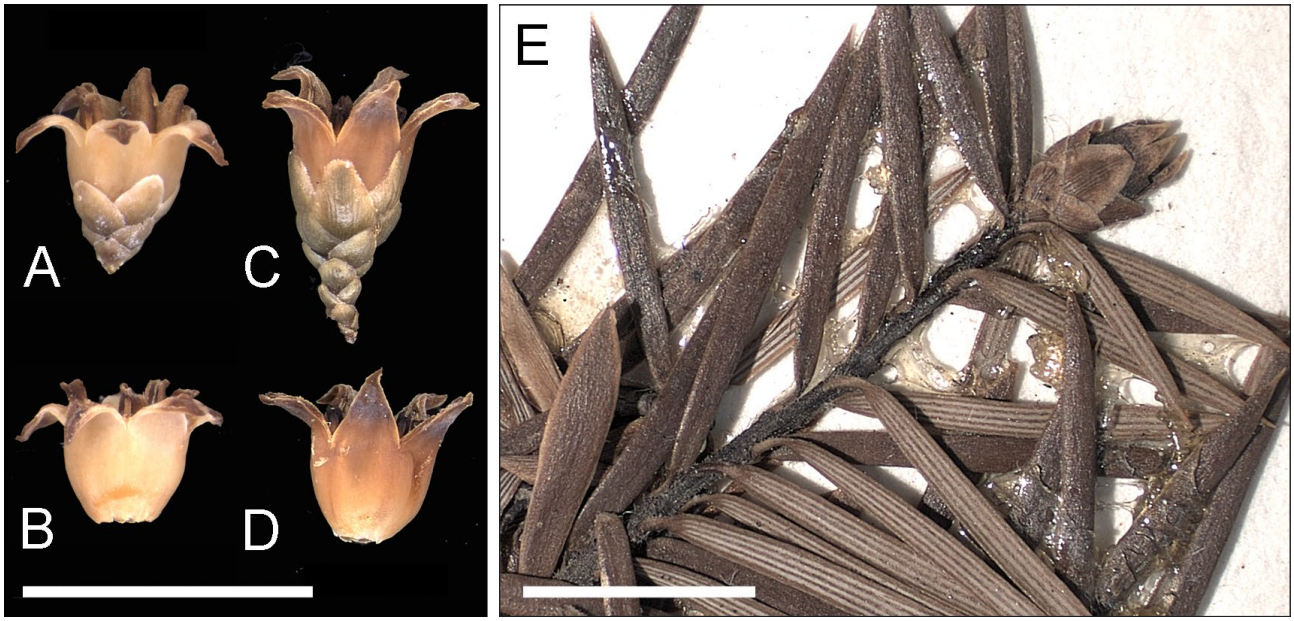

Fig. 4. Flowers of ***Leptecophylla juniperina***. **A** Reconstituted flower from dried material (AK258766; dissection undertaken with permission); **B** corolla from A. **C** Reconstituted flower from HO583393; **D** corolla from C. **E** Partially opened flower on the lectotype, photographed from BM000797781. Scale = 5 mm.

leaves (e.g. Fig. 5). There is a zone between the last totally scarious bract and the first properly formed leaf where there are a number of 'transition' leaves that differ in shape from both the bracts and the properly formed leaves. They have abaxial venation that is composed of finely branched veins, which, although essentially parallel, do not have the distinctly striate appearance seen in typical leaves. Much of the 'transition' leaf comprises green photosynthetic tissue.

In the 'transition' leaves of *Leptecophylla oxycedrus*, the hyaline or scarious part of the margin towards the tip is quite broad but rolls towards the undersurface as the young shoot expands. As a result, the transition leaves more-or-less resemble the typical leaves in outline (Figs 6A, 6B) and blend inconspicuously among them (Fig. 7A). They are most easily recognised by checking the leaf undersurface for the rolled margin in the upper part of the leaf, and the finely branched venation

Fig. 5. Seasonal production of leaves in ***Leptecophylla***. Scale = 5 mm.

(Fig. 6A). Except for a few tiny bracts at the very base of the branchlets, all of the bracts and many of the transition leaves fall by the time the branchlet reaches its ultimate size for that year's growth. By the second year of growth, although some of the uppermost transition leaves may remain, they are uncommon and essentially indistinguishable from the fully formed mature leaves when viewed from their upper surface.

In the transition leaves of *L. juniperina*, the hyaline or scarious portion towards the apex is quite narrow and is not or only scarcely rolled under, giving the transition leaves an oblanceolate shape (Figs 6C, 7B). The finely branched venation of these leaves is clearly visible on the undersurface (Fig. 6C). The 'transition' leaves persist and are held across several years' growth (Fig. 7B) and, because of their different shape and venation, and their frequency and persistence, they give a subtle but distinctive aspect to the plant. There is also a difference in the shape of normal leaves, which tend to be more linear in *L. juniperina* (Fig. 6D) than in *L. oxycedrus* (Fig. 6B). The tendency for the major veins to branch, particularly towards the leaf apex, also persists into the true leaves to a greater extent in *L. juniperina* than in *L. oxycedrus*.

The branching venation on the underleaf of *L. juniperina* has been commented upon by earlier botanists, including Robert Brown, who, in 1810, observed that the Tasmanian *Cyathodes* (*Leptecophylla*) *oxycedrus* differed from the New Zealand *C. acerosa* (*Leptecophylla juniperina*) in the branching of the veins towards the leaf extremities. Hooker (1853), in the *Flora of New Zealand*, makes the comment about *C. acerosa*:

> 'There is a tendency in the leaf (very variable in amount) to become broader towards the tip, whence the outer nerves branch to supply the increased surface, which I do not observe in the following species [*C. oxycedrus*]; this character Mr Brown detected, and applied in distinguishing them.'

These vegetative differences in venation, and shape and level of persistence of transition leaves are accompanied by important floral differences between the two species (see above), which have proved to be consistent wherever the appropriate floral stages have been available for checking.

Our assessment that *L. juniperina* and *L. oxycedrus* are separate species is not novel, with botanists such as Brown (1810), Sprengel (1824), de Candolle (1838), Hooker (1853, 1859) and, more recently, Sleumer (1963), treating the two separately, albeit acknowledging their close affinities.

Descriptions of *L. oxycedrus* are given in Ewart (1930, as *Cyathodes acerosa* R.Br.) and Albrecht (1996, as *Cyathodes juniperina* (J.R.Forst. & G.Forst.) Druce), and are not repeated here.

Notes. In recent works (Weiller 1999; Crowden & Duretto 2013), the presence of sparse, rigid hairs on the corolla of *L. oxycedrus* has been used as a key identification character. However, corolla hairiness does not appear to be a reliable taxonomic character in this species and its close relatives.

Labillardière (1805) described the corolla as scarcely hairy and the hairs on the corolla limb as rare ('corollae limbo ... vix piloso', and 'Corollae limbus pilis raris'). In the illustration accompanying Labillardière's work, it is difficult to see any sign of hairs on the corolla, although admittedly the floral drawing is rather small. Labillardière himself is unlikely to have seen many flowers, either on a single plant or across the population, because his visits to Tasmania were well outside the peak flowering times for *L. oxycedrus* (August–October). We have collected flowering material from the area most likely to be the Type locality of Labillardière's specimens (Recherche Bay), where plants are still plentiful. In an examination (dissecting microscope) of 60 plants (three flowers/plant) encompassing two populations at Recherche Bay, approximately two-thirds of the plants were found to have a glabrous corolla. The remaining third had hairs present on the corolla, but these were sometimes as few as one or two. Hairs were mostly in

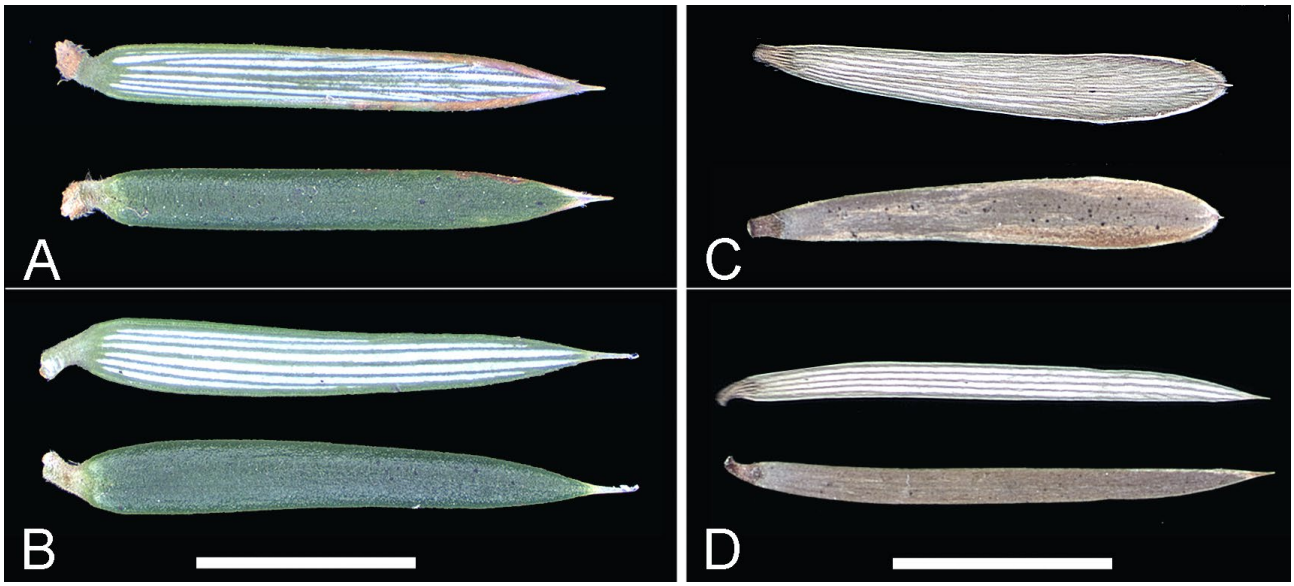

Fig. 6. Leaves of ***Leptecophylla oxycedrus*** from Recherche Bay (**A**, **B**) and ***L. juniperina*** from New Zealand (**C**, **D**, Auckland area, HO504556). **A**, **C** Transition leaf, showing shape and venation on the upper and lower surface. **B**, **D** Typical leaf from mid-season's growth, showing shape and venation on upper and lower surface. Scale = 5 mm.

Fig. 7. ***Leptecophylla oxycedrus*** (**A**) from Recherche Bay, the probable Type locality, and ***L. juniperina*** (**B**) from New Zealand (Auckland area, HO504556). Arrows show the position and/or shape of transition leaves (fallen or scarcely discernible among the typical leaves of ***L. oxycedrus***; readily distinguished in ***L. juniperina***). Scale = 1 cm.

the tube near the base of the anthers, but occasionally one or a few hairs also occurred on the lobes.

Populations in the southern half of Tasmania, on the south-eastern, southern and western coasts, typically have a glabrous corolla or one with so few hairs that, for identification purposes, it can be considered glabrous. Further north, on the Bass Strait Islands and in the far north-west (also in southern Victoria), the populations seem to be more variable (as indicated by collections at HO), and a greater proportion of plants have hairs present on the corolla. In those plants, the hairs, though sparse, are often more numerous on individual flowers than seen in southern plants. In an examination of 25 plants from Slaves Bay (north-western Tasmania), all plants had one to a few hairs on the tube near the anthers, and about half (13/25) had at least one or two hairs on the limb.

The presence of sparse hairs on the corolla is clearly a variable character within and between populations of *L. oxycedrus*. Two other species that normally have a glabrous corolla (*L. juniperina* and *L. pogonocalyx*) have also been observed occasionally with sparse hairs on the upper surface of the lobes and at the top of the corolla tube.

Distribution. The stronghold of *Leptecophylla oxycedrus* is in Tasmania but the species also occurs in southern Victoria (Ewart 1930; Willis 1973; Albrecht 1996). It has been reported from New Zealand (Hooker 1853; Cheeseman 1906, 1925; Allan 1961), where it has mostly been treated as a variety of *L. juniperina*. However, we very much doubt its occurrence in that country. Although *Leptecophylla juniperina* exhibits a high level of morphological variability (as observed from loan material), none of the variants we have seen can be ascribed to *L. oxycedrus*.

Selected specimens examined

TASMANIA: Walkers Hill, Flinders Island, 20.x.1976, *M.Allan* (HO27696); King Island, 24.iv.1802, *R.Brown* (BM000797755, BM000797756); Kent Group, Bass Strait, 12–19.xii.1803, *R.Brown* (BM000797757); Nye Bay, 8.i.1986, *A.M.Buchanan 7702* (HO97763); Observatory site, Bennetts Point, Recherche, 11.ix.2003, *A.M.Buchanan 16054* (HO523632); Nettley Bay Road, 11.i.2003, *L.H.Cave* (HO583395); Maria Island, Bishop and Clerk, 14.xii.2011, *L.H.Cave 1395* (HO564872); Mt Munro, Cape Barren Island, 7.x.1988, *P.A.Collier 3550* (HO118374); Strzelecki summit, Flinders Island, 27.x.1990, *R.K.Crowden & Y.Menadue* (HO536147); Marrawah, v.1948, *W.M.Curtis* (HO53463); Surprise Bay, 6.iii.2003, *H.J.Elliott* (HO583396); Old rehabilitated mine tailings near Grassy, King Island, 26.x.2005, *A.M.Gray 1590* (HO535658); Emu Bay Road, 21.viii.1838, *R.C.Gunn 714* (HO4071); South Hummock, Three Hummock Island, 5.x.1995, *S.Harris & J.Balmer* (HO445082); Balt Spur, Tasman Peninsula, 26.x.1979, *J.Jarman* (HO31368); Slaves Bay, 13.x.2003, *J.Jarman & G.Kantvilas* (HO583399); D'Entrecasteaux's Watering Place in Recherche Bay, 17.i.2004, *J.Jarman & G.Kantvilas* (HO583400); Gillams Beach in Recherche Bay, 4.ix.2014, *J.Jarman & G.Kantvilas* (HO583401); Macquarie Heads, 19.ix.2014, *J.Jarman & G.Kantvilas* (HO583402); Road to Redbill Point, Port Dalrymple, 12.ix.2015, *J.Jarman & L.A.Thorne* (HO583403); Track to Cape Raoul, 19.xi.2003, *G.Kantvilas* (HO583404); Coxs Bight, 31.xii.1982, *D.I.Morris 8285* (HO68182); Maatsuyker Island, viii.1976, *A.Moscal* (HO32384); Point Hibbs, 23.i.1984, *A.Moscal 5863* (HO401591); Boat Harbour, 17.xi.2002, *M.R. & M.H.Stanton* (HO583397); Mt Leventhorpe, summit, Flinders Island, 3.iv.2007, *P.Tyson* (HO583398); Tasman Island, downhill of quarters, 25.ix.2007, *P.A.Tyson 485* (HO545837).
VICTORIA: Cape Woolami, Phillip Island, 8.ix.1981, *A.Opie & S.Van Berkel* (HO58969).

2. *Leptecophylla parvifolia* (R.Br.) Jarman, *comb. nov.*
Cyathodes parvifolia R.Br., *Prodr.* 540 (1810). — **Type:** [Tasmania: Mount Wellington (Table Mountain), near River Derwent], *R.Brown*, Feb–May 1804 (as *Styphelia erythrocarpa*) (holo: BM000802314! Bennett No. 2416). For additional notes and a detailed synonomy, see Weiller (1999, p. 204) under *Leptecophylla juniperina* subsp. *parvifolia*.

Leptecophylla parvifolia was first collected from Mt Wellington (Table Mountain) by Robert Brown in 1804 during his nine-month sojourn in southern Tasmania. Brown named the plant *Cyathodes parvifolia* (Fig. 8) and described it in his *Prodromus florae Novae Hollandiae*, published in 1810. He commented on its similarity to *C. oxycedrus* (= *Leptecophylla oxycedrus*) which he had seen growing on the Bass Strait Islands but observed that it was easily distinguished by its small size. Since Brown's initial description, *L. parvifolia* has generally been accepted at specific rank (e.g. by de Candolle 1838; Hooker 1859; Bentham 1868; Rodway 1903 and Curtis 1963). However, Sleumer (1963) considered it a subspecies of *Leptecophylla oxycedrus* (as *Styphelia oxycedrus* Labill. subsp. *parvifolia* (R.Br.) Sleum.) and, more recently, Weiller (1999) treated it as a subspecies of *L. juniperina*.

Leptecophylla parvifolia* and *L. juniperina
Several morphological characters readily separate *Leptecophylla parvifolia* from *L. juniperina*. The corolla shape and size is different (Fig. 9 compared to Fig. 4), as well as leaf size, shape and venation, and the level of retention of the transition leaves. *Leptecophylla parvifolia* loses most of its transition leaves promptly and the ones remaining are superficially similar to the typical leaves. Even in the very oldest transition leaves, the shape is more ellipical than oblanceolate, in contrast to the persistent oblanceolate-shaped transition leaves of *L. juniperina*.

Leptecophylla parvifolia* and *L. oxycedrus
In floral morphology, *L. parvifolia* is similar to *L. oxycedrus*, except that the flowers are slightly smaller (Fig. 9 compared to Fig. 3), and the lobes of *L. parvifolia* are somewhat longer and narrower in relation to the tube compared to those of *L. oxycedrus*. Leaves of the two species may be similar in shape, but those of *L. parvifolia* are distinctly shorter and narrower, and they may be elliptical to oblong as well as lanceolate.

In its typical form, *L. parvifolia* grows as a compact rounded shrub, about 50–100 cm tall and often wider than high, with many branches from ground level. Even in dense understoreys at its lowest elevation, it rarely exceeds 2 m in height. On the other hand, *L. oxycedrus* typically occurs as a tall shrub greater than 3 m in height, and has been reported as a small tree reaching 10 m (Curtis 1963, as *Cyathodes juniperina*). In extreme coastal environments, it can occur as a dense wind-pruned, low to medium shrub, but in such situations, its overall appearance is very different from that of *L. parvifolia*. Where living plants are growing in their natural habitat there is little likelihood of confusion between these two species.

The two species differ in ecology and distribution. *Leptecophylla parvifolia* is widespread in Tasmania, and abundant in the southern, central and north-eastern highlands. It occurs in heathy vegetation or in open forest dominated by various *Eucalyptus* species, and can also be associated with high-altitude *Nothofagus cunninghamii* forests. It is particularly abundant on

Fig. 8. ***Leptecophylla parvifolia***. Holotype collected by Robert Brown from Mt Wellington (Table Mt) in Van Diemens Land (Tasmania) in1804.

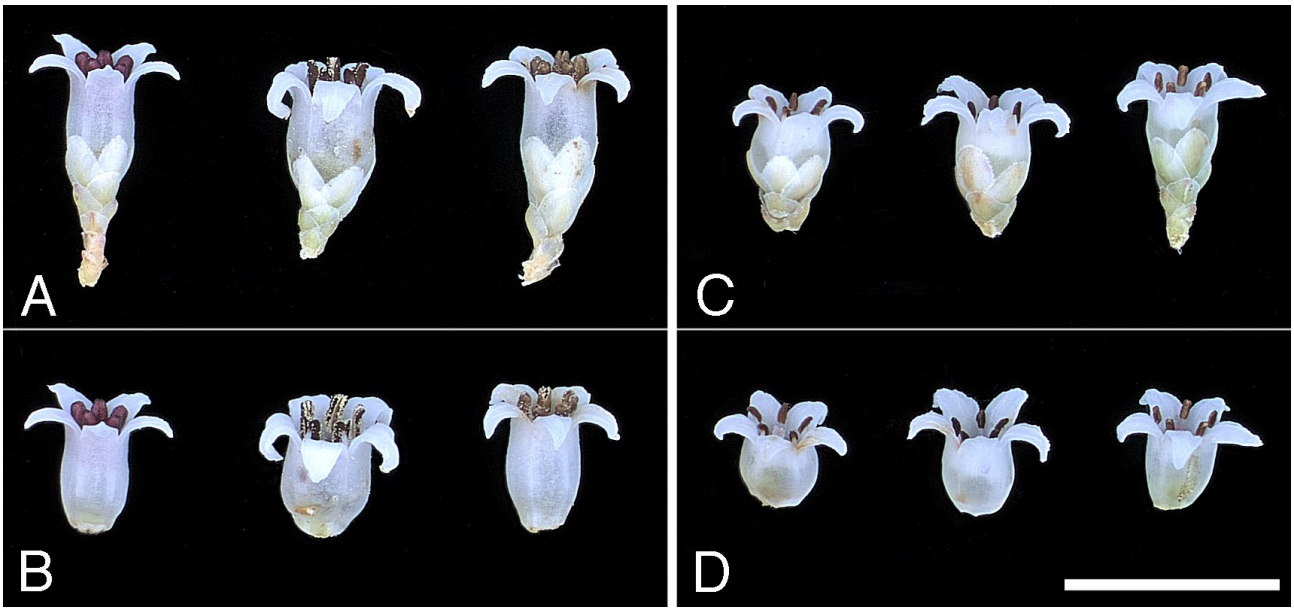

Fig. 9. Flowers of ***Leptecophylla parvifolia*** from Mt Wellington, the Type locality. **A** Pollen-producing flowers from three different plants; **B** corolla of flowers shown in A. **C** Female flowers from three different plants; **D** corolla of flowers shown in C. Scale = 5 mm.

the Central Plateau, where it occurs in broad expanses as a dominant or subdominant low shrub in the understorey (e.g. Fig. 10). It is found most commonly above 500–600 m, ascending to over 1200 m, but can occur at lower elevations especially where it has dispersed from higher ground nearby. In contrast, *L. oxycedrus* occurs in lowland coastal areas, where it mostly grows as a medium to tall shrub in wet eucalypt forest or coastal scrub, but may also form a small tree (Fig. 11). Hooker (1859) records *Cyathodes oxycedrus* (= *L. oxycedrus*) as ascending to 3000 ft, but this is possibly an error resulting from confusion with *Leptecophylla pogonocalyx* which, until the work of Weiller (1999), remained unrecognised in the Tasmanian flora. The

Fig. 10. ***Leptecophylla parvifolia*** dominating the low heathy layer in eucalypt forest on Tasmania's Central Plateau.

Fig. 11. ***Leptecophylla oxycedrus*** forming a small tree at Recherche Bay. The fence post (scale) is c. 1.2 m tall.

highest elevation for *L. oxycedrus* known at present is 750 m on Mt Strzelecki on Flinders Island; the highest on the Tasmanian mainland is 400 m on Mt Raoul on the Tasman Peninsula. Its furthest recorded distance from the coast is about 10 km on Mt Leventhorpe, also on Flinders Island, but this, and other inland sites, are likely to be subjected to strong maritime influences. *Leptecophylla parvifolia* is restricted to the Tasmanian mainland whereas *L. oxycedrus* extends to the Bass Strait Islands and is also recorded from southern Victoria.

Taxonomic status

Morphological differences between *L. parvifolia* and the New Zealand *L. juniperina* are such that there is no justification in uniting the two. The situation is less straightforward between *L. parvifolia* and *L. oxycedrus*. However, the widespread distribution of *L. parvifolia* in Tasmania, its abundance across very large areas, its retention of small leaves across a range of ecological conditions and, typically, its very different aspect from *L. oxycedrus*, are strong arguments in favour of separating the two. This view supports that of Brown (1810), who described the species, and others who worked on the Tasmanian flora such as Hooker (1859), Rodway (1903) and Curtis (1963).

Descriptions of *L. parvifolia* are given in Bentham (1868), Rodway (1903) and Curtis (1963), all as *Cyathodes parvifolia* R.Br., and are not repeated here.

Selected specimens examined

TASMANIA: Bradys Lake, 17.x.1975, *M.Allan* (HO572582); Western Mountains, Western Tiers, i.1848, *W.H.Archer* (HO4131); south slope of Mt Maurice, 9.xii.1979, *A.M.Buchanan 76* (HO32182); north ridge of Mt Mangana, South Bruny Island, 9.xi.1984, *A.M.Buchanan 4264* (HO407859); Mt Barrow, 27.xii.1959, *T.E.Burns 231* (HO4116); Lyell Highway, east of turnoff to Rufus Canal, 12.i.2003, *L.H.Cave* (HO583004); N ridge of Millers Bluff, 25 km W of Campbell Town, 8.xii.1990, *P.Collier 4976* (HO126290); Mt Faulkner, 26.ix.1954, *W.M.Curtis* (HO4122); MacKenzies Tier, c. 3 km SSW of dam on Little Pine Lagoon, 21.ii.2014, *M.F. de Salas 626, M.L.Baker & G.Kantvilas* (HO575139); Snow Hill Marshes, 29.iv.1986, *F.Duncan & M.Brown 83* (HO507457); Herringback, summit, 1.xii.2006, *A.Gray 1756* (HO538694); Poatina Highway, SW of Poatina, 17.xi.2002, *J.Jarman* (HO583006); Murchison Highway, near Belmont Road turnoff, 12.x.2003, *J.Jarman & G.Kantvilas* (HO583007); Bruny Island, Lockleys Road, 2.ix.2015, *J.Jarman & G.Kantvilas* (HO583008); Cathedral Rock, 1.xii.2013, *G.Kantvilas* (HO583005); Quoin Mountain, near summit, 20.iv.1986, *A.Moscal 12887* (HO410253); Cathcart Bluff, 11.i.1990, *A.Moscal 18371* (HO144597); Ben Lomond National Park, at treeline near Ranger's Headquarters, 18.xii.1979, *M.G.Noble* (HO74451); One O'Clock Hill, Murderers Marsh, Mt Dromedary, 20.i.1981, *A.E.Orchard 5277* (HO40863); Lake Fenton area, Mt Field National Park, 10.v.1986, *J.M.Powell 2153* (HO307760); Lake Sorell, xi.1908, *L.Rodway 496* (HO4079); Breona, Great Lake, 14.xi.1947, *J.Somerville* (HO53458); Collinsvale, 13.x.1934, *V.V.Hickman* (HO4125).

3. *Leptecophylla juniperina* (J.R.Forst. & G.Forst.) C.M.Weiller

Muelleria 12: 200 (1999); *Epacris juniperina* J.R.Forst. & G.Forst., *Char. Gen. Pl.* 20, t. 10 (1776). — **Type:** [New Zealand], *sine loco*, *Forster*, G.Forster's Herbarium (lecto, fide Weiller 1999: BM00079771!); Herb. Pallas (isolecto: BM00079772!).
For a detailed synonomy, see Weiller (1999, p. 203).

Leptecophylla juniperina (Figs 4, 12) was first described as *Epacris juniperina* in 1776 from material collected by Johann and Georg Forster in New Zealand during James Cook's second Pacific Voyage in the ships *Resolution* and *Adventure* (Forster & Forster 1776). The same species was described 15 years later by Joseph Gaertner as *Ardisia acerosa* (Gaertner 1791), again based on material from New Zealand, but this time from specimens collected by Joseph Banks and Daniel Solander on Cook's earlier voyage in the *Endeavour* in 1769. For many years, the specific epithet *acerosa* was the one used most commonly for the species (*Cyathodes acerosa* or *Styphelia acerosa*), with the earlier name given by the Forsters generally being ignored. However, Sleumer (1963) and Curtis (1963) reverted to the name *juniperina* and, thereafter, the epithet has been applied widely.

Leptecophylla juniperina (as *Cyathodes acerosa*) was included in the Tasmanian flora at least as early as 1819, when Roemer & Schultes (1819) indicated it occurred 'In insulae Van Diemen'. The source of their information is not clear and was possibly due to a misinterpretation of Brown's (1810) comments in his *Prodromus florae Novae Hollandiae*, where he noted the close similarities between *Cyathodes oxycedrus* and *C. acerosa*. Another possible explanation is that the information came from an examination of early collections of plant material from Tasmania. Some of Robert Brown's specimens of *C. oxycedrus* from Bass Strait collected in 1802 (BM00797756 from King Island) and 1803 (BM000797757, Kents Group) carry the name *C. acerosa*, but this was probably a temporary field name used by Brown until further information came to hand. Having the use of Joseph Banks' library and herbarium (Vallance *et al.* 2001), Brown would have seen Banks and Solander specimens of *C. acerosa* from New Zealand before his Australian trip commenced in 1801. He was also unlikely to have had access at that time to Labillardière's Tasmanian specimens of *Styphelia* (*Cyathodes*) *oxycedrus*, a species that was not published until 1805. By the time Brown published his *Prodromus* in 1810, he was apparently satisfied that *C. oxycedrus* and *C. acerosa* were different, and that only one of them, *C. oxycedrus*, occurred in Tasmania.

In spite of the distribution given by Roemer & Schultes (1819), most of the early botanical references after Robert Brown omitted *C. acerosa* from the Tasmanian flora (e.g. de Candolle 1838; Hooker 1859). However, in 1868, in *Flora Australiensis*, Bentham synonymised the Tasmanian *C. oxycedrus* with *C. acerosa* under the latter name. Through this synonymy, *C. acerosa* (under various names) has continued to be listed as a Tasmanian plant by many botanists, with the notable exception of Sleumer (1963).

Exclusion of *L. juniperina* from the Tasmanian flora

The close relationship between *Leptecophylla juniperina* and Tasmanian members of the genus is immediately apparent from the general appearance of the plants, which have narrow, sharply pointed leaves that are striate and glaucous below. In spite of these similarities, *L. juniperina* can be separated from all Tasmanian species using vegetative characters and from most using floral characters.

Important vegetative characters involve leaf shape and venation, and persistence of transition leaves (see above under *L. oxycedrus*). *Leptecophylla abietina* is the only Tasmanian species that has any tendency to produce persistent, oblanceolate transition leaves. However, it is probably the most distinctive of all Tasmanian *Leptecophylla* species and is very easily separated from *L. juniperina* by a broad array of characters, including the densely hairy corolla lobes, long corolla tube and horizontally orientated trichomes between the veins on the leaf undersurface.

In terms of floral morphology, *L. juniperina* differs from all Tasmanian species except *L. pogonocalyx* in its relatively short, broad corolla tube. However, the two can be easily separated on the basis of leaf characters (venation, subtleties of leaf shape, and differences in shape and retention of transition leaves).

We have examined specimens of *Leptecophylla juniperina* collected by the Forsters (lectotype: BM000797781, Fig. 12; isolectotype: BM000797782) and Banks and Solander (BM000802315, BM000802316) and compared them with numerous specimens of *Leptecophylla* from widely dispersed locations in Tasmania. Comparisons have also been made with material of *L. juniperina* on loan from New Zealand. On this basis, we do not consider *L. juniperina* to be a Tasmanian species, and formally exclude it from the Tasmanian flora. Plants previously identified as *L. juniperina* in Tasmania are mostly either *L. oxycedrus* or a newly described subspecies of *L. pogonocalyx*.

Selected specimens examined

NEW ZEALAND, NORTH ISLAND: Cascade Park, Waitakere Range, Waitemata City, Auckland, 11.ix.1974, *S.J.Astridge & L.R.Stemmer* (CHR259266); Tairua State Forest, 24.iv.1956, *I.L.Barton* (AK213083); Jacks Bay, Bay of Islands, 3.viii.1967, *R.Belcher* (AK117922); Hauraki Gulf, Ponui (Chamberlins) Island, 28.viii.1978, *E.A.Brown* (AK151185); north Waikawau Bay, 26.ix.2002, *E.K.Cameron* (AK258766); Waitangi, Manukau County, 3.x.1900, *H.Carse* (CHR332679); Woodhill, West Coast, Waitemata County, 12.vii.1921, *H.Carse* (CHR332677); summits of hills at Mangaroa, xi.1826, *A.Cunningham[?]* (MEL685918); W. of Mt Messenger, N. Taranaki, iii.1978, *A.P.Druce* (CHR323871); Pokai Reserve, S. Mamaku Plateau, x.1978, *A.P.Druce* (CHR325967); Mt William, Pokeno, 27.x.1972, *R.O.Gardner*

Fig. 12. Lectotype of ***Leptecophylla juniperina*** (BM000797781) collected by the Forsters in New Zealand. Inset: magnified segment of the main image.

(CHR258390); Whangaparapara Bay, Great Barrier Island, ix.1964, *B.L.Gee & M.S.Reid* (AK263286); Little Barrier Island, 1.ix.1963, *P.Hynes* (AK98692); Forestry Department area, Woodhill, 17.viii.1968, *P.Hynes* (AK118807); Northcote, Kauri Glen, 18.ix.1943, *D.L.Knowlton* (AK132300); Hapuakohe Range, Waiti Road above Ohinekaua Stream, 6.vii.1991, *P.J. de Lange 856 & G.M.Crowcroft* (HO504556, ex CHR473442); Birkenhead, in Le Roys Bush, 14.vii.1982, *D.Lewis* (AK271068); Hunua Ranges, Mangatangi Track, Auckland, 13.ix.2003, *T.J.Martin* (HO583394); Birkdale, Auckland, 18.viii.1924, *H.B.Mathews?* (AK105578); Little Barrier Island, 26.vi.1947, *H.R.McKenzie* (AK211747); Whangarei, 1957, *T.W.Mellor* (AK50410); Cascades, Waitakere Ranges, 30.i.1983, *J.M.Powell 2074* (HO584244); Baie des Iles, 1843, *M.Raoul* (MEL685965); Wairata Forest Farm, Wairata, Opotiki, x.2014, *A.Redpath* (HO583393); c. 3 km SW of Waiwera, 26.x.1980, *P.Scofield 29* (AK154355); Mt Manganui, Tauranga, i.1960, *A.G.Simpson* (AK266216); c. 2 km SW of Waiwera, 3.x.1981, *G.Straka 336* (AK155408); Mamaku, x.1941, *M.R.Woodhead* (AK151817); Auckland (MEL2380635).
SOUTH ISLAND: Opuragi, Totaranui, 5–15.xi.1769, *J.Banks & D.Solander* (BM000802315, BM000802316).

4. *Leptecophylla pogonocalyx* C.M.Weiller

Muelleria 12: 206 (1999). — **Type citation:** above Lake Dove, Cradle Mountain, eastern slopes, 21.xi.1985, *C.M.Mihaich 5*. **Type sheet:** From the eastern slopes above Lake Dove, Cradle Mountain–Lake St Clair National Park, 21.xi.1985, *C.M.Mihaich 5* (holo: HO521873!).

Leptecophylla pogonocalyx was segregated by Weiller (1999) from what had been known until then as *L. juniperina*. Distinguishing characters are a short corolla tube and pubescent calyx and bracteoles (Weiller 1999). The species is very widespread in the south-west and west of Tasmania and is now known to cover a much broader altitude range than when first reported, occurring from sea level to alpine elevations.

In the present study, the circumscription of *L. pogonocalyx* is broadened to include a new subspecies, *L. pogonocalyx* subsp. *decipiens*. In their typical form, subsp. *pogonocalyx* (Fig. 13) and subsp. *decipiens* (Figs 13, 14) can be distinguished unambiguously by the degree of hairiness of the sepals and floral bracts (glabrous vs hairy), and this distinction applies across much of the area they occupy: subsp. *pogonocalyx* in southern and western areas; subsp. *decipiens* in north-western areas. However, where their distribution patterns converge (north-western parts of the Central Plateau, parts of the West Coast), it becomes increasingly difficult to assign plants to one or other subspecies with certainty because of the intergrading level of hairiness and the absence of any other diagnostic character.

***Leptecophylla pogonocalyx* subsp. *decipiens* Jarman, subsp. nov.**

A *L. pogonocalyce* subsp. *pogonocalyce* C.M.Weiller sepalis glabris differt.

Type: slopes of Mt Leslie, 12.xi.2015, *J.Jarman & G.Kantvilas* (holo: HO583888; iso: MEL, CANB, AK, CHR, WELT).

Medium to tall shrub up to c. 4 m; branchlets pubescent, with short stiff hairs. Leaves alternate, spreading or reflexed, narrow-ovate to narrow elliptical-lanceolate, tapering to a pungent point, 8–17 (–23) mm long (including pungent point), 1.2–1.6 mm wide; upper surface convex, green; lower surface glaucous, striate with 3–5 (–7) unbranched parallel veins; margin smooth or scabrous above; petiole short, c. 1 mm long, glabrous or with short hairs on the upper surface; apex acute, with a stiff sharp point, c. 1 mm long. Flowers white, solitary, mostly in the upper axils, on straight or recurved pedicels, 1–3 mm long; bracts glabrous or with minute, inconspicuous hairs at the tip, ovate-oblong to broadly triangular, margin ciliolate, apex obtuse, upper bracts imbricate, decreasing in size to the lower bracts, lower bracts imbricate or distant; sepals glabrous or with a small patch of minute, inconspicuous hairs at the apex, ovate-oblong, apex obtuse, margin ciliolate; corolla tube 1.5–2.5 (–3) mm long, 2–3 mm wide, bulbous in the middle, exserted beyond the calyx or equal to it, corolla lobes spreading or reflexed, 1–1.5 mm long, shorter than the tube, glabrous or rarely with sparse hairs. Anthers half-exserted. Ovary 5-locular; disk of five scales or lobes. Fruit a drupe, pink to red, 7–10 mm diam. **Figs 13D–F, 14.**

Etymology. The epithet *decipiens*, from the Greek participle meaning 'deceiving', refers to the general appearance of the subspecies, which is so like that of several other Tasmanian *Leptecophylla* species that the taxon has been overlooked or misidentified in the past.

Distribution and ecology. *Leptecophylla pogonocalyx* subsp. *decipiens* is the typical *Leptecophylla* occurring throughout north-western Tasmania, from the lowlands to over 1000 m elevation. It is known as far south as the Pieman River and extends onto the northern and north-western rim of the Central Plateau. It has not been recorded from southern parts of Tasmania. It commonly grows as a tall understorey shrub in wet eucalypt forest. However, like other tall-growing Tasmanian *Leptecophylla* species, it matures as a small plant and can be found flowering at heights below 1 m in open situations, at high elevations, or along margins of roadsides and other disturbed areas. Peak flowering time is October–November, with later flowering at higher elevations.

Selected specimens examined

TASMANIA: Bowry Creek, Savage River, 9.vi.1993, *A.M.Buchanan 13378* (HO409926); south ridge of St Valentines Peak, 13.1.1986, *P.A.Collier 1165* (HO116892); Baretop Ridge, 29.i.2015, *M.F. de Salas 1140 & M.L.Baker* (HO578612); Mt Bertha, near summit trig point, 5.ii.2015, *M.F. de Salas 1354 & M.L.Baker* (HO578425); Murchison Highway 7.7 km N of Waratah and Guildford Roads junction, 10.x.1978, *A.M.Gray 281* (HO28100); near mouth

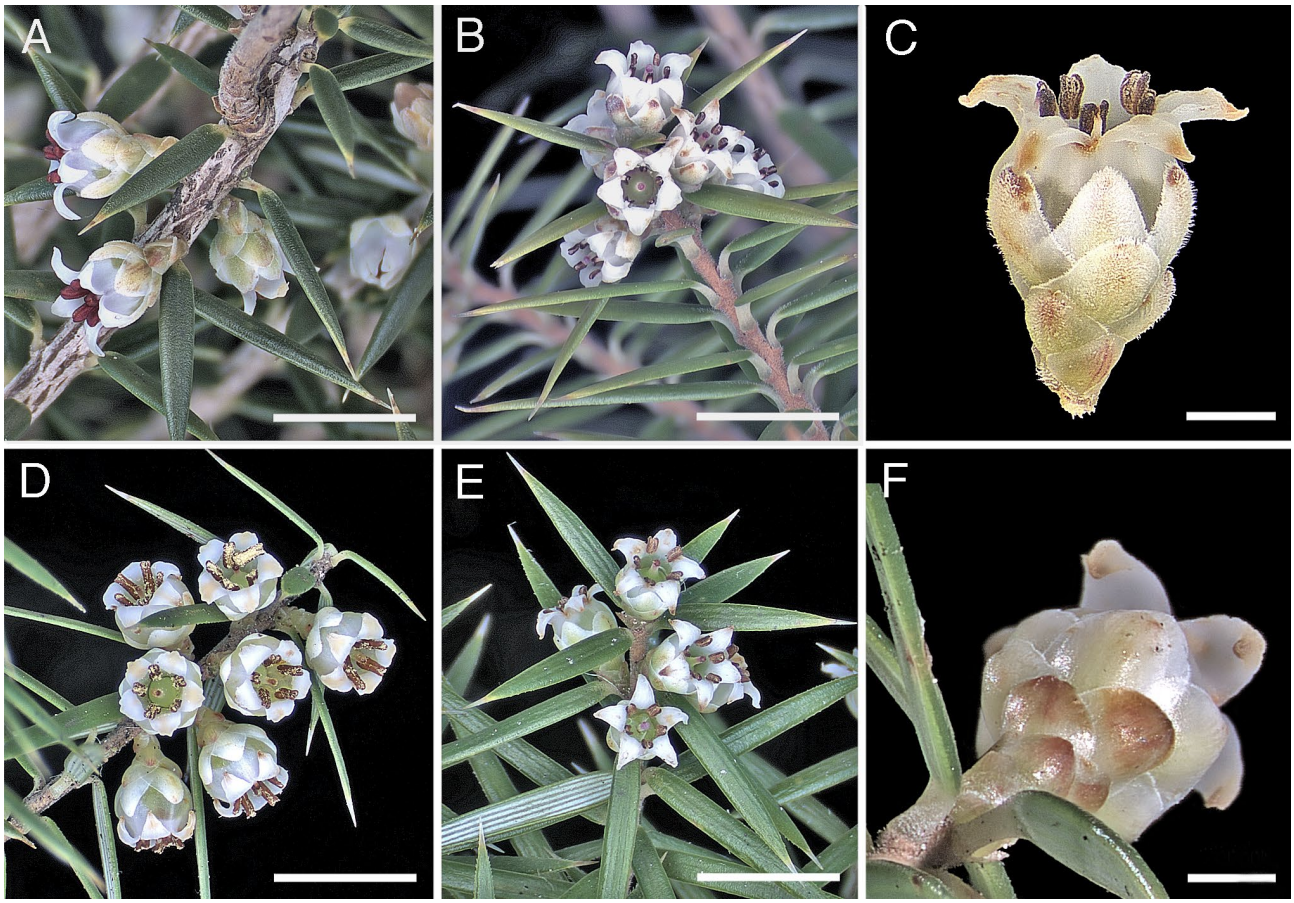

Fig. 13. ***Leptecophylla pogonocalyx*** **subsp.** ***pogonocalyx*** (**A**–**C**) and ***L. pogonocalyx*** **subsp.** ***decipiens*** (**D**–**F**). **A**, **D** Pollen-producing plant; **B**, **E** female plant; **C** flower showing hairy calyx; **F** flower showing glabrous calyx. Scale A, B, D, E = 5 mm; C, F = 1 mm.

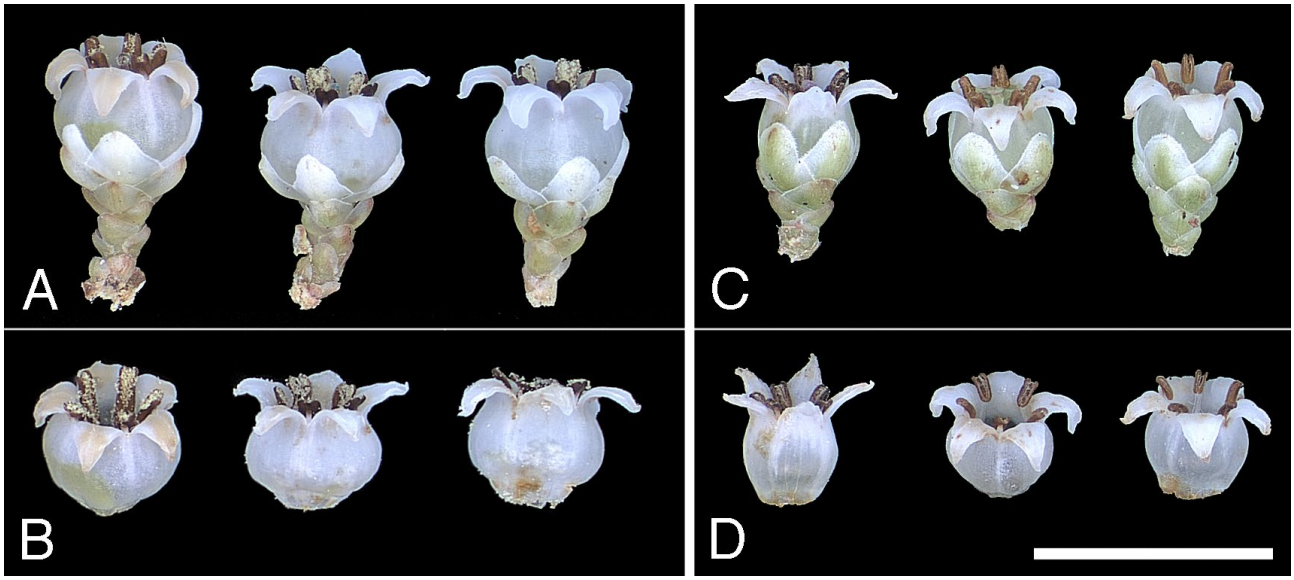

Fig. 14. ***Leptecophylla pogonocalyx*** **subsp.** ***decipiens***. **A** Pollen-producing flowers from three different plants; **B** corolla from flowers shown in A. **C** Female flowers from three different plants; **D** corolla from flowers shown in C. Scale = 5 mm.

of Pieman River, 15.i.1954, *W.D.Jackson 136* (HO4096); Wandle River, 16.xi.2014, *J.Jarman* (HO584431); Loyatea Peak, 19.x.2001, *J.Jarman & G.Kantvilas* (HO584432); Black Bluff Track, 19.x.2001, *J.Jarman & G.Kantvilas* (HO584433); Savage River Pipeline Road, 27.xi.2003, *J.Jarman & G.Kantvilas* (HO584434); Murchison Highway, near Belmont Road turnoff, 28.xi.2003, *J.Jarman & G.Kantvilas* (HO584435); Blackwater Road near spur 5, 10.xi.2015, *J.Jarman & G.Kantvilas* (HO583890); Norfolk Road near the junction with Sumac Road, 10.xi.2015, *J.Jarman & G.Kantvilas* (HO583891); Henrietta, 12.xi.2015, *J.Jarman & G.Kantvilas* (HO583892); Bonds

Range, 25.xi.1982, *A.Moscal 1044* (HO68368); The Clump, 9.xii.1983, *A.Moscal 4666* (HO79821); Frankland Creek, 18.xii.1983, *A.Moscal 5003* (HO111287); Providence Creek, Arthur River, 28.iii.1984, *A.Moscal 7166* (HO121900); Trowutta Arch, 7.iv.1984, *A.Moscal 7434* (HO92140); Mother Cummings Peak, 20.ii.1986, *A.Moscal 12368* (HO402240).

Composition of *Leptecophylla* in Tasmania

On the basis of this study, the genus *Leptecophylla* comprises six species in Tasmania, one of which has two subspecies. These include *L. abietina* (Labill.) C.M.Weiller, *L. divaricata* (R.Br.) C.M.Weiller, and *L. pendulosa* (Jarman) C.M.Weiller, in addition to the taxa documented herein. An identification key to these species is provided (below).

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Key to Tasmanian species of *Leptecophylla**

1. Flowers with a short, broad corolla tube: in pollen-producing flowers, the length of the tube equal to or less than the diameter at the widest point; tube bulbous in shape (e.g. Fig. 14)

  2. Sepals pubescent on the outer surface . . . . . ***L. pogonocalyx* subsp. *pogonocalyx***

  2: Sepals glabrous on the outer surface . . . . . ***L. pogonocalyx* subsp. *decipiens***

1: Corolla tube relatively long in relation to its diameter: in pollen-producing flowers, at least 1.5 times as long as the width; tube barrel-shaped or cylindrical (e.g. Figs 3, 9)

  3. Style long, at least twice the height of the ovary

    4. Corolla lobes with long straggling hairs; bracts distant, bracteoles scarcely reaching the sepals . . . . . ***L. divaricata***

    4: Corolla lobes glabrous, rarely with one or two hairs; bracts and bracteoles overlapping . . . . . ***L. pendulosa***

  3: Style short, less than twice the height of the ovary

    5. Leaves longer than 7 mm

      6. Inside of corolla lobes densely hairy . . . . . ***L. abietina***

      6: Inside of corolla glabrous or with scattered sparse hairs. . . . . ***L. oxycedrus***

    5: Leaves shorter than 7 mm . . . . . ***L. parvifolia***

* *Leptecophylla juniperina* is excluded from the Tasmanian flora.

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