

An overview of the *Thelymitra nuda* (Orchidaceae) complex in Australia including the description of six new species

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Introduction

Thelymitra J.R.Forst. & G.Forst. is a complex genus of orchids consisting of about 110 described species, several described natural hybrids and at least 10 undescribed taxa. It is concentrated in higher rainfall areas of temperate Australia, but a few species occur in tropical north-eastern Australia, about 20 species occur in New Zealand (14 endemic) and a few species occur in Indonesia, New Caledonia, New Guinea and the Philippines.

Taxonomic history and discussion

The complex of taxa surrounding *Thelymitra longifolia* J.R.Forst. & G.Forst. (the type species of *Thelymitra*) is vast, and probably includes about half the total number of species in the genus (Bates 1999). The first botanist to study the genus in any detail was Robert Brown (1810), who described three new species, which can be placed in the *T. longifolia* complex – *Thelymitra angustifolia* R.Br., *Thelymitra nuda* R.Br. and *Thelymitra pauciflora* R.Br. from eastern Australia. Lindley (1839–40 & 1840) described a further four new species in this group – *Thelymitra arenaria* Lindl., *Thelymitra graminea* Lindl., *Thelymitra macrophylla* Lindl. and *Thelymitra versicolor* Lindl. (the latter I regard as a synonym of *T. nuda*) – two species from the eastern states and two from Western Australia. Bentham (1873) took an extraordinarily conservative approach by recognising only *T. longifolia* as a valid species, while relegating *T. arenaria*, *T. graminea*, *T. nuda*, *T. pauciflora* and *T. versicolor* to synonymy under that species, *T. angustifolia* to synonymy under the unrelated *Thelymitra aristata* Lindl. and *T. macrophylla* as a taxon linking *T. aristata* to *T. longifolia*. Most botanists and authors that have dealt with the genus since Bentham acknowledged that there are several to many distinct species involved (e.g. Fitzgerald 1875–95, Nicholls 1969, Jones 1988, Clements 1989,

Abstract

The *Thelymitra nuda* J.R.Forst. & G.Forst. complex is defined as a group and an overview of the Australian members is presented. Six new species, *T. alcockiae* D.L. Jones ex Jeanes, *T. alpina* Jeanes, *T. glaucophylla* R.J. Bates ex Jeanes, *T. paludosa* Jeanes, *T. petrophila* Jeanes and *T. queenslandica* Jeanes, are described and illustrated. The key diagnostic characters are discussed where relevant. Information on distribution, habitat, flowering time, pollination biology and conservation status is given for all taxa. A dichotomous key is provided.

Key words: *Thelymitra*, sun orchids, taxonomy, diagnostic features.

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Bernhardt 1993, Backhouse & Jeanes 1995, Jones & Clements 1998b, Jeanes 2004 and Bates 2010) resulting in a steady stream of new taxa being described.

Taxa in the *T. longifolia* complex generally have unspotted blue flowers (less often white or pink) varying in size from about 10 mm to 50 mm in diameter when fully open. The post-anther lobe of the column is tubular, variously inflated, usually smooth on the dorsal surface, variously open on the ventral side and entire, emarginate or deeply bifid at the apex. The auxiliary lobes are at most rudimentary, consisting of a pair of tiny incurved spurs on the lower apical margin of the post-anther lobe, or more often completely absent. The two finger-like lateral lobes extend forward from the column wing, one on each side of the anther and just below the post-anther lobe. These may be more or less straight, curved gently or bent upwards at right angles near the middle. Each lateral lobe has a tuft of white hairs (less often yellow or mauve) that may be elongate resembling a toothbrush or short and more or less terminal resembling a mop.

Thelymitra longifolia appears to be endemic to New Zealand as I have seen no specimens collected outside that country that are a good match for the type material. Australian members of the *T. longifolia* complex are often divided conveniently, but rather arbitrarily, into two smaller complexes on the basis of flower size and pollination biology. Members of the so-called *T. pauciflora* complex have small flowers (perianth segments usually to 10 mm long, sometimes as long as 12 mm and rarely reaching or exceeding 15 mm) that are usually unscented, generally autogamous and often also cleistogamous. This group has been dealt with elsewhere by the current author (Jeanes 2004). Members of the so-called *T. nuda* complex generally have larger flowers (perianth segments on mature plants are usually more than 15 mm long and sometimes as long as 25 mm) that open more readily, are often scented and are usually pollinated by native bees (melittophilous). A full revision of the *T. nuda* complex has not been attempted at this time as three informal taxa within the group were recently recognised for Western Australia (Hoffman & Brown 2011) and possibly others for South Australia (Bates 2011). I have not had an opportunity to study these taxa in the field nor examined herbarium material of them.

The *T. pauciflora* and *T. nuda* complexes are probably artificial as several taxa could be placed in either group based on flower size and *T. malvina* appears to produce both insect-pollinated and autogamous clones. Also, initial phylogenetic studies based on molecular analyses do not support either of these complexes as being natural groups (M.A.Clements pers. comm.).

At the outset of this study, nine species were recognised in the *T. nuda* complex in Australia – *Thelymitra aggericola* D.L.Jones, *Thelymitra fragrans* D.L.Jones & M.A.Clem., *T. graminea*, *Thelymitra granitora* D.L.Jones & M.A.Clem., *Thelymitra gregaria* D.L.Jones & M.A.Clem., *Thelymitra imbricata* D.L.Jones & M.A.Clem., *T. macrophylla*, *Thelymitra megalyptra* Fitzg. and *T. nuda*. It became evident during this study that there are many more than just these nine species present. The differences between the species are often subtle and may only become evident after close scrutiny of the whole above-ground parts of fresh plant material with a hand lens or a microscope.

Traditionally, the column has provided the main suite of characters used to distinguish between the species in *Thelymitra*. However, for this study of the *T. nuda* complex, vegetative characters, phenology and habitat information have proven more important for distinguishing many of the species. For example, *Thelymitra glaucophylla* R.J.Bates ex Jeanes can be identified with a high degree of confidence from mature leaves alone. *Thelymitra paludosa* Jeanes is similar morphologically to *T. macrophylla*, but usually grows in wetter substrates and generally flowers later (although there is some overlap). Most species in the complex exist as solitary individuals producing only a single replacement tuber each season. Others such as *T. gregaria* produce small dense clumps by vegetative reproduction (Jones & Clements 1998a).

The various members of the *T. nuda* complex have a propensity to hybridise with other *Thelymitra* species, both inside and outside the group (Weber & Entwisle 1994; Jones 2006), making positive identification of some plants extremely difficult.

Explanation of the terminology used

The genus *Thelymitra* is unusual in the Orchidaceae in that the six perianth segments generally differ very

little from each other in terms of size, shape and ornamentation. The labellum does not bear any hairs, calli, glands, ridges, lobes, teeth or fringes and is apparently not involved in pollination. Since the perianth is virtually actinomorphic and generally lacks characters by which to distinguish the species, traditionally the structure of the column has supplied most of these distinguishing characters. Over the years a terminology has evolved to describe the column structure in *Thelymitra*, but some of these terms are poorly understood and some have never been defined adequately. Below is an explanation of some of the terms commonly used in this paper; most have a traditional usage, although this has often not been well understood.

Column (gynostemium): The column is exposed in the centre of the flower; it lacks a free filament and style, is short and thick and broadly winged from below the stigma to the level of the anther or beyond. The apex is usually 3–5-lobed and is often ornamented with hairs, fringes, teeth, calli, glands, tubercles or lobes. In members of the *T. nuda* complex the apex of the column is more or less tri-lobed with hairs adorning the two lateral lobes.

Post-anther lobe (mid-lobe): This structure protrudes beyond the point of insertion of the anther and of the lateral lobes, and it is usually of a different colour to the rest of the column. It has a complex vascular supply always associated with that of the functional anther and could be regarded as an outgrowth of the filament and the lateral lobes. In some species it is represented only by a short flap or a band of small calli crowded across the back of the anther. In most species it extends well beyond the anther with a free margin that may be plain, undulate, toothed, notched or variously ornamented with tubercles. At its maximum development (such as in the *T. nuda* complex) it forms a tubular hood that is variously open on the ventral side and overhangs and obscures the anther. The apex of this tube is usually bright yellow and is often variously cleft into two distinct lobes that have shallowly toothed and often thickened margins. In the literature the post-anther lobe has often been described as ‘inflated’, particularly in reference to some members of the *T. pauciflora* and *T. nuda* complexes. In this account the term inflated is used in relation to those taxa in which the shape of the post-anther lobe is noticeably bulbous and is discontinuous

with the shape of the column lower down. This is often obvious when viewing the column in profile, but is usually more evident when viewing it from above and behind. The orifice at the apex of the post-anther lobe is usually more or less circular when viewed from the front, but in some species it is oval due to dorsal compression.

Lateral lobes (column-arms or lateral staminodes): These two structures lie one each side of the post-anther lobe and of the anther and extend forward or upward and often converge. They are each supplied by a single unbranched vascular bundle and are thought to represent staminodes. They may be flat and ribbon-like, terete and finger-like, straight, curved, twisted spirally or bent sharply, and are usually ornamented with lobes, teeth, tubercles or hairs. The lateral lobes are finger-like and trichomate in members of the *T. nuda* complex, but may be straight, curved gently, bent sharply, parallel or convergent.

Trichomes (hairs): These structures are present on the lateral lobes of many *Thelymitra* species, including those in the *T. nuda* complex. They are each 1–2 cells wide throughout their length and may be thickened and glandular at the apex (Weber & Bates 1986). In the *T. nuda* complex they usually extend along nearly the entire length of the lateral lobe in a toothbrush-like arrangement, or more rarely concentrated in the distal half in a more mop-like arrangement. The hairs are usually white in the *T. nuda* complex.

Auxiliary lobes (accessory lobes or side lobules): Several species of *Thelymitra* (e.g. members of the *Thelymitra canaliculata* R.Br. complex) have a pair of distinct lobes between the post-anther lobe and the lateral lobes. These have no vascular strand and are most accurately described as being part of a tripartite post-anther lobe. They tend to be fleshy with irregularly jagged margins and sometimes have small surface tubercles. In the *T. nuda* complex the auxiliary lobes are often completely absent or they may be reduced to a pair of small incurved spurs or bumps on the distal margin of the post-anther lobe.

Anther: In *Thelymitra*, the anther is usually small, ovoid, and situated entirely between the column wings. The connective extends beyond the pollinia into an apical beak-like projection of varying size. The anther may be entirely above the stigma or variously obscured behind it. In the *T. nuda* complex the anther is usually

inserted about halfway along the column at anthesis and is most often entirely above the stigma.

Pollinarium: In *Thelymitra* the pollinarium consists of four pollinia (in two groups of two) attached directly, or by a short caudicle, to a terminal viscidium.

Pollinia: In *Thelymitra* the pollinia consists of pollen grains in monads or tetrads. In the *T. nuda* complex the pollen grains are usually bound tightly and the pollinarium is removed as a single unit by pollinators.

Stigma: The stigma in *Thelymitra* is more or less bilobed at the apex, usually quadrate or transverse-elliptic in shape and located at the base of the column on a thick stalk.

Materials and methods

This paper is the result of a qualitative and quantitative study of the pertinent type material (or photographic reproductions thereof), all the available herbarium specimens (both dry and spirit-preserved) from AD, BM, BRI, CANB, E, HO, MEL, NSW, P, PERTH, QRS, SUNIV and WELT, and freshly collected specimens of all taxa except *T. queenslandica*, which were vouchered and deposited at the relevant herbaria. Orchid taxa in general, and *Thelymitra* taxa in particular, are much more readily identified from fresh living material where characters of the perianth, the column, flower colour and fragrance are still intact. Familiarity with the taxa gained from field study and the study of freshly collected specimens sent to me by field operatives has made the identification of dried and spirit-preserved herbarium material (including type specimens) much easier.

When collecting *Thelymitra* for study it is essential that the entire above ground parts of the plant be taken, with the majority of the material being preserved in spirit (a good preserving medium is ethanol, water and glycerol in the ratio 1750:750:125). Plants preserved in the pressed state are often difficult to identify to species level in the absence of additional information. To aid identification it is recommended that one or two flowers on each specimen have the perianth removed before pressing so that the column is not obscured. Spirit-preserved specimens, on the other hand, are generally much more easily identified to species level. The observation of plants growing *in-situ* is the ideal method of study for *Thelymitra* in general, and often it is only by this method that cryptic new species

can be identified. For this reason the importance of field work in the study of species complexes within *Thelymitra* cannot be overstated and should form an integral part of any future studies of the group or its individual members. It is likely that other taxa worthy of recognition exist within this large and diverse complex, but adequate information and collections of these are lacking at present.

Taxonomy

1. *Thelymitra gregaria* D.L.Jones & M.A.Clem., *Orchadian* 12(7): 327 (1998)

Type: VICTORIA. Chatsworth Rd, Derrinallum, 11.x. 1997, D.L. Jones 15585 & E. Foster (holotype CANB 990888; isotypes AD, MEL 2089285, MEL 2089286, NSW!).

Illustrations: Backhouse & Jeanes (1995) page 355 (as *Thelymitra* sp. aff. *nuda*); Jeanes & Backhouse (2006) page 207; Jones (2006) page 230.

Glabrous terrestrial *herb*, usually growing in dense clumps. *Tubers* ovoid to obloid, 1–2 cm long, 8–10 mm wide, fleshy. *Leaf* linear to linear-lanceolate, 5–12(–18) cm long, 5–12 mm wide, erect, canaliculate, fleshy, dark green to yellowish with a purplish base, ribbed abaxially, sheathing at base, lower margins minutely denticulate, apex acute. *Scapes* 9–20 cm tall, 1–2.5 mm diam., moderately stout, straight, usually purplish, often pruinose. *Sterile bracts* usually 2, rarely 1 or 3, linear-lanceolate, 13–45 mm long, 3–8 mm wide, closely sheathing, acute to acuminate, green and purplish, often pruinose. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–24 mm long, 3–7 mm wide, closely sheathing the pedicels, green and purplish, often pruinose. *Pedicels* 4–10 mm long, slender. *Ovary* cylindrical to narrow-obovoid, 3–10 mm long, 1.5–4 mm wide. *Flowers* 1–6, 20–40 mm across, dark violet-blue to purple with darker longitudinal veins, opening freely on mild to warm days, scented. *Perianth segments* 10–20 mm long, 5–10 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate to elliptic, often cucullate, obtuse; *lateral sepals* ovate to lanceolate, obtuse to acute; *petals* ovate to elliptic, obtuse; *labellum* obovate, acute to obtuse. *Column* erect from the end of ovary, 5–7 mm long, 2.5–3.5 mm wide, pink, blue or purplish; *post-anther lobe* hooding the anther, 2–3.3 mm

Key to members of the *Thelymitra nuda* complex in Australia

1 Plant short and stocky; inflorescence rarely exceeding 20 cm and often considerably shorter.....**2**

1: Plant tall and often slender; at least some mature plants with the inflorescence exceeding 20 cm tall**4**

2 Leaf erect, more or less straight, usually only half the height of the inflorescence; flowers rich purple or mauve; grassland habitats of Victoria only..... **1. *T. gregaria***

2: Leaf curving away strongly from the inflorescence, usually as long as distance from ground to lowest flower and often longer than entire inflorescence; flowers white or pale blue; rock outcrops of Tasmania and Western Australia.....**3**

3 Perianth segments to 14 mm long; plants solitary; flowers usually pale blue, sometimes white; post-anther lobe brown or orange with a yellow apex; flowers late October to December; Tasmania only **2. *T. aggericola***

3: Perianth segments >14 mm long at least on some mature specimens; plants forming clumps; flowers usually white, sometimes pale blue; post-anther lobe usually all yellow; flowers September and October; Western Australia only **3. *T. granitora***

4 Leaf usually as long as distance from ground to lowest flower and often exceeding height of inflorescence.....**5**

4: Leaf usually only half height of inflorescence or less**7**

5 Leaf fleshy, canaliculate; post-anther lobe entire to emarginate, often entirely red or yellow; lateral lobes toothbrush-like, glabrous only at the very base; Western Australia only..... **4. *T. petrophila***

5: Leaf thin-textured, strap-like, canaliculate at base only; post-anther lobe bilobed at apex, usually brown or purplish with a yellow apex; lateral lobes mop-like, glabrous in lower half; Queensland and New South Wales only.....**6**

6 Flowers usually pale blue, pink or mauve; sterile bracts usually 2; mostly found on rocks growing with the lithophytic orchid *Thelychiton kingianus*; flowers August to October; south-east Queensland and New South Wales.....**5. *T. fragrans***

6: Flowers dark blue to purplish; sterile bracts usually 3; plants terrestrial; flowers mostly June to September; northern Queensland only.....**6. *T. queenslandica***

7 Perianth segments in mature plants rarely exceeding 18 mm long.....**8**

7: Perianth segments in most mature plants exceeding 18 mm long**12**

8 Inflorescence, basal part of the leaf and bracts often a striking reddish purple in colour; whole plant sometimes glaucous; mallee habitats of South Australia and Victoria.....**7. *T. alcockiae***

8: Inflorescence, leaf and bracts predominantly green, sometimes with some minor purplish suffusions; plant not glaucous.....**9**

9 Flowers pale purplish blue; perianth segments strongly imbricate; grassland habitats of Tasmania **8. *T. imbricata***

9: Flowers dark purplish blue to violet; perianth segments imbricate at base only **10**

10 Post-anther lobe not strongly inflated, compressed dorsally in distal half; lateral lobes inserted c. 1 mm from apex of post-anther lobe; hairs on lateral lobes not embracing apex of post-anther lobe; swamp margins of south-west Western Australia **9. *T. paludosa***

10: Post-anther lobe strongly inflated, not compressed dorsally in distal half; lateral lobes inserted c. 0.5 mm from apex of post-anther lobe; hairs on lateral lobes embracing apex of post-anther lobe; sclerophyll forests **11**

11 Post-anther lobe v-notched at apex; south-eastern Australia..... **10. *T. nuda***

11: Post-anther lobe entire or emarginate at apex; Western Australia only **11. *T. graminea***

12 Leaf mostly pale green with a whitish bloom, often senescent at anthesis; flowers pale blue, mauve or white; perianth segments thin-textured, papery; South Australia only **12. *T. glaucophylla***

12: Leaf mostly dark green lacking a whitish bloom, usually not senescent at anthesis; flowers usually dark blue to purplish; perianth segments thick-textured, not papery **13**

Key to members of the *Thelymitra nuda* complex in Australia cont.

- 13** Leaf often >15 mm wide in mature plants; lateral lobes inserted c. 1 mm from apex of post-anther lobe; hairs on lateral lobes usually clear of apex of post-anther lobe; Western Australia only..... **13. *T. macrophylla***
- 13:** Leaf to 15 mm wide in mature plants; lateral lobes inserted c. 0.5 mm from apex of post-anther lobe; hairs on lateral lobes often touching apex of post-anther lobe; south-eastern Australia only **14**
- 14** Post-anther lobe compressed dorsally, orifice oval, distal margin usually with two forward-pointing teeth; montane and subalpine habitats; flowers mostly December to February..... **14. *T. alpina***
- 14:** Post-anther lobe barely compressed dorsally, orifice more or less round, distal margin lacking two forward-pointing teeth; lowland habitats; flowers mostly September to October **15. *T. megalyptra***

long, 1.3–2 mm wide, tubular, inflated, gently curved, brownish with a blackish sub-terminal collar, narrowed basally, apex slightly expanded, yellow, shallowly bilobed (lobes 0.5–1.5 mm long), apical margins sinuate; *auxiliary lobes* absent; *lateral lobes* converging, 0.8–1.5 mm long, digitiform, obliquely erect, each with a toothbrush-like arrangement of white hairs, the individual hairs 0.7–1 mm long. *Anther* inserted towards apex of column, ovoid, 2.3–2.8 mm long, 1.5–2 mm wide, the connective produced into a beak 0.4–0.6 mm long; *pollinarium* c. 2 mm long; *viscidium* circular to elliptic, c. 0.5 mm diam.; *pollinia* white, with coherent pollen. *Stigma* situated at base of column, ovate-quadrate, 1.5–2.5 mm long, 1.5–2.5 mm wide, margins irregular. *Capsules* obovoid, 8–12 mm long, 6–8 mm wide, erect, ribbed, often reddish. (Fig. 1a)

Selected specimens examined: VICTORIA. Darlington–Camperdown Rd, 5 km SSE of Darlington PO, 15.x.1977, G.J. Hirth s.n. (MEL 1513210); Werribee, 18.x.1890, A. Morrison s.n. (CANB 367971); Western Plains region: Vite Vite, 11.x.1997, D.L. Jones 15599 & E. Foster (CANB 9908897); Western Highlands region: Woorndoo, roadside reserve just N of town, 11.x.1997, D.L. Jones 15595 & E. Foster (CANB 9908893); Western Plains region: Vite Vite, 4.xi.1992, E. Foster DLJ10636 (CANB 9702502); Western Plains region: Vite Vite, 16.xi.2000, D.L. Jones 17698 & K.J. Fitzgerald (CANB 631092); Corangamite District: Chatsworth Road, 8 km WNW of Derrinallum, 19.x.1991, J.A. Jeanes s.n. (MEL 2011687); Corangamite District: About 8 km WNW of Derrinallum beside Chatsworth Rd, 4.x.1999, A. & B. Tindall JAJ678 (MEL 2172992); Grassland reserve near Vite Vite railway siding, 4.x.1999, A. & B. Tindall JAJ679 (MEL 2173010); Vite Vite Railway Reserve, 17.x.2001, J.A. Jeanes 1172 (MEL 2172997); Beside Chatsworth Rd c. 5 km WNW of Derrinallum, 8.x.1999, J.A. Jeanes 570, C. & M. Trigg (MEL 2172972); Shelford–Mt Mercer Rd, c. 5 km N of the Shelford–Rokewood Rd, 26.ix.2002, J.A. Jeanes 1223 & W.A. Gebert (MEL 2173005).

Distribution and habitat: Endemic to Victoria and apparently confined to the Victorian Volcanic Plain Region (Conn 1993), mostly in the vicinity of Derrinallum, Woorndoo, Willaura and Shelford, with numerous old collections from the basalt plains near Melbourne probably also referable to this species. Grows in tussock grassland on rich red-brown loams derived from basalt. Altitude: 20–150 m. (Fig. 2a)

Conservation status: Of limited distribution, not reserved and most likely endangered. Suggest 3E by criteria of Briggs and Leigh (1996) and Endangered (E) by criteria of IUCN (2011).

Flowering period: Late September to early November.

Pollination biology: The easily spreading perianth, functional viscidium, coherent pollen and sporadic production of seed capsules would suggest that this species is entomophilous.

Notes: *Thelymitra gregaria* is a distinctive species characterised by its grassland habitat, short, stocky, clumping habit, short, broad leaf and the large, freely opening dark purple or mauve flowers that have prominent darker longitudinal striations.

Several old pressed collections from the basalt plains to the west of Melbourne (particularly from St Albans) appear to be of this species, but since it is almost certainly extinct in the region, it is unlikely that this will ever be verified by the examination of living material.

Thelymitra gregaria is known to hybridise readily with *Thelymitra exigua* Jeanes wherever the two species grow together and, near the type locality, *T. gregaria* is also known to hybridise with *Thelymitra antennifera* (Lindl.) Hook.f., yielding plants with flowers indistinguishable from *Thelymitra x macmillanii* F.Muell.

2. *Thelymitra aggericola* D.L.Jones, *Orchadian* 12(11): 517 (1999)

Type: TASMANIA. Just S of Rebecca Ck, near Temma, 4.xi.1998, *D.L. Jones 16160*, *M. Garratt*, *L. Rubenach*, *J.E. & A. Wapstra* (holotype CANB 605802, isotypes CANBI, AD, HOI, MEL 2089289).

Illustrations: Jones *et al.* (1999) pages 260 & 262; Jones (2006) page 229.

Glabrous terrestrial *herb*. *Tubers* ovoid to obloid, 6–20 mm long, 3–6 mm wide, fleshy. *Leaf* linear to linear-lanceolate, 7–20(–30) cm long, 4–10(–15) mm wide, erect, curved, thin-textured to fleshy, canaliculate, dark green with a purplish base, ribbed abaxially, sheathing at base, apex acute. *Scape* 5–15(–30) cm tall, 1.2–2.8 mm diam., straight, green or purplish. *Sterile bract* usually solitary, rarely 2, linear-lanceolate, 1.5–3(–6) cm long, 4–7 mm wide, closely sheathing, green or purplish, acute to acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–15(–20) mm long, 3–7 mm wide, green or purplish, sheathing the pedicels. *Pedicels* 1.5–6 mm long, stout to slender. *Ovary* cylindrical to narrow-obovoid, 5–10 mm long, 2–3.5 mm wide. *Flowers* 1–7(–10), 20–30 mm across, usually white to pale blue, opening freely in warm weather. *Perianth segments* 8–14 mm long, 3.5–9 mm wide, concave, apex acute to obtuse, often shortly apiculate; *dorsal sepal* ovate; *lateral sepals* lanceolate to ovate, slightly asymmetric; *petals* ovate; *labellum* elliptic to oblanceolate, often shortly stalked, usually narrower than other segments. *Column* erect from the end of ovary, 4.5–6 mm long, 2–3.5 mm wide, white to pale blue or pink; *post-anther lobe* hooding the anther, 2.5–3 mm long, 1.3–2.5 mm wide, tubular, slightly inflated, gently curved through c. 90°, brownish, apex yellow or occasionally bright orange, shallowly bilobed, lobes irregular; *auxiliary lobes* often present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 1.3–2 mm long, digitiform, porrect at base, curved upwards, each with a toothbrush-like arrangement of white hairs along most of their length, the individual hairs 0.7–1 mm long. *Anther* inserted towards apex of column, ovoid, 2–2.8 mm long, 1.3–2 mm wide, the connective produced into a beak 0.5–0.7 mm long; *pollinarium* c. 2 mm long; *viscidium* more or less circular, c. 0.6 mm diam.; *pollinia* white with mealy, friable pollen. *Stigma* situated at base

of column, ovate-quadrate, c. 2 mm long, c. 2 mm wide, margins irregular. *Capsules* obovoid, 10–15 mm long, 4–6 mm wide, erect, ribbed. (Fig. 1b)

Selected specimens examined: TASMANIA. Arthur River, Rebecca Lagoon, 4.xi.1998, *H. & A. Wapstra* (HO 500051); Arthur River Road, Little Sundown Creek, 3.xi.1999, *H. & A. Wapstra JAJ675* (MEL 2172982); 11.2 km S of Arthur River, towards Temma, 4.xi.1998, *D.L. Jones 16149 & M. Garrett* (CANB 6057911); 10.7 km S of Arthur River, just S of Nelsons Bay River, 4.xi.1998, *D.L. Jones 16143 & M. Garrett* (CANB 6057851); 8.7 km S of Arthur River Bridge, towards Temma, 4.xi.1998, *D.L. Jones 16134*, *M. Garrett*, *H. Wapstra*, *A. Wapstra & L. Rubenach* (CANB 6057761); Rebecca Creek, 5.xi.1990, *D.L. Jones 7033 & C.H. Broers* (CANB 9614130); c. 3 km E of West Point, 5.xi.1990, *D.L. Jones 6995 & C.H. Broers* (CANB 9614092); Mount Brown, Storm Bay, 4.xii.1983, *A. Moscal 4627* (HO 401913); Tasman Peninsula, Mt Brown Reserve, 14.xii.1995, *H. Wapstra DLJ14738* (CANB 9609811); Recherche, xii.1901, *F.A. Rodway 8573* (AD 99405117).

Distribution and habitat: Apparently endemic to Tasmania, mostly in the north-western region near Arthur River, but also with a couple of disjunct collections from near-coastal areas of the south-east. Grows in shallow soil in pockets and crevices of rocky outcrops in low heathland, or occasionally in open heathland on shallow dark sandy loams. Altitude: 3–180 m. (Fig. 2b)

Conservation status: Rare overall but sometimes locally common and conserved. Suggest 3RC by criteria of Briggs and Leigh (1996) and Near Threatened (NT) by criteria of IUCN (2011).

Flowering period: October to December.

Pollination biology: In spite of the freely opening flowers, the abundance of seed capsules produced by this species would suggest that it is facultatively autogamous.

Notes: *Thelymitra aggericola* is readily distinguished from all other related species by a combination of features including its generally short stature, strongly curved leaf that is often as long as or longer than the inflorescence and the rather small, pale-coloured, freely opening flowers.

3. *Thelymitra granitora* D.L.Jones & M.A.Clem., *Orchadian* 12(7): 326 (1998)

Type: WESTERN AUSTRALIA. Near Torbay Hill, Torbay, 18.x.1988, *D.L. Jones 3250*, *M.A. Clements & R. Heberle* (holotype CANB 8806912, isotype PERTH!).

Illustrations: Jones & Clements (1998a) page 328; Hoffman & Brown (1998) page 264; Jones (2006) page 235; Brown *et al.* (2008) page 329, C; Hoffman & Brown (2011) page 318.

Glabrous, usually clumping, terrestrial *herb*. *Tubers* ovoid to obloid, 1–2 cm long, 5–8 mm wide, fleshy. *Leaf* linear-lanceolate, 7–15 cm long, 5–13 mm wide, erect at base, strongly curved away from inflorescence, canaliculate, fleshy, dark green to purplish with a purplish base, ribbed abaxially, sheathing at base, apex acute. *Scape* 6–20 cm tall, 1.5–3 mm diam., stout, straight, often pruinose, green or purplish. *Sterile bracts* 1–3, linear-lanceolate, 2–6.5 cm long, 4–9 mm wide, closely sheathing, acute to acuminate, green to purplish, often pruinose. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–30 mm long, 3–8 mm wide, sheathing the pedicel, green to purplish, often pruinose. *Pedicels* 3–9 mm long, slender. *Ovary* narrow-obovoid, 5–10 mm long, 1.5–3.5 mm wide. *Flowers* 2–8, 17–35 mm across, usually pale blue or white, opening only in hot weather. *Perianth segments* 7–17 mm long, 2–5 mm wide, concave, sometimes shortly apiculate, distal margins often incurved; *dorsal sepal* narrowly oblong-ovate, acute; *lateral sepals* narrowly oblong-ovate, slightly asymmetric, acute to acuminate; *petals* narrowly oblong-obovate, acute; *labellum* narrowly oblong-obovate, acute, often slightly smaller than other segments. *Column* erect from the end of ovary, 6–7.5 mm long, 2.5–3 mm wide, white to pale blue; *post-anther lobe* hooding the anther, 1.5–2.5 mm long, 1.5–2.5 mm wide, tubular, slightly inflated, more or less erect at base, gently curved, narrowed at base where dark blue, expanded distally into a rounded hood, apex shallowly bilobed, yellow; *auxiliary lobes* absent; *lateral lobes* converging, 1.3–1.8 mm long, 0.4–0.6 mm wide at base, narrowing and digitiform in the distal two-thirds, erect or porrect at base, curved upwards, each with a dense toothbrush-like arrangement of white hairs along upper $\frac{1}{2}$ to $\frac{3}{4}$ of their length, the individual hairs 0.8–1 mm long. *Anther* inserted about midway along column, ovoid, 2.5–3 mm long, 1.3–2 mm wide, connective produced into a beak 0.6–0.8 mm long; *pollinarium* 1.8–2.2 mm long; *viscidium* elliptic, c. 0.3 mm long; *pollinia* white with friable, mealy pollen. *Stigma* situated at base of column, quadrate, c. 2.5 mm long, c. 2.5 mm wide, margins entire or slightly irregular. *Capsules* obovoid, 10–16 mm long, 4–6 mm wide, erect, ribbed. (Fig. 1c)

Specimens examined: WESTERN AUSTRALIA. Cape Leeuwin, 2.x.1982, *G.J. Keighery* 5356 (PERTH 271977); Eyre District: Coastal granite headlands overlooking mouth of the Thomas River, 15.ix.1996, *C.J. French* 281 (CANB 627194); South Coast. Recherche Archipelago. Pasco Island, 12.xi.1950, *J.H. Willis s.n.* (MEL 114557); Summit of Mt Belches on Duke of Orleans Bay, c. 42 miles (67 km) E of Esperance, 30.xi.1950, *J.H. Willis s.n.* (MEL 1549685); Cape Leeuwin near old waterwheel, 22.x.2000, *J.A. Jeanes* 867 & *C. French* (MEL 2093582, MEL 2093583 & PERTH); Darling District: 12.9 km SW from Boyup Brook on road to Bridgetown, 9.x.1991, *D.L. Jones* 8276 (CANB 610411); Nature Reserve on Highway #1 c. 0.9 km E of Tindale Road; c. 34 km W of Denmark by road, 4.x.2001, *J.A. Jeanes* 1165 & *S.A. Jeanes* (MEL 2172938, MEL 2172939 & PERTH).

Distribution and habitat: South-western Western Australia mostly in a near-coastal strip between Margaret River and Israelite Bay, with disjunct more inland occurrences near Pinjarra and Boyup Brook. Grows in shallow soil in pockets and crevices of granite outcrops on coastal headlands or rarely further inland. Soils are dark loams and gravelly loams derived from granite. Altitude: 10–50 m. (Fig. 2c)

Conservation status: Widespread, sometimes locally common and conserved.

Flowering period: September to October.

Pollination biology: This species is apparently facultatively autogamous.

Notes: *Thelymitra granitora* is characterised by its clumping habit, short curved leaves, short stout inflorescence and relatively large white to pale blue flowers that open tardily.

4. *Thelymitra petrophila* Jeanes, *sp. nov.*

Type: WESTERN AUSTRALIA. Coolgardie District: Ularring Rock, SW of Menzies on road to Mulline, 26.ix.1991, *D.L. Jones* 7945, *C.H. Broers*, *M.A. Clements* & *B.E. Jones* (holotype CANB 9609547; isotypes AD 99642411, BRI 660020, MEL 250472, PERTH 4563697 & NSW!).

Illustrations: Hoffman & Brown (1998) page 268 (as *Thelymitra* aff. *macrophylla*); Brown *et al.* (2008) page 333, A; Hoffman & Brown (2011) page 324.

Solitary or clumping, glabrous, terrestrial *herb*. *Tubers* ovoid, 1–2.5 cm long, 5–10 mm wide, fleshy. *Leaf* linear to linear-lanceolate, 10–30(–60) cm long, 4–8(–12) mm

wide, erect, canaliculate, leathery, ribbed abaxially, light green with a purplish base, sheathing at base, apex acute to acuminate. *Scape* 10–40(–70) cm tall, 1–3.5 mm diam., straight, green to purplish. *Sterile bracts* usually 2, occasionally 3, linear to linear-lanceolate, 1.5–7 cm long, 3–10 mm wide, closely sheathing, acute to acuminate, green to purplish. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–22 mm long, 3–6 mm wide, sheathing the pedicels, green to purplish. *Pedicels* 2–10 mm long, slender. *Ovary* cylindrical to narrow-obovoid,

5–10 mm long, 1–3 mm wide. *Flowers* 2–10(–15), (15–)20–30(–40) mm across, usually pale blue to mauve, sometimes pink, opening freely in warm weather. *Perianth segments* (7–)10–15(–20) mm long, 3–8 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate, obtuse to subacute; *lateral sepals* lanceolate to ovate, slightly asymmetric, acute to obtuse; *petals* ovate, obtuse to subacute; *labellum* narrow-ovate to lanceolate, acute, often smaller than other segments. *Column* erect from the end of ovary, (4–)5–7 mm long, 2–4 mm wide,



Figure 1. **a.** *Thelymitra gregaria* Derrinallum, Vic. (photograph by J.A. Jeanes); **b.** *T. aggericola*, Arthur River, Tas. (photograph by J.A. Jeanes); **c.** *T. granitora*, Walpole, WA (photograph by J.A. Jeanes); **d.** *T. petrophila*, Brookton, WA (photograph by J.A. Jeanes); **e.** *T. fragrans*, Gibraltar Range N.P., NSW (photograph by J.A. Jeanes); **f.** *T. queenslandica*, Herberton Range, Qld (photograph by B. Gray)

white to pale blue or pale pink; *post-anther lobe* hooding the anther, 2.5–3.5 mm long, 1.4–2.5 mm wide, tubular, inflated, gently curved, brown to orange or reddish, apex entire or emarginate, sometimes yellow, distal margin undulate; *auxiliary lobes* often present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 1–1.5 mm long, digitiform, porrect at base, curved upwards sharply at about the middle, each with a short toothbrush-like arrangement of white hairs along the upper ½ to ¾ of

their length, the individual hairs 0.6–1 mm long. *Anther* inserted about mid-way along column, ovoid, 2.5–3.5 mm long, 1.5–2 mm wide, connective produced into a beak 0.3–0.8 mm long; *pollinarium* 1.8–2.5 mm long; *viscidium* more or less circular, 0.5–0.7 mm diam., often thrust forward; *pollinia* white with coherent pollen. *Stigma* situated at base of column, ovate-quadrate, 1.5–2.5 mm long, 1.2–2.2 mm wide, margins irregular. *Capsules* obovoid, 8–15 mm long, 4–7 mm wide, erect, ribbed. (Fig. 1d)

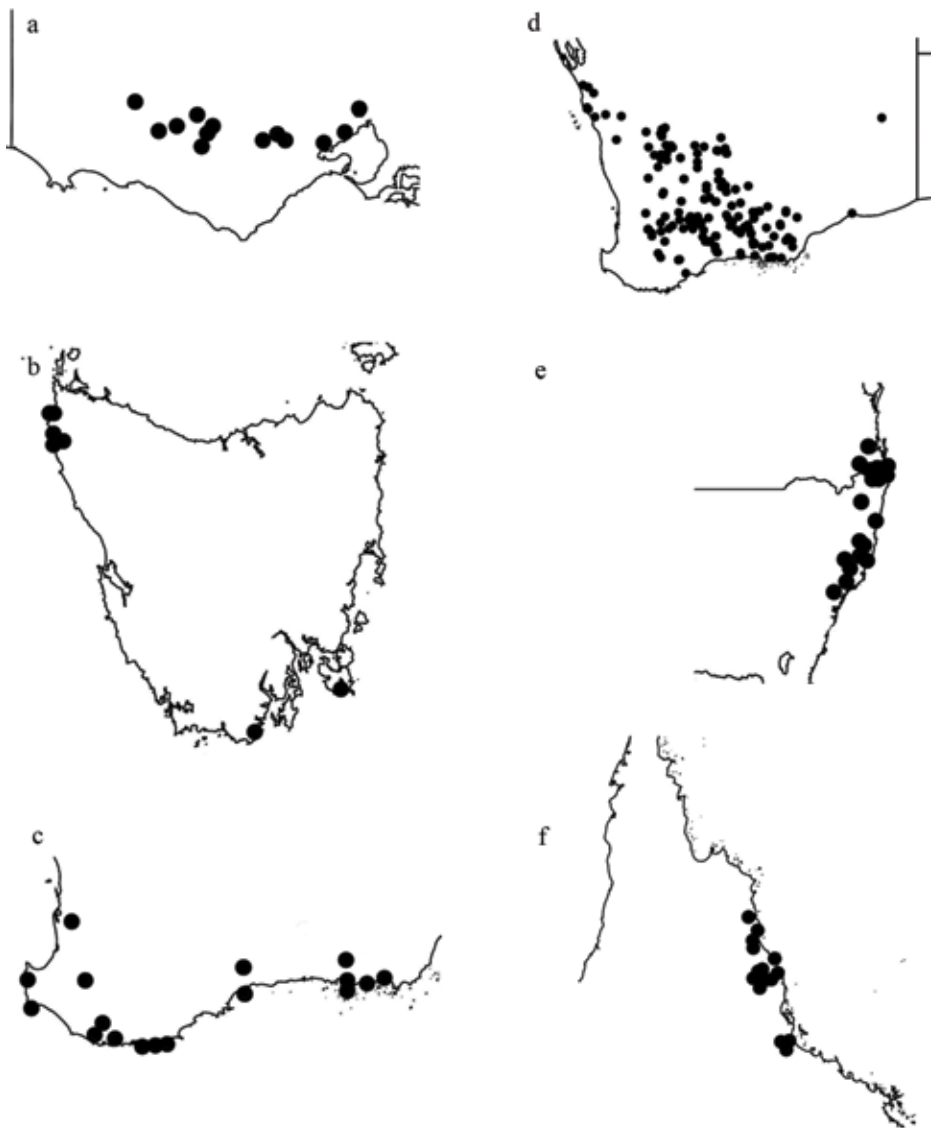


Figure 2. Distribution of **a.** *Thelymitra gregaria*; **b.** *T. aggericola*; **c.** *T. granitora*; **d.** *T. petrophila*; **e.** *T. fragrans*; **f.** *T. queenslandica*

Selected specimens examined: WESTERN AUSTRALIA.

Coolgardie District: False Duck Rock 1, 31.2 km SE of Hyden on road to Lake King, 28.ix.1991, *D.L. Jones 8008, C.H. Broers, M.A. Clements & B.E. Jones* (CANB 9609609); Roe District: Pallarup Rock, c. 20 km S of Lake King beside road to Ravensthorpe, 12.x.1988, *D.L. Jones 3013 & M.A. Clements* (CANB 8806676, BRI, NSW, MEL 2045546, AD 99541006 & PERTH); Roe District: c. 3.5 km N of Salmon Gums, beside road to Norseman, 24.ix.1991, *D.L. Jones 7887, C.H. Broers, M.A. Clements & B.E. Jones* (CANB 9609491); Coolgardie District: Dundas Rocks, c. 19.8 km S of Norseman, 2 km E of road to Esperance, 24.ix.1991, *D.L. Jones 7872, C.H. Broers, M.A. Clements & B.E. Jones* (CANB 9609479, PERTH 4563670); Coolgardie District: Grahams Rock c. 15 km E of Hyden, 1.x.2001, *J.A. Jeanes 1160 & S.A. Jeanes* (MEL 2172925, MEL 2172927 & PERTH); Coolgardie District: The Humps c. 15 km NE of Hyden, 30.ix.2001, *J.A. Jeanes 1159 & S.A. Jeanes* (MEL 2172924, MEL 2172926 & PERTH); Roe District: Peak Charles, c. 100 km SW of Norseman, 11.x.1988, *D.L. Jones 3001 & M.A. Clements* (CANB 8806664); Coolgardie District: Keys Rocks, c. 21.5 km SW of Norseman Post Office, 1.x.2000, *B. Archer 1662* (MEL 2067962 & MEL 2067963).

Distribution and habitat: Endemic to Western Australia. Found in drier inland areas throughout the Wheatbelt and Goldfields regions, and also extending into the Great Victorian Desert. Usually grows in shallow pockets of soil on granite rock outcrops, often in association with *Borya* species (Pincushions), but also occurs on laterite, ironstone and limestone. Sometimes found in tall mallee heathland and inland dune country in mulga scrub. Altitude: 200–600 m. (Fig. 2d)

Conservation status: Widespread, often locally common and well conserved.

Flowering period: Late August to October.

Pollination biology: The easily spreading perianth, scented flowers, functional viscidium, coherent pollen and sporadic production of seed capsules would suggest that this species is entomophilous.

Notes: *Thelymitra petrophila* has a proportionately very long leaf, compared with most other related species, the apex of which often (but not always) reaches the lowest flower and sometimes exceeds the entire inflorescence.

Natural hybrids with *Thelymitra campanulata* Lindl. have been observed.

Etymology: Greek *petra*, rock; *phileo*, to love; in reference to the affinity this species has for rock outcrops.

5. *Thelymitra fragrans* D.L.Jones & M.A.Clem., *Austrobaileya* 2(5): 550–52, f. 2 C & D (1988)

Type: QUEENSLAND. Moreton District: O'Reilly's property, Green Mountains, in clumps of *Dendrobium kingianum* on exposed escarpments, 14.ix.1987, *C. Harman s.n.* (holotype BRI!, isotypes AD!, BRI!, CANB 8804417, NSW 465647, PERTH 01553089).

Illustrations: Jones & Clements (1988) page 551, C & D; Bishop (1996) Plate 69; Jones (2006) page 229.

Glabrous terrestrial *herb*. *Tubers* ovoid to obovoid, 2–5 cm long, 1–2 cm wide, fleshy. *Leaf* linear-lanceolate to lanceolate, 10–30 cm long, 5–22 mm wide, usually flaccid, shallowly canaliculate or more or less flat, thin-textured, bright green, glossy, ribbed abaxially, sheathing at base, apex acute to acuminate. *Scapes* 15–35 cm tall, 1.2–3.5 mm diam., slender, straight, green or purplish. *Sterile bracts* usually 2, rarely 1 or 3, linear to linear-lanceolate, 1.5–6 cm long, 4–10 mm wide, closely sheathing throughout, acute to acuminate, green or purplish. *Fertile bracts* lanceolate-acuminate to oblanceolate-acuminate, 4–21 mm long, 2.5–6 mm wide, sheathing the pedicels, green or purplish. *Pedicels* 6–18 mm long, slender. *Ovary* cylindrical to narrow-obovoid, 5–12 mm long, 1–3 mm wide. *Flowers* 2–11, 21–36 mm across, usually pale blue, pink or mauve, rarely white, opening readily in warm weather, with a strong, spicy fragrance. *Perianth segments* 10–18 mm long, 4–8.5 mm wide, concave, often apiculate; *dorsal sepal* elliptic to ovate, obtuse to subacute; *lateral sepals* elliptic to ovate, often slightly asymmetric, obtuse to acute; *petals* ovate, obtuse to subacute; *labellum* obovate to oblanceolate, obtuse to subacute, often slightly smaller than other segments. *Column* erect from the end of ovary, 4.5–6 mm long, 2.2–3.5 mm wide, white to pale blue or pinkish; *post-anther lobe* hooding the anther, 2–3 mm long, 1.5–2.5 mm wide, tubular, inflated, brown, apex prominently bilobed with a notch 1–2 mm deep, lobes spreading, yellow or orange; *auxiliary lobes* absent; *lateral lobes* converging, 1–1.2 mm long, digitiform, fleshy, porrect, curving gently upwards, each with a short toothbrush-like arrangement of white hairs along the distal half, the individual hairs 1–1.5 mm long. *Anther* inserted near middle of column, ovoid, 2.3–3 mm long, 1.5–2.2 mm wide, connective produced into

a beak 0.4–0.6 mm long; *pollinarium* 1.9–2.4 mm long; *viscidium* more or less circular, 0.4–0.6 mm diam.; *pollinia* white with coherent pollen. *Stigma* situated near base of column, ovate-quadrate, 1.5–2.2 mm long, 1.5–2.7 mm wide, margins irregular. *Capsules* obovoid, 6–16 mm long, 4–6 mm wide, erect, ribbed. (Fig. 1e)

Selected specimens examined: QUEENSLAND. Moreton district: Brisbane Forest Park, Northbrook Mt, 6.ix.1985, *R. Crane 69* (CANB 8601136); Moreton district: Brisbane Forest Park, Northbrook Mt, 14.ix.1985, *R. Crane 74A* (CANB 8601142); Darling Downs: Mt Huntley, western slopes, 4.x.1992, *P.I. Forster PIF11842*, *D. Halford & R. Reilly* (BRI 547134); Darling Downs: c. 1 km ENE of Gambubal Forest Station, E of Warwick, 6.x.1996, *A.R. Bean 10973* (BRI 641692); McPherson Ranges, x.1932, *T. Green s.n.* (MEL 651023); Moreton district: Mt Ballow National Park, 7.x.1995, *R. Crane 1464* (BRI 584003); Moreton district: Mount Ernest near Aratula, 11.ix.1989, *G. Leiper s.n.* (BRI 447085); Burleigh Heads, ix.1934, *C.P. Ledward s.n.* (NSW 190318); Mt Ballow, ix.1949, *T.E. Hunt s.n.* (NSW 10467). **NEW SOUTH WALES.** 0.5 km from start of Perlite Drive, Whian Whian State Forest, 28.ix.1989, *A.D. Bishop J86/11-21* (NSW 274058); Rummerys Rd, 0.5 km N of Rocky Creek, Whian Whian State Forest, 3.x.1992, *A.D. Bishop J228/23-24* (NSW 429581); North Coast: Minyon Falls, 26 km NNE of Lismore, 28.ix.1973, *I.R. Telford 3293* (CANB 8202224); North Coast: 2 km N of Peach Mountain, NNE of Lismore, 29.ix.1973, *I.R. Telford 3319* (CANB 8202226); North Coast: Comboyne, 28.ix.1966, *E. Todd s.n.* (CANB 8104452); North Coast: Coramba Mountain, c. 10 miles NW of Coffs Harbour, 9.ix.1958, *L.W. Archer s.n.* (NSW 437714); Wilson River, 13.x.1958, *B.M. Borger s.n.* (NSW 190462); Orara, 16.ix.1959, *L.W. Archer s.n.* (NSW 190463); Gloucester Bucketts, ix.1897, *J.H. Maiden s.n.* (NSW 190467); South Brother, Port Macquarie, 14.ix.1959, *B.M. Borger s.n.* (NSW 190471).

Distribution and habitat: North-eastern New South Wales and south-eastern Queensland. Grows on rocky escarpments and rocky slopes in open forest, often near streams, usually in association with clumps of the lithophytic orchid *Thelychiton kingianus* (Bidw. ex Lindl.) M.A.Clem. & D.L.Jones. Altitude: 100–1200 m. (Fig. 2e)

Conservation status: Widespread, often locally common and well conserved.

Flowering period: August to October.

Pollination biology: The large, freely opening, strongly scented flowers, functional viscidium, coherent pollen and sporadic capsule production would suggest that this species is entomophilous.

Notes: *Thelymitra fragrans* can be distinguished from other members of the *T. nuda* complex by a combination

of features including its very long, thin-textured leaf, usually two sterile bracts, moderately large scented flowers and deeply v-notched post-anther lobe on the column. The flowers apparently mimic those of co-flowering *T. kingianus* with which it usually grows.

6. *Thelymitra queenslandica* Jeanes, *sp. nov.*

Type: QUEENSLAND. Cook District: c. 10 km W of Herberton towards Petford, 4.vii.2002, *D.L. Jones 18503* (holotype MEL 2173012; isotype CANB).

Illustrations: Dockrill (1992) vol. 1, page 171 (as *T. nuda*); Jones (2006) page 232.

Glabrous terrestrial *herb*. *Tubers* ovoid, 1–3 cm long, 5–15 mm wide, fleshy. *Leaf* linear to linear-lanceolate, 15–50 cm long, 5–15 mm wide, erect, canaliculate at base, thin-textured, dark green with a purplish base, ribbed abaxially, sheathing at base, apex acute. *Scape* 20–60 cm tall, 1.3–3.5 mm diam., slender, straight, green to purplish. *Sterile bracts* usually 3, sometimes 2 or 4, linear to linear-lanceolate, 1.5–11 cm long, 3–11 mm wide, closely sheathing, acute to acuminate, green to purplish. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–26 mm long, 3–8 mm wide, sheathing the pedicels, green to purplish. *Pedicels* 0–11 mm long, slender. *Ovary* cylindrical to narrow-obovoid, 6–13 mm long, 1.5–3.5 mm wide. *Flowers* 4–15, (20–)25–35(–40) mm across, usually dark blue to purplish, occasionally lilac, pink or white, opening freely in warm weather. *Perianth segments* (10–)12–17(–20) mm long, 5–10 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate, obtuse to subacute; *lateral sepals* lanceolate to ovate, slightly asymmetric, acute; *petals* ovate, obtuse to subacute; *labellum* elliptic to oblanceolate, acute, usually narrower than other segments. *Column* erect from the end of ovary, (5–)6–7 mm long, 3–4 mm wide, pale blue to pinkish; *post-anther lobe* hooding the anther, 3.5–4 mm long, 2–3.5 mm wide, tubular, inflated, gently curved through c. 90°, pale to dark brown, apex yellow, bilobed, lobes irregular, to c. 1.5 mm long; *auxiliary lobes* often present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 1.2–1.7 mm long, digitiform, porrect at base, curved upwards, each with a more or less terminal mop-like arrangement of white or pink hairs along their upper

half, the individual hairs 1–1.5 mm long. *Anther* inserted about mid-way along column, ovoid, 2.5–3.5 mm long, 1.5–2.7 mm wide, connective produced into a beak 0.6–1 mm long; *pollinarium* 2–3 mm long; *viscidium* more or less circular, 0.5–0.8 mm diam.; *pollinia* white with coherent pollen. *Stigma* situated at base of column, ovate-quadrangle, 2.2–3 mm long, 1.8–3 mm wide, margins irregular. *Capsules* obovoid, 10–20 mm long, 5–8 mm wide, erect, ribbed. (Fig. 1f)

Selected specimens examined: QUEENSLAND. Herberton Range, viii.1996, *D.L. Jones* ORG2620 (CANB 609329); Herberton Range, viii.1996, *D.L. Jones* 14840 (CANB 611759); Cook District: Herberton Range, 26.viii.1988, *L. Lawler* 22 (CANB 8807166); Cook District: Herberton Range, north, 4.vii.1983, *D.L. Jones* 1187 (CANB 609381); Cook District: Herberton Range, towards Irvinebank, N side of road, 22.viii.1997, *D.L. Jones* 15168 (CANB 618158); Mt Bartle Frere, N slope of South Peak, 8.vi.1985, *A.M. Buchanan* 7033 (HO 91561); Ravenshoe, 6.ix.1958, *K. Wadsworth, J.H. Wilkie, S.F. St Cloud & A.W. Dockrill* s.n. (QRS 44584); Cook District: Baal Gammon, Toy Creek, 3.vi.1997, *P.I. Forster* PIF21217, *R. Booth & R. Jensen* (BRI 655342); North Kennedy District: 17.4 km W of Ivy Teahouse, Paluma-Hidden Valley Road, 21.viii.1994, *J. Kemp* 561H & *A. Kutt* (BRI 632392); 8 km E of Hidden Valley on Paluma Road, 18.viii.1984, *K. Hill* 1156 (NSW 462475 & MEL 2172929); Cook District: Mt Lewis Road near Mt Spurgeon, 28.1 km from Rex Highway, 20.viii.1986, *P.H. Weston* 776 (NSW 395239, MEL 2172923 & AD).

Distribution and habitat: North Queensland between Cairns and Townsville. Grows in grassland, grassy/shrubby woodland and open forest, usually on well-drained stony skeletal brown loams or sandy loams. Altitude: 200–1200 m. (Fig. 2f)

Conservation status: Poorly known, but probably reasonably widespread and conserved.

Flowering period: Mostly from June to September.

Pollination biology: The easily spreading perianth, functional viscidium, coherent pollen and sporadic production of seed capsules would suggest that this species is entomophilous.

Notes: *Thelymitra queenslandica* is readily distinguished from all other members of the *T. nuda* complex by its northern distribution, early flowering period, long narrow leaf that often reaches the lowest flower and sometimes exceeds the entire inflorescence, usually three sterile bracts and the hair tufts on the lateral lobes that are concentrated along the distal half in a mop-like arrangement.

Etymology: From the Australian State of Queensland where this species is apparently endemic.

7. *Thelymitra alcockiae* D.L. Jones ex Jeanes, sp. nov.

Type: SOUTH AUSTRALIA. South-east Region: c. 20 km NE of Naracoorte, 20.x.1997, *K. Alcock* DLJ15611 (holotype CANB 9908909; isotype AD).

Illustrations: Jeanes & Backhouse (2006) page 216, A & B (as *Thelymitra* sp. aff. *megcalyptra* 1); Bates (2011) pages 7 & 8.

Glabrous, somewhat glaucous terrestrial *herb*. *Tubers* ovoid, 1–2.5 cm long, 0.6–1 cm wide, fleshy. *Leaf* linear to linear-lanceolate, 8–25(–40) cm long, 5–10 mm wide, erect, canaliculate, green, grading to reddish purple towards base, ribbed abaxially, sheathing at base, apex acute to acuminate. *Scape* 10–40(–60) cm tall, 1–3.5 mm diam., slender to stout, straight, straw-coloured to purplish. *Sterile bracts* usually 2, sometimes 1, rarely 3, linear to linear-lanceolate, 1.5–7 cm long, 3–8 mm wide, closely sheathing, usually purplish, acute to acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–20 mm long, 3–7 mm wide, sheathing the pedicels, usually purplish. *Pedicels* 1–15 mm long, slender. *Ovary* cylindrical to narrow-obovoid, 5–12 mm long, 1–3.5 mm wide. *Flowers* 2–8(–12), (15–)19–30 mm across, pink, mauve, pale blue to deep purplish blue, rarely white, sweetly scented, opening freely in warm weather. *Perianth segments* (8–)10–16 mm long, 4–8 mm wide, concave, apex acute to obtuse, often shortly apiculate; *dorsal sepal* ovate; *lateral sepals* ovate-lanceolate to ovate, slightly asymmetric; *petals* ovate; *labellum* lanceolate to ovate-lanceolate, slightly smaller than other segments. *Column* erect from the end of ovary, 4–6.5 mm long, 2.5–3.5 mm wide, pale blue to pinkish; *post-anther lobe* hooding the anther, 3–4 mm long, 2–2.5 mm wide, tubular, inflated, gently curved through c. 90°, brown, apex yellow, shallowly v-notched, margin of notch and apex irregularly undulate or toothed; *auxiliary lobes* often present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 1–1.5 mm long, digitiform, porrect at base, bent upwards at c. 90° near the middle, each with a toothbrush-like arrangement of white hairs along

upper $\frac{1}{2}$ to $\frac{3}{4}$ of their length, the individual hairs 0.5–1 mm long. *Anther* inserted about mid-way along column, ovoid, 2–3 mm long, 1.5–2 mm wide, connective produced into a beak 0.3–0.5 mm long; *pollinarium* 2–2.5 mm long; *viscidium* more or less circular, c. 0.6 mm diam.; *pollinia* white with coherent pollen. *Stigma* situated at base of column, ovate-quadrangle, 2–2.5 mm long, 2–2.5 mm wide, margins irregular. *Capsules* obovoid, 10–20 mm long, 4–7 mm wide, erect, ribbed. (Fig. 3a)

Selected specimens examined: SOUTH AUSTRALIA. Northern Eyre Peninsula. Gawler Range; Yandinga Gorge, c. 37 km NNE of Minnipa, 26.ix.1969, A.E. Orchard 2222 (AD 96947076); Northern Flinders Range. Wilpena Pound; c. 40 km NNE of Hawker, 11.ix.1957, H. Goldsack 808 (AD 97631551); 90 Mile Desert, Mt Shaugh National Park, 2.x.1977, C.R. Alcock 5655 (AD 98563933); Yorke Peninsula. Muloowurtie Conservation Reserve, 2.ix.1999, D.L. Jones 16612 & M. Garratt (CANB 607203); Yorke Peninsula. 34 miles from Yorketown towards Stenhouse Bay, 18.x.1966, M.E. Phillips s.n. (CANB 039911); Yorke Peninsula. Innes National Park, 21.x.1976, A. Robinson s.n. (AD 97648014); Lower Murray Mallee. MacDonald Reserve, Chaunceys Line, c. 20 km SW of Murray Bridge, 21.ix.1963, J.B. Cleland s.n. (AD 97311233); Northern Eyre Peninsula. Gawler Range c. 190 km W of Port Augusta, 13.ix.1938, E.H. Ising s.n. (AD 96935207); Eyre Peninsula. Hundred of Koppio, c. 30 km N of Port Lincoln, 18.ix.1964, M.G. Clarke s.n. (AD 98839126); Eyre Peninsula. Hundred of Blesing, c. 8 km S of Bascombe Well Homestead, 5.x.1967, N.N. Donner 2264 (AD 96817141); Kangaroo Island. 4.1 km SW of Penneshaw P.O., 13.xi.1989, P. Canty, S. Kinnear & B. Overton NPK140527 (AD 99009001); 90 Mile Desert, environs of Comet Bore, 3.x.1977, C.R. Alcock 5728 (AD 98563513). **VICTORIA.** Mallee. 15 km SW of Rainbow, just to NW of Lake Hindmarsh, 14.x.1970, T.B. Muir 4844 (MEL 518813, MEL 2039680 & CANB 330129); Little Desert. By main N-S track 2.5 km S of Little Desert National Park and 27 km S of Kiata, 4.xi.1978, T.B. Muir 6315 (MEL 565910); Sunset Country. 28 miles W of the road junction 14 miles N of Birthday Tank, 25.ix.1965, R. Filson 7436 (MEL 114562); Sunset Country. Rock Hole Bore, ix.1963, N. Wettenhall 12 (MEL 593647); Mallee. Sea Lake district, x.1912, J.C. Goudie s.n. (AD 97725201 & AD 97725193); Mallee. Wyperfeld, x.1965, P. Holland W28 (CANB 176787); Little Desert, between Booroopki and Kaniva, 2.xi.1971, M.E. Phillips 420 (CANB 048586); Mallee. W side of hill, on E side of Calder Highway, between 317 & 318 mile posts, 25.viii.1951, E. Ramsay s.n. (MEL 1532669); Little Desert. Near fringe SE of Kaniva, x.1949, A.C. Beauglehole 18785 (MEL 1530150); Wimmera, 1893, W.E. Matthews s.n. (MEL 114405 & MEL 114391); North-west Victoria, 1895, M. Kentish s.n. (MEL 1549678).

Distribution and habitat: Found mostly in South Australia in the Eyre Peninsula, Yorke Peninsula, Flinders Ranges, Northern Lofty, Southern Lofty, Kangaroo Island, Murray Basin and South East Regions, but also extending to the Victorian Murray Mallee, Lowan Mallee and Wimmera Regions (Conn 1993). Grows in dry lowland areas, often in woodlands or mallee scrublands. Soils are usually well drained sands or sandy loams often over limestone. Altitude: 5–200 m. (Fig. 4a)

Conservation status: Widespread, sometimes locally common and well conserved.

Flowering period: Late August to October.

Pollination biology: The scented flowers, readily spreading perianth, functional viscidium, coherent pollen and sporadic production of seed capsules would suggest that this species is entomophilous.

Notes: The great variation displayed by *Thelymitra alcockiae* over its range, as well as its wide choice of habitats, is suggestive of there being more than one taxon involved. However, based on the preserved specimens, there would appear to be nearly as much variation within populations as between them. Segregate taxa cannot be isolated at this time as there is no apparent consistent correlation between morphology, plant size, flowering time and habitat over the range of the species.

Etymology: Named after Kath Alcock (1925–), botanical artist and field naturalist with an extraordinary knowledge of the natural history of the Australian bush. Kath has assisted me considerably in my work on *Thelymitra*, and collected the type material of this species.

8. *Thelymitra imbricata* D.L.Jones & M.A.Clem., Contributions to Tasmanian Orchidology–8, *Austral. Orchid Res.* 3: 186–7 (1998)

Basionym: *Thelymitra nuda* R.Br. var. *grandiflora* Lindl., *Gen. sp. orchid. pl.* 520 (1840).

Type: TASMANIA. Circular Head, xi.1837, R. Gunn 940 (lectotype specimen 20b, K-LI, *fide* Clements 1989; isolectotype BM!, K!, FI!, P!).

Thelymitra megcalyptra sensu W.M. Curtis, *Student's Fl. Tasmania* 4A 43 (1979), *non* Fitzg.

Illustrations: Jones *et al.* (1999) page 273; Jones (2006) page 230.

Glabrous terrestrial *herb*. *Tubers* ovoid, 1–3 cm long, 5–13 mm wide, fleshy. *Leaf* linear to linear-lanceolate, 15–30 cm long, 5–18 mm wide, erect, canaliculate, fleshy, light green with a purplish base, ribbed abaxially, sheathing at base, apex acute. *Scape* 15–60 cm tall, 1.5–3 mm diam., slender, straight, light green, straw-coloured or purplish. *Sterile bracts* usually 2, linear to linear-lanceolate, 2.5–8 cm long, 4–8 mm wide, closely sheathing, acute to acuminate, green or purplish. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–20 mm long, 3–7 mm wide, sheathing the pedicel, green or purplish. *Pedicels* 2–12 mm long, stout to slender. *Ovary* cylindrical to narrow-obovoid, 4–10 mm long, 1.5–4 mm wide. *Flowers* 3–15, (19–)25–35 mm across, usually pale purplish blue, opening freely in warm weather. *Perianth segments* (8–)12–20 mm long, 5–10 mm wide, concave, imbricate in open flowers, apex acute to obtuse, often shortly apiculate; *dorsal sepal* ovate; *lateral sepals* lanceolate to ovate, slightly asymmetric; *petals* ovate; *labellum* elliptic to oblanceolate, often stalked, usually narrower than other segments. *Column* erect from the end of ovary, 5–7 mm long, 2.5–3.5 mm wide, pale blue to pinkish; *post-anther lobe* hooding the anther, 3–3.5 mm long, 1.8–2.2 mm wide, tubular, inflated, gently curved, brown or brownish orange with a narrow blue collar, apex v-notched, yellow, lobes toothed; *auxiliary lobes* often present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 1.5–2 mm long, digitiform, porrect at base, curved sharply upwards, each with a dense toothbrush-like tuft of white hairs, the individual hairs 0.7–1 mm long. *Anther* inserted towards apex of column, ovoid, 2.5–3.2 mm long, 1.5–2 mm wide, the connective produced into a beak 0.5–0.6 mm long; *pollinarium* 2–2.6 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* white with coherent pollen. *Stigma* situated at base of column, ovate-quadrate, c. 2.5 mm long, c. 2 mm wide, margins irregular. *Capsules* obovoid, 10–15 mm long, 4.5–6 mm wide, erect, ribbed. (Fig. 3b)

Selected specimens examined: TASMANIA. Howrah Hills, 26.x.1998, *D. Randall* s.n. (HO 500013); Conara, Midland Highway near church, 18.xi.1998, *H. & A. Wapstra* s.n. (HO 500102); Conara, track to old church, 18.xi.1998, *J.E. Wapstra* ORG1945 & *A. Wapstra* (CANB 610454); Conara Junction, 18.xi.1998, *J.E. Wapstra* ORG1830 (CANB 610402); Conara, just north of railway crossing, 27.xi.1996, *H. & A. Wapstra* s.n. (HO 329537); Campbell Town Golf Course, 28.xi.1995, *H. & A. Wapstra* s.n. (HO 500107);

Campbell Town Golf Course, 21.xi.1995, *H. Wapstra* DLJ14685 (CANB 9609758); Campbell Town Golf Course, 5.xi.1998, *D.L. Jones* 16181 & *M. Garratt* (CANB 605821); Conara, Midland Highway, 27.xi.1996, *J.E. Wapstra* ORG460 (CANB 610405 & HO 500101); Maranoa Heights, Kingston, 11.xi.1996, *J.E. Wapstra* ORG441 (CANB 610404); Conara, 14.xi.1999, *H. & A. Wapstra* JAJ692 (MEL 2172980); Campbell Town Golf Course, 8.xi.2000, *H. Wapstra* JAJ945 (MEL 2087452 & MEL 2089307).

Distribution and habitat: Northern and eastern Tasmania from Circular Head to near Hobart, with most recent collections coming from the Midlands Region in the vicinity of Campbell Town. Grows in heathy open forest, scrubland or grassland on well-drained sand and sandy loams. Altitude: 0–200 m. (Fig. 4b)

Conservation status: Not recorded for any biological reserves and poorly known overall. Recommend 3K by criteria of Briggs and Leigh (1996) and Data Deficient (DD) by criteria of IUCN (2011).

Flowering period: Late October to early December.

Pollination biology: The large, freely opening flowers and sporadic production of seed capsules would suggest that this species is most likely entomophilous.

Notes: *Thelymitra imbricata* has been confused with *T. nuda* from which it can be distinguished by its generally stockier appearance, often longer, broader leaf and the usually larger flowers with broader, more overlapping perianth segments.

9. *Thelymitra paludosa* Jeanes, *sp. nov.*

Type: WESTERN AUSTRALIA. Eyre District: Mt Merivale, 20 km E of Esperance, 7.xi.1995, *B. Archer* 178 (holotype MEL 2032843; isotypes MEL 2032844, PERTH 4433432)

Illustrations: Hoffman & Brown (1998) page 267 (as *Thelymitra* aff. *holmesii*); Brown *et al.* (2008) page 331, A; Hoffman & Brown (2011) page 323.

Glabrous terrestrial *herb*. *Tubers* ovoid, 1–3 cm long, 5–15 mm wide, fleshy. *Leaf* linear, 14–30(–50) cm long, 5–10(–15) mm wide, erect, canaliculate, leathery, dark green with a purplish base, ribbed abaxially, sheathing at base, apex acute. *Scape* 20–50(–90) cm tall, 1.5–5 mm diam., straight, green to purplish. *Sterile bracts* usually 2 or 3, rarely 1, linear to linear-lanceolate, 2–10 cm long, 4–12 mm wide, lower bracts closely sheathing throughout, acuminate, when 3 bracts present upper

one often more or less free with the base only half encircling the inflorescence, green to purplish. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–32 mm long, 3–9 mm wide, sheathing the pedicels, green to purplish. *Pedicels* 0.5–18 mm long, slender. *Ovary* cylindrical to narrow-obovoid, 4–12 mm long, 1–4 mm wide. *Flowers* 2–10(–18), 18–30(–45) mm across, blue to violet, occasionally pink or white, often strongly scented, opening freely in warm weather. *Perianth segments* 8–18(–20) mm long, 4–10 mm wide, concave, sometimes stalked to spatulate, often shortly apiculate; *dorsal sepal* ovate, acute to obtuse; *lateral sepals* lanceolate to ovate, slightly asymmetric, acute; *petals* ovate, acute to obtuse; *labellum* elliptic to oblanceolate, usually slightly smaller than other segments, acute. *Column* erect from the end of ovary, (5–)6–8.5 mm long, (2–)3–5 mm wide, pale blue to pinkish; *post-anther lobe* hooding the anther, 3.5–4.5 mm long, 1.5–3 mm wide, tubular, hardly inflated, gently curved through c. 90°, dark brown to almost black, apex dorsally compressed, yellow, emarginate to shallowly v-notched, distal margin irregularly toothed; *auxiliary lobes* often present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 1–2 mm long, digitiform, porrect at base, bent upwards at c. 90° near the middle, each with a toothbrush-like arrangement of white hairs along the upper ½ to ¾ of their length, the individual hairs 0.6–1.2 mm long. *Anther* inserted about mid-way along column, ovoid, 2.3–3.3 mm long, 1.5–2.5 mm wide, connective produced into a beak 0.3–0.9 mm long; *pollinarium* 1.7–2.6 mm long; *viscidium* more or less circular, 0.4–0.8 mm diam.; *pollinia* white with coherent pollen. *Stigma* situated at base of column, ovate-quadrate, 2–3 mm long, 1.8–2.5 mm wide, margins irregular. *Capsules* obovoid, 10–20 mm long, 5–8 mm wide, erect, ribbed. (Fig. 3c)

Selected specimens examined: WESTERN AUSTRALIA.

Walpole Nornalup National Park, 13 km WSW of Walpole, 30.xi.1988, G. Wardell-Johnson W123 (PERTH 2661160 & PERTH 2661179); Darling District: Reserve 1167, Site 6, Map 2031 Bunbury, Dardarnup, 20.x.1997, S. Fisher 137 (PERTH 5001501); 12 km SW of Pemberton, 8.xii.1988, A.R. Annels 511 (PERTH 2661195); Pingerup Road, 2.5 km NE of Chesapeake Road junction, near Broke Inlet, 16.xi.1991, N. Gibson & M. Lyons 1138 (PERTH 3133478); Links Road, SE of Mt Barker, 16.xi.1993, A.R. Annels ARA4171 (PERTH 4572289); SW of Manjimup near Jardee and Deanmill, 15.xi.1968, G.S. McCutcheon 122 (PERTH

306452); Walpole Nornalup National Park, Conspicuous Beach, 9.xi.1988, A.R. Annels 447 (PERTH 2661209); Ambergate Reserve, 9 km S of Busselton, 7.xi.1992, B.J. Keighery & N. Gibson 789 (PERTH 4496469); 12 km ENE of Denmark, E of Sunny Glen Road, 5.xii.1993, A.R. Annels ARA4327 (PERTH 4587499); Mount Barker–Denmark Rd, c. 1 km NE of Harvey Rd, 19.x.2000, J.A. Jeanes 852 (MEL 2087466, MEL 2087467 & PERTH); North Walpole Rd, near Walpole, 4.xii.2001, W. Jackson JAJ1127 (MEL 2172996); Mt Chudalup, lower slope of dome adjacent to boardwalk, 1.xi.1994, A.R. Annels & R.W. Hearn ARA4773 (PERTH 4125843).

Distribution and habitat: Western Australia. Found in higher rainfall near-coastal regions of the south, from near Bunbury to just east of Esperance. Usually grows around the margins of winter-wet swamps. Altitude: 10–100 m. (Fig. 4c)

Conservation status: Widespread, sometimes locally common and well conserved.

Flowering period: Mid-October to December.

Pollination biology: The easily spreading perianth, scented flowers, functional viscidium, coherent pollen and sporadic production of seed capsules would suggest that this species is entomophilous.

Notes: *Thelymitra paludosa* is closely related to, and often confused with, *T. macrophylla*, but the latter usually flowers earlier (although there is some overlap), grows in drier habitats, has a more robust habit, a generally broader leaf and more, somewhat larger flowers. Earlier flowering (September to October) plants of similar appearance to *T. paludosa* from swamps between Perth and Bunbury (Hoffman & Brown 2011) need further study. Similar looking sympatric plants from drier, well-drained sites that flower from late October to December also need further study (Andrew Brown pers. comm. 2012).

Etymology: Latin *paludosa*, boggy, marshy; a reference to the preferred habitat of this species.

10. *Thelymitra nuda* R.Br., Prodr. 314 (1810)

Type: TASMANIA. *In pratis dipritis prope Western Arm Port Dalrymple* (Tasmania. Near the Western Arm of Port Dalrymple), 5.i.1804, R. Brown s.n. (lectotype specimen (a) BM!, *fide* Clements 1989; isolectotypes BM!, E!, FI, P). *Syntype:* Port Dalrymple, 1805, R. Brown s.n. (BM!, KI, AD!)

Thelymitra versicolor Lindl., *Gen. sp. orchid pl.* 520 (1840). *Type:* Tasmania, Circular Head, xii.1837, R. Gunn 943 (holotype P!); *Syntype:* Tasmania, R. Gunn 943 (BM!).

Thelymitra angustifolia sensu Hook.f., *Fl. Tasman.* 2: 5 (1858), non R.Br. (1810).

Thelymitra grandis F.Muell. ex Benth., *Fl. Austral.* 6: 319 (1873), nom. nud.

Illustrations: Backhouse & Jeanes (1995) page 356 (as *T. pauciflora*); Jones *et al.* (1999) page 281; Jeanes & Backhouse (2006) page 206, A & B; Jones (2006) page 231.

Glabrous terrestrial herb. Tubers ovoid, 1–3 cm long, 5–12 mm wide, fleshy. Leaf linear to linear-lanceolate, 10–25 cm long, 5–12 mm wide, erect, fleshy, canaliculate, dark green with a purplish base, ribbed abaxially, sheathing at base, apex acute to acuminate. Scape 15–50 cm tall, 1.2–3.5 mm diam., slender to moderately stout, straight, green to purplish. Sterile bracts usually 2, rarely 1 or 3, linear to linear-lanceolate, 1.4–7 cm long, 3–9 mm



Figure 3. a. *Thelymitra alcockiae*, Tintinara, SA (photograph by J.A. Jeanes); b. *T. imbricata*, Campbelltown, Tas. (photograph by J.A. Jeanes); c. *T. paludosa*, Denmark, WA (photograph by A.P. Brown); d. *T. nuda*, Eaglehawk Neck, Tas. (photograph by J.A. Jeanes); e. *T. graminea*, Darling Ranges, WA (photograph by A.P. Brown); f. *T. glaucophylla*, Spring Gully C.P., SA (photograph by J.A. Jeanes)

wide, closely sheathing, acute to acuminate, green to purplish. *Fertile bracts* ovate-acuminate to obovate-acuminate, 4–20(–25) mm long, 3–5 mm wide, green to purplish, sheathing the pedicels. *Pedicels* 1–17 mm long, slender. *Ovary* narrow-obovoid, 6–13 mm long, 1–3 mm wide. *Flowers* (1–)3–8(–12), (15–)20–30(–35) mm across, usually dark blue to purplish, rarely pink or white, opening readily on warm to hot days. *Perianth segments* (8–)11–15(–18) mm long, 3–6 mm wide,

concave, not overlapping greatly in open flowers, often shortly apiculate; *dorsal sepal* ovate-lanceolate to ovate, obtuse to subacute; *lateral sepals* ovate-lanceolate to ovate, often slightly asymmetric, acute; *petals* ovate to obovate, obtuse to subacute; *labellum* elliptic to lanceolate, often smaller than other segments, acute. *Column* erect from the end of ovary, 5–6.5 mm long, 2.5–3.5 mm wide, pale purplish or pale pink; *post-anther lobe* hooding the anther, 3–4 mm long, 1.5–2 mm wide,



Figure 4. Distribution of **a.** *Thelymitra alcockiae*; **b.** *T. imbricata*; **c.** *T. paludosa*; **d.** *T. nuda*; **e.** *T. graminea*; **f.** *T. glaucophylla*

tubular, inflated, gently curved through c. 90°, usually dark brown or blackish, apex yellow, emarginate or shallowly v-notched, the lobes to c. 1 mm long; *auxiliary lobes* often present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 1.2–2 mm long, digitiform, porrect at base, bent sharply upwards near the middle at c. 90°, each with a toothbrush-like arrangement of white hairs along almost their entire length, the individual hairs 0.5–1 mm long. *Anther* inserted near centre of column, ovoid, 2.5–3.5 mm long, 1.5–2 mm wide, the connective produced into an apical beak 0.4–0.7 mm long; *pollinarium* 2–3 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* white with coherent pollen. *Stigma* situated at base of column, ovate-quadrate, 2–2.5 mm long, 1.5–2 mm wide, margins irregular. *Capsules* obovoid, 8–16 mm long, 4–8 mm wide, erect, ribbed. (Fig. 3d)

Selected specimens examined: SOUTH AUSTRALIA.

Southern Lofty Region: Teatree Gully c. 15 km NE of Adelaide, 27.ix.1913, ?*R.S. Rogers s.n.* (AD 98003218); Goolwa Scrub, 30.x.1894, ?*Tate s.n.* (AD 97518179); Mount Lofty Range. Echunga, ix., *J. Ferries s.n.* (AD 96750984); Southern Lofty Region: Aldgate, 15.x.1911, *R.S. Rogers 4972* (AD 97725220); Southern Lofty Region: Belair Recreation Park, SE of Adelaide, 1.x.1909, *R.S. Rogers 4981* (AD 97725219); Pine oval, x.1944, *R.A. Perry s.n.* (CANB 18330); Mt Lofty Range. Belair National Park, 22.x.1910, *E.H. Ising s.n.* (AD 966031489); Willunga via Blackwood, x.1906, *E. Ashby s.n.* (MEL 114492 & MEL 2039586); Clare Hills, 8.x.1957, *B.B. Lowery s.n.* (QRS 044585); Mt Lofty Range. Black Hill, *J. Ferries s.n.* (AD 96750983); Southern Lofty Region: Black Hill Native Flora Park; near Athelstone, c. 10 km ENE of Adelaide, 6.xi.1980, *K. Clipstone 52* (AD 98046031); Port Elliot, x.1896, *Tate 41* (AD 96945236A). **NEW SOUTH WALES.** Albury, 15.x.1950, *E.J. McBarron s.n.* (NSW 156398); Tenterfield (MEL 114484); On hill above falls, Gloucester River, Gloucester Tops, 26.x.1963, *R. Filson 5540* (MEL 646914); Armidale, *Perrott s.n.* (MEL 114495); Central Tablelands: 56 km N of Taralgo on road to Oberon, 2.xii.1984, *M.A. Clements 3596* (CANB 8411787); Paramatta, *W. Woolls s.n.* (MEL 114491); 20 km E of Guyra, 21.xi.1987, *R.J. Bates 12771* (AD 98746535); Northern Tablelands: Lot 90, Invergowrie, 28.x.1990, *S. McIntyre s.n.* (NSW 415781); Central Tablelands: 7 km from Binda along road to Crookwell, 24.x.1998, *R.W. Purdie 4660* (CANB 9810236); Gloucester Tops, W of Gloucester, 2.xi.1968, *B.G. Briggs 2464* (NSW 124945). **AUSTRALIAN CAPITAL TERRITORY.** Western slopes of Mt Taylor, 13.xi.1991, *D.L. Jones 8507*, *B.E. Jones & S.R. Jones* (CANB 9803903). **VICTORIA.** Glenelg River, *C. Walter s.n.* (MEL 221648); South-west. Richardsons River, S of

Casterton-Penola Rd, 27.x.1963, *A.H. Corrick s.n.* (MEL 665163); Shepherds Gap, Grampians, xi.1920, *J.W. Audas s.n.* (MEL 1549676); Bannockburn, x.1938, *W.H. Nicholls s.n.* (MEL 650294 & MEL 650377); Steiglitz heathlands, 27.ix.1969, *M. Quick s.n.* (MEL 518814); Blue Range Creek, x.1906, *C.S. Sutton s.n.* (AD 97725185); 1 km SW of Fernbank, 4.x.1984, *A.C. Beauglehole 77751* (MEL 670969); Boronia, x.1929, *A.B. Braine s.n.* (MEL 625596 & MEL 2039604); Hurstbridge, x.1930, *W.H. Nicholls s.n.* (MEL 625587); Creswick, x.1930, *J.H. Willis s.n.* (MEL 577252); Bay of Islands Coastal Park, Flaxmans Hill area c. 200 m from coastal cliffs, 30.xi.2000, *A. Pritchard JAJ800* (MEL 2172974). **TASMANIA.** Mt Direction, 6.xii.1841, *R.C. Gunn s.n.* (HO 99285); Bruny Island, 4 km E of Alonnah along Bruny Island Main Road, 22.xi.2000, *H. Wapstra JAJ784*, *A. Wapstra & L. Rubenach* (MEL 2087444 & MEL 2089316); Newtown, 31.x.1990, *D.L. Jones 6865 & C.H. Broers* (CANB 9016335); Howrah, 3.xi.1992, *D. Randall DLJ10610* (CANB 9702476); Ridgeway Park, near Mt Wellington, 16.xii.1992, *M. Wapstra DLJ11008 & L. Yeates* (CANB 605294); Risdon Hill, 8.xi.1960, *M.E. Phillips s.n.* (CANB 14372); St Marys, xi.1929, *E. Rees s.n.* (HO 99288 & HO 99292); Domain, Hobart, 28.x.1937, *H.D. Gordon s.n.* (HO 99295); Barossa Road, Glenorchy, 31.x.1931, *F.H. Long 971* (HO 99298); Lindisfarne, 3.xi.1934, *E.W. Little s.n.* (HO 411697); Kingston Beach, 17.xi.1940, *Mrs O. Rodway s.n.* (AD 97913267); Pirates Rd, Tasman Peninsula, 25.xi.2001, *H. & A. Wapstra JAJ1123* (MEL 2172928 & MEL 2172930).

Distribution and habitat: South Australia, New South Wales, Australian Capital Territory, Victoria and Tasmania. Found mostly in more mesic near-coastal forests and heathlands on sandy, gravelly or clay loam soils. Altitude: 5–1000 m. (Fig. 4d)

Conservation status: Widespread, sometimes locally common and well conserved.

Flowering period: October to December.

Pollination biology: The easily spreading perianth, functional viscidium, coherent pollen and sporadic production of seed capsules would suggest that this species is entomophilous.

Typification: The type sheet contains five specimens of fairly uniform appearance with two labels showing different dates but similar origins. The two left-hand specimens appear to be part of the same collection, and Clements (1989) selected specimen (a), the more intact of the two, as the lectotype, the other (b) becoming an isolectotype. The three specimens on the right (c, d & e) are probably best regarded as syntypes.

Brown's Latin description (Brown 1810): *T. nuda, cucullo perianthio patulo dimidio brevior: laciniis extimis penicillatis: intermedia dorso nudo emarginata lobulis*

rotundatis integris, spicâ multiflorâ. (Hood shorter than half the widely spread perianth: side lobes penicillate: post-anther lobe naked, emarginate, lobules rounded, entire, spike many-flowered.)

Notes: Plants consistent with Brown's description of *Thelymitra nuda* and with the specimens on the type sheet still occur near the type locality in northern Tasmania, and have been collected recently and studied. This taxon appears to be relatively common and widespread, at least through much of south-eastern Australia.

Hybridises with *T. antennifera* to produce *T. ×macmillanii* and with *Thelymitra ixioides* Sw. and *Thelymitra azurea* R.S. Rogers (Jones 2006).

11. *Thelymitra graminea* Lindl. in *Edwards's Bot. Reg.* 1–23: Sketch Veg. Swan R., app. 49 (216) (1839–40)

Type: WESTERN AUSTRALIA. Swan River, 1839, *J. Drummond s.n.* (holotype K-LI).

Illustrations: Brown *et al.* (2008) page 331, B; Hoffman & Brown (2011) page 321.

Glabrous terrestrial herb. *Tubers* ovoid, 1–3 cm long, 7–15 mm wide, fleshy. *Leaf* linear, 7–25 cm long, 5–10(–12) mm wide, erect, canaliculate, leathery, dark green with a purplish base, ribbed abaxially, sheathing at base, apex acute. *Scape* 20–55 cm tall, 1.5–3.5 mm diam., usually slender, straight, green to purplish. *Sterile bracts* usually 2, sometimes 3, linear to linear-lanceolate, 2–6(–10) cm long, 4–9 mm wide, closely sheathing, acute to acuminate, green to purplish. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–20 mm long, 3–7 mm wide, sheathing the pedicels, green to purplish. *Pedicels* 1–12 mm long, slender. *Ovary* cylindrical to narrow-obovoid, 5–10 mm long, 1–3.5 mm wide. *Flowers* 1–8(–14), 25–30 mm across, usually dark blue to purplish, often strongly scented, opening freely in warm weather. *Perianth segments* 10–17 mm long, 4–10 mm wide, concave, apex acute to obtuse, often shortly apiculate; *dorsal sepal* ovate; *lateral sepals* lanceolate to ovate, slightly asymmetric; *petals* ovate; *labellum* elliptic to oblanceolate, usually slightly smaller than other segments. *Column* erect from the end of ovary, 6–7.5 mm long, 3–4 mm wide, pale blue to pinkish;

post-anther lobe hooding the anther, 3.5–4 mm long, 1.4–2.2 mm wide, tubular, hardly inflated, gently curved through c. 90°, dark brown to almost black, apex yellow, entire to shallowly emarginate, distal margin more or less smooth; *auxiliary lobes* often present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 1.5–2 mm long, digitiform, porrect at base, bent upwards at c. 90° near the middle, each with a toothbrush-like arrangement of white hairs along the upper ½ to ¾ of their length, the individual hairs 0.7–1.1 mm long. *Anther* inserted about mid-way along column, ovoid, 2.5–3.5 mm long, 1.5–2.5 mm wide, connective produced into a beak 0.4–0.6 mm long; *pollinarium* 2–3 mm long; *viscidium* more or less circular, 0.3–0.6 mm diam.; *pollinia* white with coherent pollen. *Stigma* situated at base of column, ovate-quadrangle, 2–3 mm long, 1.5–2.5 mm wide, margins irregular. *Capsules* obovoid, 10–15 mm long, 5–7 mm wide, erect, ribbed. (Fig. 3e)

Selected specimens examined: WESTERN AUSTRALIA. Brookton Hwy near intersection of Darkan Road, 12.x.2000, *J.A. Jeanes 834* (MEL 2093610, MEL 2093611 & PERTH); Near corner of Brookton Hwy and Lupton Road, 12.x.2000, *J.A. Jeanes 832* (MEL 2093608, MEL 2093609 & PERTH); Dryandra State Forest, Koomal Rd c. 1.5 km E of York–Williams Rd, 17.x.2000, *J.A. Jeanes 848* (MEL 2087478, MEL 2087479 & PERTH); Rock opposite Tindale Rd and adjacent to South Coast Highway. Mehinup Nature Reserve, c. 31 km E of Walpole, 19.x.2000, *J.A. Jeanes 854 & W. Jackson* (MEL 2087470, MEL 2087471 & PERTH); Toolbrunup Rd at intersection of Aylmore Rd; c. 14 km ESE of Tambellup, 17.x.2000, *J.A. Jeanes 850* (MEL 2093572, MEL 2093573 & PERTH); Darling District: 17.6 km N of Kojonup, 8.x.1991, *D.L. Jones 8243* (CANB 609382); Brookton area. Moorumbine Rd, c. 100 m SE of Schultz Rd, behind quarry, 15.x.2000, *J.A. Jeanes 844, C. French & H. Beyrle* (MEL 2093578, MEL 2093579 & PERTH); Corner of Qualen Rd and Kitters Rd, SW of York, 14.x.2000, *J.A. Jeanes 839, C. French & H. Beyrle* (MEL 2087465, MEL 2089294); Avon District: 29 km W of Brookton beside Brookton Hwy, 7.x.1991, *D.L. Jones 8202* (CANB 609383); Blue Rock near Jarrahdale, 14.x.2001, *C.J. French 3216* (MEL 2172970); Darling District: 20 km SE of Moodiarrup, 23.ix.1985, *D.L. Jones 1940, B.E. Jones & A.P. Brown* (CANB 8506425); Darling District: Crooked Brook Rd, 2.8 km W of Ferguson Rd, 7 km ESE of Dardanup, 31.x.1998, *P.H. Weston 2197 & 2198* (NSW 432775 & NSW 432776).

Distribution and habitat: Western Australia between about Gingin and Esperance. Found mostly in higher rainfall near-coastal regions and in the ranges and hill country, but extending inland to the edges of the

wheatbelt. Preferred habitats include open forest, woodlands, heathy woodlands and mallee scrubs on well-drained sandy or lateritic soils. Altitude: 10–500 m. (Fig. 4e)

Conservation status: Widespread, often locally common and well conserved.

Flowering period: September to November.

Pollination biology: The easily spreading perianth, scented flowers, functional viscidium, coherent pollen and sporadic production of seed capsules suggest that this species is entomophilous.

Typification: The type sheet is a mixed collection containing a single specimen (the lectotype) of *Thelymitra campanulata* Lindl. on the right, and three specimens of *T. graminea* on the left, the latter of fairly uniform appearance and apparently from a single collection. The specimens are 33–36 cm tall, have a relatively narrow leaf (the upper part of the leaf on all three specimens is missing) and 3–6 flowers with perianth segments about 10 mm long.

Lindley's Latin description (Lindley 1839–40): *Thelymitra graminea; folio radicali lineari, racemo secundo multifloro, floribus purpureis, cuculli laciniis lateralibus stuposis unguiculatis intermedia fornicata integerrima glaberrima.* (Leaf radical linear, raceme one-sided multi-flowered, flowers purple, hood with lateral flaps covered with matted hairs clawed mid-lobe arched quite entire and glabrous).

Notes: A somewhat stylised drawing by Lindley of a semi-frontal view of a column is on the lower left-hand side of the sheet containing the holotype. This shows the post-anther lobe to be entire and the lateral lobes to be glabrous towards the base and with an elongate, toothbrush-like arrangement of hairs along the upper part. Lindley (1840) notes "A very slender species near *T. nuda*, from which it differs in the form of the middle lobe of the cucullus (post-anther lobe)". From Drummond's journal it would appear that he collected the type material of *T. graminea* somewhere between Perth and his farm at Toodyay (A. Brown pers. comm.). Plants consistent with Lindley's description, notes and with the type collection of *T. graminea* still occur in the ranges to the east of Perth, and specimens have been collected recently and studied. It is apparent that this taxon remains poorly known today due to the presence of several superficially similar taxa, both in Western Australia and in the eastern states.

12. *Thelymitra glaucophylla* R.J.Bates ex Jeanes, *sp. nov.*

Type: SOUTH AUSTRALIA. Northern Lofty Region: Leighton Road, W of Sevenhill, 18.xi.2001, *R.J. Bates* 60334 (holotype AD 187235, isotypes MEL 2172094, MEL 2172095, AD 138701, CANB).

Illustration: Bates (2011) pages 43 & 44.

Glabrous, glaucous, terrestrial *herb*. *Tubers* ovoid, 1–2.5 cm long, 6–12 mm wide, fleshy. *Leaf* linear-lanceolate to lanceolate, 10–50 cm long, 8–20 mm wide, erect, canaliculate, fleshy, pale green with a whitish bloom and a purplish base, often senescent at anthesis, ribbed abaxially, sheathing at base, apex acute to acuminate. *Scape* 25–80 cm tall, 1.5–5 mm diam., slender to stout, straight, glaucous green to purplish. *Sterile bracts* usually 2, rarely 3, linear to linear-lanceolate, 2.5–10 cm long, 4–12 mm wide, closely sheathing, glaucous green, often purplish towards apex, acuminate to subulate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–32 mm long, 3–9 mm wide, sheathing the pedicels, glaucous green to purplish. *Pedicels* 1–15(–23) mm long, slender. *Ovary* cylindrical to narrow-obovoid, 5–17 mm long, 1–4 mm wide, glaucous. *Flowers* 3–15, (20–)30–50 mm across, usually pale blue, mauve or white, strongly sweet-scented, opening freely in warm weather. *Perianth segments* (10–)15–25 mm long, 4–13 mm wide, concave, somewhat stalked to spatulate, apex acute to obtuse, often shortly apiculate; sepals glaucous on outer surface; *dorsal sepal* ovate; *lateral sepals* lanceolate to ovate, slightly asymmetric; *petals* ovate; *labellum* elliptic to oblanceolate, hardly smaller than other segments. *Column* erect from the end of ovary, 5.5–7.5 mm long, 3–4.5 mm wide, pale blue to pinkish; *post-anther lobe* hooding the anther, 3.5–4.5 mm long, 2.5–3.7 mm wide, tubular, very inflated, somewhat dorsally compressed, gently curved through c. 90°, greyish brown, surface often ruminant, apex yellow, toothed, bilobed, lobes irregular, to c. 1.6 mm long, inner margins toothed; *auxiliary lobes* often present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 1–2 mm long, digitiform, porrect at base, curved upwards gradually throughout or at c. 90° near the middle, each with a toothbrush-like arrangement of white or creamy yellow hairs along most of their length, the individual hairs 1–1.5

mm long. *Anther* inserted about mid-way along column, ovoid, 3–3.8 mm long, 2–2.6 mm wide, connective produced into a beak 0.6–0.8 mm long; *pollinarium* 2.4–3 mm long; *viscidium* more or less circular, 0.7 mm diam.; *pollinia* white with coherent pollen. *Stigma* situated at base of column, ovate-quadrate, 2.5–3.5 mm long, 2.3–3 mm wide, margins irregular. *Capsules* obovoid, 12–18 mm long, 4–8 mm wide, erect, ribbed. (Fig. 3f)

Selected specimens examined: SOUTH AUSTRALIA.

Southern Lofty Region. Stock Road, Mylor, 18.x.2001, *R.J. Bates 60097* (MEL 2172087 & MEL 2172088); Northern Lofty Region. Jacobs Range Heritage Woodland, 10 km E of Blyth, 28.x.2001, *R.J. Bates 60131* & *60136* (MEL 2172098, MEL 2172099, MEL 2172096 & MEL 2172097); Near Mookra Tower, Mt Helen, 24.x.1996, *R.J. Bates 43060* (AD 99841300); Northern Lofty Region. Skillogalee via Clare, 24.x.1992, *R.J. Bates 29955* (AD 99319208); Southern Lofty Region. Para Wirra National Park, 30.x.1984, *D.J.E. Whibley 9621* (AD 98825164); Northern Lofty Region. Clare Hills, xi.2000, *R.J. Bates s.n.* (MEL 2100149); Southern Lofty Region. Kersbrook, 2 km N along main road to Williamstown, x.2000, *R.J. Bates 57793* (MEL 2100131); Ferguson Park, 12.x.1958, *R. Filson 1388* (MEL 622699); Northern Lofty Region. Clare Cemetery, x.1979, *R.J. Bates 532* (AD 98003053); Mt Lofty Range. National Park, Belair, 14.x.1906, *R.S. Rogers s.n.* (AD 97517132, BRI & NSW); Northern Lofty Region. Spring Gully Conservation Park via Clare, 7.xi.1999, *R.J. Bates 54946* (CANB 609400).

Distribution and habitat: Apparently endemic to South Australia where found in the Southern Flinders Ranges, Northern Lofty and Southern Lofty Regions. Grows mostly in hill country in open forest, woodlands and grasslands, usually in moderately rich clay loam soils. Altitude: 50–700 m. (Fig. 4f)

Conservation status: Widespread, sometimes locally common and well conserved.

Flowering period: October to December.

Pollination biology: The large, strongly scented flowers, easily spreading perianth, functional viscidium, coherent pollen and sporadic production of seed capsules would suggest that this species is entomophilous.

Notes: *Thelymitra glaucophylla* is a robust species with a large distinctive pale green leaf with a whitish bloom. Natural hybrids between *T. glaucophylla* and *Thelymitra rubra* Fitzg. have been observed near Clare. Apparent natural hybrids between *T. glaucophylla* and *Thelymitra batesii* Jeanes have been observed near Kersbrook.

Etymology: From the Greek *glauco*, bluish gray, *phylla*, a leaf; plants of this species have a large glaucous leaf.

13. *Thelymitra macrophylla* Lindl. in *Edwards's Bot. Reg.* 1–23: Sketch Veg. Swan R., app. 49 (213) (1839–40)

Type: WESTERN AUSTRALIA. Swan River, 1839, *J. Drummond s.n.* (holotype K-L, isotypes FI!, KI). *Syntypes:* Swan River, 1838, *J. Drummond s.n.* (BM!, AD!).

Illustrations: Nicholls (1969) plate 32 (as *T. nuda*); Hoffman & Brown (1998) page 269; Jones (2006) page 230; Brown *et al.* (2008) page 333, B; Hoffman & Brown (2011) page 326.

Glabrous terrestrial *herb*. *Tubers* ovoid, 1–3 cm long, 5–15 mm wide, fleshy. *Leaf* linear to linear-lanceolate, 15–30(–50) cm long, 5–25 mm wide, erect, canaliculate, leathery, dark green with a purplish base, ribbed abaxially, sheathing at base, apex acute. *Scape* 20–60(–105) cm tall, 1.5–10 mm diam., usually stout, straight, green to purplish. *Sterile bracts* usually 2 or 3, linear to linear-lanceolate, 2.5–16 cm long, 4–18 mm wide, lower bracts closely sheathing throughout, acute to acuminate, when 3 bracts present upper one often more or less free with the base only half encircling the inflorescence, green to purplish. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–40 mm long, 3–10 mm wide, sheathing the pedicels, green to purplish. *Pedicels* 2–27 mm long, slender. *Ovary* cylindrical to narrow-obovoid, 5–15 mm long, 1–4 mm wide. *Flowers* 3–20(–25), (20–)30–50 mm across, usually dark blue to purplish, occasionally lilac, pink or white, often strongly scented, opening freely in warm weather. *Perianth segments* (10–)15–25 mm long, 5–12 mm wide, concave, sometimes stalked to spatulate, often shortly apiculate; *dorsal sepal* ovate, obtuse to subacute; *lateral sepals* lanceolate to ovate, slightly asymmetric, acute; *petals* ovate, obtuse to subacute; *labellum* elliptic to oblanceolate, acute, usually slightly smaller than other segments. *Column* erect from the end of ovary, (5.5–)6–8 mm long, (3–)3.5–5.5 mm wide, pale blue to pinkish; *post-anther lobe* hooding the anther, 3.5–5 mm long, 1.8–3 mm wide, tubular, hardly inflated, gently curved through c. 90°, dark brown to almost black, apex yellow, entire to shallowly emarginate, distal margin

irregularly toothed; *auxiliary lobes* often present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 1.5–2 mm long, digitiform, porrect at base, bent upwards at c. 90° near the middle, each with a toothbrush-like arrangement of white hairs along the upper ½ to ¾ of their length, the individual hairs 0.8–1.2 mm long. *Anther* inserted about mid-way along column, ovoid, 2.5–3.5 mm long, 1.5–3 mm wide, connective produced into a beak 0.5–0.8 mm long; *pollinarium* 2–3 mm long; *viscidium* more or less circular, 0.5–1 mm diam.; *pollinia* white with coherent pollen. *Stigma* situated at base of column, ovate-quadrangle, 2.5–3.5 mm long, 2–3.5 mm wide, margins irregular. *Capsules* obovoid, 12–25 mm long, 5–10 mm wide, erect, ribbed. (Fig. 5a)

Selected specimens examined: WESTERN AUSTRALIA. Great Eastern Highway. John Forrest NP, Glen Forrest, 14.x.2000, J.A. Jeanes 835, C. French & H. Beyrle (MEL 2093602, MEL 2093603 & PERTH); 15.4 km W of the Frankland River along the Muirs Highway, 20.x.2000, J.A. Jeanes 862, W. & G. Jackson (MEL 2093600, MEL 2093601 & PERTH); Richardsons Rd Stoneville, c. 1.4 km W of Agnes Rd, 14.x.2000, J.A. Jeanes 836, C. French & H. Beyrle (MEL 2093604, MEL 2093605 & PERTH); Corner of Winnejump and Elwin Rds, Winnejump, 13.x.2001, C.J. French 3183 (MEL 2172931 & MEL 2172932); Darling District. 90.1 km W of Mt Barker, 12.x.1991, D.L. Jones 8364 (CANB 611756); 12 km E of Kwinana, 29.ix.1992, N. Gibson & M.N. Lyon 1536 (PERTH 4521072); Serpentine Falls, 22.ix.1904, A. Purdie s.n. (PERTH 276278); 22 km SW of Frankland, 2.xi.1977, A.S. George 15012 (PERTH 283487); Walpole, 2.xi.1974, T. Wilson s.n. (PERTH 284386); Lake Muir, 25.x.1978, R. Heberle s.n. (PERTH 273880); Warren National Park, 25.x.1959, M.C. George s.n. (PERTH 274321); Galamup Nature Reserve, 22.x.1997, G.J. Keighery & N. Gibson 2330 (PERTH 5150345); Eucla Division. Esperance district: Buyi Billanak Homestead, 21.ix.1968, D.G. Austin 106 (AD 97118089); Kamballup area, 25.x.1975, M.A. Clements 194 (CANB 7800281).

Distribution and habitat: Western Australia from Geraldton to east of Esperance. Grows mostly in higher rainfall near-coastal regions and in the ranges and hill country in habitats such as open forest, woodlands and heathy woodlands on well-drained sand and clay loams. Altitude: 10–500 m. (Fig. 6a)

Conservation status: Widespread, often locally common and well conserved.

Flowering period: Late August to November.

Pollination biology: The easily spreading perianth, scented flowers, functional viscidium, coherent pollen

and sporadic production of seed capsules would suggest that this species is entomophilous.

Typification: The type sheet contains three specimens, apparently from a single collection. The left-hand specimen (which is in two parts) is about 60 cm tall, has a leaf about 23 cm long and 13 mm wide, about 15 flowers with perianth segments about 15 mm long. The two right-hand specimens have their lower inflorescence and leaf missing, but are consistent in flower number and size with the specimen on the left.

Lindley's Latin description (Lindley 1839–40): *Thelymitra macrophylla*; *folio radicali erecto elongato lanceolato, racemo elongato cylindraceo, floribus purpureis, cuculli laciniis lateralibus parvis stuposis: intermedia majore fornicata glabra*. (Leaf radical, erect, elongate, lanceolate, raceme elongate cylindrical, flowers purple, hood lateral flap fringed: middle larger arched glabrous).

Lindley's second Latin description (Lindley 1840): *T. folio radicali erecto lanceolato, racemo elongato cylindraceo, floribus purpureis, cuculli laciniis lateralibus parvis subsessilibus stuposis: intermedia majore fornicata glabra indivisa*. (Leaf radical, erect, lanceolate, raceme elongate cylindrical, flowers purple, hood lateral flap small subsessile fringed: intermediate larger arched glabrous entire).

Notes: A somewhat stylised drawing by Lindley of a column in profile is on the lower right hand side of the sheet containing the holotype. This shows a rather inflated post-anther lobe and more or less straight lateral lobes with an elongate toothbrush-like arrangement of hairs. A more recent sketch by Clements (1984, unpublished) of a reconstituted flower from the holotype shows the post-anther lobe to be shallowly cleft at the apex and the lateral lobes to be relatively short, bent upwards sharply near the middle and have the hairs concentrated more towards the distal half. This latter depiction is more in keeping with Lindley's Latin description (Lindley 1840). Lindley (1840) also notes "A very tall species, apparently at least 2 feet [c. 60 cm] high, raceme about 20 flowered". Plants consistent with Lindley's description and notes, and with the type collection, are still common near Perth and many other parts of Western Australia and have been collected recently and studied. This taxon is relatively common and widespread throughout much of the higher rainfall parts of south-western Western Australia, but remains

poorly known today due to the presence of several superficially similar taxa, both in Western Australia and in the eastern states.

Thelymitra macrophylla has been confused with *T. paludosa*, but the latter usually flowers later (although there is some overlap), grows in wetter habitats, has a less robust habit, a generally narrower leaf and fewer, somewhat smaller flowers.

Plants similar to *T. macrophylla* from north of Geraldton and near Beacon (Hoffman & Brown 2011) are in need of study.

Thelymitra macrophylla apparently hybridises with *Thelymitra flexuosa* Endl., *Thelymitra crinita* Lindl., *Thelymitra vulgaris* Jeanes and *T. antennifera* the latter giving rise to plants with flowers very similar to the eastern Australian *T. xmacmillanii* (Hoffman & Brown 1998; Jones 2006; Brown *et al.* 2008).

14. *Thelymitra alpina* Jeanes, *sp. nov.*

Type: NEW SOUTH WALES. Southern Tablelands. Kosciuszko National Park, c. 5.3 km along Tantangara Dam Road, 13.xii.1997, *D.L. Jones 15642* & *B.E. Jones* (holotype CANB 9908940; isotype CANB).

Illustrations: Nicholls (1969), plate 28 (as *Thelymitra aristata*); Backhouse & Jeanes (1995), page 354 (as *T. nuda*); Jeanes & Backhouse (2006), page 218, A–D (as *Thelymitra* sp. aff. *megalyptra* 2); Jones (2006) page 229.

Glabrous terrestrial *herb*. *Tubers* ovoid, 1–3 cm long, 0.5–1.5 cm wide, fleshy. *Leaf* linear-lanceolate to lanceolate, 10–32 cm long, 5–15 mm wide, erect, canaliculate, fleshy, dark green with a purplish base, ribbed abaxially, sheathing at base, apex acute. *Scape* 15–45(–80) cm tall, 1.5–4.5 mm diam., slender to stout, straight, green to purplish. *Sterile bracts* usually 2, sometimes 3, linear to linear-lanceolate, 2–7(–12) cm long, 4–10 mm wide, closely sheathing, green to purplish, acute to acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–20(–30) mm long, 3–7 mm wide, sheathing the pedicels, green to purplish. *Pedicels* 1–12(–25) mm long, slender. *Ovary* cylindrical to narrow-obovoid, 5–14 mm long, 1–3.5 mm wide. *Flowers* 2–10(–20), (20–)25–40 mm across, usually blue to purplish, occasionally lilac, pink or white, opening freely in warm weather. *Perianth segments* (9–)15–20(–25) mm long, 3–11 mm wide, concave, somewhat stalked to spatulate, apex acute to obtuse, often shortly

apiculate; *dorsal sepal* ovate; *lateral sepals* lanceolate to ovate, slightly asymmetric; *petals* ovate; *labellum* elliptic to oblanceolate, usually narrower than other segments. *Column* erect from the end of ovary, 5.5–7 mm long, 3–4 mm wide, pale blue to pinkish; *post-anther lobe* hooding the anther, 3.5–5 mm long, 2–3 mm wide, tubular, very inflated, often somewhat compressed dorsally, gently curved through c. 90°, pale to dark brown, apex yellow, bilobed, lobes irregular, to c. 1.5 mm long, distal margin irregularly toothed, usually also with two prominent forward-pointing horn-like teeth, orifice small; *auxiliary lobes* often present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 1–2 mm long, digitiform, porrect at base, curved upwards, each with a toothbrush-like arrangement of white or pinkish hairs along the upper ½ to ¾ of their length, the individual hairs 0.8–1.2 mm long. *Anther* inserted about mid-way along column, ovoid, 2.5–3.5 mm long, 1.5–2.5 mm wide, connective produced into a beak 0.4–1 mm long; *pollinarium* 2–2.6 mm long; *viscidium* more or less circular, c. 0.6 mm diam.; *pollinia* white with coherent pollen. *Stigma* situated at base of column, ovate-quadrangle, 2–3 mm long, 2–3 mm wide, margins irregular. *Capsules* obovoid, 10–20 mm long, 4.5–8 mm wide, erect, ribbed. (Fig. 5b)

Selected specimens examined: NEW SOUTH WALES.

Southern Tablelands: c. 5 km along Tantangara Dam Road, 2.xii.1990, *D.L. Jones 7260* (CANB 9016526); Southern Tablelands: Kosciuszko National Park, c. 4 km along Tantangara Dam Road, 10.xii.1994, *D.L. Jones 13759* & *B.E. Jones* (CANB 609326); Tantangara Dam, 29.xi.1987, *R.J. Bates s.n.* (AD 98746537); Southern Tablelands: Kosciuszko National Park, south side of Cave Creek, 1.5 km downstream of Blue Waterholes, 9.xii.1998, *N.G. Walsh 4881* & *K.L. McDougall* (MEL 2054134); Southern Tablelands: c. 6.5 km by road WSW of Kiandra, 28.xii.1994, *J.A. Jeanes 132* (MEL 2025003); Southern Tablelands: between Kiandra and Cabramurra; top of the Great Dividing Range at 3 Mile Dam, 21.xii.1985, *M.A. Clements 3932* (CANB 8505584); Southern Tablelands: Brindabella area towards Tumut, 8.xii.1985, *M.A. Clements 3899* (CANB 8505551); Southern Tablelands: Gold Seekers Trail, 3 Mile Dam area, Mt Selwyn, 14.i.1993, *D.L. Jones 11190* & *C.H. Broers* (CANB 609327); Brindabella Range, Coree Flat, 28.xi.1968, *E.M. Canning EMC1328* (CANB 068431); Southern Tablelands: Kosciuszko National Park, 2.2 km up Ravine Road from Snowy Mountains Highway, 14.xii.2001, *D. Rouse JAJ1286* (MEL 2172092 & MEL 2172093). **AUSTRALIAN CAPITAL TERRITORY.** Bendora Dam Road, c. 10 km from Bulls Head, 2.xii.1989, *D.L. Jones 5445* & *B.E. Jones* (CANB

8913975); Blue Gum Creek (upper Paddys River) c. 2 miles SW of 'Booroomba' station, 29.xi.1960, *R. Pullen 2406* (CANB 86267); One mile S of Forest Rangers hut, Upper Cotter, Bimberi Creek, 14.xii.1960, *P. Darbyshire 62* (CANB 87344 & NSW); Nursery Swamp, Namadgi National Park, 3.xii.1998, *D.J. Mallinson ORG1978* (CANB 609325). **VICTORIA.** Eastern Highlands. Bundara River, 11.xi.1999, *P.G. Branwhite 65 & 66* (CANB 609390 & CANB 612484); Eastern Highlands. Cravensville, 5.xi.1999, *P.G. Branwhite 51* (CANB 610973); Snowfields. Alpine National Park, Wonnangatta-Moroka unit. Walking track from Bryce Gorge carpark towards Piemans Ck Falls, 16.xii.2000, *N.G. Walsh 5279* (MEL 2089868 & MEL 2089869); Wulgulmerang, 25.xii.1985, *R.J. Bates 6673* (AD 98608155); North-east. Benambra-Corryong Rd c. 64 km S of Nariel, 1.xi.1977, *M.G. Corrick 6013* (MEL 533532); Burbibyong Creek Reference Area, 26.x.1987, *A.C. Beauglehole 89462 & L.W. Huebner* (MEL 238616); Mitta Mitta Reference Area, 10.xi.1987, *A.C. Beauglehole 91326 & C.C. Taylor* (MEL 238617); Eastern Highlands. 3 km along Knocker Tk (Burnside Track intersection) from Omeo Valley Rd intersection, 6.xi.1983, *C.W. Huggins 56* (MEL 630352); Snowfields. 4 miles NE of Mt Arbuckle, on Doolans Plain Rd, 17.i.1967, *T.B. Muir 4528* (MEL 221676); North-east. 17.5 km S from Whitfield, on Wabonga Track in Wabonga Plateau State Park, 19.xi.1986, *A.D.J. Piesse 559* (MEL 1557426 & MEL 2039568); Eastern Highlands. Bundarra River, near Anglers Rest, 29.xi.1989, *P. Branwhite DLJ5442* (CANB 8913972); Eastern Highlands. Blue Plain Spur, 3.2 km S of Saltlick Saddle/Blue Plain Spur Track junction, ?i.1978, *N.G. Walsh & P.K. Gullen 955* (MEL 629692).

Distribution and habitat: Alpine, sub-alpine and montane areas of south-eastern New South Wales, the Australian Capital Territory and eastern Victoria. Grows in alpine and sub-alpine meadows and woodlands often dominated by Snow Gums, or in open montane forests. Substrates are usually sandy and peaty loams. Altitude: 500–1600 m. (Fig. 6b)

Conservation status: Widespread, sometimes locally common and well conserved.

Flowering period: Late October to January.

Pollination biology: The large, freely opening flowers, functional viscidium, coherent pollen and sporadic capsule production would suggest that this species is entomophilous

Notes: *Thelymitra alpina* differs from *T. megcalyptra* in its high altitude, more mesic habitat, usually shorter leaf and more elongate, dorsally compressed post-anther lobe that has an irregularly toothed apical margin often with two forward-pointing horn-like teeth.

Thelymitra alpina sometimes grows with *Thelymitra simulata* D.L.Jones & M.A.Clem. and apparent hybrids

have been observed near Kiandra in the Kosciuszko National Park.

Etymology: From the Latin *alpina*, of the alps; the species most often grows in alpine and sub-alpine habitats.

15. *Thelymitra megcalyptra* Fitzg., *Austral. Orch* 1(5): t. 2 (1879)

Type: NEW SOUTH WALES. Deniliquin, x., *R.D. Fitzgerald s.n.* (lectotype specimen (a) BM!, *vide* Clements 1989, isolectotype AD!). *Syntype:* Lake George, x., *R.D. Fitzgerald s.n.* (BM!).

Thelymitra aristata Lindl. var. *megcalyptra* (Fitzg.) Nicholls in J.M. Black, *Fl. South Australia* ed. 2, 1: 215 (1943).

Illustrations: Fitzgerald (1879) 1: 5; Nicholls (1969) Plate 30 (as *T. aristata* var. *megcalyptra*); Backhouse & Jeanes (1995) page 351; Jeanes & Backhouse (2006) page 217; Jones (2006) page 231; Bates (2011) pages 73 & 74.

Glabrous terrestrial *herb*. *Tubers* ovoid, 1–2 cm long, 5–10 mm wide, fleshy. *Leaf* linear to linear-lanceolate, 10–30 cm long, 5–15 mm wide, erect, canaliculate, fleshy, dark green with a purplish base, ribbed abaxially, sheathing at base, apex acute. *Scapes* 20–60 cm tall, 1.5–5 mm diam., slender to stout, straight, green to purplish. *Sterile bracts* usually 2, linear to linear-lanceolate, 1.5–7.5 cm long, 4–12 mm wide, closely sheathing, green to purplish, acute to acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–26 mm long, 3–7 mm wide, sheathing the pedicels, green to purplish. *Pedicels* 1–15 mm long, slender. *Ovary* cylindrical to narrow-obovoid, 6–12 mm long, 1.5–3.5 mm wide. *Flowers* 2–15, (20–)30–40 mm across, usually dark blue to purplish, occasionally lilac, pink or white, opening freely in warm weather. *Perianth segments* (9–)15–22 mm long, 4–11 mm wide, concave, often somewhat stalked to spatulate, apex acute to obtuse, often shortly apiculate; *dorsal sepal* ovate; *lateral sepals* lanceolate to ovate, slightly asymmetric; *petals* ovate; *labellum* elliptic to oblanceolate, usually narrower than other segments. *Column* erect from the end of ovary, (5–)6–8 mm long, (2.5–)3–4.7 mm wide, pale blue to pinkish; *post-anther lobe* hooding the anther, 3.5–4.5 mm long, 1.8–3 mm wide, tubular, usually very inflated, gently curved through c. 90°, pale to dark brown, apex yellow, bilobed,

lobes irregular, to c. 1 mm long; *auxiliary lobes* often present as 2 tiny incurved spurs on the lower apical margin of the post-anther lobe; *lateral lobes* converging, 1.5–2.2 mm long, digitiform, porrect at base, curved upwards, each with a toothbrush-like arrangement of white hairs along the upper ½ to ¾ of their length, the individual hairs 0.8–1.2 mm long. *Anther* inserted about mid-way along column, ovoid, 2.5–3.5 mm long, 1.5–2.5 mm wide, connective produced into a beak 0.4–0.7 mm long; *pollinarium* 2–3.3 mm long; *viscidium* more or less circular, c. 0.6 mm diam.; *pollinia* white with coherent pollen. *Stigma* situated at base of column, ovate-quadrangle, 2.3–3 mm long, 2–3 mm wide, margins irregular. *Capsules* obovoid, 10–20 mm long, 5–8 mm wide, erect, ribbed. (Fig. 5c)

Selected specimens examined: SOUTH AUSTRALIA. Wilpena Pound, about 6 km SW of Chalet, near foot of Dick's Nob, 28.viii.1974, *T.B. Muir 5325* (MEL 114560 & MEL 2039739); Yorke Peninsula: Mulburra Park Conservation Reserve, 3.ix.2000, *D.L. Jones 17255* (MEL 2087463, MEL 2089296 & CANB); Railway enclosure c. 2 miles (3 km) E of Tintinara, 28.ix.1961, *J.H. Willis s.n.* (MEL 114558 & MEL 221672); Eyre Peninsula: SW of Wanilla Railway Siding, Hundred of Wanilla, 5.x.1967, *C.R. Alcock 2696D & 2696B* (AD 98839144, AD 98839146, MEL 2067264, MEL 2067263, CANB 524788 & CANB 524787); Stansbury Scrubs, c. 5.3 km W along road to Minlaton, 3.ix.1999, *D.L. Jones 16663 & M. Garratt* (CANB 607255 & AD); South-east District: Desert

Camp Park, southern side of Keith–Padthaway Road, 14.ix.1999, *D.L. Jones 16949 & M. Garratt* (CANB 606837); Mulburra Park Flora Reserve, near Port Vincent, 2.ix.1999, *D.L. Jones 16631 & M. Garratt* (CANB 607222); South-east District: 6.8 km W of Coonalpyn towards Meningie, 14.ix.1999, *D.L. Jones 16912 & M. Garratt* (CANB 606800 & AD); Yorke Peninsula: Rail Reserve above Lochiel turnoff, Bute–Snowtown Road, 27.viii.1966, *B. Copley 539* (AD 96643216); Lower Murray Mallee: Monarto South, c. 15 km W of Murray Bridge on Adelaide–Melbourne railway, 26.ix.1936, *W. Giles 863* (AD 97631486). **NEW SOUTH WALES.** Moama, x.1891, (NSW 462446); Central-west Slopes. Holy Camp, Weddin Mountains National Park, 14.x.1999, *M. Garratt ORG2758 & K.J. Fitzgerald* (CANB 611758); Central-west Slopes. Weddin Mountains National Park, in camp ground, c. 15 km W of Grenfell, 23.x.1989, *A.M. Lyne 17* (CANB 9012015); Central Tablelands. Mullion Range, c. 6 km along Ophir Road, N of Mullion Creek, 24.x.1989, *D.L. Jones 5299* (CANB 8913829); South-west Slopes. Nailcan Range, Albury, 17.x.1998, *P.G. Branwhite ORG1639* (CANB 609386); Cocoparra National Park, Woolshed Creek area, 4.x.1971, *J.W. Wrigley s.n.* (CANB 42233); 6 miles N of Junee on highway, 3.x.1963, *I.G. Matthias s.n.* (CANB 64975); Central-west Slopes. Kangaroooby, 22.x.1966, *B. Whitehead s.n.* (CANB 8104449, CANB 8104450 & CANB 8104451); Merrimerrriwa Range, along S boundary fence of Yathong Nature Reserve, 11.x.1983, *K. Hill 114 & L. Johnson* (NSW 465653); 22.6 km S of Rye Park on Boorowa–Yass Rd, 16.x.1980, *R. Coveny 10754 & P.D. Hind* (NSW 412016 & CANB 509588); Warrambungle National Park, Beloungery Split Rock, 10.ix.1988, *W. Greuter 20647* (MEL 2199225 & NSW 462476).

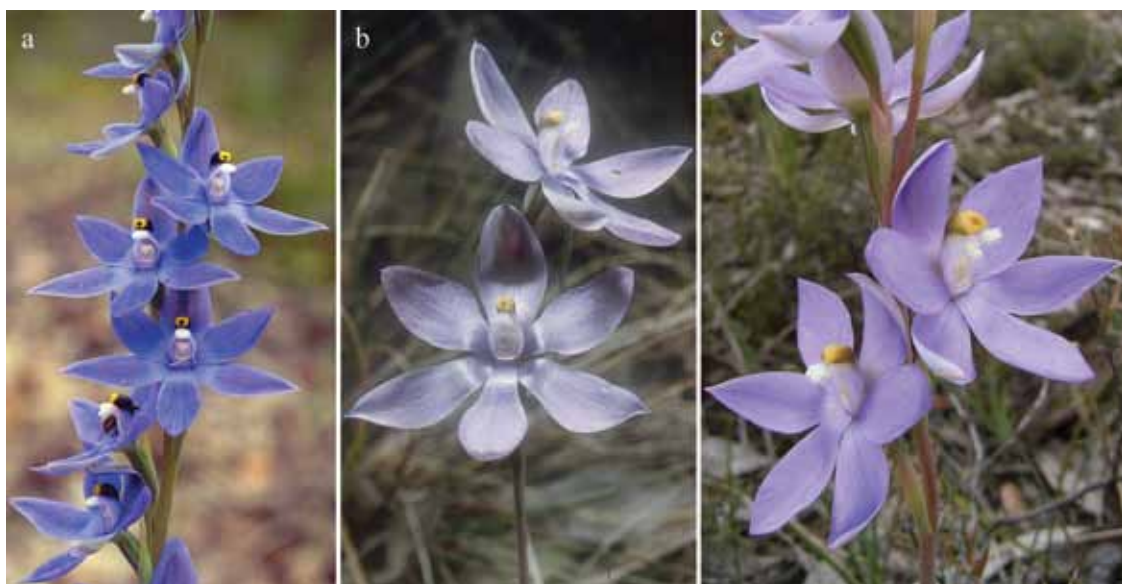


Figure 5. a. *Thelymitra macrophylla*, Rocky Gully, WA (photograph by J.A. Jeanes); **b.** *T. alpina*, Snowy Plains, Vic. (photograph by J.A. Jeanes); **c.** *T. megalyptra*, Deep Lead, Vic. (photograph by J.A. Jeanes)

AUSTRALIAN CAPITAL TERRITORY. Black Mountain, section W of Caswell Drive, 9.xi.1975, *J.H. Webb s.n.* (CANB 506689); Bulls Head to Bendora Dam Rd, 31.x.1963, *M. Gray 5346* (CANB 505955); Mt Ainslie, 29.x.1991, *C.H. Broers 232 & D.L. Jones* (CANB 9109483); Gibraltar Falls, 2.xi.1991, *C.H. Broers 255 & P. Branwhite* (CANB 9219840); Corin Forest, on Corin Dam Road, 17.xi.1991, *M.A. Clements 7666* (CANB 611757); Hill E of Cotter River crossing, Cotter Hut Rd, Namadgi National Park, 30.xi.1998, *D.L. Jones 16224, M. Garratt & K.J. Fitzgerald* (CANB 611755, MEL 2089292 & NSW); Kowen Pine Forest, 18.xi.1964, *M. Gray 5584* (CANB 505941); Black Mountain, W side adjacent to Aranda, 1.xi.1989, *D.L. Jones 5335 & B.E. Jones* (CANB 8913865); 8 km S of Gibraltar Falls on Corin Rd, 27.xi.1984, *G. Stewart 400, B. O'Shea & S. Young* (CANB 8413192). **VICTORIA.** Murray Valley: Warby Range, 15 km SW of Wangaratta, 5.xi.1985, *A.D.J. Piesse 91* (MEL 1543154); Chiltern State Park, Skeleton Boundary Track 200 m in from Lancashire Gap Road, 16.x.1989, *J. Strudwick JS433* (MEL 1576857); Riddell rail enclosure, xi.1941, *W.H. Nicholls s.n.* (MEL 650292); North-west: Big Desert, 13 km S of Murrayville on the Nhill Road, 2.x.1979, *M.G. Corrick 6366* (MEL 1515757); Big Desert. Wyperfeld National Park, 7.7 km ENE from Ring Road, 10.x.1990, *N.G. Walsh 2997* (MEL 1598339 & MEL 2045489); Cemetery at Kingower, c. 7 miles SW of Inglewood, 9.x.1960, *T.B. Muir 1371* (MEL 221679); Railway line 2 miles E of Heathcote, xi.1964, *D.L. Jones s.n.* (MEL 649023 & MEL 648745); Whroo Forest. Whroo, 7 km SSW of Rushworth, 27.x.1974, *T.B. Muir 5375* (MEL 114544 & CANB 8309420); Western Highlands region: Lake Fyans area, 18.xi.1996, *D.L. Jones 14973 & M. Garratt* (CANB 9908963); Anglesea, near summit of Mt Ingoldsby, 24.x.1966, *D.L. Jones s.n.* (CANB 523996 & CANB 9800268).

Distribution and habitat: South Australia, New South Wales, Australian Capital Territory and Victoria. Grows mostly in drier inland habitats such as open forest, woodlands and mallee scrublands on well-drained sand and clay loams. Altitude: 10–1000 m. (Fig. 6c)

Conservation status: Widespread, often locally common and well conserved.

Flowering period: Late August to November.

Pollination biology: The easily spreading perianth, functional viscidium, coherent pollen and sporadic production of seed capsules would suggest that this species is entomophilous.

Typification: The type sheet contains four specimens and two labels. The left-hand specimen (a) was designated by Clements (1989) as the lectotype. The remaining three specimens are from a different collection and are probably syntypes. All four specimens appear to be of the same species although the one on the left is more robust and has somewhat larger flowers.

The lower part of the inflorescence and the leaf are missing from all specimens.

Notes: Plants consistent with Fitzgerald's description, illustration and notes on *Thelymitra megalyptra*, and with the type collection, can still be found in southern New South Wales in the vicinity of the type locality and have been collected recently and studied. This taxon is relatively common and widespread throughout much of inland south-eastern Australia, but remains poorly known today due to the presence of several superficially similar taxa. The degree of inflation of the post-anther lobe is variable within and between populations,

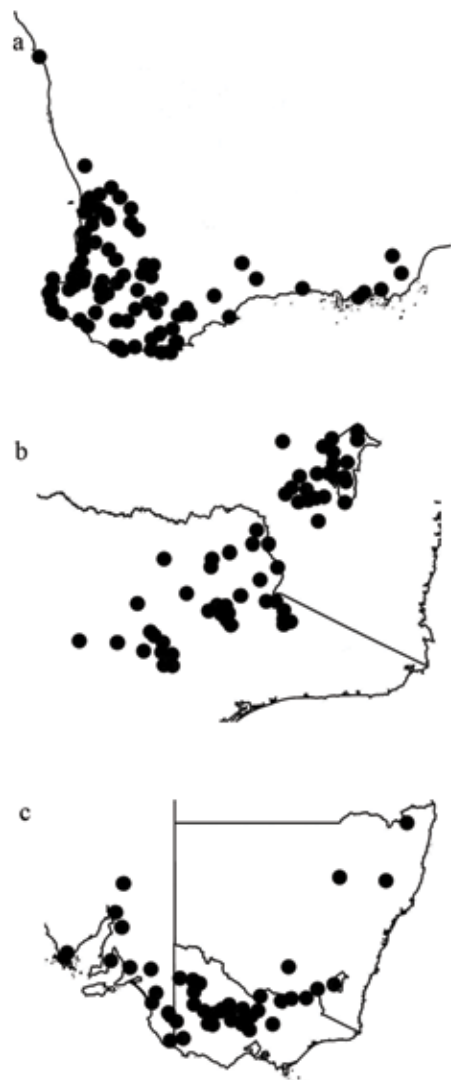


Figure 6. Distribution of **a.** *Thelymitra macrophylla*; **b.** *T. alpina*; **c.** *T. megalyptra*

and, used by itself, this character is unreliable for identification purposes.

Thelymitra megcalyptra hybridises with *Thelymitra luteociliium* Fitzg. (to produce *Thelymitra* × *chasmogama* R.S. Rogers) and with *T. antennifera* (Jones 2006)

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CSIRO = CSIRO, Centre for Plant Biodiversity Research (ACT)

DEC = Department of Environment and Conservation (WA)

MEL = National Herbarium, Melbourne (Vic.)

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