Resolution of the *Thelymitra canaliculata* R.Br. (Orchidaceae) complex in southern Australia.

Jeffrey A. Jeanes

Royal Botanic Gardens Melbourne, Birdwood Avenue, South Yarra, Victoria 3141, Australia

Abstract

The five currently known taxa in the *Thelymitra canaliculata* R.Br. complex from southern Australia are discussed and descriptions are presented for each. *Thelymitra jonesii* Jeanes from Tasmania, *Thelymitra latiloba* Jeanes from southwestern Australia and *Thelymitra occidentalis* Jeanes from southern Australia are described as new and illustrated. The key diagnostic features relating to the size, shape and relative position of the auxiliary lobes of the column and the size and shape of the post-anther lobe of the column are elucidated. Information on distribution, habitat, pollination biology and conservation status is given for all five taxa. The relationships between *Thelymitra canaliculata*, *Thelymitra azurea* R.S.Rogers and the three new species are discussed. A key is provided to distinguish all five members of the *Thelymitra canaliculata* complex.

Introduction

Thelymitra J. & G. Forst. is a complex genus consisting of about 75 described species, several described natural hybrids and an uncertain number of undescribed taxa. It is mainly concentrated in higher rainfall areas of temperate Australia, but a few species occur in tropical northeastern Australia, about 10 endemic species occur in New Zealand and four additional species occur in Indonesia, New Caledonia, New Guinea and the Philippines.

There are a number of features that, in combination, readily distinguish members of the *Thelymitra canaliculata* R.Br. complex from all other *Thelymitra* species. The column has a well developed, fleshy, post-anther lobe (sometimes called the mid-lobe) that forms a hood over the anther, as well as two adjacent well developed, fleshy, auxiliary lobes (sometimes called accessory lobes or side lobules). The flowers are pale blue to deep azure blue, usually with darker longitudinal stripes and often with pink to mauve flushes at the base and/or apex of the perianth segments. The column wings have variously developed distal flanges on which the lateral lobes (sometimes called column arms or lateral staminodes) are inserted.

Thelymitra canaliculata was described by Robert Brown in his *Prodromus* (Brown 1810), the distribution given as (T.) for Tropical Australia. This is obviously in error as the specimens in Brown's herbarium and Bauer's drawing give King Georges Sound (Albany, Western Australia) as the provenance (Bentham 1873, Clements 1989). Over 100 years later, Dr Richard Rogers of Adelaide described *Thelymitra azurea* R.S.Rogers from South Australia (Rogers 1917), a species with obvious affinities to *T. canaliculata*. *Thelymitra azurea* was later reduced to synonymy under *T. canaliculata* (George 1971) with the comment "Rogers' specimens are shorter and more robust than Brown's but the floral morphology is the same. Both forms occur in Western Australia." Clements (1989) reinstated *T. azurea* commenting on the different structure of the column lobes and the different habitats of the two species.

After examining preserved and living plants as part of a revision of *Thelymitra* for Australia (in preparation), I am confident that *T. canaliculata* and *T. azurea* are distinct species. These studies further revealed that another three distinct undescribed species occur within the *T. canaliculata* complex in southern Australia. This opportunity is taken to describe these three new species and discuss their distinguishing characteristics.

Taxonomy

Thelymitra canaliculata R.Br., *Prod.* 314 (1810). *Type*: 'In swamps towards King Georges Sound' (*In paludibus ad Portum Regis Georgii III*), xii. 1801, *F. Bauer s.n.* (lectotype α BM!, designated Clements 1989; isolectotypes BM!, E).

Illustration: Hoffman & Brown (1998) page 257

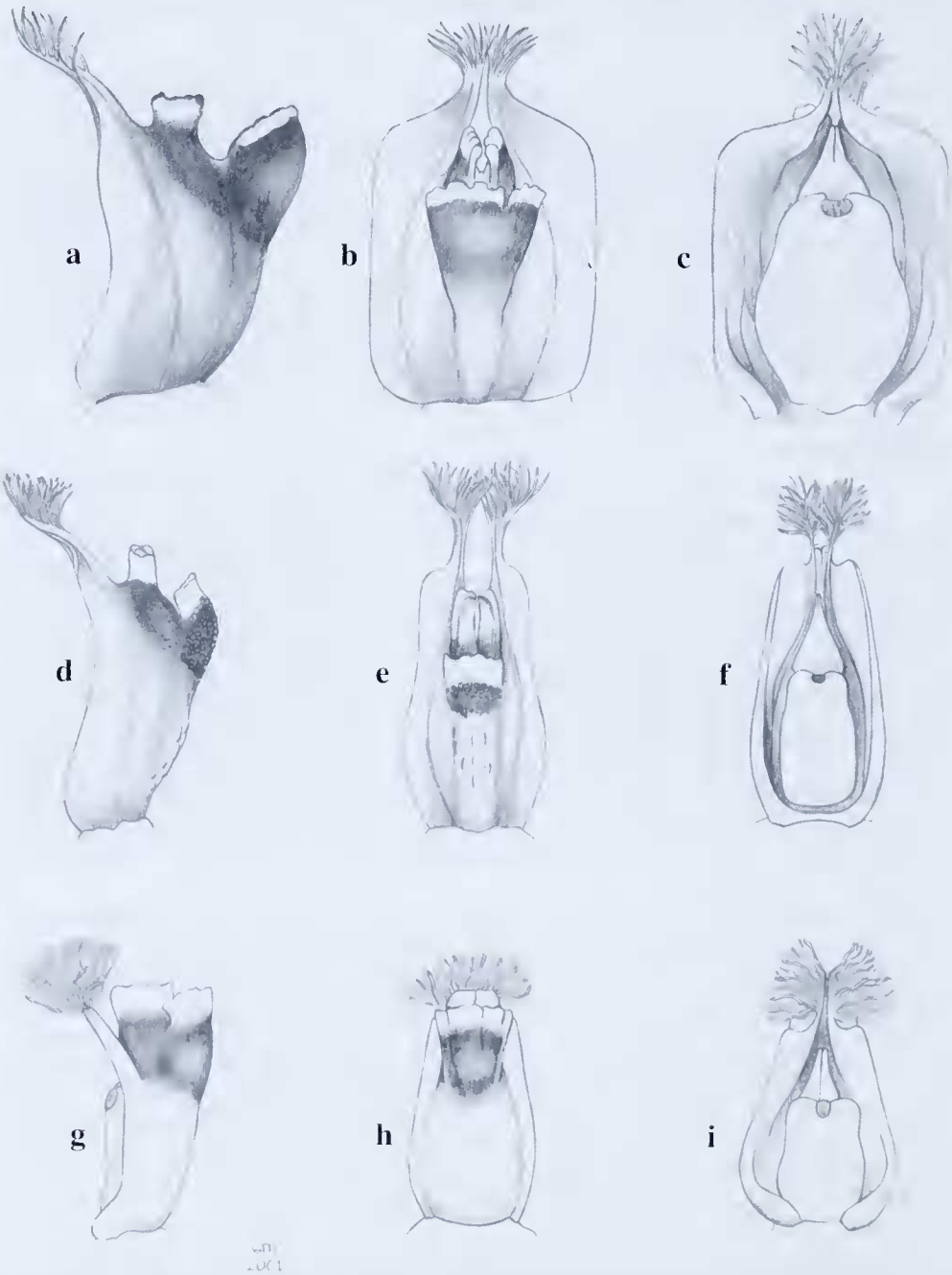

Figure 1. *Thelymitra canaliculata* **a** column from side ×8; **b** column from rear ×8; **c** column from front ×8; *Thelymitra azurea* **d** column from side ×8; **e** column from rear ×8; **f** column from front ×8; *Thelymitra jonesii* **g** column from side ×8; **h** column from rear ×8; **i** column from front ×8.

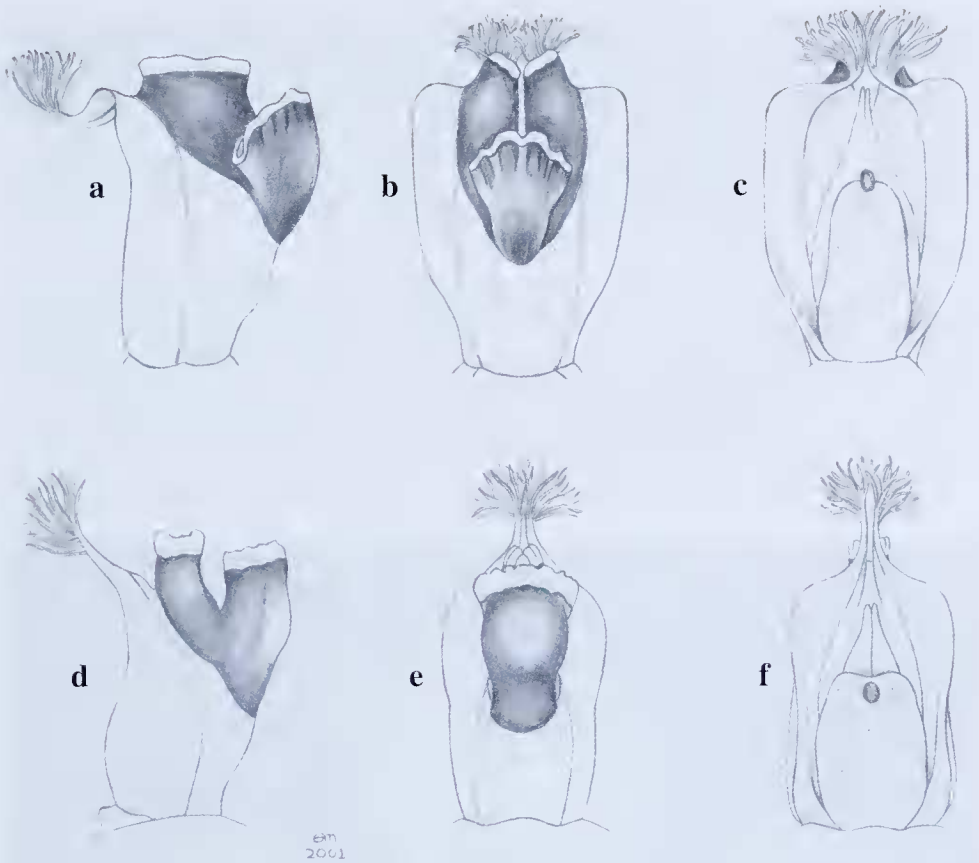

Figure 2. *Thelymitra latiloba* **a** column from side ×8; **b** column from rear ×8; **c** column from front ×8; *Thelymitra occidentalis* **d** column from side ×8; **e** column from rear ×8; **f** column from front ×8.

Glabrous, terrestrial *herb*. *Tubers* ovoid, fleshy. *Leaf* linear to linear-lanceolate, 20–35 cm long, 3–20 mm wide, erect, fleshy, canaliculate, dark green with a purplish base, ribbed abaxially, sheathing at base, apex acuminate. *Scape* 20–85 cm tall, 1–6 mm diam., straight, green to purplish. *Sterile bracts* 1–3, linear to linear-lanceolate, 1.2–8.5 cm long, 2–15 mm wide, closely sheathing, green or purplish, apex acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 4–25 mm long, 2–8 mm wide, sheathing the pedicels, green or purplish. *Pedicels* 2.5–7 mm long, slender. *Ovary* cylindric to narrow-obovoid, 3.5–13 mm long, 1.5–3 mm wide. *Flowers* 3–28, (15–)20–36 mm across, pale to dark blue with darker longitudinal veins, sometimes flushed pinkish, opening freely in warm weather. *Perianth segments* (7.5–)10–18 mm long, 3–9 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate to obovate, acute; *lateral sepals* ovate to obovate, acute; *petals* ovate to obovate, obtuse to acute; *labellum* lanceolate to oblanceolate, often smaller than other segments, obtuse to acute. *Column* erect from the end of ovary, 4–6 mm long, 2.5–4 mm wide, winged, pale blue at base grading to dark purplish black towards apex, wings with distal flanges; *post-anther lobe* hooding the anther, 1–1.5 mm long, 2.5–3.5 mm wide when flattened, purplish black at base, apex almost semicircular, fleshy, toothed, irregularly undulate, dissected, crest yellow; *auxiliary lobes* converging, 0.8–1.1 mm long, 0.8–1.3 mm wide, fleshy, more or less flat, usually wider than long and widest at apex, purplish black at base, apex shallowly toothed, irregularly undulate, yellow; *lateral lobes* converging, 2–2.7 mm long, flat, porrect or obliquely erect, 0.7–1.3 mm wide at base, tapering abruptly, distal half

oblong, each with a dense mass of erect and spreading trichomes on distal margins, the individual trichomes 0.8–1.1 mm long, white, rarely yellow or purplish. *Anther* situated about mid-way along column, mostly obscured behind stigma, ovoid, 2.5–3.1 mm long, 1.5–2 mm wide, connective produced into an apical beak 0.5–1 mm long; *pollinarium* 1.5–2.5 mm long; *viscidium* elliptic to more or less circular, c. 0.5 mm long, c. 0.4 mm wide; *pollinia* white, mealy. *Stigma* situated at base of column, ovate-quadrate, 2–3 mm long, c. 2.5 mm wide, margins irregular. *Capsules* obovoid, 8–15 mm long, 3–7 mm wide, erect, ribbed. (Fig. 1 a–c; Fig. 3)

Selected specimens examined: WESTERN AUSTRALIA: 13 km WSW of Walpole. Walpole Nornalup National Park, 30 xi. 1988, *G. Wardell-Johnson W120* (PERTH *02661020* & PERTH *02661039*); Spencer Park, Albany, xi. 1978, *R. Heberle s.n.* (PERTH *00293946*); Flat at junction of Station Road and Conspicuous Beach Road, Nornalup, 23 xi. 1994, *W. Jackson BJ305* (PERTH *04261917*); 9 miles S of Northcliffe, 26 xi. 1961, *A.S. George 3197* (PERTH *00293881*); Nannarup, 9 xii. 1964, *A.S. George 6481* (PERTH *00293849*); Spencer Park, Albany, 28 x. 1959, *Peter Smith s.n.* (PERTH *00293377*); 2 miles S of Pemberton-Nannup Road, c. 15 miles W. of Pemberton, 8 xii. 1957, *A.S. George s.n.* (PERTH *00330329*); Gravel road running S from South Coast Hwy just W

Figure 3. *Thelymitra canaliculata* Walpole area, Western Australia (photograph by C.J. French).

of Kent River, 13 xii. 1984, *A.P. Brown & S. Van Leeuwen 169* (PERTH *00293865*); Peaceful Bay Road recreation site, 2.5 km NE of Ficifolia Road junction, Walpole-Nornalup National Park, 24 xi. 1990, *N. Gibson & M. Lyons 1206* (PERTH *03050505*); 3 km E of Walpole, Walpole-Nornalup National Park, near Pt. 1041, 19 xi. 1987, *A.R. Annels 138* (PERTH *02661012*).

Distribution and habitat: Endemic to near coastal, south-west Western Australia, mostly between Augusta and Albany (Fig. 8). Grows around the margins of winter-wet swamps or on raised hummocks within them (Hoffman & Brown 1998). Altitude: 10–200 m.

Conservation Status: This species is moderately widespread and represented in reserves.

Flowering period: Late October to December.

Pollination biology: The large, freely opening flowers, coherent pollen, functional viscidium and sporadic capsule development, indicate that this species is most likely entomophilous.

Notes: *Thelymitra canaliculata* has been confused with *Thelymitra azurea*, but the two species are quite distinct. The latter is a less robust, earlier flowering species with generally smaller flowers (21–27 mm across), a narrower post-anther lobe (0.9–2 mm wide) and smaller auxiliary lobes (0.5–1 mm long by 0.5–0.8 mm wide). It is found primarily in sandy heathland and mallee scrubland in dry situations, and is confined to eastern Australia. *Thelymitra canaliculata* is probably most closely related to *Thelymitra latiloba* Jeanes from the wheatbelt of Western Australia. The latter grows primarily in dry 'Wandoo' open forests and woodlands, has an earlier flowering season, a more convoluted apex to the post-anther lobe and generally broader (1.1–2.1 mm) and shorter (0.4–0.7 mm) auxiliary lobes. The apices of the three column lobes are distinctly bright yellow in *T. canaliculata*, but white or pale pink in *T. latiloba*. *Thelymitra canaliculata* is also related to *Thelymitra occidentalis* Jeanes, but the latter has a slightly narrower post-anther lobe (2–2.5 mm wide when flattened), slightly narrower auxiliary lobes (0.5–0.8 mm wide), flowers considerably earlier and grows in drier habitats.

Thelymitra azurea R.S.Rogers, *Trans. & Proc. Roy. Soc. South Australia* 41: 342, t. 17 (1917). *Type*: Found blooming in great numbers between Mount Compass and Victor Harbour, South Australia, 19 xi. 1916, *R.S. Rogers s.n.* (holotype AD, isotypes AD, MEL *677563*!).

Thelymitra canaliculata sensu J.Z. Weber & T.J. Entwisle in N.G. Walsh & T.J. Entwisle (eds), *Fl. Victoria* 1: 845 (1994), *non* R.Br. (1810).

Illustrations: Backhouse & Jeanes (1995) page 331; Bates & Weber (1990) Plate 200

Glabrous, somewhat glaucous terrestrial *herb*. *Tubers* ovoid, fleshy. *Leaf* linear to filiform, 10–27 cm long, 3–8 mm wide, erect, fleshy, canaliculate to conduplicate, dark green with a purplish base, ribbed abaxially, sheathing at base, apex acuminate. *Scape* 13–45 cm tall, 0.8–2.2 mm diam., straight to slightly flexuose, green to purplish. *Sterile bract* 1, rarely 2, linear to linear-lanceolate, 1.5–4 cm long, 3–6 mm wide, closely sheathing, green or purplish, apex acuminate and papillate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 3–14 mm long, 2–5 mm wide, sheathing the pedicels, green or purplish, apex papillate. *Pedicels* 2–7 mm long, slender. *Ovary* cylindric to narrow-obovoid, 4–10 mm long, 1.5–4 mm wide. *Flowers* 1–10, (13–)21–27 mm across, usually dark azure blue with darker longitudinal veins, often with mauve tonings, rarely pink, opening moderately freely in warm weather. *Perianth segments* (6–)10–13 mm long, 3–7 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate, obtuse; *lateral sepals* lanceolate to ovate, acute or obtuse; *petals* lanceolate to ovate, acute or obtuse; *labellum* lanceolate to narrow-ovate, often narrow than other segments, apex acute. *Column* erect from the end of ovary, 2.5–4.5 mm long, 2–2.5 mm wide, winged, blue to purplish, wings with distal flanges; *post-anther lobe* slightly hooding the anther, 0.5–1 mm long, 0.9–2 mm wide when flattened, fleshy, blackish at base, apex an arc subtending an angle of c. 90 °, toothed or warty, yel-

low; *auxiliary lobes* converging, 0.5–1 mm long, 0.5–0.8 mm wide, fleshy, rod-like, blackish at base, apex toothed or warty, yellow; *lateral lobes* converging, 1.2–2 mm long, flat, porrect or obliquely erect, 0.5–1 mm wide at base, tapering abruptly, distal half oblong, each with a dense mass of erect and spreading trichomes on distal margins, the individual trichomes 0.7–1 mm long, white or purplish. *Anther* situated at base of column, mostly obscured behind stigma, ovoid, 1.8–2.4 mm long, 1–1.6 mm wide, connective produced into an apical beak 0.4–0.8 mm long; *pollinarium* 1.2–1.8 mm long; *viscidium* ovate, 0.3–0.5 mm long, c. 0.3 mm wide; *pollinia* white, mealy. *Stigma* situated at base of column, ovate-quadrate, 1.8–2.3 mm long, 1.2–1.6 mm wide, margins irregular. *Capsules* obovoid, 8–14 mm long, 4–6 mm wide, erect, ribbed. (Fig. 1 d–f; Fig. 4)

Selected specimens examined: **South australia**: Mt Compass, 14 xi. 1932, *R.S. Rogers s.n.* (MEL *625468*); South east district: Lower Coorong, between the 156 and 157 mile post on the road from Adelaide to Kingston SE, 22 x. 1967, *R. Nash s.n.* (CANB *8104444*); South east district: 45 mile post on Naracoorte–Keith Road, 13 x. 1969, *M. Beek s.n.* (CANB *8104443*); Port Elliot, 19 xi. 1916, *Dr & Mrs Rogers s.n.* (NSW *181295*); Eyre Peninsula: Tooligie Hills, 13 x. 1958, *P.G. Wilson 442* (AD *95930067*); Eyre Peninsula: Cowell Hills, 29 ix. 1989, *R. Bates 20932* (AD *98930065*);

Figure 4. *Thelymitra azurea* Little Desert N.P., Victoria (photograph by J.A. Jeanes).

Gip Gip Rocks, Padthaway, 10 x. 1964, *D. Hunt 2182* (AD *DH2182*); Mt Compass, 30 x. 1976, *R. Bates s.n.* (AD *RJB/SE*). **Victoria**: 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 6324* (MEL *1591905* & MEL *565908*); Victoria Valley, xi. 1932, *Lorna Banfield s.n.* (MEL *236697*); Mallee. 8 km by track south-west of Red Bluff camping area on the SA/Vic. Border track, Big Desert, 6 xi. 1984, *David E. Albrecht 1235* (MEL *673998*); Glenisla heathland, beside Henty Highway & west of Grampians Victoria Range, 6 xii. 1968, *A.H. Corrick s.n.* (MEL *665159*); Wyperfeld National Park. 0.5 miles SE of Quandong Hill, 14 x. 1968, *A.C. Beauglehole 29355* (MEL *652722*); Glenelg Shire, 8 miles W of Casterton P.O., 17 xi. 1971, *A.C. Beauglehole 37909* (MEL *652720*); Lower Glenelg National Park, Kentbruck Heath, 22 xi. 1984, *A.C. Beauglehole 79113* (MEL *669210*); Little Desert (Eastern) near Wail, x. 1948, *A.C. Beauglehole 18787* (MEL *221696*); Tea Tree Creek area S of Glenisla Station, 13 xi. 1971, *A.C. Beauglehole 37894* (MEL *652721*); Yanac, x. 1942, *T.E. George s.n.* (MEL *1550418*).

Distribution and habitat: South Australia and Victoria (Fig. 8). In South Australia it occurs from the Eyre Peninsula to the Victorian border including Kangaroo Island. In Victoria it occurs in the Lowan Mallee, Wannon and Grampians Natural Regions (Conn 1993). Widespread but rather uncommon in mallee scrublands, heathy woodland and heathland on deep sand or sandy loam or peaty soils around swamp margins, often flowering most abundantly the season following fires. Altitude: 10–250 m.

Conservation Status: This species is moderately widespread and represented in reserves.

Flowering period: Late September to early December

Pollination biology: The freely opening flowers, coherent pollen, functional viscidium and sporadic capsule development, indicate that this species is most likely entomophilous.

Notes: *Thelymitra azurea* has been confused with *Thelymitra canaliculata*, but the two species are quite distinct (see notes under the latter species). *Thelymitra azurea* is most closely related to *Thelymitra occidentalis*, but the latter species has a broader post-anther lobe (2–2.5 mm wide) whose distal margin forms a more or less semi-circular rim, a more westerly distribution and generally earlier flowering period.

Thelymitra jonesii Jeanes, *sp. nov.*

T. azureae R.S.Rogers affinis sed floribus pallidioribus, lobis lateralibus columnae brevioribus, et lobis auxiliaribus ab lobis post-antheris distinctus minus a plicis involutis duis vel incisuris vadis duis marginis distalis sejunctis differt.

Type: Tasmania. Tasman Peninsula; Arthur Highway, between Eaglehawk Neck and Taranna, 24 x. 1997, *J.E. Wapstra ORG962* (holotype CANB *609353.1*, isotype CANB *609353.2*).

Thelymitra azurea sensu D.L.Jones *et al.*, *The Orchids of Tasmania* 266 (1999) *non* R.S.Rogers (1917).

Illustrations: Jones *et al.* (1999) pp. 260 & 266

Glabrous terrestrial *herb*. *Tubers* not seen. *Leaf* linear to filiform, 6–21 cm long, 3–6 mm wide, erect, fleshy, canaliculate to conduplicate, ribbed abaxially, dark green with a purplish base, sheathing at base, apex acuminate. *Scape* 8–40 cm tall, 0.7–2.5 mm diam., straight to slightly flexuose, green or purplish. *Sterile bract* solitary, linear to linear-lanceolate, 1.5–3.6 cm long, 3–6 mm wide, closely sheathing, green or purplish, apex acuminate and papillate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 4–12 mm long, 2–5 mm wide, closely sheathing the pedicels, green or purplish, apex papillate. *Pedicels* 2–6 mm long, relatively stout. *Ovary* narrow-obovoid, 4–8 mm long, 1.5–4 mm wide. *Flowers* 1–6, 13–21(–27) mm across, light blue to azure blue with darker veins, opening freely in warm weather. *Perianth segments* 6–10(–13) mm long, 2–8 mm wide, often shortly apiculate; *dorsal sepal* ovate, obtuse; *lateral sepals* lanceolate to ovate, acute or obtuse; *petals* lanceolate to ovate, acute or obtuse; *labellum* lanceolate to narrow-ovate,

often narrower than other segments, apex acute. *Column* erect from the end of ovary, 3–5 mm long, 1.5–2.5 mm wide, winged, blue to purplish, wings with distal flanges, sometimes terminating in entire, toothed or fimbriate lobes; *post-anther lobe* hooding the anther, 0.5–0.9 mm long, 1–2 mm wide when flattened, blackish at base, apex a fleshy, curved, toothed or warty crest, yellow; *auxiliary lobes* converging, 0.7–1.1 mm long, 0.5–1 mm wide, held in close proximity to post-anther lobe and differentiated from it by two inward folds or two shallow incisions of the distal margin, thick and fleshy, blackish at base, apex toothed or warty, yellow; *lateral lobes* converging, 0.5–1 mm long, 0.3–0.4 mm wide, fleshy, porrect or obliquely erect, terminal, continuous with column wing or inserted on inner apical margin of column-wing, each with a dense mass of erect and spreading trichomes on distal margins, the individual trichomes 0.9–1.1 mm long, white. *Anther* situated at base of column, mostly obscured,behind stigma, ovoid, 1.7–2.5 mm long, 1.2–1.8 mm wide, connective produced into an apical beak 0.3–0.8 mm long; *pollinarium* 1.4–2 mm long; *viscidium* more or less circular, c. 0.3 mm diam.; *pollinia* white, friable, mealy. *Stigma* situated at base of column, ovate-quadrate, 1.5–2.2 mm long, 1.1–1.9 mm wide, margins irregular. *Capsules* obovoid, 8–12 mm long, 4–6 mm wide, erect, ribbed. (Fig. 1 g–i: Fig. 5)

Figure 5. *Thelymitra jonesii* Tasman Peninsula, Tasmania (photograph by L. Rubenach).

Specimens examined: TASMANIA: Cape Barren Island, Furneaux Group, 26 x. 1973, *J.S. Whinray 631* (MEL *533323*); Cape Barren Island, Furneaux Group, 26 x. 1973, *J.S. Whinray 177* (AD *97512443*); Southport Bluff, 28 xi. 1976, *M. Allan s.n.* (HO *410816*); Eaglehawk Neck, 5 xi. 1984, *M. Cameron s.n.* (CANB *9702851.1* upper photograph); Mason Point between Eaglehawk Neck and Taranna, 31 x. 2000, *J. & A. Wapstra JAJ909* (MEL *2089283*); Taranna, Tasman Peninsula, 31 x. 1996, *R. Minchin ORG385* (CANB *611006.1* & CANB *611006.3*).

Distribution and habitat: Apparently endemic to Tasmania where known from only four widely separated areas (Fig. 8). Grows in moist coastal heath on sandy to peaty soil (Jones *et al.* 1999). Altitude: 10–250 m.

Conservation Status: Known from very few collections. Suggest 3EC by criteria of Briggs & Leigh (1996).

Flowering period: October to early December.

Pollination biology: The freely opening flowers, coherent pollen, functional viscidium and sporadic capsule development, indicate that this species is most likely entomophilous.

Notes: *Thelymitra jonesii* Jeanes is most closely related to *Thelymitra azurea* and *Thelymitra occidentalis*, but the former has generally paler blue flowers and the column has shorter lateral lobes (1.2–2 mm long in *T. azurea*, 1.5–2.5 mm long in *T. occidentalis*). Also, the auxiliary lobes in *T. jonesii* are less differentiated from the post-anther lobe, only being separated from it by two inward folds or two shallow incisions of the distal margin.

Specimens of *T. jonesii* from Cape Barren Island have a variable column post-anther lobe ranging from virtually absent to more typical of the species on the Tasmanian mainland.

Etymology: Named after David L. Jones (1944–), botanist, horticulturist and botanical author, and probably the first person to recognise *Thelymitra jonesii* as a distinct species. David is pre-eminent among contemporary orchid taxonomists in Australia, and has been of immeasurable help in my orchid research over many years, particularly more recently on the genus *Thelymitra*.

Thelymitra latiloba Jeanes, *sp. nov.*

T. canaliculatae R.Br. affinis sed lobis columnae ad apicem alba vel rosea, lobis auxiliaribus brevioribus latioribus, florescentia praecociore et habitationibus siccioribus differt.

Type: Western Australia. Weam Nature Reserve, c. 9 km E of Brookton, 15 x. 2000, *J.A. Jeanes* 845 (holotype PERTH, isotypes CANB, MEL *2089278*).

Thelymitra azurea sensu N. Hoffman & A. Brown, *Orchids of South-west Australia* edn 2, 258 (1998) *p.p.*, *non* R.S.Rogers (1917).

Glabrous, terrestrial *herb*. *Tubers* not seen. *Leaf* linear to linear-lanceolate, 15–30 cm long, 3–12 mm wide, erect, fleshy, canaliculate, dark green with a purplish base, ribbed abaxially, sheathing at base, apex acuminate. *Scape* 8–60 cm tall, 1.3–3.5 mm diam., straight, green to purplish. *Sterile bract* usually 1, rarely 2, linear to linear-lanceolate, 2–8 cm long, 3–10 mm wide, closely sheathing, green or purplish, apex acuminate to long-acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 3.5–25 mm long, 2–6 mm wide, green or purplish, sheathing the pedicels. *Pedicels* 3–8 mm long, slender. *Ovary* narrow-obovoid, 4–10 mm long, 1.5–3 mm wide. *Flowers* 2–12, (20–)30–38(–46) mm across, blue with darker blue longitudinal veins, sometimes flushed mauve towards centre and at extremities, opening freely in warm weather. *Perianth segments* (8–) 14–18(–22) mm long, 3–9 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate-lanceolate to ovate, acute; *lateral sepals* ovate-lanceolate to ovate, acute; *petals* ovate-lanceolate to ovate, sometimes asymmetric, obtuse to acute; *labellum* lanceolate to ovate-lanceolate, often smaller than other segments, subacute. *Column* erect from the end of

ovary, 3.5–5.5 mm long, 2–3 mm wide, winged, whitish or pale blue at base grading to dark blue dorsally and towards apex, wings with distal flanges; *post-anther lobe* hooding the anther, 1–1.7 mm long, 1.9–3.5 mm wide when flattened, a dorsally compressed inflated tube, dark purplish black, apex a curved, fleshy, toothed or lobed, irregularly undulate to crispate, white or pink crest; *auxiliary lobes* converging, 0.4–0.7 mm long, 1.1–2.1 mm wide, flat, dark purplish black at base, apex fleshy, shallowly toothed, irregularly undulate, white or pink; *lateral lobes* converging, 1.3–2 mm long, flat, porrect or obliquely erect, 0.5–1.1 mm wide at base, tapering abruptly, distal half oblong, each with a dense mass of erect and spreading trichomes on distal margins, the individual trichomes 0.8–1.1 mm long, usually purple, occasionally white. *Anther* situated about mid-way along column, mostly obscured behind stigma, ovoid, 2–3 mm long, 1.3–2 mm wide, connective produced into an apical beak 0.5–0.8 mm long; *pollinarium* 1.4–2.3 mm long; *viscidium* ovate, c. 0.4 mm long; *pollinia* white, mealy. *Stigma* situated at base of column, ovate-quadrate, 2–2.5 mm long, 1.5–2 mm wide, margins irregular. *Capsules* obovoid, 6–12 mm long, 3–7 mm wide, erect, ribbed. (Fig. 2 a–c; Fig. 6)

Figure 6. *Thelymitra latiloba* York area, Western Australia (photograph by J.A. Jeanes).

Specimens examined: **Western australia**: Dragon Rocks Nature Reserve No. 36128. NE section N of Jilakin Rocks Road, 24 x. 1991, *A.M. Coates 3316* (PERTH *05153433*); Dumbleyung, x. 1924, *B.T. Goadby s.n.* (PERTH *00330337*); Bruce Rock, x., *O.H. Sargent s.n.* (PERTH *00293393*); York, x. 1904, *A. Purdie s.n.* (PERTH *00293903*); Cut Hill, W of York, 8 x. 1905, *?O.H. Sargent s.n.* (PERTH *00293458*); 2 km S of Wongan Hills/Piawaning Road, Wongan Hills, 194 km NE of Perth, 21 ix. 1974, *K.F. Kenneally 2264* (PERTH *01220497*); 2 km S of Wongan Hills/Piawaning Road, Wongan Hills, 194 km NE of Perth, 6 x. 1974, *K.F. Kenneally 2342* (PERTH *01220519* & PERTH *3318/B*); Dryandra State Forest, Crossman map 1:100000, Grid Reference 955793, 28 x. 1987, *D.M. Rose 438* (PERTH *01699520*); Brookton area. Moorumbine South Rd, c. 100 m SE of Schultz Rd, 15 x. 2000, *J.A. Jeanes 843, C. French & H. Beyrle* (MEL *2089280*, PERTH); Dryandra State Forest, NW corner of reserve, 17 x. 2000, *J.A. Jeanes 847* (MEL *2089275*, PERTH); c. 6 km W of York. Balladong Rd c. 4 km from Southern Hwy, 16 x. 2000, *J.A. Jeanes 846* (MEL *2089277*, PERTH); Corner of Qualen Rd and Kittlers Rd, SW of York, 14 x. 2000, *J.A. Jeanes 838, C. French & H. Beyrle* (MEL *2089282*, PERTH).

Distribution and habitat: Endemic to southwest Western Australia, where apparently confined to the wheatbelt region between Wongan Hills and Dumbleyung (Fig. 8). Grows in 'Wandoo' open forest and woodland (*Eucalyptus drummondii*, *E. gardnerii*, *E. ornata* and *E. transcontinentalis* are also sometimes present), usually on slopes below laterite outcrops. Soils are sandy or gravelly loams over laterite, and are often covered by copious leaf and bark litter. Altitude: 200–400 m.

Conservation Status: Poorly known, but reasonably widespread and represented in reserves.

Flowering period: Late September to early November.

Pollination biology: The large, freely opening flowers, coherent pollen, functional viscidium and sporadic capsule development, indicate that this species is most likely entomophilous.

Notes: *Thelymitra latiloba* has been confused with *Thelymitra canaliculata*, but the two species are quite distinct (see notes under the latter species). *Thelymitra occidentalis* from dry mallee scrublands of southern Western Australia and South Australia differs from *T. latiloba* in its narrower auxiliary lobes (0.5–0.8 mm wide), generally less robust habit, often smaller flowers (15–32 mm across) and yellow-tipped column lobes.
Hybrids between *Thelymitra latiloba* and *Thelymitra macrophylla* Lindl. *sensu lato* have been observed near York and Brookton where the two species grow sympatrically.

Etymology: Latin *latus*, broad, wide; *lobus*, lobe; an allusion to the very broad auxiliary lobes on the column.

Thelymitra occidentalis Jeanes, *sp. nov.*

T. azureae R.S.Rogers affinis sed loba post-antherae latiore, incisa profunde magis, florescentia praecociore et distributione occidentalioribus differt.

Type: Western Australia. 32 miles E of Cranbrook, on Chester Pass Rd, 14 xi. 1959, *A.S. George 406* (holotype PERTH *00293415*).
Thelymitra azurea sensu N. Hoffman & A. Brown, *Orchids of South-west Australia* edn 2, 258 (1998) *p.p.*, *non* R.S.Rogers (1917).

Illustrations: Hoffman & Brown (1998) page 258; Bates & Weber (1990) plate 199

Glabrous, terrestrial *herb*. *Tubers* ovoid to obloid, 6–12 mm long, 3–6 mm wide, fleshy. *Leaf* linear to linear-lanceolate, 8–25 cm long, 3–10 mm wide, erect, fleshy, canaliculate, dark green with a purplish base, ribbed abaxially, sheathing at base, apex acuminate. *Scape* 12–40 cm tall, 0.8–2.5 mm diam., straight, green to purplish. *Sterile bract* usually 1, rarely 2, linear to linear-lanceolate, 1–5.5 cm long, 2–7 mm wide, closely sheathing, green or purplish, apex acuminate to long-acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 3–19 mm long, 2–6 mm wide, sheathing the pedicels, green or purplish. *Pedicels* 2–8 mm long, slender. *Ovary* narrow-obovoid, 3.5–12 mm long, 1–3 mm wide. *Flowers* 2–15, (15–)21–32 mm across, blue with darker blue longitudinal veins,

sometimes flushed mauve towards centre and at extremities, opening freely in warm weather. *Perianth segments* (7–)10–15 mm long, 3–6 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate-lanceolate to ovate, obtuse to acute; *lateral sepals* ovate-lanceolate to ovate, acute; *petals* ovate-lanceolate to ovate, obtuse to acute; *labellum* lanceolate to ovate-lanceolate, often smaller than other segments, acute. *Column* erect from the end of ovary, 3–5 mm long, 1.8–3 mm wide, winged, whitish or pale blue, wings with distal flanges; *post-anther lobe* hooding the anther, 0.8–1.4 mm long, 2–2.5 mm wide when flattened, purplish black at base, apex a more or less semicircular, occasionally bilobed or incised, fleshy, irregularly undulate, yellow crest; *auxiliary lobes* converging, 0.6–1 mm long, 0.5–0.8 mm wide, flat, usually longer than wide, purplish black at base, apex shallowly toothed, fleshy but not greatly thickened, yellow; *lateral lobes* converging, 1.5–2.5 mm long, flat, porrect or obliquely erect, 0.7–1 mm wide at base, tapering abruptly, distal half oblong, each with a mass of erect and spreading trichomes on distal margins, the individual trichomes 0.7–1 mm long, white or purplish. *Anther* situated about mid-way along column, mostly obscured behind stigma, ovoid, 1.5–2.5 mm

Figure 7. *Thelymitra occidentalis* Ravensthorpe, Western Australia (photograph by C.J. French).

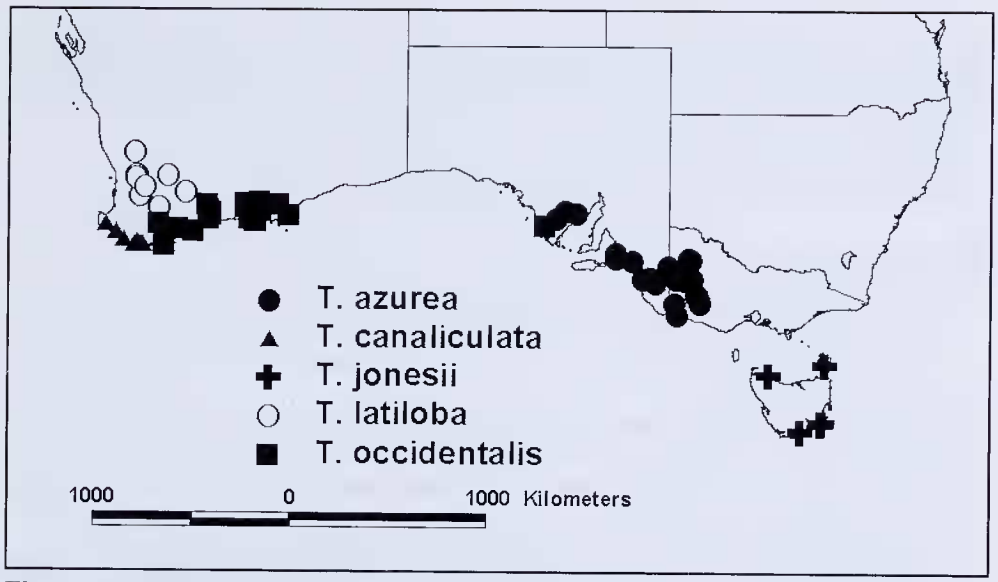

Figure 8. Distribution of *Thelymitra canaliculata, T. azurea, T. jonesii, T. latiloba* and *T. occidentalis.*

long, 1–1.5 mm wide, connective produced into an apical beak 0.4–0.6 mm long; *pollinarium* 1.2–2 mm long; *viscidium* more or less circular, c. 0.3 mm diam.; *pollinia* white, friable, mealy. *Stigma* situated at base of column, oblong, 2–2.5 mm long, 1–1.5 mm wide, margins irregular. *Capsules* obovoid, 6–12 mm long, 4–7 mm wide, erect, ribbed. (Fig. 2 d–f; Fig. 7)

Selected specimens examined: WESTERN AUSTRALIA: Mt Merivale, 20 km E of Esperance, 30 x. 1995, *B. Archer 174* (MEL *2032837* & MEL *2032838*); Norseman–Esperance Rd, c. 5 miles S of Grass Patch, 7 ix. 1963, *J.H. Willis s.n.* (MEL *221698*); Lower southern slopes of East Mt Barren, 13 km WNW of Hopetoun, 4 x. 1966, *T.B. Muir 4176* (MEL *565673*); Roe Botanical District, 32 km NE of Mt Ridley, 14 ix. 1991, *W.R. Archer 1409935* (MEL *2013882*); 6 km E of Mt Buraminya, 11 x. 1992, *W.R. Archer 1110923* (MEL *2034244*); 6 km ENE of Mt Buraminya, 11 x. 1992, *W.R. Archer 1110922* (MEL *2034243*); Mount le Grand, near Esperance, 11 ix. 1971, *A.S. George 11017* (PERTH *00300632*); Ravensthorpe–Hopetoun Rd, *W. Rogerson 258* (PERTH *00293407*); Ravensthorpe, ix. 1967, *Mrs V.M. Bennett s.n.* (PERTH *00293466*); 10 miles ESE of Tambellup, 30 ix. 1971, *A.S. George 11081* (PERTH *00300659*).

Distribution and habitat: Western Australia and South Australia (Fig. 8). In Western Australia it is found in southern regions between Katanning and the South Australian border, with isolated inland records for the southern fringe of the Great Victoria Desert (Hoffman & Brown 1998). In South Australia, apparently found on the Eyre Peninsula (eg. Mt Hope), based on unpublished information (R. Bates pers. comm.) and on plate 199 in *Orchids of South Australia* (Bates & Weber 1990). Grows in sand or sandy clay soils in heathland or shrubby mallee woodland, often near rock outcrops or around winter-wet depressions. Altitude: 5–200 m.

Conservation Status: This species is very widespread and represented in reserves.

Flowering period: September to early November.

Pollination biology: The large, freely opening flowers, coherent pollen, functional viscidium and sporadic capsule development, indicate that this species is most likely entomophilous.

Notes: *Thelymitra occidentalis* is apparently most closely related to *Thelymitra azurea*, but the two species are quite distinct (see notes under the latter species). *Thelymitra occidentalis* has also been confused with *Thelymitra canaliculata* (see notes under the latter species).

A few collections of *T. occidentalis* from near Esperance are unusual in having two sterile bracts and mauve hair tufts on the lateral lobes. This variant also appears to multiply vegetatively as one specimen examined had a developing daughter tuber on a lateral root.

Etymology: Latin *occidentalis*, western; the species has a generally more western distribution than its closest congener, *Thelymitra azurea*.

The following key is provided to distinguish the five members of the *Thelymitra canaliculata* complex.

1. Auxiliary lobes of the column held in close proximity to the post-anther lobe and only differentiated from the latter by two shallow incisions in, or by two inward folds of, the distal margin; lateral lobes of the column to 1 mm long; perianth segments usually to 10 mm long; Tasmania only ..... ***T. jonesii***
1. Auxiliary lobes of the column held well away from the post-anther lobe and differentiated from the latter by two obvious broad recesses in the distal margin; lateral lobes of the column >1 mm long; perianth segments usually more than 10 mm long; mainland Australia only 2

2. Auxiliary lobes of the column 0.8–2.1 mm wide, usually wider than long; post-anther lobe of the column >2.5 mm wide when flattened, distal margin greatly convoluted and often deeply dissected; Western Australia only (far south-west corner and western wheatbelt) 3
2. Auxiliary lobes of the column 0.5–0.8 mm wide, usually longer than wide; post-anther lobe of the column to 2.5 mm wide when flattened, distal margin not greatly convoluted or deeply dissected; Southern Australia (extending from Albany in Western Australia to the Victorian Grampians) 4

3. Auxiliary lobes of the column 1.1–2.1 mm wide, 0.4–0.7 mm long; post-anther lobe of the column often a dorsally compressed tube; apex of column lobes white or pale pink; flowers mostly in October; plants growing in 'Wandoo' open forests and woodlands of the western edge of the Western Australian wheatbelt ..... ***T. latiloba***
3. Auxiliary lobes of the column 0.8–1.3 mm wide, 0.8–1.1 mm long; post-anther lobe of the column rarely a dorsally compressed tube; apex of column lobes bright yellow; flowers mostly November to December; plants growing in moist situations around swamp margins of far southwest Western Australia ..... ***T. canaliculata***

4. Post-anther lobe of the column usually <2 mm wide when flattened, apex forming an arc-like rim subtended by an angle of about 90 degrees; flowers mostly October and November; South Australia and Victoria ..... ***T. azurea***
4. Post-anther lobe of the column 2–2.5 mm wide when flattened, apex forming a more or less semicircular arc-like rim; flowers mostly September to October; southern Western Australia and South Australia (Eyre Peninsula) ..... ***T. occidentalis***

Concluding remarks

This paper is based primarily on the quantitative and qualitative study of dried and spirit preserved herbarium specimens, supplemented by field observations, photographs and illustrations from the literature. Although the specimens within each species show considerable variation, no intermediates were encountered and remarkably few were difficult to classify, and these were generally dried specimens that had either been pressed poorly and lost important diagnostic features or had deteriorated with age. A few aberrant specimens were encountered, and comment is made on these under the species in question. The size, shape and position of the auxiliary lobes are the most important diagnostic features of this complex, and most specimens can be identified positively from these alone.

The size and shape of the post-anther lobe are particularly important in distinguishing between *Thelymitra azurea* and *Thelymitra occidentalis*, which appear to be close sister taxa. The yellow pigment at the apex of the post-anther lobe and auxiliary lobes of four of the five species is highly durable and obvious in most dried specimens regardless of age. Dried specimens of *Thelymitra latiloba* are usually readily identified by their lack of this yellow pigmentation. Annotations on herbarium sheets concerning flowering times and habitat preferences are also useful aids to identification.

The presence of *T. occidentalis* in South Australia is not supported by any preserved specimens that I had access to during this study. A more complete picture of its distribution would be facilitated by field research, particularly on the Eyre Peninsula.

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