

## Five new species of *Adenanthos* (Proteaceae) from Western Australia

By A. S. George

### Abstract

The following new species of *Adenanthos* are described and their relationships discussed: *A. acanthophyllus* sp. nov., *A. ellipticus* sp. nov., *A. gracilipes* sp. nov., *A. stictus* sp. nov., and *A. teges* sp. nov.

### Introduction

Recognition of the following new species of *Adenanthos* arose during preliminary work on the genus towards the Flora of Western Australia. All belong to the Section *Stenolaema* in which all four anthers are perfect.

### Notes on Morphology

In *Adenanthos* the zygomorphic perianth is arranged antero-posteriorly so that there is a posticous and an anticous segment and two lateral ones. The anticous one is the broadest, the posticous the narrowest, with the lateral ones intermediate but more similar to the anticous one. They form a tube in the lower half but separate above. Before anthesis, the posticous segment separates to a lower level than the others but may adhere on either side to the adjacent segment, and the style, except for the pollen presenter, emerges on the more deeply split side. The pollen presenter is held until anthesis within the limb, when the latter opens to free it, bearing the pollen. The limb of the anticous segment recurves more than the others, and its anther may reflex against the claw. A ring of straight, erect hairs usually surrounds the base of the perianth, and another surrounds the ovary.

### The gender of *Adenanthos*

The name *Adenanthos*, for many years treated as feminine, is here given masculine gender. The International Code of Botanical Nomenclature (1972), Chapter VI Section 2, Recommendation 75A, states:

“Similarly, all modern compounds ending in *-ceras*, *-dendron*, *-nema*, *-stigma*, *-stoma*, and other neuter words should be neuter. The fact that Robert Brown and Bunge respectively made *Aceras* and *Xanthoceras* feminine is immaterial. An exception should be made for names ending in *-anthos* (or *-anthus*) and *-chilos* (*chilus* or *-cheilos*), which ought to be neuter, since that is the gender of the Greek words *anthos* and *cheilos*, but which have generally been treated as masculine and should have that gender assigned to them.”

In Australia most genera of the latter endings are already treated as masculine, e.g. *Acianthus*, *Angianthus*, *Phyllanthus*, *Calochilus*, *Eriochilus*, etc. In order to further settle nomenclature, the Recommendation has been adopted for some time in Western Australia for *Adenanthos* and is followed here. Similarly, the genus *Anigozanthos* is now treated as masculine (Geerinck, 1970, p. 261).

**Adenanthos acanthophyllus** A. S. George sp. nov.

Derivation of epithet: Greek, *acantha*, a spine or prickle, and *phyllon*, a leaf.

*Frutex* multicaulis ad 5 m altus cum lignotubero. *Folio* rhombo-lunata 15–25 mm longa, 18–40 mm lata, profunde trilobata, lobis denue 2–3-lobatis; lobi triangulari-ovati 4–10 mm longi in spinis pungentibus contracti; laminae crassae aliquantum undulatae marginibus planis venatione furcato-reticulata; petiolis teretibus 5–10 mm longis; folia juvenes pubescentes, deinde glabra.

*Flores* solitarii in pedunculos 3–4 mm longos. *Bracteae* ovato-lanceolatae, acutae, 2–8 mm longae, appresso-pubescentes. *Perianthium* 24–28 mm longum limbo acuto 2–3 mm longo, intus glabrum, extus pilis brevibus longisque pubescens. *Antherae* sessiles 2 mm longae. *Squamae hypogynae* oblongae 2.5 mm longae. *Ovarium* breviter pubescens. *Stylus* glaber. *Fructus* fusiformis, obtuso-truncatus, 5–7 mm longus, breviter pubescens.

*Type*: Nanga Station, on road to Tamala, 5 miles SW of turnoff from Denham road, Western Australia—26°34'S, 113°55'E, 15 July 1973, A. S. George 11671. Holo: PERTH, iso: CANB, K, MEL, NSW, PERTH.

A broad, dense shrub to 3 m tall, occasionally to 5 m, with many stout, erect or spreading stems arising from a lignotuber. *Bark* smooth, light grey. *Branchlets* terete, yellowish, pubescent with short curled hairs and a few  $\pm$  straight ones, becoming glabrous after a few years. *Leaves* deeply 3-lobed, each lobe again 2–3-lobed, or when small simply 3-lobed, rarely entire; rhombic to lunate in outline, 15–25 mm long, 18–40 mm wide, the lobes often unequal, triangular-ovate, 4–10 mm long, contracted into a pungent, acuminate spine; lamina  $\pm$  undulate, sclerophyllous, margins flat, venation furcate-reticulate, pubescent when young, becoming glabrous; petiole terete, 5–10 mm long, pubescent.

*Flowers* pale pink and green, solitary, axillary in the uppermost axils; peduncles 3–4 mm long, bearing a few scattered, ovate bracts less than 1 mm. *Involucral bracts* ovate-lanceolate, acute to acuminate, the outermost 2 mm long, the innermost 7–8 mm, appressed-pubescent. *Perianth* 24–28 mm long including the limb of 2–3 mm; tube slightly swollen above base, then narrowed to the limb which is acute; tube moderately pubescent with short and long, straight to curled hairs, the limb with mostly long straight hairs; perianth glabrous within. *Anthers* sessile, 2 mm long, the connective broad, slightly produced, obtuse. *Hypogynous scales* oblong, 2.5 mm long, shortly united to the perianth. *Ovary* shortly pubescent. *Style* glabrous; *pollen presenter* 2 mm long, flattened on the lower side but the apex laterally compressed, otherwise smooth and rounded, the stigmatic groove terminal.

*Fruit* fusiform but swollen, obtuse-truncate, shortly spreading-pubescent, with a ring of straight, erect hairs 5–7 mm long around the base. Bracts slightly enlarged about fruit.

*Distribution*: central west coast of Western Australia: restricted to the southern end of Nanga Station just south of Shark Bay, where it is relatively frequent.

*Other collection*: type locality, 26 August 1969, A. S. George s.n. (PERTH).

This unusual species differs from all others of the genus especially in the form of its leaves. The only other species with pungent leaves is *A. pungens* Meisn., in which they are divided into terete lobes. *A. acanthophyllus* is much more robust than other species. Its stems are thick and woody, and the whole shrub is quite dense. Only *A. cygnorum* Diels approaches it in the size of the stems, but it is more brittle than the new species.

Geographically the species is of great interest. It is the only *Adenanthos* in the area, the nearest locality for another species being *A. cygnorum* near the Murchison River nearly 150 km to the south. It is also at the northern extremity of the South-West Botanical Province, in an area where several other taxa of unusual interest occur, e.g. *Newcastelia chrysophylla* C. A. Gardn., *Grevillea rogersoniana* C. A. Gardn. and *Eucalyptus roycei* Carr, Carr & George. These and many other species form a tall, fairly dense shrubland on deep red sand.

**Adenanthos ellipticus** A. S. George sp. nov.

Derivation of epithet: Latin, *ellipticus*, elliptic, in reference to the leaf-shape.

*Frutex* patenti-ramosus ad 5 m altus sine lignotubero. *Folia* elliptica, 2–5 cm longa, 5–15 mm lata, plana vel concava, plerumque integra, raro apicibus 2–3-lobatis, 3–5-nervata, breviter tomentosa, in petiolis 4–10 mm longis angustata.

*Flores* axillares in pedunculis graciles 6–12 mm longos. *Bracteae* ovato-ellipticae, obtusae, 1–3 longae, pubescentes. *Perianthium* 22–23 mm longum limbo 4 mm longo, intus glabrum praeter pilos longos post antheram, extus pilis brevibus rectis pubescens. *Antherae* sessiles 2.5 mm longae. *Squamae hypogynae* late obtusae, 1.3 mm longae, ad basin cum perianthio connatae. *Ovarium* doliiforme, breviter pubescens. *Stylus* 29–32 mm longus, dimidio supero patenti-hirsuto, ad basin glaber. *Fructus* doliiformis 6–7 mm longus, parce pubescens.

*Type*: East Mt. Barren, Fitzgerald River National Park, Western Australia—33°55'S, 120°02'E, 9 September 1971, A. S. George 10968. Holo: PERTH, iso: CANB, K, NSW. PERTH. In spirit collection at PERTH, no. 1310/A.

A rather slender, openly-branched *shrub* to 5 m high, without a lignotuber. *Branchlets* erect or ascending, terete, tomentose with somewhat curled, simple hairs, wearing off after several years leaving a smooth bark. *Leaves* elliptic, mostly 2–5 cm long, 5–15 mm wide (sometimes smaller and narrower); flat, (or concave in upper half), entire or with 2–3 obtuse lobes 1–4 mm long; 3–5-nerved (when 5 the inner 3 more prominent); shortly tomentose with curled,  $\pm$  appressed hairs; contracted into a terete petiole 4–10 mm long; a small, yellow-orange gland at the apex of the leaf or each lobe.

*Flowers* dull pink or red, axillary on slender peduncles 6–12 mm long bearing a few scattered bracts up to 1 mm long. *Involucral bracts* about 4, ovate-elliptic, obtuse, 1–3 mm long. *Perianth* 22–23 mm long at anthesis, including the limb of 4 mm long; tube contracted about ovary, broader above, then narrowed towards the limb; pubescent outside with short, straight hairs, glabrous inside except for silky hairs behind the anther. *Anthers* sessile, 2.5 mm long, connective produced into a short acute appendage. *Hypogynous scales* oblong, obtuse, thin, 1.3 mm long, fused to perianth in lower 3/4. *Ovary* doliform, shortly pubescent, the long basal hairs slightly exceeding the ovary. *Style* 29–32 mm long, upper half spreading-hirsute, becoming glabrous below. *Pollen presenter* 2.5 mm long, with a slight kink just above the base, almost terete but the apex laterally compressed, obtuse; stigmatic groove terminal.

*Fruit* 6–7 mm long, doliform with the truncate apex slightly curved postically; irregularly ribbed, sparsely pubescent, with long hairs about base. Bracts enlarged to 9 mm long in fruit.

*Distribution*: south coast of Western Australia: restricted to East Mt. Barren in the Fitzgerald River National Park.

*Other collections*: all from East Mt. Barren: 26 Nov. 1931, W. E. Blackall 1433 and C. A. Gardner 2953; 31 Jan. 1960, A. S. George 572; 21 April 1962, A. S. George 3677A; 25 Oct. 1964, K. Newbey 1451. (All at PERTH)

The affinity of this species is with *Adenanthos cuneatus* Labill. and *A. stictus* A. S. George (see below). However, its leaves are usually entire, have more prominent nervation and lack the small glands over the surface. It is much taller than *A. cuneatus* and lacks a lignotuber which the latter has. *A. cuneatus* also occurs around East Mt. Barren, but the two taxa remain distinct. *A. stictus* is far removed geographically, and though of tall habit is more densely branched than *A. ellipticus*.

**Adenanthos gracilipes** A. S. George sp. nov.

Derivation of epithet: Latin, *gracilis*, slender, and *pes*, a foot, in reference to the slender peduncles.

*Frutex* effusus ad 70 cm altus. *Folia* sessilia, 1–3 cm longa, in lobis 3 teretibus angustis divisa, lobi etiam 1-furcati, obtusi, cum glande miniata sub apice, parce appresso-pubescentes, deinde glabra; lobis 3–15 mm longis.

*Flores* axillares solitariae in pedunculos graciles glabros 3–5 mm longus. *Bractaeae* ovatae, obtusae, exteriores 1–2 mm, interiores 3–4 mm longae, fere glabrae marginibus ciliatis, cum glande miniata sub apice. *Perianthium* 17–18 mm longum; unguis fere aequales, extus dense pubescentes, intus glabri; limbus 2.5 mm longus, obtusus, cum glande miniata sub apice, extus dense pubescens, intus cum pilis longis post antherum. *Antherae* 1.5 mm longae, connectivis breviter productis, acutis. *Squamae hypogynae* anguste-ovatae, obtusae, minus quam 1 mm longae. *Ovarium* breviter hirsutum. *Stylus* glaber, 23–25 mm longus.

*Type*: ± 65 km E of Lake King, on Norseman road, Western Australia, 15 Sept. 1964, R. H. Kuchel 1817. *Holo*: PERTH, *iso*: AD, CANB, PERTH.

A low, spreading shrub to 70 cm tall. *Branchlets* terete, reddish, appressed-pubescent, becoming glabrous after 1–2 years. *Leaves* sessile, 1–3 cm long, divided for 1/3–1/2-way into 3 terete, narrow lobes, these again often once-forked; lobes 3–15 mm long, obtuse but with a small orange-red gland below the somewhat uncinuate apex; sparsely appressed-pubescent with straight hairs, becoming glabrous but slightly scabrous.

*Flowers* pink, solitary in the woolly, uppermost axils, on slender, glabrous peduncles 3–5 mm long, the latter sometimes bearing a few minute bracts. *Involucral bracts* ovate, obtuse, outer ones 1–2 mm long, the inner 3–4 mm, with a small red gland below the apex, almost glabrous on both sides, the margins ciliate. *Perianth* 17–18 mm long, the tube swollen about the ovary, narrowed above; claws almost equal, densely pubescent outside with straight, spreading hairs, glabrous within; limb 2.5 mm long, obtuse, with an oval red gland on the outer surface below the apex, densely pubescent outside, with a few long hairs inside behind the anthers. *Anthers* 1.5 mm long, the connective shortly produced, acute. *Hypogynous scales* narrow-ovate, obtuse, less than 1 mm long, shortly united to the perianth. *Ovary* shortly hirsute. *Style* glabrous, somewhat flattened in upper half, 23–25 mm long; *pollen presenter* 1.5 mm long, ± terete but finely ribbed, the apex laterally compressed. *Fruit* not seen.

*Distribution*: South-Western Australia, between Hyden, Lake King and Salmon Gums.

*Other collections*: 300 mile peg, Hyden-Norseman road, 26 Oct. 1964, J. S. Beard 3853; sine loc., 1965, W. Rogerson 239. (All at PERTH)

*Adenanthos gracilipes* is a distinctive species with no very close allies. It is somewhat similar to *A. apiculatus* R.Br. which is of similar, sprawling habit. However the new species has leaves with thicker, widely-spreading lobes, the peduncles are longer and very slender, and the involucre and flowers are different in many respects.

#### *Adenanthos stictus* A. S. George sp. nov.

Derivation of epithet: Greek, *stictos*, spotted, in reference to the small glands over the leaf surface.

*Frutex* ramosus ad 5 m altus ramis erectis vel ascendentibus. *Folia* anguste-ad late-cuneata, 15–35 mm longa petiolis 5–10 mm longis, apicibus 3–6-lobatis lobis triangularibus obtusis 1–4 mm longis cum glandibus miniatis terminalibus; lamina plana, 5–25 mm lata, utrinque sericeo-pubescent tandem ± glabra, glandibus atro-rufis multis punctata.

*Flores* axillares, solitariae, in pedunculos 7–13 mm longos. *Bractaeae* ovatae 1–3 mm longae, sericeo-pubescentes, obtusae vel acutae, apicibus canaliculatis cum glandibus parvis. *Perianthium* 23–25 mm longum extus hirsutum intus glabrum, limbo 3–4 mm longo sub-acuto extus hirsuto intus post antheram sericeo. *Antherae* 3 mm longae connectivis brevibus. *Squamae hypogynae* cum perianthio pro 1.5 mm connatae, partibus liberis minus quam 1 mm longis, obtuse-lobatis. *Ovarium* breviter pubescens. *Stylus* 29–32 mm longus, ad basin glaber, supra breviter hirsutus, deinde glaber.

*Type*: ± 8 miles N of Marchagee on Geraldton Hwy, Western Australia—29°57'S, 116°04'E, 10 Sept. 1970, A. S. George 10379. *Holo*: PERTH, *iso*: AD, CANB, K, MEL, NSW, PERTH, RSA.

A much-branched, grey-green *shrub* to 5 m tall without a lignotuber, the branches erect or ascending. *Branchlets* terete, densely pubescent with  $\pm$  straight, appressed hairs, becoming glabrous. *Leaves* narrowly to broadly cuneate, mostly 15–35 mm long including the petiole of 5–10 mm; apex 3–6-lobed, rarely entire when small or with up to 9 lobes in seedling leaves, the lobes triangular, often unequal, 1–4 mm long, obtuse, terminating in a yellow-orange gland; lamina flat, 5–25 mm wide, silky-pubescent on both sides, at length  $\pm$  glabrous, dotted with many small dark red-brown glands, more numerous on the upper surface; venation furcate.

*Flowers* dull reddish-pink and green, axillary, solitary, on slender peduncles 7–13 mm long, the latter bearing scattered, ovate bracts  $\pm$  1 mm long. *Involucral bracts* 4–6, ovate, 1–3 mm long, silky-pubescent, obtuse to acute, the apex canaliculate and tipped with a small orange-yellow gland. *Perianth* 23–25 mm long (including the limb of 3–4 mm), hirsute outside with rather spreading hairs, glabrous inside, the limb sub-acute, hirsute outside, silky inside behind the anther. *Anther* sessile, 3 mm long, connective shortly produced. *Hypogynous scales* united to perianth for 1.5 mm, the free part less than 1 mm long, obtusely lobed. *Ovary* shortly pubescent, the long basal hairs 4 mm long. *Style* 29–32 mm long, glabrous at base, shortly hirsute above, but glabrous towards apex; *pollen presenter* 2–2.5 mm long, scarcely thicker than style apex. *Fruit* 7–8 mm long, oblong but narrowed at apex, obtuse, smooth, sparsely and shortly pubescent, with a basal ring of straight, erect hairs.

*Distribution*: South-Western Australia, between Coorow and Marchagee, growing in deep sand on heath.

*Other collections*: W of Coorow, 25 Sept. 1962, J. S. Beard 1933; Marchagee, 14 Jan. 1931, C. A. Gardner s.n.; Watheroo National Park, 7 Oct. 1971, R. D. Royce 9695. (All at PERTH)

*Adenanthos stictus* is the equivalent on the heaths north of Perth of *A. cuneatus* Labill. on the south coastal heaths. The two are closely related and possibly form a vicarious pair. *A. cuneatus* differs in having a lignotuber; in its lower habit; in the leaves having straight margins and shorter petioles, with a more silky and appressed indumentum which is also more persistent; in the very inconspicuous glands; in the denser, closer, indumentum of the flowers; and in the style having long, spreading hairs as well as short ones. The new growth of *A. cuneatus* is much more red than that of *A. stictus*, and the leaf surface does not wrinkle so much on drying.

*Adenanthos teges* A. S. George sp. nov.

Derivation of epithet: Latin, *teges*, a mat, in reference to the habit.

*Frutex* prostratus ad 3 m latus, sine lignotubero. *Ramuli* teretes, dense tomentosi pilibus brevibus longisque crispatis. *Folia* variabilia, ternato-divisa lobis filiformibus teretibus, lateralibus plerumque etiam furcatis; ea ad basin surculorum 6–7 mm longa, supra majora, ad 20 mm longa; ea floralibus simpliciter ternata vel integra, 25–28 mm longa; omnia laxe appresso-hirsuta, cum glandibus miniatis sub apices loborum.

*Flores* terminales in pedunculis 1–2 mm longos. *Bractae* triangulari-ovatae, 1–3 mm longae, obtusae, pubescentes. *Perianthium* 15–16 mm longum, extus breviter hirsutum, intus glabrum, limbo acuto 2.5 mm longo extus hirsuto intus post antherum sericeo. *Antherae* 1.25 mm longae, connectivis prominenter et anguste productis. *Squamae hypogynae* ca. 1 mm longae, oblongae, obtusae. *Ovarium* breviter pubescens. *Stylus* 27–28 mm longus, glaber.

*Type*: North-east of Mundaring Weir,  $\pm$  32 km east of Perth, Western Australia—31°57'S, 116°17'E, 7 December 1973, A. S. George 11758. Holo: PERTH, iso: PERTH, CANB, K, NSW. In spirit collection at PERTH, no. 1523/B.

A prostrate, mat-like *shrub* to 3 m broad, without a lignotuber, the branchlets rarely ascending, not rooting. *Branchlets* terete, densely tomentose with short and long curled hairs, the latter disappearing with age; when young with a few very long hairs also.

*Leaves* variable, usually ternately divided into filiform, terete lobes, the lateral lobes again once-forked (rarely also ternate); leaves at the base of the annual shoots 6–7 mm, becoming up to 20 mm long above; floral leaves simply ternate or undivided, 25–28 mm long, very slender; all leaves loosely appressed-hirsute with straight hairs (somewhat curled towards leaf base); the longer leaves (especially the floral ones) also with long spreading hairs; each lobe with a lateral orange-red oval gland at the apex.

*Flowers* 1–4 together on peduncles 1–2 mm long at the end of the branchlets. *Involucral bracts* triangular-ovate, the outermost 1 mm long, the inner 3 mm, obtuse, pubescent. *Perianth* 15–16 mm long, including the limb of 2.5 mm; claws shortly hirsute (more densely in upper half), glabrous within; limb acute, shortly spreading-hirsute outside, with long, coarse hairs inside behind the anthers. *Anthers* 1.25 mm long, connective produced into a prominent, narrow appendage. *Hypogynous scales* a little over 1 mm long, oblong, obtuse, united with perianth in basal third. *Ovary* shortly pubescent. *Style* 27–28 mm long, glabrous, *pollen presenter* 1.25 mm long, the base scarcely compressed, much thicker than the apex of the style, the upper part laterally compressed, with the stigmatic groove set obliquely on the dorsal side of the apex. Fruit not seen.

*Distribution*: restricted to a few populations on the Darling Plateau, near Mundaring Weir and Chidlow, east of Perth.

*Other collections*: type locality, December 1969, *A. B. Selkirk* (PERTH);  $\pm$  2 km north of Chidlow, Western Australia—31°51'S, 116°16'E, 7 December 1973, *A. S. George* 11759 (PERTH, MEL, RSA).

*Adenanthos teges* is remarkable for its dense, mat-like habit: the margins of the plant can be lifted almost like a carpet and then replaced on the ground. It was discovered in 1966 by Mr. A. B. Selkirk, of the Forests Department of W.A., who was intrigued by its resistance to burning. During controlled-burning of the forest near Mundaring, this plant not only resisted burning but in doing so protected those plants growing within the margin of the "mats".

The species is allied to *A. cygnorum* Diels and *A. sericeus* Labill. Besides the markedly different habit, it differs from both in the smaller flowers, the indumentum, and the larger glands at the apices of the lobes of the leaves. *A. cygnorum* has thicker leaves, often more divided than those of *A. teges* and occurs on deep sands of the coastal plain north and south of Perth. *A. sericeus* has bright red flowers, and occurs in deep sand or rocky sand of the south coastal heaths from Albany to Israelite Bay. *A. teges* grows in lateritic soils in Jarrah forest (*Eucalyptus marginata* Donn. ex Sm.) in a few localities near Mundaring Weir, east of Perth.

*Adenanthos apiculatus* R.Br. also is a broad, low shrub, often prostrate but with the ultimate branchlets ascending or erect, and its habit is more open than that of *A. teges*. It has a sparser indumentum on vegetative parts, the leaves becoming glabrous or almost so. The leaf lobes are uncinately over the sub-terminal glands. The perianth is only 10–12 mm long and is densely hirsute outside including the limb, while the pollen presenter is prominent and laterally compressed. *A. apiculatus* inhabits south coastal sandheaths between Denmark and Cape Riche, extending inland to the Stirling Range.

### Reference

- GEERINCK, D. (1970)—Revision du genre *Anigozanthos* Labill. Bull. Jard. Bot. Nat. Belg. 40: 261–276.

### Publication date of Volume 1 Number 3

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