

Grevillea pieroniae Olde (Proteaceae: Grevilleoideae: Hakeinae), a rare new species in the *Triloba* Group from the Stirling Range, Western Australia, and a short history of the group

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Abstract

Twenty-one *Grevillea* species currently comprise the *Triloba* Group *sensu Flora of Australia*, or Group 1 *sensu The Grevillea Book*. All species except the transcontinental species *G. anethifolia* R.Br. are distributed in south-west Western Australia. *Grevillea pieroniae* Olde, herein described, is currently treated as *Grevillea* sp. Stirling Range (D.J. McGillivray 3488 & A.S. George) by the Western Australian Herbarium. It has some affinity with *Grevillea anethifolia* through shared possession of similar truncate-conical to cylindrical pollen-presenters. *Grevillea pieroniae* is a rare species that is potentially threatened by *Phytophthora cinnamomi*, fire frequency, a drying climate, as well as grazing by feral and native herbivores, so requires careful assessment and ongoing monitoring. A short history of the *Triloba* Group is provided to give context to *Grevillea pieroniae* and as precursor to other related species soon to be recognised.

Introduction

The *Grevillea Triloba* Group is a highly distinctive group currently comprising species circumscribed by shared morphological characters. It is probably monophyletic with several potentially synapomorphic characters but only two species, *G. anethifolia* R.Br. and *G. acrobotrya* Meisn., have been included in existing phylogenies (Mast *et al.* 2015). A comprehensive summary of morphological characters for the Group is given by McGillivray and Makinson (1993: 167), Olde and Marriott (1994: 194) and Makinson (2000: 414–415). All species are entomophilous, have fragrant, white flowers and lack glandular hairs. Important characters include pedicels that are relatively thin and elongate; actinomorphic perianths; glabrous pistils and short gynophores that are undulate when preanthetic; styles that are constricted immediately above the ovary, then abruptly dilated in the proximal half, tapering distally; pollen-presenters erect, conico-cylindrical; and follicular, thin-walled fruits with a variable pericarp architecture that are monospermous by abortion of one embryo. Pericarp architecture has been noted as important for species-level diagnosis (Olde and Marriott 1994).

The botanical history of the *Grevillea Triloba* Group is complex. The first species scientifically described (*G. anethifolia*) was discovered on 13 Jun 1817 during Oxley's first expedition into western New South Wales and was collected by Allan Cunningham and Charles Fraser. Specimens remitted to Brown by Cunningham

had the Mss name ‘*Anadenia anethifolia*’ attached. The specimen material was mounted on separate sheets, together with a syntype collected by William Baxter in 1823 on the south coast of Western Australia. This combined material formed the basis for Robert Brown’s description (Brown 1830: 21). Brown placed *G. anethifolia* in his newly erected *Grevillea* Sect. *Conogyne*, of which it later became the lectotype species (McGillivray and Makinson 1993: 400).

In May 1839, Stephan Endlicher, working at Vienna with specimens supplied or collected by Charles von Hügel and John Septimus Roe, erected the genus *Manglesia* in which he described two related species, *Manglesia tridentifera* and *M. vestita* (Endlicher 1839: 25–26). It is unclear whether the descriptions were based on cultivated material raised from seed or on wild-source specimens, although dried material was mentioned in the description of the former ‘*Flores...ex sicco flavescentes*’. Types of both species have never been found. Nor is there any evidence that they were ever seen even by contemporary botanists such as Robert Brown, Robert Graham, John Lindley, and Carl Meisner, although there was certainly communication between Endlicher and Brown, Endlicher and Lindley, and probably Meisner.

To paraphrase the original Latin descriptions, Endlicher wrote of *Manglesia* ‘A genus, in which especially all the new species below require description, along with *Manglesia cuneata* Endl. (of which *Grevillera manglesii* Hortul. is a synonym), and probably all *Grevilleas* in *Grevillea* section *Conogyne* R. Brown *Supplementum* 21, related to *Anadenia* by Cunningham, must in future be referred, and which differ from true *Grevillea* in their perianth regular, style and stigma diverse, from *Anadenia* in the presence of a hypogynous gland, and in the style maximally thickened above a filiform base’. For the first time, *Grevillea anethifolia* was united, albeit briefly, with the remainder of the group as then known.

John Lindley (1840: xxxvii) supported Endlicher’s *Manglesia* ‘... it appears to be well distinguished from *Grevillea* by the style being thickened in a very remarkable manner a little below the stigma, while the stipes of the ovary is unusually long’. Lindley (1840) published the name *Manglesia glabrata* Lindl. However, Brown did not agree. Endlicher (1842: 37) refers to a discussion with the ‘very famous Brown’ who said that *Manglesia* was ‘not supportable’ and needed to be sunk into *Anadenia* [notwithstanding the presence of a gland]. Endlicher did not elaborate further on Brown’s reasons. However, Brown (1810: 166) had already described *Anadenia pulchella* which also has actinomorphic flowers. Moreover, the precedent was further established when Scotsman Prof. Robert Graham (1839: 189) described a related species as *Anadenia manglesii*, in June 1839. Graham had received a cultivated specimen from the nurseryman Lowe [sic] of the Clapton nursery, in 1837, ‘under the name *Grevillea manglesii*’.

Probably after discussion with Brown, Meisner (1845: 548–549) referred both *Manglesia* and *Anadenia* to synonymy under *Grevillea* which he regarded as *primum generis series* divided into six sections, the distinction between which is sometimes quite impossible to discern. Meisner (1848, 1855) published two new species. In De Candolle’s *Prodromus*, Meisner (1856: 391–393) reviewed the whole genus, grouping species into three Subgenera. He raised his Section *Manglesia* to Subgenus *Manglesia*. It contained no sections and only eight species. However, both *G. anethifolia* and *G. triloba* Meisn. were retained in Subgenus *Conogyne*, Section 2. *Angustilobae* (Meisner 1856: 387–388). From the abbreviated description, it seems clear that Meisner relied on Brown for the placement of *G. anethifolia* and did not actually sight the specimens for himself, most of which, like *G. triloba*, are infertile anyway. No new species were added to the group. However, *Manglesia lawrenceana* hort. ex Meisn. was synonymised under *Grevillea vestita* var. *angustata* Meisn.

Bentham (1870) included all ten known related species in his Section *Manglesia*. Curiously he moved *Grevillea anethifolia* from his Sect. 9, Section *Conogyne*, and placed it into Sect. *Anadenia* instead of Sect. *Manglesia*, a decision that defies adequate explanation, as does the persistent misplacement of *Grevillea anethifolia* by so many capable botanists before him.

Up until 1993, there was no comprehensive, correct structure into which all members of the *Triloba* Group had been formally assembled. McGillivray and Makinson (1993) were the first to aggregate all known related species into a single group by simply amending Bentham’s ‘Section *Manglesia*’ and including *G. anethifolia* plus additional species that had been subsequently described. They recognised 12 species.

Olde & Marriott (1994: 174–176), recognised 20 species in their Group 1, after adding further new species (Olde and Marriott 1993) and adjusting species boundaries. Makinson (2000: 414–440) recognised 21 species, after re-ranking and adding new taxa. The Group was there informally named the ‘*Triloba*’ Group. Makinson (2000: 415) speculated that the *Rudis* group, a small group which includes *G. pulchella* (R.Br.) Meisn. and whose members also have actinomorphic perianths, ‘seems likely to represent the most closely related group’. However, this was not confirmed in a molecular systematic analysis of subtribe Hakeinae Endl. published by Mast *et al.* (2015). Although they found that taxa included from both the *Triloba* and *Rudis* Groups were resolved in the same heterogeneous clade, along with members of the genera *Hakea* and *Finschia*, the *Rudis*

Group showed an unexpected close relationship to the *Petrophiloides* Group and the *Triloba* Group was resolved as sister to *G. dielsiana* C.A.Gardner.

It is anticipated that an ongoing study (led by M. Cardillo) in which most *Grevillea* species will be included in a molecular phylogeny (cf. a representative sample of only two species from informally recognised groups in Mast *et al.* 2015) will provide much greater insights into relationships between both species and species groups.

A major finding of the study by Mast *et al.* (2015) is that *Grevillea* is paraphyletic with respect to a monophyletic *Hakea* and *Finschia*, with obvious nomenclatural consequences. Christenhusz *et al.* (2018) have acted on this finding, and without consultation, transferred most species and subspecies to *Hakea*, giving new names where needed. This transfer is here rejected for the present. Mast *et al.* (2015) were unable to resolve *Grevillea* into bifurcating branches using the five selected genes. The phylogenetic dendrogram produced in that study contained a large polytomy from which six clades were descendant. Early results from a new study to resolve this impasse suggests that the transfer to *Hakea* is premature. Accordingly, new species are here described in the genus *Grevillea*.

In their discussion of *Grevillea* specimens in Section *Manglesia* ‘unassignable to species’, McGillivray and Makinson (1993: 185–187) drew attention to 18 specimens, five with affinity to *Grevillea anethifolia*. *Grevillea pieroniae* is equivalent to one of these, treated by them as ‘Unassigned x’. Field investigation and microscopic examination of plants characterised as ‘Unassigned x’ showed that the plants should be recognised as a distinct species because they occur in populations that can be reliably characterised and separately distinguished.

Apart from *G. pieroniae*, which has been recognised as *Grevillea* sp. Stirling Range (D.J.McGillivray 3488 & A.S.George) in Western Australian Herbarium (1998–) and Hollister *et al.* (2020), five additional species with phrase names in the *Triloba* Group are recognised by the Western Australian Herbarium but remain unnamed. These include *Grevillea* sp. Cape Arid (R.Spjut & R.Smith RS12562), *Grevillea* sp. Duranillin (E.F.Shedley 180), *Grevillea* sp. Gunapin (F.Hort 308), *Grevillea* sp. Harrismith (G.J.Keighery & N.Gibson 7094) and *Grevillea* sp. Shark Bay (N.H.Speck 24/09/1953). To these can be added eight specimens treated as Unassigned by McGillivray and Makinson (1993: 185–187), some of which may be extinct: Unassigned ‘v’, ‘vi’, ‘viii’, ‘ix’, ‘xi’ in part, ‘xiii’, ‘xv’ and ‘xviii’. Additional species in the *Triloba* Group have also been discovered during the ongoing study of this group. Taxonomic assessment of these entities is ongoing.

This paper describes a new species, *Grevillea pieroniae* Olde, a member of the *Triloba* Group *sensu* Makinson (2000), or Group 1 *sensu* Olde and Marriott (1994). *Grevillea pieroniae* is endemic to the Stirling range in south-west Western Australia, a region with a large number of locally endemic *Grevillea* species.

Morphology

Descriptions broadly follow the pattern and terminology developed by McGillivray and Makinson (1993) and the glossary therein. Conflorescences can be simple or compound; compound conflorescences comprise two or more unit conflorescences. The term was suggested to the author by the late Dr. L.A.S. Johnson.

Taxonomy

Grevillea pieroniae Olde, **sp. nov.**

Type: Western Australia: Stirling Range Drive, 9.1 km west north-west from Chester Pass Drive, *P.M. Olde* 01/171 & *N. Marriott*, 13 Sep 2001 (holo: NSW 1099556; iso: CANB, K, MEL, NSW, PERTH) (*distribuendi*).

Diagnosis: Near to *Grevillea anethifolia* R.Br. which differs in its more slender, non-ribbed branchlets with a close-appressed, dense indumentum of short hairs; ultimate leaf lobes narrower (< 1 mm wide), the lamina tightly revolute against the midvein on the abaxial surface, notably at the lobe sinuses; the basal leaf internode not reduced in length nor alate when subtending axillary growth; conflorescences mostly terminal or subterminal; buds smaller, shortly pedunculate and not arrested in development; floral rachises either glabrous or not densely hairy; common bracts glabrous-ciliate, smaller (0.2–)0.3–1.8(–2) mm long, (0.2–) 0.3–1.2(–1.5) mm wide; nectary prominent, recurved, and rising 0.2–0.4 mm above the toral rim; and fruits more prominently rugose.

Grevillea ‘Section *Manglesia*’ unassignable to species ‘x’ *sensu* McGillivray & Makinson (1993: 186).

Grevillea sp. Stirling Range (D.J. McGillivray 3488 & A.S. George). Western Australian Herbarium (1998–) <https://florabase.dpaw.wa.gov.au/> (accessed 26 November 2020)

Seedlings not seen. *Mature plant*: An erect, somewhat wispy, seed-obligate, stenobasic, self-compatible shrub 0.5–1.5 m high, c.1 m wide, with branches weakly ascending from low on the trunk. *Branchlets* 2–5 mm thick, subterete to slightly angular, substrate with glabrous ribs decurrent from the leaf base extending a short distance down the branchlet, elsewhere densely pubescent-tomentose to subvelutinous, the hairs 0.2–0.3 mm long, \pm uniform in length, dull, wavy to slightly curled, spreading, with contents mostly white. *Adult leaves* 2–4.5 cm long, 2–5 cm wide, polymorphic, divaricately and deeply trisect, the primary leaf rachis angularly refracted at leaf nodes, ovate in gross outline, crowded, the lobes of different leaves frequently overlapping, ascending to spreading, petiolate, the distal leaves often once-divided, the remainder 3–5-sect, with up to three orders of division, most leaves biternate, the proximal leaves with tertiary orders of division; *new growth* reddish, glabrous or with scattered hairs; *basal internode* (1–)3–14 mm long, 1.25–2 mm wide, dimorphous, linear to very narrow-cuneate, alate, reduced in length when subtending axillary growth, suberect to spreading, straight or slightly incurved, subquadrangular in cross-section; non-alate segments 5–14 mm long, 1.25 mm wide, alate segments 1–5 mm long, 2 mm wide, the unfurled lamina up to 0.5 mm wide on each side of the midvein, the adaxial surface slightly concave, proximally tomentose, distally glabrous, the abaxial surface sparsely tomentose to glabrous, often fully exposed at the proximal sinuses; *primary lobes* 3; *central lobe* usually with secondary or tertiary tripartite division, rarely the distal leaves with central lobe undivided; *ultimate central lobes* (0.3–)0.6–1.8(–2.5) cm long, 1.5–1.8 mm wide, slightly to strongly descending, linear, straight to slightly incurved, not twisted; *lateral lobes* either simple or one or both either secondarily bi- or tripartite; *ultimate lateral leaf lobes* (0.3–)0.6–1.8(–2.5) cm long, 1.5–1.8 mm wide, spreading, linear, quadrangular in cross section, usually straight, twisted or not twisted, usually equal; *apices of lobes* acute, spinescent, pungent; *spine* 1–1.5 mm long, reddish, straight; *margins* angularly refracted about intramarginal vein; *adaxial surface* flat or concave and V-shaped, sometimes 2-channelled, smooth, usually a few hairs scattered around the midvein, otherwise glabrous, dull, the midvein and longitudinal intramarginal veins prominent, discoloured; *abaxial surface* bisulcate, mostly enclosed by the revolute margin, exposed and curly tomentose at the proximal sinuses of lobes, the midvein of the leaf and leaf lobes conspicuously raised, glabrous, sometimes with a few scattered hairs; *sulcae* 0.03–0.05 mm wide, spreading wider on the proximal sinuses, glabrous or with short curled hairs; *texture* rigid to coriaceous; *petioles* (1–)2–5 mm long, 1.3–2.4 mm wide, normal or alate, 3-merous, the medial axis sometimes extending down the branchlet at the point of attachment, the lateral segments spreading; *adaxial surface* concave, sparsely to moderately sericeo-tomentose, usually with scattered appressed short hairs; *abaxial surface* convex, pubescent to glabrous. *Conflorescences* 1.5–2 cm long, 1.5(–3) cm wide, mostly simple, axillary, occasionally subterminal on short side branches, rarely terminal, exceeding the leaves or just within the outer lobes, mostly confined to the upper axils; *terminal and subterminal conflorescences* simple, rarely 1-branched at base; *axillary conflorescences* simple; *unit conflorescences* 1.5–2 cm long, 1.5 cm wide, subglobose, 30–40 flowered, dense proximally becoming more open distally, acropetal; *buds* 6–7 mm long, 4–6 mm wide, sessile, globose to ellipsoid, not overarched by bractiform leaves, development shortly arrested; *peduncles* absent; *floral rachises* 10–40 mm long, 1.5 mm wide for 1–3 mm at base, 1 mm wide at apex, the apex without obvious vegetative extension, erect, usually straight, sometimes curved or slightly undulate, stout with slight distal taper, densely tomentose-villous at base, sericeo-tomentose distally, the hairs exceeding the rim of the floral nodes; *rachis nodes* prominent, crowded at base, the hairs tufted; *peduncular bracts* absent; *involucral bracts* 4 mm long, 3–5 mm wide, broadly ovate; *common bracts* (1.8–)2.5–4 mm long, 1.8–4 mm wide, broadly ovate to cordate, the abaxial surface sometimes with a subterminal apiculum or prominent raised central rib, concavo-convex with compressed marginal flap, the abaxial surface glabrous-ciliate, sometimes sericeous, caducous at early bud stage. *Flower colour* perianth and style white with creamy perianth limb. *Flowers* acroscopic; lightly to not nectariferous, fragrant, entomophilous, glabrous except where noted; *pedicels* white, 8–11 mm long, 0.2–0.3 mm wide, filamentous, the apex below the torus scarcely expanded, ascending, straight, crowded proximally; *basal pedicels* 8–11 mm long; *distal pedicels* 8–9.5 mm long; *torus* 0.4–0.5 mm long, squarish in polar view, scarcely wider than the pedicel apex, oblique at c. 25–40°; *nectary* absent to obscure and then rising c. 0.1 mm above the toral rim, U-shaped, the margin entire. *Pistil* 4.5–5.5 mm long; *gynophore* 1.5–1.9 mm long; *ovary* 0.8 mm long, 0.5–0.6 mm wide, lateral, round to broadly ellipsoid in side-view, laterally compressed, wrinkled soon after fertilisation; *style* constricted above the ovary, then swollen; *stylar constriction* 0.3–0.5 mm long, 0.3 mm wide, incurved or straight; *stylar swelling* 1.5–1.7 mm long, 0.35–0.5 mm maximum width, tapering to 0.4 mm slightly below the style-end, ovoid to subcylindrical; *pollen-presenter* 0.7–0.9 mm long, subcylindrical to truncate-conical with straight to slightly incurved sides; *base* 0.4–0.5 mm wide, scarcely wider than but abruptly divergent from the style-end, transverse to oblique at 10–20°, sometimes slightly rimmed; *stigma* 0.2–0.5 mm wide, transverse to oblique at c. 10°, sometimes slightly flared. *Perianth* 3.7–4 mm long, 0.4–1 mm wide, actinomorphic; *perianth tube* green in bud, soon white, 2.5 mm long, 0.4–1.0 mm maximum width, narrowly obovoid, contracting below the limb into a neck 0.4–0.7 mm wide; *perianth limb* cream to lemon-yellow, 1.2 mm long 1.2–1.5 mm wide, depressed globose to round; *tepals* 4–4.2 mm long, 0.3 mm wide at base, 0.7–0.8 mm wide in upper half, 0.5 mm wide below the

limb; *abaxial surface* glabrous, smooth with midrib prominent; *adaxial surface* glabrous or a few scaly simple trichomes 0.1–0.2 mm long at base, papillose and usually farinaceous, the midrib obscure; *tepal-limbs* 1–1.2 mm long, 1 mm wide, with prominent midrib. *Fruits* follicular, monospermous, 7–11 mm long, 4.5–6 mm wide, oblong–ellipsoidal, transverse to very oblique on erect gynophore, the pedicel strongly curved, attachment subposterior 2–3 mm from base on dorsal side; *fructual style* lateral to the dorsal side, erect or decurved, sometimes slightly oblique; *fructual pollen–presenter* cylindrical; *pericarp* 0.4–0.7 mm thick along the suture, slightly thicker at the ends; *exocarp* almost smooth to moderately rugose with discontinuous rounded ridges and irregularly colliculate; *mesocarp* crustaceous; *endocarp* smooth, membranaceous. *Seeds* not seen.



Fig. 1. *Grevillea pieroniae*. Photo: I. Gilmour.

Summary of diagnostic features: Seed-obligate, stenobasic habit; branchlets densely pubescent–tomentose with glabrous ribs; leaves petiolate with alate petioles 3–5 mm long, divaricately trisect, usually with secondary or tertiary division of the lobes; basal internode reducing in length and alate when subtending axillary growth; ultimate lobes linear to subulate, 1–2 cm long, mostly ≥ 1.5 mm wide; margin angular, enclosing most of the abaxial surface except at the sinuses. Conflorescences axillary, simple, sessile; buds globose, up to 6 mm wide, with shortly arrested development; rachises 10–15 mm long, tomentose with tufted hairs on the nodes; common bracts broadly ovate, glabrous–ciliate or sometimes subsericeous or openly so on the abaxial surface, 2.5–4 mm long, 1.8–4 mm wide; perianth glabrous, except few or solitary simple hairs at base of adaxial surface; nectary obscure; pollen–presenter cylindrical to truncate–conical, stigmas usually *c.* 0.3 mm across; fruits follicular, monospermous, with colliculose to faintly rugose exocarp; mesocarp crustaceous; fructual style with pollen–presenter cylindrical or truncate–conical.



Fig 2. *Grevillea pieroniae* showing enlarged inflorescence buds. Photo P.M. Olde.

Distribution: Western Australia where known only from the central Stirling Range National Park, south-west Western Australia in three areas. It occurs in the Gnowangerup LGA, in the Fitzgerald Subregion of the Esperance Plains IBRA Region.

Phenology: Flowering commences in mid-winter and extends into spring; fruits form more abundantly in late spring.

Habitat and ecology: Grows near creek lines and areas of impeded drainage in elevated terrain comprising marri-jarrah woodland and proteaceous heath–shrubland with *Hakea ferruginea*, *H. trifurcata*, *H. cucullata*, *Banksia gardneri*, *B. tenuis*, *Grevillea crassifolia*, *G. muelleri*, *Petrophile squamata*, *Isopogon spathulatus* and *Mesomelaena stygia* in yellowish sandy loam or silt over laterite.

Conservation status: Known from only three generalised locations within Stirling Range National Park. The areas of occurrence of populations range from 0.5–2 hectares each throughout which the species is nevertheless well represented. The population at the type locality is in decline with limb dieback and plant deaths observed since the mid-2000s. Habitat is infested with *Phytophthora cinnamomi* and the pathogen has been recovered from dead plants. However, the level of disease susceptibility is unknown. A conservation code of Priority Two has been determined for this species by the Western Australian Herbarium (1998–).

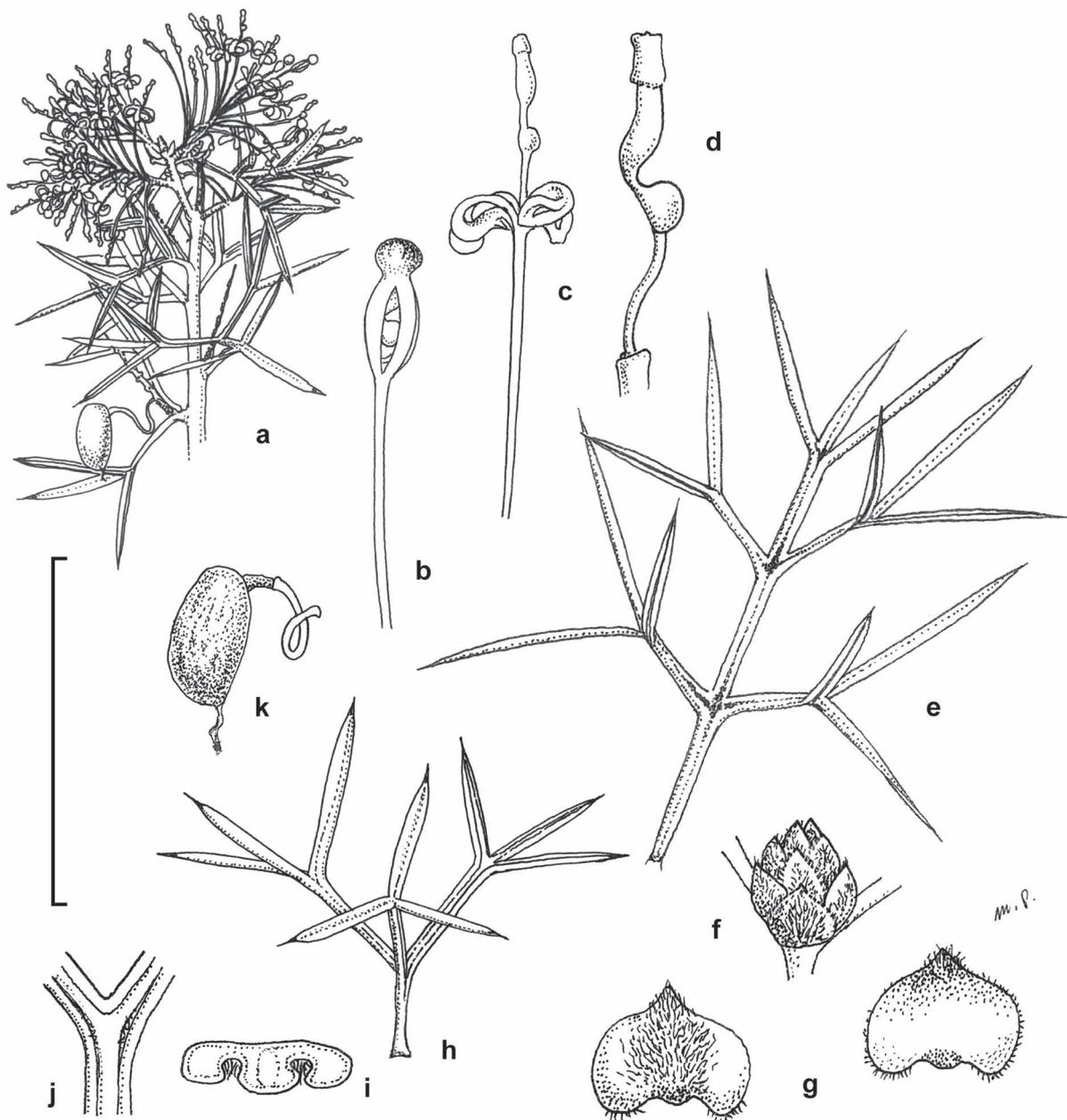


Fig 3. A. Inflorescence $\times 1$. B. Flower before anthesis $\times 4$. C. Flower after anthesis $\times 4$. D. Pistil $\times 4$. E. Leaf $\times 1.5$. F. Bud of inflorescence $\times 3$. G. Common bracts $\times 5$. H. Leaf $\times 1$. I. Leaf lobe cross-section $\times 20$. J. Underside of leaf sinus exposed $\times 4$. K. Follicle $\times 2$. Illustration: M. Pieroni.

Etymology: Named for the botanical artist and author Margaret Pieroni née Hellmers (1936–) whose inspirational drawings, friendship and field knowledge have greatly advanced knowledge of the Australian flora, especially *Banksia* ser. *Dryandra* and *Verticordia*.

Discussion: Although there is a perceived possible relationship to *G. anethifolia*, from which it is distinguished in the diagnosis and to which morphological keys and botanical opinion point, the actual relationship to this and other species in the *Triloba* Group is unknown and remains phylogenetically untested. It is unclear even as to what morphological character(s) are important to an assessment of relationship in this Group.

The basal leaf internode of *G. pieroniae* shows a similar though less dramatic pattern of length reduction, associated with unfurling of lamina beside the midvein on leaves subtending axillary growth, to that of *G. corrugata* Olde & Marriott. Nonetheless, *G. corrugata* remains a distinct species, differing from *G. pieroniae* in its wider leaves (5–9 cm wide), its villous branchlets, its prominent nectary and its markedly rugose and larger follicles.

Other specimens examined: Western Australia: 8.8 km west north–west of Chester Pass Road on Stirling Range Drive, Stirling Range, P.M. Olde 01/170 & N. Marriott, 13 Sep 2001 (AD, NSW, G, PERTH); On Scenic Drive, Stirling Range National Park, near The Abbey, D.J. McGillivray 3488 & A.S. George, 24 June 1976 (NSW 900944, CANB, K, PERTH, US).

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