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***Blackallia*, *Serichonus* and *Papistylus*: three closely related genera of Rhamnaceae (Pomaderreae) from south-western Australia**

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Abstract

Kellermann, J., Rye, B.L. & Thiele, K.R. *Blackallia*, *Serichonus* and *Papistylus*: three closely related genera of Rhamnaceae (Pomaderreae) from south-western Australia. *Nuytsia* 16(2): 299–316 (2007). Recent molecular and morphological studies of Pomaderreae indicate that a number of species that have traditionally been of uncertain affinity require new genera. *Blackallia* C.A. Gardner is lectotypified and restricted to one species, *B. nudiflora* (F. Muell.) Rye & Kellermann, for which a new combination is made. Two new genera are described, *Serichonus* K.R. Thiele comprising the single species *S. gracilipes* (Diels) K.R. Thiele, and *Papistylus* Kellermann, Rye & K.R. Thiele with two species, *P. grandiflorus* (C.A. Gardner) Kellermann, Rye & K.R. Thiele and the new species *P. intropubens* Rye. All three genera are restricted to the South West Botanical Province of Western Australia. They are closely related but can be readily distinguished from one another by some significant morphological differences, especially in their inflorescences. A revised key to the genera of Pomaderreae is presented and lectotypes are chosen for *B. nudiflora* and *S. gracilipes*.

Introduction

The tribe Pomaderreae (Rhamnaceae) is restricted to Australia and New Zealand. It currently comprises approximately 220 species in eight genera: *Blackallia* C.A. Gardner (2 species), *Cryptandra* Sm. (c. 55), *Polianthion* K.R. Thiele (4), *Pomaderris* Labill. (c. 70), *Siegfriedia* C.A. Gardner (1), *Spyridium* Fenzl (c. 45), *Stenanthemum* Reissek (c. 30) and *Trymalium* Fenzl (13). All of these genera are represented in Western Australia, with the two smallest genera endemic there and three others (*Polianthion*, *Stenanthemum* and *Trymalium*) showing their maximum development in the State. Keys to the genera of Rhamnaceae in Western Australia are given in the accompanying paper by Rye (2007) for central and southern Western Australia and in Rye (1997) for the Kimberley region.

During revision of the Western Australian taxa (e.g. Rye 1995a,b, 1996a,b, 2000, 2001), molecular systematic work on the generic limits of Pomaderreae (Kellermann *et al.* 2005, Kellermann 2007, Kellermann & Udovicic 2007), and on-going work on the “Flora of Australia” treatment of the family (Thiele *et al.*, in prep.), it has become clear that several species do not readily fit into any of the currently named genera. In a previous paper, Kellermann *et al.* (2006) established *Polianthion* for four unusual species that were misplaced in *Cryptandra*, *Pomaderris*, and *Trymalium*. In this paper we clarify the

status of *Blackallia* and establish two new genera, the monotypic *Serichonus* and *Papistylus* with two species. A key to all genera of the tribe Pomaderreae is presented, reflecting the recent taxonomic changes made in Rye (1995b, 2007), Thiele & West (2004), Kellermann *et al.* (2006) and this paper. The different types of discs, fruitlets and stipules found in the tribe and referred to in the text are explained and illustrated in Thiele (2007).

Key to the genera of Pomaderreae

- 1 Leaves opposite; flowers in pendent, terminal heads surrounded by an involucre of large coloured bracts **Siegfriedia**
- 1: Leaves alternate; flowers not as above
 - 2 Flowers without a distinct floral tube [except *Trymalium urceolare* (F. Muell.) Diels]; sepals wide-spreading at anthesis
 - 3 Fruitlets indehiscent; stamens incurved, enclosed at first by the hooded petals **Trymalium**
 - 3: Fruitlets dehiscent (usually by a window on the inner face); stamens \pm straight (rarely incurved), not hooded by the petals **Pomaderris**
 - 2: Flowers with a distinct (though sometimes very short) tube; if apparently without a tube then sepals incurved to erect at anthesis
 - 4 Floral disc hairy (rarely glabrous); stipules basally fused around the outside of the petiole and often enclosing it, not connate between the petiole and axis **Cryptandra**
 - 4: Floral disc glabrous; stipules various, not fused around the outside of the petiole, but often connate between the petiole and axis
 - 5 Flowers in densely contracted cymose heads subtended by broad, persistent, prominent bracts, often surrounded by whitish or green floral leaves
 - 6 Disc prominent, at the summit or the base of the floral tube
 - 7 Disc at the summit of the hyanthium tube, indented adjacent to the stamens; fruitlets indehiscent, papery, enclosing the seed when shed **Spyridium**
 - 7: Disc at the base of the floral tube, forming a prominent ring; fruitlets dehiscent, crustaceous, releasing the seed at maturity **Papistylus**
 - 6: Disc lining the floral tube and confluent with the staminal filaments (sometimes obscure) **Stenanthemum**
 - 5: Flowers not in dense heads; bracts small, persistent or scarious and deciduous; floral leaves absent
 - 8 Flowers long-pedicellate, glabrous; ovary and fruit largely to fully superior **Blackallia**
 - 8: Flowers sessile to long-pedicellate, pubescent or pilose; ovary and fruit *c.* half to fully inferior
 - 9 Disc at the summit of the floral tube; fruitlets indehiscent, papery, enclosing the seed when shed **Spyridium**
 - 9: Disc forming a ring around the ovary at the base of the floral tube; fruitlets dehiscent, crustaceous, releasing the seed at maturity
 - 10 Flowers and leaves densely stellate-hairy; ovary 2-locular **Polianthion**
 - 10: Flowers and leaves simple-pubescent or pilose (stellate hairs, if present, obscured by the simple ones); ovary 3-locular **Serichonus**

Taxonomy

Blackallia C.A. Gardner, *J. Roy. Soc. Western Australia* 27: 183 (1942), emend. Kellermann, Rye & K.R. Thiele. *Lectotype* (here designated): *Blackallia biloba* C.A. Gardner = *Blackallia nudiflora* (F. Muell.) Rye & Kellermann.

Excluded species: *Blackallia connata* (C.A. Gardner) C.A. Gardner, *J. Roy. Soc. Western Australia* 27: 184 (1942). ≡ *Cryptandra connata* C.A. Gardner, *J. Roy. Soc. Western Australia* 14: 80, plate 3H–L (1928). *Type*: Sandstone, Western Australia, 19 July 1927, C.A. Gardner s.n. (*lecto*: PERTH 01599259, *fide* Rye, *Nuytsia* 16: 355 (2007); *isolecto*: PERTH 01599240).

Small evergreen *shrubs*, usually spinescent, glabrescent with simple and stellate hairs on the young leaves. *Stipules* connate at base between the petiole and stem, ± persistent. *Leaves* alternate-fasciculate, petiolate, discolorous, entire, conduplicate when young, margins flat. *Inflorescence* comprising several flowers in densely contracted cymes with cymose bracts. *Flowers* bisexual, 5-partite, white or cream to pale pink when young, long-pedicellate. *Hypanthium* long-tubular, usually slightly widened at base. *Sepals* ± erect, persistent in fruit. *Petals* erect, cucullate, shortly clawed, smooth; claw not adnate to base of stamen filament. *Stamens* enclosed in and shorter than or subequal to the petals, erect to incurved. *Disc* forming a narrow, undulate ring around the ovary base, free, glabrous, becoming circular in fruit. *Gynoecium* of 3 carpels; ovary superior or largely so; style entire, glabrous, smooth, stigma slightly 3-lobed. *Fruit* a schizocarpic capsule, superior or largely so, obovoid; fruitlets crustaceous, splitting longitudinally along their inner surface and over the summit to release the seed. *Seeds* arillate; body uniformly coloured above a darkened base; aril moderately large, translucent, 3-lobed.

Etymology. The genus is named after the Western Australian doctor and botanist W.E. Blackall (1876–1941).

Distribution. A monotypic genus endemic to the south-west of Western Australia.

Notes. Gardner (1942) erected his new genus *Blackallia* to accommodate two species: *Blackallia connata* (C.A. Gardner) C.A. Gardner and *Blackallia biloba* C.A. Gardner. The latter is a synonym of *Cryptandra nudiflora* as Mueller had already described the species in 1862.

Gardner did not nominate a type species for the genus, but possibly gave prominence to *B. connata* as he listed it first, followed by a full description of his new species *B. biloba*. In a draft version of his manuscript, housed at PERTH, Gardner treated *Blackallia* as a monotypic genus comprising *B. connata* only. However, *Blackallia connata* clearly belongs in *Cryptandra* on the basis of morphological (Rye 2007) and molecular data (Kellermann *et al.* 2005). Hence, *B. biloba* is selected here as the lectotype of the genus and the new combination *Blackallia nudiflora* is made below. *Blackallia connata* is removed from the genus and accepted as *Cryptandra connata*; the closely related *C. imbricata* Rye is described in Rye (2007), who also discusses the affinities of these two species within *Cryptandra*.

Blackallia is similar to *Serichonus* and *Papistylus* in its conduplicate young leaves, long floral tube and glabrous disc. It differs from the other two genera in its spinescent habit, fasciculate leaves, smooth glabrous style and largely to fully superior glabrous ovary and fruit. *Blackallia* and *Serichonus* both differ from *Papistylus* in their long-pedicellate flowers, but *Blackallia* differs from *Serichonus* in the densely contracted inflorescence and smaller leaves which are soon glabrous. Flowers in *Serichonus* are arranged in open, loose cymes.

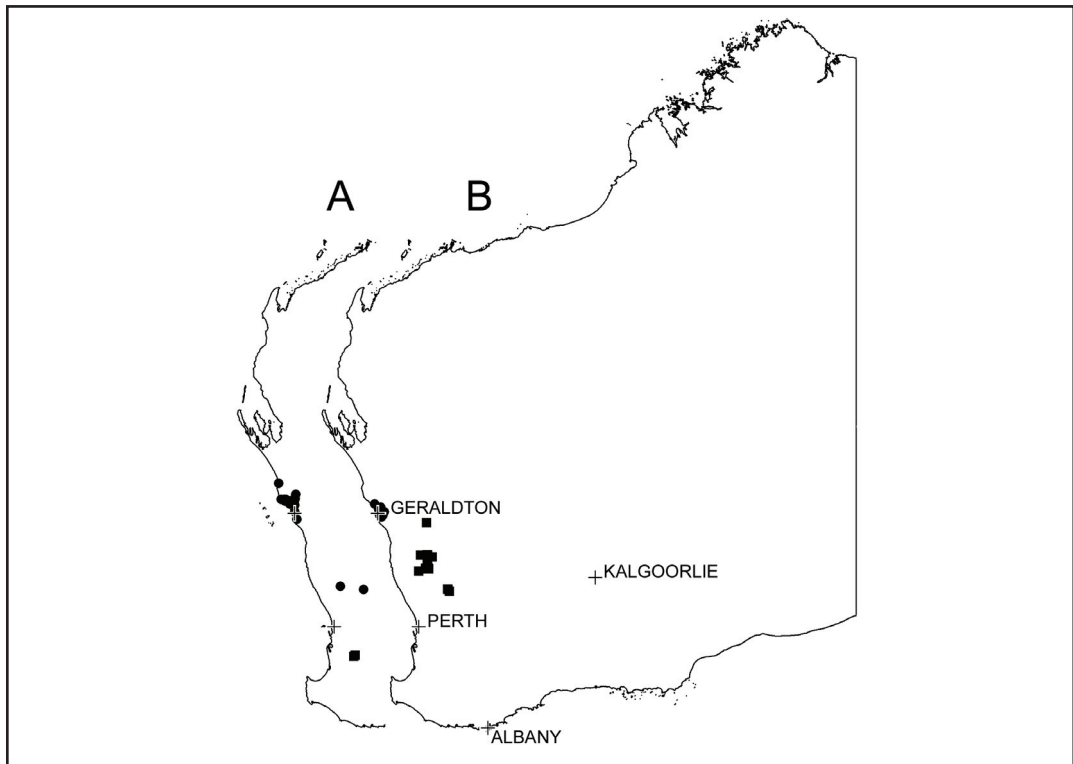


Figure 1. Distribution maps. A – *Blackallia nudiflora* (●), *Papistylus intropubens* (■); B – *Papistylus grandiflorus* (■), *Serichonus gracilipes* (●).

Blackallia nudiflora (F. Muell.) Rye & Kellermann, *comb. nov.*

Cryptandra nudiflora F. Muell, *Fragm.* 3: 64 (1862). *Type citation*: “In locis tam saxosis tam arenosis ad portum Gregory et flumen Murchison. Oldfield.” *Type*: Port Gregory, Western Australia, A.F. Oldfield s.n. (*lecto*: MEL 1618388, here designated; *isolecto*: MEL 1618389; K, top left specimen on sheet with loan stamp 21/1310/95 64/76). *Other material*: Murchison River, Western Australia, A.F. Oldfield s.n. (*residual syn*: MEL 1618193; K, bottom specimens on sheet with loan stamp 21/1310/95 64/76).

Blackallia biloba C.A. Gardner, *J. Roy. Soc. Western Australia* 27: 184 (1942). *Type*: between Northampton and Lynton, Western Australia, September 1940, W.E. Blackall 4517 (*holo*: PERTH 01751468).

Illustrations. W.E. Blackall & B.J. Grieve, *How Know W. Austral. Wildfl.*, 1st edn, 2: 338 (1956) [as *Blackallia biloba*]; B.J. Grieve, *How Know W. Austral. Wildfl.*, 2nd edn, 2: 599 (1998) [as *Cryptandra nudiflora*].

Shrubs 0.3–1 m high, often with spinescent branchlets 5–35 mm long, the leaves alternate-fasciculate (sometimes most leaves fallen but a tight cluster of nodes still apparent); long branches often arching to the ground. *Young stems* reddish with minute appressed simple hairs at first but soon becoming glabrous. *Stipules* scarious, narrowly triangular to triangular, 0.8–1.2 mm long, connate for up to half their length between the petiole and the stem, glabrous or with simple hairs along the midvein

and/or on the margins, often denticulate; apex acute. *Petiole* 0.2–1.5 mm long, glabrous. *Leaf blades* conduplicate at first, entire, narrowly obovate to narrow-oblongate, 3–13 mm long, 0.9–5 mm wide; base narrowly cuneate, apex obtuse to emarginate with a slightly recurved tip; lower surface densely silky hairy when young with long simple antrorse hairs overlying few stellate hairs, soon glabrescent with simple appressed hairs along midvein and sometimes also a few elsewhere; upper surface glabrous. *Inflorescence* of long-pedicellate flowers arranged in very densely clustered 3–5-flowered cymes in the axils of the fasciculate leaves (i.e., the flowers appearing to be in lateral umbels on short shoots); bracts at base of pedicels persistent, small, inconspicuous, triangular, *c.* 0.5 mm long, acute, quite glabrous. *Flowers* white at first, then pale pink with 10 darker longitudinal stripes, becoming deep pink in fruit; pedicel 1.4–4 mm long. *Floral tube* 1.5–2.5 mm long (enlarging to *c.* 3 mm in fruit), 1.8–2.5 mm in diameter, glabrous throughout, almost entirely free, distinctly tubular, broadest and indented at the usually bulging base. *Sepals* erect or slightly spreading, 1.2–2.3 mm long, glabrous. *Petals* 0.8–1.2 mm long, distinctly clawed. *Stamens* 0.7–1 mm long, the anther 0.3–0.4 mm long. *Disc* smooth. *Ovary* summit smooth and glabrous. *Style* 1.7–2.6 mm long, persistent in fruit. *Fruit* fully or almost fully superior, obovoid, 2.8–3.2 mm long. *Seeds* compressed, elliptic-obovate in outline, *c.* 1.8–2 mm long, 1–1.3 mm wide, somewhat darkened at base, uniformly orange-brown above, shiny; aril *c.* 0.4 mm long, orange-brown-translucent, compressed, very shortly 3-lobed. (Figure 2A–D)

Other specimens examined. WESTERNAUSTRALIA [precise localities withheld]: S of Northampton, 16 Aug. 1964, *A.M. Ashby* 1000 (collected by *Mrs Cramer*) (AD); N of Port Gregory road junction with Kalbarri coastal road, 9 Sep. 1994, *B. & B. Backhouse* NC 52 (PERTH); between Northampton and Lynton, Sep. 1940, *W.E. Blackall* 4517 (PERTH); N bank of Chapman River, 5 Aug. 2002, *J. Brooker* 427 (PERTH); Yerina Spring road, 9 Aug. 1994, *A.P. Brown* 1119 (PERTH) & 10 Sep. 2001, *J. Kellermann* 228 (MEL); E of Ogilvie, 28 July 1968, *A.C. Burns* 20 (PERTH); Bishops Gully Rd, 8 July 1997, *R. Davis* 3623 (PERTH); Yerina Spring, *c.* 30 km NW of Northampton, 15 Aug. 2001, *R. Davis* 9908 (PERTH); 18 km N of Northampton, 2 Sep. 1985, *H. Demarz* 10719 (PERTH); Hutt River, Sep. 1959, *C.A. Gardner s.n.* (PERTH); W side of North West Coastal Highway, N of Northampton, 3 Oct. 1998, *N. Gibson* 4119 (PERTH), 12 Sep. 2001, *J. Kellermann* 256 (MEL) & 7 Aug. 1994, *S.J. Patrick* 1958 (PERTH); O’Kagu [Oakajee], *s.dat.*, *A.F. Oldfield s.n.* (MEL); Mugiegaby [Munga Gabby], *s.dat.*, *A.F. Oldfield s.n.* (MEL); Ogilvie West Rd, W of North West Coastal Highway, 7 Aug. 1994, *S.J. Patrick* 1960 (PERTH); Port Gregory Road, 7 Aug. 1994, *S.J. Patrick* 1968 (PERTH); Rob Rd, SE of Port Gregory, 8 Aug. 1994, *S.J. Patrick* 1969 (PERTH); Yallabatharra Rd, SE of Port Gregory, 8 Aug. 1994, *S.J. Patrick* 1972 (PERTH); Ogilvie East Rd on E side of Old North West Coastal Highway, 13 Aug. 1996, *S.J. Patrick* 2713 (PERTH); W side of Chilimony Rd, 13 Aug. 1996, *S.J. Patrick* 2711 & *A. Brown* (PERTH); E side of Old North West Coastal Highway, 13 Aug. 1996, *S.J. Patrick* 2715 & *A. Brown* (PERTH); *c.* 350 miles [565 km] from Perth on Carnarvon road, 20 July 1967, *E.B.J. Smith s.n.* (PERTH).

Specimens examined of southern variant. WESTERNAUSTRALIA: S of Moora, near Koojan, 9 Sep. 1969, *C. Chapman s.n.* (PERTH); S of Koojan, 17 Aug. 1978, *C. Chapman s.n.* (PERTH).

Distribution. Endemic to the South West Botanical Province of Western Australia, principally from near the coast in the Hutt River area inland to east of Ogilvie, and south to Chapman River, with a disjunction of over 250 km to a much smaller area of occurrence south of Moora. (Figure 1A)

Habitat. Occurs in low shrublands, on clay or sandy clay, sometimes associated with granite, recorded both on hills or breakaways and on plains.

Phenology. Flowers: July to September. Fruits recorded in August and September.

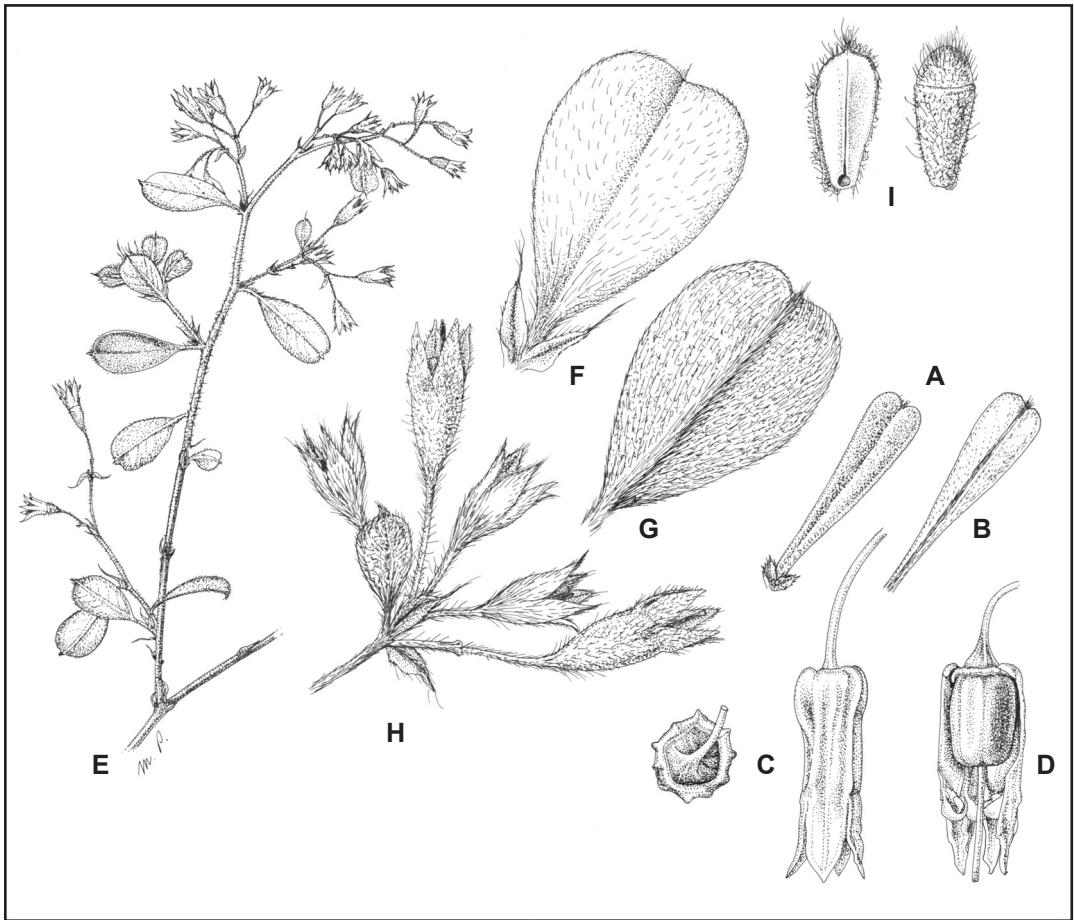


Figure 2. A–D. *Blackallia nudiflora*. A – stipules and upper surface of leaf ($\times 6$), B – lower surface of leaf ($\times 6$), C – pedicellate flower from basal and side views ($\times 6$), D – fruit, with half the enclosing floral tube removed ($\times 6$); E–I. *Serichonus gracilipes*. E – flowering and fruiting branch ($\times 1$), F – stipules and upper surface of leaf ($\times 4$), G – lower surface of leaf ($\times 4$), H – cluster of flowers and fruits ($\times 3$), I – inner and outer surfaces of fruitlet ($\times 6$). Drawn from C. Chapman s.n. (A–D) and R.J. Cranfield 3098 (E–I).

Conservation status. Conservation Codes for Western Australian Flora: Priority Three. Known from c. 12 localities with a range of c. 30 km and a single isolated locality c. 250 km to the south-east. The southern variant is probably at risk and should be highlighted for studies of its conservation status.

Etymology. From the Latin *nudus* (naked) and *flos* (flower), referring to the glabrous flower.

Typification. A well preserved specimen of the Port Gregory collection by Oldfield at MEL is selected as lectotype (Figure 3). This collection is also represented with duplicates in MEL and K. The Murchison River collection is only known from two specimens at MEL and K. The K specimens from both localities are mounted on the same sheet.

Notes. The southern material of *Blackallia nudiflora*, from the Moora area, is widely disjunct from the remainder of the species range, and differs slightly in that its ovary is not fully superior. Possibly it should be recognised as a distinct subspecies, but it is too poorly known currently to be sure of its status. The lack of recent collections suggests that this variant is either extinct or highly threatened.

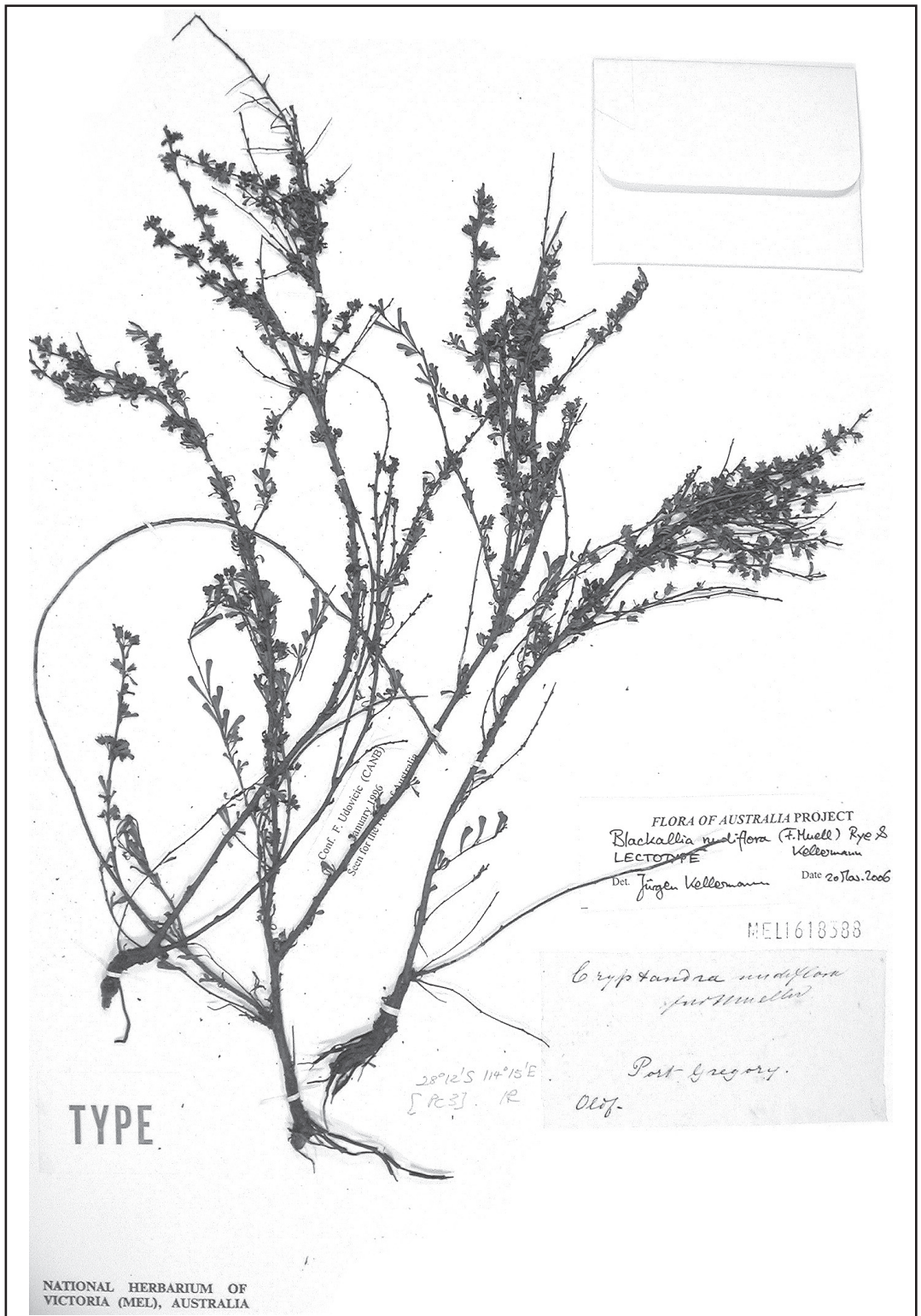


Figure 3. *Blackallia nudiflora*. Photograph of lectotype: Port Gregory, A.F. Oldfield s.n. (MEL 1618388).

Papistylus Kellermann, Rye & K.R. Thiele, *gen. nov.*

Fruitices molliter pubescentes. Stipulae persistentes, liberae vel ad basim breviter connatae inter petiolulum et caulem. Folia conduplicata vel aperiens. Inflorescentiae capituliformes, cymis contractis formantes. Flores fusiformes, sessiles, pilis simplicibus mollibusque vestiti. Discus glaber, sinuosus, ovarium basin cingens. Ovarium trilocolatum vertice dense stellato-tomentoso. Schizocarpium coccis tribus, his findentibus secus superficiem internum.

Typus: Papistylus grandiflorus (C.A. Gardner) Kellermann, Rye & K.R. Thiele.

Small evergreen *shrubs*, softly pubescent with simple hairs. *Stipules* free or very shortly connate at base between the petiole and stem, \pm persistent. *Leaves* alternate, shortly petiolate, discolorous, entire. *Inflorescences* mostly terminal, comprising densely contracted many-flowered cymes surrounded by large broad persistent brown bracts. *Flowers* bisexual, 5-partite, white or cream, sessile or subsessile. *Hypanthium* long, tubular, fusiform; free tube much longer than adnate base. *Sepals* erect to spreading, persistent in fruit. *Petals* erect, cucullate, shortly clawed, smooth; claw not adnate to base of stamen filament. *Stamens* enclosed in and subequal to the petals, erect to incurved. *Disc* forming a narrow undulate ring around the ovary summit, free, glabrous, becoming circular in fruit. *Gynoecium* of 3 carpels; ovary inferior or largely inferior, densely hairy on summit; style entire, glabrous, prominently papillose for most of its length, apex with 3 stigmatic lobes. *Fruit* a schizocarpic capsule, *c.* half-inferior or largely inferior, obovoid; fruitlets crustaceous, splitting longitudinally along their inner surface and over the summit to release the seed. *Seeds* arillate; body uniformly coloured above a darkened base; aril moderately large, translucent, 3-lobed.

Size and distribution. A genus of two species, endemic to the south-west of Western Australia.

Etymology. From the Latin *papilla* (nipple) and *stylus* (column), in reference to the markedly papillose style.

Notes. The unusual styler papillae in *Papistylus* are larger and more prominent than the ones found in *Serichonus*. These two genera appear to be close to *Stenanthemum* but differ in disc type as well as their fruit tending not to be fully inferior and their non-mottled seeds. Stellate hairs are less obvious in *Papistylus* than in the other genera. *Papistylus* appears to have all of its hairs simple on the stems and lower surface of the leaves, but close examination reveals minute stellate hairs hidden beneath the densely silky lower surface of the leaves, at least in *P. grandiflorus*. The minute stellate hairs on the floral tube and sepals are less conspicuous in *P. grandiflorus* than in most taxa of other genera.

Papistylus appears to lack the crystal layer between the fruitlets that occurs in *Serichonus*, however, the fruits are unknown in *P. intropubens* and mostly immature on specimens of *P. grandiflorus*.

Key to species of *Papistylus*

- 1 Leaves flat, conduplicate at first, apex recurved; floral tube glabrous inside (Carnamah area to Wongan Hills) **P. grandiflorus**
- 1: Leaves with recurved to revolute margins, apex straight; floral tube with fine hairs inside (Boddington area) **P. intropubens**

Papistylus grandiflorus (C.A. Gardner) Kellermann, Rye & K.R. Thiele, *comb. nov.*

Cryptandra grandiflora C.A. Gardner, *J. Roy. Soc. Western Australia* 27: 183 (1942). *Type*: west of Carnamah, Western Australia, September 1934, *E.M. Barker* 17 (*holo*: PERTH 01599283; *iso*: PERTH 01599267, 01599275, 01599291).

Illustrations: W.E. Blackall & B.J. Grieve, *How Know W. Austral. Wildfl.*, 1st edn, 2: 337 (1956) [as *Cryptandra grandiflora*]; B.J. Grieve, *How Know W. Austral. Wildfl.*, 2nd edn, 2: 296 (1998) [as *Stenanthemum grandiflorum*].

Shrubs 0.3–0.8 m high, not spinescent, the leaves mostly distant. *Young stems* with dense, silvery or rusty, simple appressed hairs *c.* 0.5 mm long. *Stipules* narrowly triangular, 2–3.5 mm long, free or very shortly connate at base between the petiole and stem, acuminate, denticulate, with simple hairs along midvein and on margins. *Petioles* 1–2 mm long, densely hairy. *Leaf blades* conduplicate at first, narrowly obovate to obovate, (5–) 7–10 (–18) mm long, 2–4 (–7) mm wide, base narrowly cuneate, apex obtuse to acute, the apical point dark, recurved; lower surface with simple, silvery or rusty appressed hairs overlying minute stellate hairs, densely hairy when immature, becoming sparsely hairy or glabrous; upper surface glabrous at maturity, sometimes with few hairs remaining on midrib. *Inflorescence* of contracted many-flowered cymes, globular in shape, 5–15 (–20) mm wide, containing 10–50 flowers, the flowers mostly sessile within 2 floral bracts at the summit of a peduncle *c.* 0.5 mm long; flowers white or (usually) pale pink, moderately villose. *Involucral bracts* larger than the floral bracts, mostly broadly obovate but the outermost bract often with a reduced leaf attached and then 2-lobed above the free petiole. *Floral bracts* obovate or broadly obovate, the base clawed, 3–3.5 mm long, toothed, ciliate, keeled, the outer surface rather densely appressed-hairy along middle and less densely so on the sides. *Floral tube* 1–2.5 mm long (enlarging to *c.* 4 mm long in fruit), 1.5–3 mm in diameter, glabrous inside; adnate base with a dense indumentum of antrorse simple hairs, the largest hairs *c.* 0.7 mm long; free tube longer than base and less densely hairy. *Sepals* 2–2.5 mm long, with an indumentum similar to that of floral tube. *Petals* 0.8–1.2 mm long. *Disc* forming a conspicuous rim around the ovary summit. *Ovary* largely inferior; summit densely covered by erect hairs *c.* 0.5 mm long. *Style* 2.5–5 mm long, thickened in lower half, with stalked papillae *c.* 0.05 mm long, with simple hairs on basal quarter of style. *Fruit* 3–3.5 mm long, *c.* 2 mm in diameter, largely inferior. *Seeds* *c.* 1.7 mm long, 0.9–1 mm wide, darkened at base, light to medium brown above, not mottled but with the margin slightly paler than the rest; aril *c.* 0.5 mm long, white-translucent, 3-lobed. (Figure 4A–E)

Other specimens examined. WESTERN AUSTRALIA [precise localities withheld]: NW of Watheroo, 30 Aug. 1995, *P. Armstrong s.n.* (PERTH); near Coorow, 14 Sep. 1932, *W.E. Blackall* 2592 (PERTH); S Eneabba, W of Watheroo, *c.* 150 miles [*c.* 241 km] N of Perth, 6. Sep. 1968, *C. Chapman* B (PERTH); Wongan Hills, 11 Sep. 1926, *E.H. Ising s.n.* (AD) & 13 Sep. 1947, *R.D. Royce* 2195 (PERTH); off South Waddi Rd, 15 Sep. 2001, *J. Kellermann* 275 (MEL) & 30 Aug. 1996, *D. Papenfus* 525 & *A. Doley* (PERTH); N of Kalguddering Siding, 23 July 1953, *R. Melville* 4327 (MEL); Read Rd, N of Coorow–Latham road, 31 Aug. 1996, *D. Papenfus* 530 & *R. Anderson* (PERTH); Reserve on Gunyidi–Wubin road, 2 Sep. 1996, *D. Papenfus* 537 (PERTH); S of Carot Well Rd, 11 Sep. 1993, *S.J. Patrick* 1527 (PERTH); uncleared block of land on “Yo Espro”, NE of Watheroo, 4 Sep. 2001, *S.J. Patrick* 3990 (PERTH); “Yo Espro” private property of B. & G. Scott, *c.* 5 km WNW of Watheroo, 18 Oct. 1997, *S. Patrick* & *D. Papenfus* A9 (PERTH); E of Coorow, towards Maya, 13 Sep. 1968, *M.E. Phillips* 933 & *W. Lee* (CBG @ CANB; PERTH); Coorow, 12 Aug. 1955, *R.D. Royce* 5049 (PERTH).

Distribution. Endemic to the South West Botanical Province of Western Australia, extending from west of Carnamah south-east to Wongan Hills. (Figure 1B)

Habitat. Occurs in sandy clay, usually in woodlands but one record from a low shrubland associated with granite.

Phenology. Flowers and fruits: August to November.

Conservation status. Conservation Codes for Western Australian Flora: Priority Three. This species is believed to be at risk because it occurs in an agricultural region that has been largely cleared and is not known from any conservation reserves. Its known range extends *c.* 160 km.

Etymology. From Latin *grandis* (large) and *flos* (flower), referring to the large flowers of the species.

Typification: Type material collected by E.M. Barker is mounted on four sheets at PERTH. The holotype differs from the rest in having line illustrations drawn directly on the sheet by Gardner and also in having a tag attached by string to the specimen. The tag is labelled *Cryptandra* on one side and has the number 17 on the reverse side. Gardner stated in the introduction to his paper that the types of most taxa had been donated to the State Herbarium. This is the only specimen that has the State Herbarium label on it, and it is also labelled “Type”.

The other three sheets have no tags or annotations by Gardner but have the same collection details and matching plant material. These specimens were originally in the W.E. Blackall collection and Herbarium Gardnerianum; one came to PERTH from Blackall’s collection and is labelled “Isotype”. As these three specimens appear to be part of the same collection they are considered to be isotypes.

Notes. The name ‘*Stenanthemum grandiflorum* (C.A.Gardner) Rye ms.’ has been applied to this taxon by Grieve (1998), FloraBase (Western Australian Herbarium 1998–), Paczkowska & Chapman (2000), Kellermann *et al.* (2005) and Kellermann & Udovicic (2007).

Papistylus intropubens* Rye, *sp. nov.

Differt a *Papistylo grandifloro* a foliis fere linearibus vel anguste ovato, margine recurvato vel revoluto, tubo hypanthii intra pubescenti.

Typus: 10 km S of Boddington [precise locality withheld], Western Australia, 14 August 1982, K.J. Atkins 309 (*holo:* PERTH 01516884).

Shrubs erect, slender, *c.* 0.5 m high, not spinescent, the leaves mostly distant. *Young stems* with simple, appressed or antrorse, greyish hairs, the longer ones *c.* 0.5 mm long. *Stipules* narrowly triangular, 1–2 mm long, free, positioned between the petiole and the stem, acuminate, sparsely hairy on outer surface. *Petioles* 0.6–1.5 mm long, densely hairy on undersurface. *Leaf blades* not conduplicate, almost linear to very narrowly ovate, 6–10 mm long, 0.8–1.5 mm wide, entire, the margins recurved or revolute; base obtuse, apex acute, straight; lower surface largely concealed by the recurved margins, densely covered at first by appressed to antrorse simple hairs, often becoming less densely hairy; upper surface smooth, glabrous. *Inflorescence* of contracted many-flowered cymes, 9–15 mm wide, with *c.* 20 flowers; involucre bracts more or less circular, *c.* 3 mm long, acute, denticulate or minutely lacinate, prominently ciliate, the cilia *c.* 0.5 mm long, the outer surface sparsely hairy. *Floral bracts* similar to involucre bracts but smaller. *Floral tube* *c.* 3.5 mm long, with fine, simple hairs, the largest ones *c.* 0.7 mm long; adnate portion of tube 2.5–3 mm long, 1–1.5 mm in diameter, sparsely silky-hairy outside and with fine tangled hairs *c.* 0.3 mm long inside. *Sepals* 0.8–1 mm long, densely hairy;

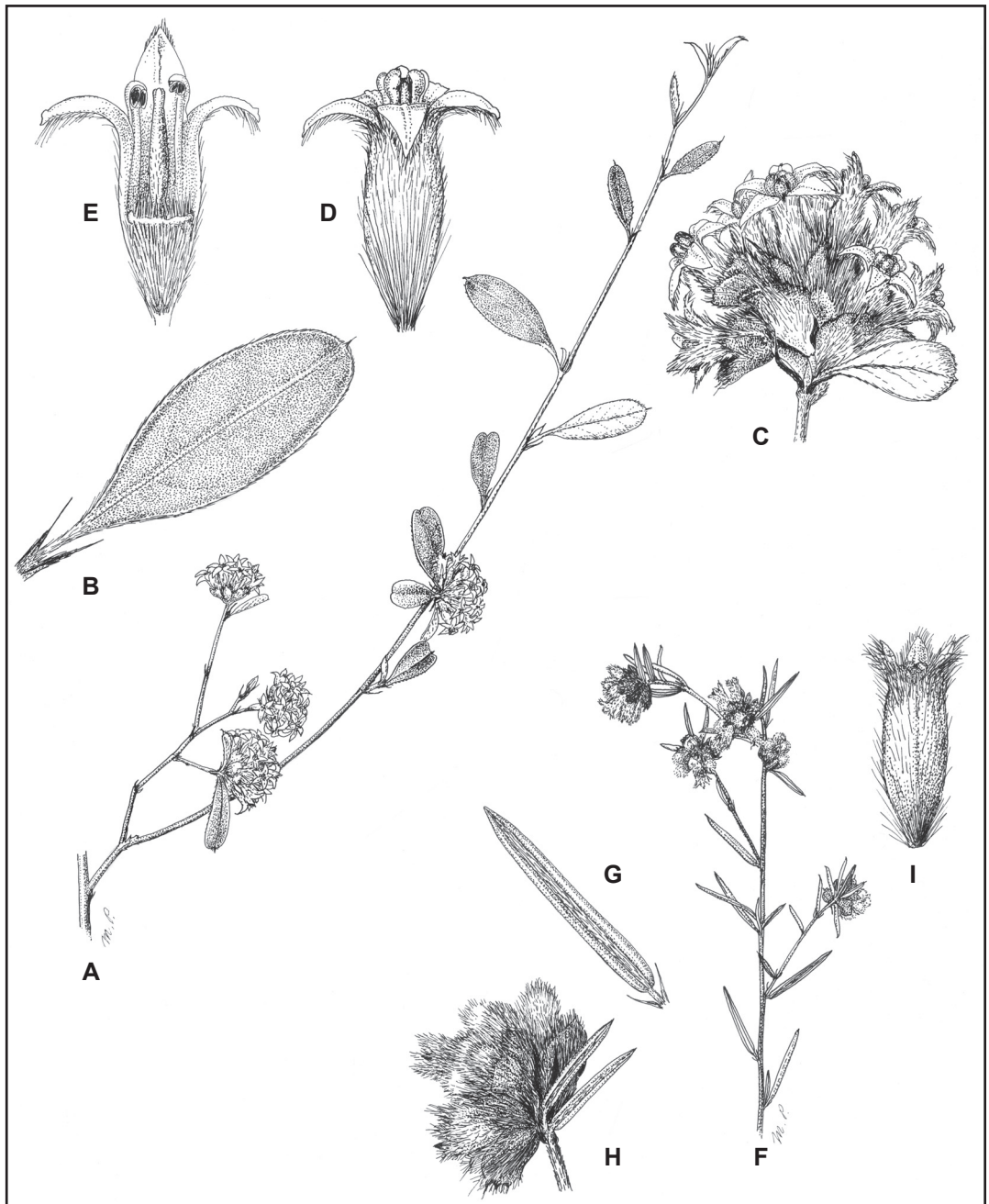


Figure 4. A–E. *Papistylus grandiflorus*. A – flowering branch ($\times 1$), B – stipules and leaf ($\times 4$), C – flower cluster ($\times 3$), D – flower ($\times 6$), E – flower partially dissected to show disc, ovary hairs and style papillae ($\times 6$); F–I. *Papistylus intropubens*. F – flowering branch ($\times 1$), G – stipules and lower surface of leaf ($\times 4$), H – flower cluster ($\times 4$), I – flower ($\times 6$). Drawn from M.E. Phillips 13 Sep. 1968 (A–E) and K.J. Atkins 309 (F–I).

hairs simple, spreading, *c.* 0.5 mm long. *Petals* *c.* 0.7 mm long. *Disc* annular, free, glabrous, forming a conspicuous free rim around the ovary roof at the base of the hypanthium. *Ovary* inferior; summit with a dense indumentum of tangled hairs up to 1 mm long. *Style* 2.5–3 mm long, with broad, rounded patent papillae *c.* 0.05 mm long. *Fruit* unknown. (Figure 4F–I)

Distribution. Endemic to the South West Botanical Province of Western Australia. Known only from a single collection from near Boddington. (Figure 1A)

Habitat. Recorded in heath vegetation.

Phenology. Flowers recorded in August.

Conservation status. Conservation Codes for Western Australian Flora: Priority One. Two unsuccessful attempts have been made to relocate the species at its only known locality. Vegetation of the area where it occurred was very dense when revisited by Kevin Kenneally (pers. comm.), who suggested that the species might require more open conditions and that disturbance might favour its reappearance. If it is primarily a coloniser species, this could help explain its rarity, but if not, the species could possibly be extinct.

Etymology. From the Latin *intro* (internal) and *pubens* (hairy), in reference to the floral tube of the species that is pubescent inside.

Notes. This very poorly known species was previously known by the phrase name *Cryptandra* sp. Boddington (*K.J. Atkins* 309). Its description is based on a single specimen that was in flower, but had no fruits. It appears to be closely related to *Papistylus grandiflorus*, which differs in having leaves with flat to incurved margins and the floral tube glabrous inside. *Papistylus intropubens* is the only species in the Pomaderreae known to have the inside of the floral tube hairy.

Serichonus K.R. Thiele, *gen. nov.*

Fruitescens molliter pubescentes. Stipulae persistentes, convenientes vel ad basim breviter connatae inter petiolum et caulem. Folia primum conduplicata deinde aperiuntia, margine plano. Inflorescentiae terminales, paniculis cymosis laxis formantes. Flores infundibuliformes, longi-pedicellati, pilis simplicibus vestiti. Discus glaber, sinuosus, ovarium basin cingens. Ovarium trilobulatum vertice dense stellato-tomentoso. Fructus pedicello quam flore multo magis longiore (usque ad triplex). Schizocarpium coccis tribus, his fidentibus secus superficiem internum.

Typus: *Serichonus gracilipes* (Diels) K.R. Thiele.

Evergreen *shrubs*, softly and densely pubescent with both simple and stellate hairs, sometimes with adventitious roots. *Stipules* free or shortly connate at base between the petiole and stem, broad, ± persistent. *Leaves* alternate, petiolate, discolorous, entire, conduplicate when young, margins flat. *Inflorescences* mostly terminal, comprising small, loose, few-flowered, cymose panicles; bracts persistent. *Flowers* bisexual, 5-partite, cream when young, often reddening with age, long-pedicellate, the pedicels elongating significantly in fruit. *Hypanthium* shortly tubular, funnel-shaped. *Sepals* erect to spreading, persistent in fruit. *Petals* erect, cucullate, shortly clawed, smooth; claw adnate to base of stamen filament for part of its length. *Stamens* enclosed in and subequal to the petals, erect to incurved. *Disc* forming a narrow, undulate ring around the ovary summit, free, glabrous, becoming circular in fruit. *Gynoecium* of 3 carpels; ovary ± inferior, densely stellate-hairy on summit; style entire, glabrous, papillose for most of its length, apex with three minute stigmatic lobes. *Fruit* a schizocarpic capsule, c. half-inferior or largely inferior, obovoid; fruitlets crustaceous, with a crystal layer between the fruitlets, splitting longitudinally along their inner surface and over the summit to release the seed. *Seeds* arillate; body uniformly coloured above a darkened base; aril moderately large, translucent, 3-lobed.

Size and distribution. A monotypic genus restricted to the area north of Geraldton in the south-west of Western Australia.

Etymology. From the Greek *serikon* (silk) and *chonos* (a funnel), in reference to the silky-pilose, funnel-shaped flowers.

Notes. This monotypic genus is similar to *Papistylus* in leaf shape and indumentum, in its long floral tube and papillose style (the papillae being more prominent in *Papistylus*). It is similar to *Blackallia* in its long-pedicellate flowers with a long floral tube and in its fruit, but is readily distinguished as outlined under that genus.

A unique character in *Serichonus* is the open lax inflorescence with pedicels that enlarge significantly, by up to three times, in fruit. In other genera of Pomaderreae the pedicels extend to at most twice their original length. There is also a distinct crystal layer on the inner surface of the fruitlets, which presumably aids in the splitting of the schizocarp; this has not been observed in *Blackallia* or *Papistylus*. Adventitious roots seem to be extremely rare among the Pomaderreae, but do occur in *Serichonus*.

The petals and stamens in *Serichonus gracilipes* are fused for *c.* 0.3 mm at the base, a feature infrequently observed in Rhamnaceae; examples of Australian species with fused petal-stamen-complexes are *Pomaderris adnata* (Walsh & Coates 1997) and *P. subplicata* (Walsh 1992). Bennek (1958) argued that petals and stamens in Rhamnaceae, which arise adjacent to each other (obhaplostemonious) rather than alternating as in most other families, develop from a common primordium. However, other authors (e.g. Ronse Decraene *et al.* 1993) dispute this, believing that separate petal and stamen primordia become secondarily fused (see also Medan & Schirarend 2004). Morphological studies on *Serichonus* and other species of Pomaderreae might help to resolve the developmental pathways that lead to the obhaplostemonious flowers in Rhamnaceae.

Serichonus gracilipes* (Diels) K.R. Thiele, *comb. nov.

Stenanthemum gracilipes Diels in L. Diels & E. Pritzel, *Bot. Jahrb.* 35: 356–357, Fig. 45E–H (1904). – *Cryptandra gracilipes* (Diels) C.A. Gardner, *Enum. Pl. Austral. Occ.* 3: 77 (1931). *Type citation*: “Hab. in distr. Irwin pr. Champion Bay in collibus quos vocant Wokatherra Hills in fruticeis lapidoso-glareosis deflor. m. Sept. (Diels), 4183.” *Type*: Wokatharra Hills, near Champion Bay, Western Australia, 9 September 1901, L. Diels 4183 (*lecto*: PERTH 1008188, ex B, here designated).

Illustrations: L. Diels & E. Pritzel, *Bot. Jahrb.* 35: 358, Fig. 45E–H (1904); L. Diels, *Pflanzenw. W. Austral.*, 174, Fig. 41E–H (1906) [both as *Stenanthemum gracilipes*]; W.E. Blackall & B.J. Grieve, *How Know W. Austral. Wildfl.*, 1st edn, 2: 334 (1956) [as *Cryptandra gracilipes*]; B.J. Grieve, *How Know W. Austral. Wildfl.*, 2nd edn, 2: 596 (1998) [as *Stenanthemum gracilipes*].

Shrubs 0.2–0.7 m high, with sprawling stems sometimes layering, not spinescent, the leaves mostly distant. *Young stems* with a dense indumentum at first of long simple and smaller stellate hairs, sometimes becoming glabrous; simple hairs mostly antrorse, the longest ones 0.7–1.5 mm long. *Stipules* broadly triangular, 3–5.5 mm long, free or connate at the very base between petiole and stem, attenuate, denticulate, hairy along midvein and on margins. *Petioles* 2–4 mm long, densely hairy. *Leaf blades* conduplicate at first, obovate, 12–20 mm long, 7–12 mm wide; base cuneate, apex emarginate and apiculate, slightly recurved; lower surface densely pilose with long simple hairs overlying smaller stellate hairs; upper surface with a sparse to moderately dense indumentum of simple hairs.

Inflorescence of loose cymes, each terminating a branchlet and commonly 3–6 (–10)-flowered; outer bracts solitary, persistent, each subtending a group of pedicels, ovate or broadly ovate, 1.5–2.5 mm long, toothed, ciliate, somewhat hairy on outer surface, the hairs simple and appressed; bracts at the base of pedicels small, 0.2–0.8 mm long. *Flowers* white, becoming red or pink in fruit, the pedicel usually 3–6 mm long (enlarging to 7–12 mm in fruit). *Floral tube* 1.5–2 mm long (enlarging to c. 3 mm long in fruit), 1.5–2.3 mm in diameter, funnel-shaped, glabrous inside; base of hypanthium with a dense or very dense indumentum of antrorse simple hairs and much smaller stellate hairs, the largest hairs c. 1 mm long; floral tube much longer than base and less densely hairy, sometimes largely glabrous with hairs restricted to the 5 longitudinal veins. *Sepals* 1.5–2 mm long, moderately to densely hairy. *Petals* 1–1.2 mm long (excluding adnate base), white with dark pink spots above; claw adnate to base of stamen filament for 0.2–0.3 mm. *Stamens* 0.8–1.1 mm long (excluding adnate base), the anther 0.25–0.3 mm long. *Disc* smooth, yellow. *Ovary* summit with a dense indumentum of long tangled erect hairs. *Style* 1.6–2.5 mm long, with papillae c. 0.02 mm long; stigma minutely 3-lobed. *Fruit* largely inferior to about half-inferior, 2.3–3 mm long, reddish-brown. *Seeds* compressed, elliptic in outline, 2.3–2.4 mm long, body c. 1.9 mm long and c. 1.1 mm wide, darkened at base, uniformly orange-brown above; aril clear-translucent, c. 0.7 mm long, shortly 3-lobed. (Figure 2E–I)

Other specimens examined. WESTERN AUSTRALIA [precise localities withheld]: c. 18 km N of Geraldton, 25 Aug. 1997, *P.G. Armstrong s.n.* (PERTH); S of Northampton towards Nanson, SE of Highway, 21 Aug. 1983, *R.J. Cranfield* 2670 (PERTH); W of North West Coastal Highway, 29 Aug. 1983, *R.J. Cranfield* 3098 (PERTH); 21 miles [34 km] N of Geraldton, 9 Sep. 1966, *A.S. George* 7945 (PERTH); Moresby Range, 8 July 2000, *S. Hopper* 10 (PERTH); Isseka Rd, S of Northampton, 13 Sep. 2001, *J. Kellermann* 262 & *I.B. Shepherd* (MEL) & 18 July 2000, *I.B. Shepherd* 230 (PERTH); S of Port Gregory Rd, 14 Aug. 1996, *S.J. Patrick* 2723 (PERTH); near Mt Rennie, 20 Aug. 2003, *B.L. Rye* 238064 & 238065 & *M.E. Trudgen* (PERTH).

Distribution. Endemic to the South West Botanical Province of Western Australia, extending from Nabawa south to Wokatharra Hill. (Figure 1B)

Habitat. Occurs in rocky habitats, usually in laterite on granite, but also recorded from sandstone. One record is from rock crevices on the margins of the flat summit of a laterite mesa dominated by *Hibbertia* and other wind-pruned shrubs and extending down top part of the steep side. Earlier records include the basal slopes of mesas, granite outcrops or sheets with *Thryptomene* (sometimes next to granite boulders) and rocky gullies.

Phenology. Flowers and fruits recorded in August and September.

Conservation status. Conservation Codes for Western Australian Flora: Priority Three. Known from less than ten localities, but more than five, with a range of c. 30 km. Not known from any nature reserves.

Etymology. From the Latin *gracilis* (slender) in reference to the loose inflorescences of the species.

Typification. Diels' original collection from his travels in Western Australia (see Diels 1904–1905, 1906), including the holotype of *Stenanthemum gracilipes*, was held at B, most of which was destroyed at the end of the second World War. A search for the type at this institution was unsuccessful (R. Vogt, pers. comm., June 2006). A type fragment at PERTH, acquired by C.A. Gardner from B in the 1930s, is here designated as the lectotype (Figure 5).

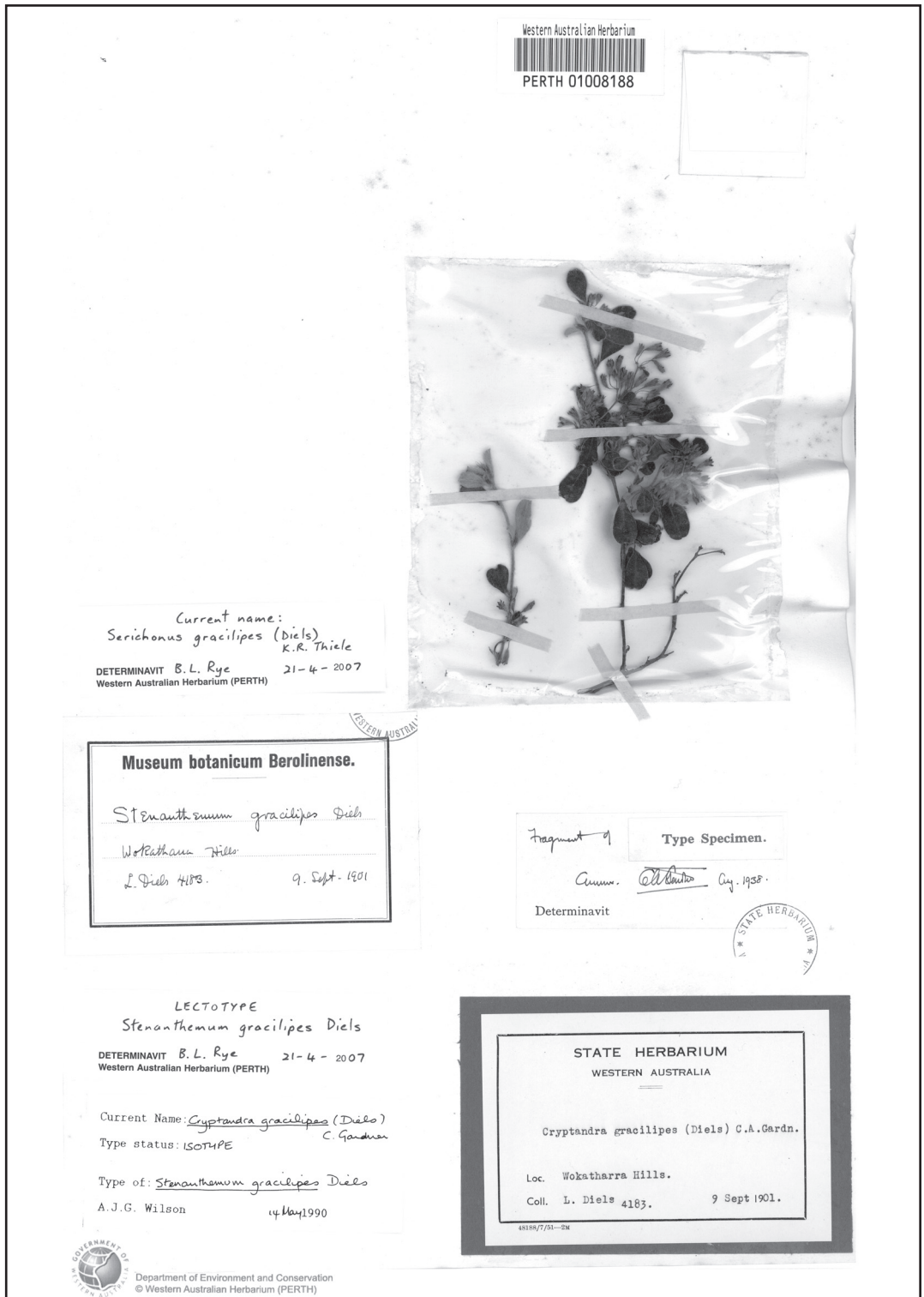


Figure 5. *Serichonus gracilipes*. Photograph of lectotype: Wokatharra Hills, near Champion Bay, 9 September 1901, L. Diels 4183 (PERTH 1008188).

Discussion

Blackallia and *Papistylus* form a clade, with very high bootstrap and jackknife support, in cladograms based on ITS sequence data (Kellermann *et al.* 2005). *Serichonus*, however, was intercalated between two clades of *Stenanthemum* in these analyses, albeit with very low support values. New evidence from combined analyses of ITS and *trnL-F* sequence data (Kellermann 2007) firmly places *Serichonus* as sister taxon to the clade of *Blackallia* and *Papistylus*, with high statistical support. Analysis of the *trnL-F* region alone also supports this finding, but was, as a whole, impeded by the paucity of informative characters and the presence of homoplasious indel characters (Kellermann & Udovicic 2007).

Placing *Serichonus* as sister taxon to the *Blackallia-Papistylus* clade is corroborated by morphological data, which is at odds with the placement of *Serichonus* in *Stenanthemum* (Kellermann *et al.* 2005). The latter genus has sessile to subsessile flowers arranged in dense, contracted head-like cymes subtended by bracts and leaves (Rye 1995a, 2001, Thiele 2007). In some species the inflorescence is surrounded by whitish floral leaves. The flowers have a short or long free floral tube with a disc lining the floral tube, confluent with the filament bases and shallowly to deeply indented between the stamens. The ovary is inferior and remains so in fruit. Seeds in *Stenanthemum* are mottled in brown and off-white.

In contrast, *Serichonus*, *Papistylus* and *Blackallia* have a long floral tube, and a free, glabrous, undulating disc inserted at the junction of the free floral tube and ovary. Seeds are uniformly coloured in all three genera. *Blackallia* and *Serichonus* have long-pedicellate flowers in cymose inflorescences, which are densely contracted at short shoots, or arranged in loose cymose panicles, respectively. *Papistylus* has more or less sessile flowers arranged in contracted head-like cymes. The ovary and fruit are superior or largely superior in *Blackallia*, whereas they are *c.* half to fully inferior in *Papistylus* and *Serichonus*. Floral leaves are absent in all three genera.

Inflorescence structure and disc type are particularly important generic characters in Pomaderreae, with ovary position and seed colouring also significant. The three genera do not fit the current circumscriptions of *Stenanthemum* or *Cryptandra* (see Rye 2007, Thiele 2007, Thiele & West 2004), in which their species were placed previously. *Blackallia*, *Serichonus* and *Papistylus* share with *Cryptandra* uniformly coloured seeds and a similar disk structure; however *Cryptandra* is characterised by a stellate-hairy disc and unique stipules, which are united at the base on the abaxial side of the petiole and tend to hide the base or whole of the petiole from view. *Cryptandra* has solitary flowers, which are usually sessile or subsessile and subtended by a series of floral bracts. The flowers in *Blackallia*, *Serichonus* and *Papistylus*, by contrast, are arranged in cymose inflorescences with a cymose bract pattern.

The three genera described in this paper have the same fruit type that characterises *Stenanthemum* and *Cryptandra* and could be placed between them on both morphological and molecular grounds. The molecular analysis of Kellermann *et al.* (2005) placed *Papistylus* and *Blackallia* as sister taxa to *Cryptandra*, albeit without statistical support. A combined analysis of *trnL-F* and ITS sequence data locates these genera in one clade, which is sister to *Stenanthemum* (Kellermann 2007). *Serichonus*, *Papistylus* and *Blackallia* are considered to be too distinct from one another to be united in an enlarged genus *Blackallia*, since they differ substantially in habit, inflorescence and flower morphology.

Acknowledgements

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