

Distribution and ecology: *Boronia excelsa* is restricted to the Mount Windsor Tableland, north-eastern Queensland (Fig. 13), where it is found growing on granite in wet sclerophyll and *Syncarpia* forests, and along rainforest edges above 1000 m.

Conservation status: 2R (Duretto 1999).

41. *Boronia foetida* Duretto, *Austrobaileya* 5: 285 (1999), fig. 11 M-R. *Type:* Mt Walsh, 7 km south of Biggenden, Grid Ref. 9347-046709, 25°34'S 152°03'E, *P.I. Forster* 7483, 28.ix.1990 (holotype MEL 1597019; isotypes AD 99135181, BRI AQ474340, CANB 406384, K *n.v.*, NSW, PERTH *n.v.*).

Boronia sp. (Mt Walsh *P.I. Forster*+ PIF17253) *sensu* Forster (1997, p. 185).

Erect, much branched *shrub* to 2 m. Multiangular stellate hairs with c. 8–20 rays; rays white to yellow, 0.05–0.1(–0.25) mm long. *Leaves* 20–52 mm long, 7–14 mm wide; petiole 2–7 mm long; lamina elliptic to slightly lanceolate, acute, attenuate. *Inflorescence* 1(–3)-flowered; peduncle 2–2.5 mm long; prophylls minutely unifoliolate, 1–6 mm long, 0.5–2 mm wide, with a dense, stellate indumentum, or as leaves; metaxyphylls 0.5–1 mm long; anthopodium 7–13 mm long. Sepals 2–3.5 mm long, 1.5–2.5 mm wide, enlarging to 4 mm long and 3 mm wide as fruit matures. Petals c. 7 mm long, c. 4 mm wide, enlarging to 8 mm long as fruit matures. Filaments sparsely to moderately pilose; antesealous filaments c. 2 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments slightly tuberculate, c. 1.5 mm long; anther-apiculum large, reflexed. Style glabrous. *Cocci* 4–5 mm long, 2–3.5 mm wide, glabrous. Seeds c. 4 mm long, c. 2 mm wide.

Selected specimens examined (of five collections): QUEENSLAND; BURNETT DISTRICT: Gully just below saddle between Mt Walsh and The Bluff, Mt Walsh NP, 25°34'S 152°03'E, *M.F. Duretto* 261-265, *M. Bayly* and *N. Marsh*, 4.ix.1992 (MFD261: MEL; MFD262: MEL, NSW; MFD263: BRI, MEL; MFD264: HO, MEL; MFD265: CANB, MEL).

Notes: *Boronia foetida* was referred to as the Mt Walsh form of *B. rosmarinifolia* by Stanley and Ross (1983). It is closely related to *B. bella* from which it can be distinguished by the smaller flowers, smaller hairs, and glabrous styles.

Distribution and ecology: *Boronia foetida* is restricted to Mount Walsh N.P., south of Biggenden, Queensland (Fig. 13), where found in a variety of habitats ranging from montane heath to densely forested gullies. Flowering and fruiting: May–September.

Conservation status: 2RC- (Duretto 1999).

42. *Boronia bella* Duretto, *Austrobaileya* 5: 287 (1999), fig. 11 S-X. *Type:* Upper Oakly Ck, Many Peaks Range, Qld, c. 24°11.5'S 151°17.5'E, 9149-263238, *M. Duretto* 269, *M. Bayly* and *N. Marsh*, 5.ix.1992 (holotype MEL 2036441; isotypes AD, BRI, CANB (CBG 9604106), DNA, K, MEL 2036442, NSW, PERTH).

Boronia sp. Telford CBG 7702560 *sensu* Batianoff and Dillewaard (1988, p. 114).

Boronia sp. (Many Peaks Range *I.R. Telford* CBG 7702560) *sensu* Forster (1997, p. 185).

Erect, much branched *shrub* to 2 m. Multiangular stellate hairs with c. 10–20 rays; rays white to yellow, (0.1–)0.25–0.5 mm long. *Leaves* 18–35 mm long, 3.5–10 mm wide; petiole 2–4 mm long; lamina elliptic, acute, attenuate. *Inflorescence* 1(–3)-flowered; peduncle 0.5–2 mm long; prophylls minutely unifoliolate, 2–5.5 mm long, 0.5–2.5 mm wide, with a dense, stellate indumentum, or as leaves; metaxyphylls 0.5–2.5 mm long; anthopodium 2–7 mm long. Sepals 4.5–5.5 mm long, 2–2.5 mm wide. Petals 7–8 mm

long, 4–5.5 mm wide, enlarging to 12 mm long as fruit matures. Filaments densely pilose; antesealous filaments c. 2.5 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments slightly tuberculate, c. 2 mm long; anther-apiculum large, erect or reflexed. Style hirsute. *Cocci* 4.5–6 mm long, 2.5–3.5 mm wide, glabrous or with few hairs along suture. Seeds 4–5 mm long, 2–2.5 mm wide.

Additional specimens examined: QUEENSLAND: BURNETT DISTRICT: Mt Castletower NP, eastern slopes of Many Peaks Range, 24°07'41"S 151°18'25"E, *P.I. Forster 16338*, 20.ii.1995 (BRI *n.v.*, MEL); Many Peaks Range, Mt Castletower, 24°10'S 151°17'E, *I.R. Telford 5479* (BRI, CANB); Upper Oaky Ck, Many Peaks Range, c. 24°11.5'S 151°17.5'E, Calliope 9149-263238, *M.F. Duretto 270-273*, *M. Bayly* and *N. Marsh*, 5.ix.1992 (MFD270: BRI, CANB, MEL; MFD271: BRI, CANB, DNA, K, MEL, NSW; MFD272: BRI, MEL, NSW; MFD273: BRI, CANB, HO, MEL, NSW, PERTH); State Forest 521, Many Peaks Range, 24°12'42"S 151°20'31"E, *P.I. Forster 16255*, 17.ii.1995 (BRI *n.v.*, MEL); Many Peaks Range, *I. Olsen 348* (NSW).

Notes: *Boronia bella* is closely related to *B. foetida* from which it differs by larger flowers and hairs, and hirsute styles.

Distribution and ecology: *Boronia bella* is restricted to the Many Peaks Range near Gladstone, Queensland (Fig. 13), where it is found in eucalypt forest and woodland on granitic soils. Flowering: May–September; fruiting: September.

Conservation status: 2RC- (Duretto 1999).

Boronia sect. *Valvatae* subsect. 4. *Grandisepalae* Duretto, subsect. nov. Sepala petalis longioribus vel subaequilibus. Antherae antipetalae antheris antisepalis largioribus. *Sp. typica:* *B. grandisepala* F. Muell.

Multiangular stellate hairs sessile, or stalked (series *Grandisepalae*); rays unfused, smooth, shiny and straight or rarely not smooth, flexuous and dull (subser. *Verecundae*), not appressed; simple hairs, when present on vegetative structures, 0.5–2 mm long,



Fig. 14. Distribution of *Boronia* subsect. *Grandisepalae*.

antrorse. *Branches* terete to quadrangular, not obviously glandular (except *B. jucunda*), decurrent leaf bases absent (except *B. pauciflora*), hairs uniformly distributed (except *B. pauciflora*, *B. filicifolia*). *Leaves* simple or imparipinnate; rachis segments triangular, rarely elliptical; lamina dorsiventral or isobilateral, epicuticular wax platelets absent or present (ser. *Quadrilatae*); the midrib usually prominently raised on the abaxial surface and impressed on the adaxial surface, with tightly packed tissue between midvein and abaxial epidermis. *Inflorescence* 1(–3)-flowered. Sepals as large or larger than petals, similar to petals in colour and texture; adaxial surface with a moderately dense to dense minute indumentum. Petals without a raised midrib or the midrib slightly raised at the base of the abaxial surface, abaxial surface with an indumentum of firm, straight and glossy stellate hairs (except ser. *Quadrilatae*, *B. verecunda*). Filaments clavate, suddenly narrowing at apex so as to appear truncated before connecting to anther, pilose on the abaxial surface and the margins below the glandular tip; antepetalous filaments glandular at the distal end or not; anthers attached to the apex of the filament, antepetalous anthers much larger than antesealous anthers; anther-apiculum absent or present. Disc entirely within stamen whorl, glabrous. *Seeds* (except *B. viridiflora*) elliptical with adaxial side flattened and with a prominent ridge, shiny, black, at magnification tuberculate; tubercles smooth, fused or unfused.

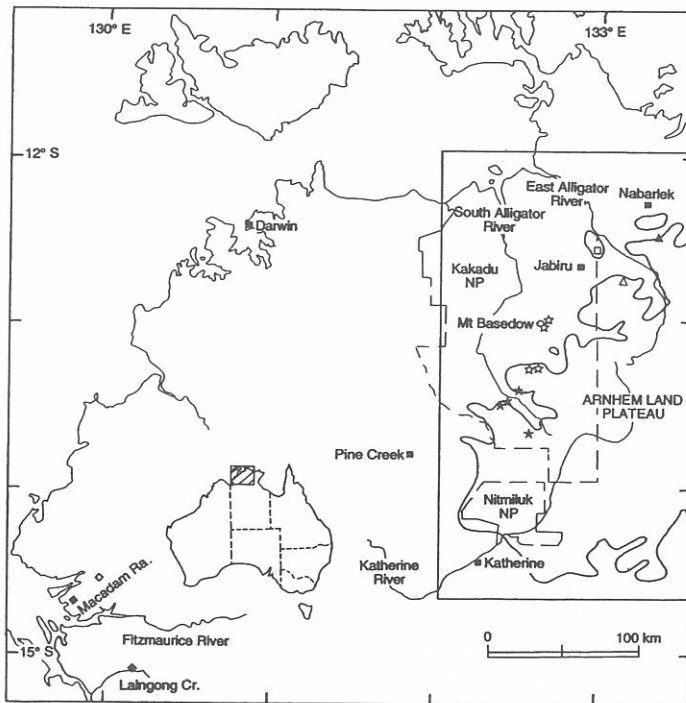


Fig. 15. Distribution of *Boronia* series *Quadrilatae*: *B. quadrilata* (Δ), *B. viridiflora* (▲); *Boronia* subseries *Verecundae*: *B. verecunda* (★), *B. xanthastrum* (☆); *Boronia* subseries *Grandisepalae*: *B. suberosa* (□); approximate locality for where Mueller crossed the Macadam Range and collected the lectotype of *B. grandisepala* (◊), western Northern Territory collections of *B. grandisepala* subsp. *grandisepala* (◆). See Fig. 16 for detail of western Arnhem Land. Adapted from Duretto and Ladiges (1997), fig. 1.

A subsection of at least 16 species divided into three series and five subseries that are found in the Kimberley Region of Western Australia, the 'Top End' of the Northern Territory and north-western Queensland (Figs 14-18). It is characterised by the large sepals relative to the petals, antepetalous anthers that are much larger than the antesepalous anthers, and the clavate filaments.

Boronia sect. *Valvatae* subsect. 4 *Grandisepalae* ser. 1. *Quadrilatae* Duretto, ser. nov.

Planta glabra praeter petala et paginas adaxiales sepalorum. Rami purpurati, quadrangulati manifeste. Folia glauca. *Sp. typica*: *B. quadrilata* Duretto

Erect or horizontal (from cliff faces) *shrubs*, glabrous except for flowers. Stellate hairs sessile, with c. 3–25 rays; rays smooth, 20–50 μm long. Branches distinctly quadrangular in cross-section, purple, decurrent leaf bases present. *Leaves* simple, slightly discoloured, paler beneath, slightly fleshy, plane, isobilateral, glaucous with a dense layer of epicuticular wax platelets, wax platelets 0.1–0.5 μm across; the midrib impressed slightly on the adaxial surface and slightly raised on the abaxial surface, cells between midvein and abaxial epidermis with or without secondary thickening. *Prophylls* unifoliolate. Sepals as large or larger than petals, acute to acuminate, abaxial surface glabrous, glaucous. Petal adaxial surface with a sparse indumentum. Antepetalous filaments glandular at the distal end or not; anther-apiculum absent. Style glabrous.

A series of two species found in the north-western portion of the Arnhem Land plateau, Northern Territory (Fig. 15). It is characterised by being glabrous (except for the flowers), having purple and quadrangular stems, and leaves that are glaucous, simple and isobilateral.

43. *Boronia quadrilata* Duretto, *Austral. Syst. Bot.* 10: 297 (1997), fig. 26. *Type*: N.T., Upper Magela Ck, 6 km N of Magela Falls, 12°45'S 133°08'E, *K. Brennan 1567*, 10.x.1991 (holotype DNA 60356 (photographs BRI, HO, MEL 2041201, NSW); isotypes CANB, MEL 242492, PERTH).

Boronia D60356 Magela *sensu* Leach *et al.* (1992, p. 35); Dunlop *et al.* (1995, p. 100).

Boronia sp.7 (Magela Creek; *K. Brennan 1567*) *sensu* Briggs and Leigh (1996, p. 167).

Erect *shrub* to 1.5 m. Multiangular stellate hairs present on petals only, with 4–25 rays per hair; rays 20–50 μm long. *Leaves* 23–55 mm long, 12–20 mm wide, sessile, glandular, elliptical, acute, aristate and slightly decurrent, epidermal wax platelets 0.1–0.5 μm across; the midrib raised on the abaxial surface, region between midvein and epidermis consisting of tightly packed cells with secondary thickening. *Peduncle* 2–2.5 mm long; *prophylls* 6–13 mm long, 3–7 mm wide; *metaxyphylls* 0.75 mm long; *anthopodium* 0.5–2 mm long. Sepals deltate, c. 6 mm long, c. 3 mm wide, enlarging to 9–10 mm long and 4.5–5.5 mm wide as fruit matures, longer and wider than petals; adaxial surface with a moderately dense stellate indumentum; abaxial surface glabrous and slightly glaucous. Petals c. 4 mm long, c. 2 mm wide, enlarging to 5 mm long as fruit matures; adaxial surface with a sparse stellate indumentum; abaxial surface with a moderately dense stellate indumentum. Antesepalous filaments c. 1.5 mm long, the distal 0.4 mm prominently glandular; antepetalous filaments smooth to slightly glandular, c. 1 mm long; abaxial surface of anther slightly frosty, anther-apiculum absent, glabrous. *Cocci* c. 6 mm long, c. 3.5 mm wide, glabrous. Seed not seen.

Specimen seen: Known from the type material only.

Notes: *Boronia quadrilata* differs from *B. viridiflora* by being erect, and by elliptical leaves with acute tips and cuneate bases and larger flowers and fruit.

Distribution and ecology: *Boronia quadrilata* is known only from the catchment area of Magela Creek in the central area of the Arnhem Land plateau, Northern Territory (Fig. 15). At present this species is known from a single population of 10–15 plants on one ridge top next to *Allosyncarpia* S.T. Blake forest (K. Brennan, pers. comm.) Flowering and fruiting: October (1 collection).

Conservation Status: This species was given a ROTAP code of 2R by Duretto and Ladiges (1997), but after discussions with K. Brennan (1997) indicated that the population was at risk from fire a ROTAP code of 2V or 2E is more appropriate. Further sampling of the known population (except perhaps for seed) should be discouraged and detailed surveys of the area are required to ascertain if any other populations exist.

44. *Boronia viridiflora* Duretto, *Austral. Syst. Bot.* 10: 295 (1997), fig. 25. *Type:* c. 2 km S of Myra Falls, Arnhem Land, NT, 12°28'S 133°20'E, *M.F. Duretto 421*, *J. Chappill, G. Howell and K. Brennan*, 14.vi.1993 (holotype DNA (photographs MEL 2041202, NSW).

Horizontal shrub, growing perpendicular or slightly upwards from vertical rock faces, to 1.5(–2) m long. Multiangular stellate hairs present on petals only, with 3–8 rays per hair; rays 20–40 µm long. Branchlets distinctly quadrangular but becoming terete as the branch ages, slightly glandular. Leaves 8–40 mm long, 7–16 mm wide; petiole 0.5–3.5 mm long; lamina elliptic to oblanceolate, acute to obtuse, attenuate, epidermal wax platelets 0.1–0.2(–0.5) µm wide; the midrib ± impressed on the adaxial surface, ± slightly raised on the abaxial surface, with tightly packed cells without secondary thickening between midvein and abaxial epidermis. Inflorescence 1–3-flowered; peduncle (0–)0.5–3 mm long; prophylls 0.75–12 mm long, 1–3 mm wide; metaxyphylls 0.5 mm long; anthopodium 1.5–2 mm long. Sepals ovate to deltate, acute, green but sometimes top half or tip burgundy, 2.5–3 mm long, 1.5–2.5 mm wide, to 3.5–4 mm long as fruit matures, ± equal to petals but becoming larger as fruit matures; adaxial surface with densely and minutely pubescent near the margins, becoming glabrous towards base and the midrib. Petals 2.5–3 mm long, 1.5–2 mm wide, not enlarging significantly as fruit matures; adaxial surface sparsely simple pubescent mainly on the margins, large number of erect multicellular glands on the distal half; abaxial surface with a sparse stellate indumentum, mainly on the midrib. Antesepalous filaments c. 1.5 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments smooth, c. 1 mm long; abaxial surface of anther not frosty. Cocci 4.5–5 mm long, 2.5–3 mm wide, glabrous. Seeds grey, dull, 4–4.5 mm long, c. 2 mm wide, without a dorsal ridge; at magnification surface c. reticulate foveate, units appearing to be collapsed tubercles, individual units 24–76 µm across.

Selected specimens examined (of 3 collections): THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: c. 4.5 km S and 1.3 km W of Myra Falls, Arnhem Land, 12°29'S 133°21'E, *M.F. Duretto 430-434*, *J. Chappill, G. Howell and K. Brennan*, 14.vi.1993 (*MFD430*: MEL; *MFD431*: AD, K, MEL; *MFD432*: CANB, DNA, MEL, NSW, PERTH; *MFD433*: DNA, MEL; *MFD434*: AD, DNA, HO, MEL).

Notes: *Boronia viridiflora* differs from *B. quadrilata* by its horizontal habit, smaller, oblanceolate, subsessile leaves with obtuse tips and attenuate bases, and smaller flowers and fruits. The horizontal habit and glaucous, glabrous leaves distinguishes *B. viridiflora* from the two other boronias, *B. rupicola* (species 20 above) and *B. suberosa* (species 47 below), that grow on vertical rock faces in Arnhem Land. This horizontal habit (from vertical cliff faces) is unique in *Boronia* but is found in other species found in the north-western escarpment of the Arnhem Land plateau, e.g. *Phyllanthus cauticola* J.T. Hunter

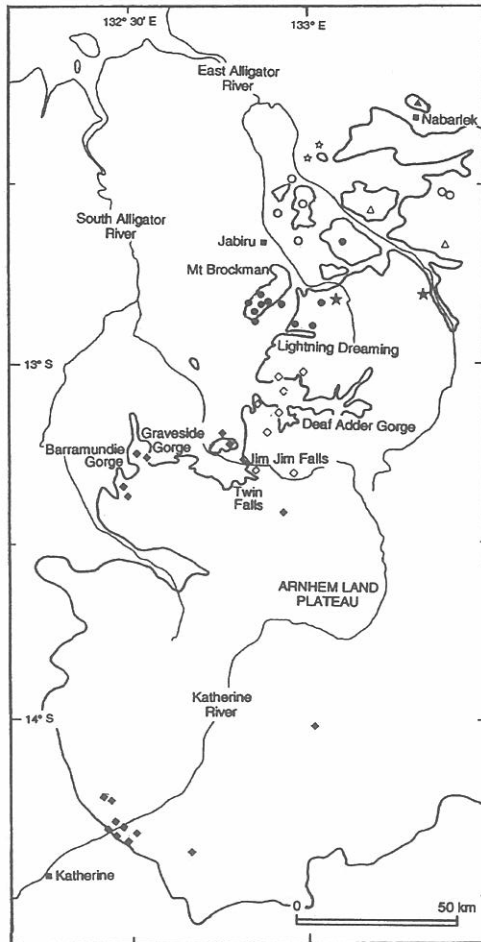


Fig. 16. Western Arnhem Land plateau and surrounds. Distribution of *Boronia* subseries *Grandisepalae*: *B. grandisepala* subsp. *grandisepala* (◆), *B. grandisepala* subsp. *acanthophida* (◇), *B. laxa* (●), *B. aff. laxa* 1 (△), *B. aff. laxa* 2 (▲), *B. prolixa* (○), *B. aff. prolixa* (☆), *B. amplectens* (★). Adapted from Duretto and Ladiges (1997), fig. 2.

& J.J. Bruhl (Euphorbiaceae; Hunter and Bruhl 1997b).

Distribution and ecology: *Boronia viridiflora* is known from two populations south of Nabarlek, Arnhem Land, Northern Territory (Fig. 15), where it grows on vertical sandstone surfaces of cliffs or boulders on the plateau surface. Flowering and fruiting: material collected in April and June.

Conservation status: 2R (Duretto and Ladiges 1997).

Boronia* sect. *Valvatae* subsect. *Grandisepalae* Duretto ser. 2. *Grandisepalae

Erect or spreading shrubs, with a sparse to dense, stellate indumentum on the branches, leaves, inflorescence parts and abaxial surfaces of the perianth. Stellate hairs sessile or stalked; rays smooth or flexuous, 0.1–1 mm long. Branches terete to slightly quadrangular, brown, decurrent leaf bases absent. Leaves simple, lamina discolourous or

concolourous, not succulent, plane or margin slightly recurved, dorsiventral or isobilateral, epicuticular wax platelets absent, the midrib impressed on the adaxial surface, prominently raised on the abaxial surface, secondary thickening in cells between midvein and abaxial epidermis. Prophylls sometimes unifoliate. Sepals longer and wider than petals, acuminate. Antepetalous filaments glandular at the distal end; anther-apiculum absent or present. Style glabrous or hirsute. Seed tuberculae unfused or fused into longitudinal rows.

A series of two subseries and at least seven species that is endemic to the Northern Territory (Figs 15, 16). It is characterised by a sparse to dense indumentum, simple leaves, and shiny, black seeds.

***Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. *Grandisepalae* subser. 1. *Verecundae* Duretto, subser. nov. Pili stellati stipitati. Gynecium glabrum et cocci glabri. Pagina seminibus tuberculata. *Sp. typica*: *B. verecunda* Duretto**

Erect shrubs, with a sparse to moderately dense stellate indumentum on the branches, leaves, inflorescence parts and abaxial surface of the perianth. Stellate hairs always stalked, even on perianth, stalks 0.25–0.5(–1) mm long; rays 0.5–1 mm long. Leaves dorsiventral. Metaxephylls minute or absent. Sepal adaxial surface glabrous or with a sparse indumentum, abaxial surface with a sparse to moderately dense stellate indumentum. Petal adaxial surface glabrous or with a sparse indumentum; abaxial surface with a sparse to moderately dense stellate indumentum. Anther-apiculum absent or present. Style glabrous. Cocci glabrous. Seeds black, at magnification tuberculate or slightly striate.

A subseries of two species, endemic to Kakadu N.P., Northern Territory (Fig. 15), characterised by stalked hairs with long rays.

45. ***Boronia verecunda* Duretto, *Austral. Syst. Bot.* 10: 291 (1997), figs 20e, f. *Type*: Kakadu N.P., 13°27'S 132°29'E, C.R. Dunlop 8611 and P.F. Munns, 22.iv.1990 (holotype DNA 47561 (photograph & transparency MEL 2041223); isotypes AD 99027035, BRI AQ511732, CANB 400809, MEL 1583457, NSW, PERTH *n.v.*).**

Boronia D6347 Kakadu *sensu* Leach *et al.* (1992, p. 35); Dunlop *et al.* (1995, p. 100).

Boronia sp.9 (Kakadu; *Martensz & Schodde 575*) *sensu* Briggs and Leigh (1996, p. 167).

Erect, much branched subshrub to 40 cm tall. Multiangular stellate hairs with 9–15 rays per hair; rays white, 0.5–0.75(–1) mm long, weak, flexuous, dull. Branchlets slightly quadrangular but becoming terete as the branch ages, decurrent leaf bases absent or indistinct; new shoots with a moderately dense, light pink to white indumentum, older branches with a sparse to moderately dense stellate indumentum and becoming glabrous as they age. Leaves 13–27(–50 on younger plants) mm long, 2–4(–8) mm wide; petiole to 1 mm long; lamina narrowly elliptic, acute, attenuate to cuneate, plane or margin slightly recurved; adaxial surface with a sparse to moderately dense stellate indumentum; abaxial surface with a sparse indumentum, the hairs mainly on margin and the midrib. Inflorescence 1-flowered; peduncle 0.5–1 mm long, with a moderately dense to dense indumentum; prophylls 4–5 mm long, 0.5 mm wide, with a sparse to moderately dense stellate indumentum; anthopodium 1–1.5 mm long, glabrous or with a sparse to moderately dense stellate indumentum. Sepals white or pink, becoming green as fruit matures, ovate to deltate, acute to acuminate, 6–7 mm long, 1.5–3 mm wide, not

enlarging significantly as fruit matures; adaxial surface glabrous or with a sparse stellate indumentum; abaxial surface with a moderately dense stellate indumentum. Petals white or pink, becoming green as fruit matures, 3.5–4.5 mm long, 1.5–2.5 mm wide, not enlarging significantly as fruit matures, midvein slightly raised on the abaxial surface at base; adaxial surface glabrous; abaxial surface with a sparse stellate indumentum, mainly on the midrib. Antesepalous filaments c. 1.5 mm long, the distal 0.75–1 mm prominently glandular; antepetalous filaments glandular, c. 1 mm long; abaxial surface of anther slightly frosty, anther-apiculum minute. Cocci 4.5–5 mm long, 3.5–4 mm wide. Seeds 3.5–4.5 mm long, 1.5–2 mm wide; tubercles 10–32 µm across.

Selected specimens examined (of five collections): THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: Kakadu NP, UDP Falls, 13°25'S 132°24'E, A.V. Shee and L.A. Craven 3053, 30.iv.1990 (AD, BRI, CANB, MEL); UDP Mine area, 13°29'S 132°26'E, Dunlop and Byrnes 2121, 17.iii.1971 (CANB, PERTH, DNA); 2–3 miles N of El Sharana, 13°31'S 132°31'E, Martensz and Schodde AE575, 25.i.1973 (CANB, DNA); Kakadu NP, 18.5 km S of Gimbat HS, below eastern edge of Marawal Plateau, 13°44'S 132°36'E, A.V. Shee and L.A. Craven 2717, 21.iv.1990 (AD, CANB, MEL).

Notes: *Boronia verecunda* differs from *B. xanthastrum* by weak, white hairs, narrower leaves, larger flowers and petals that are glabrous on the adaxial surface.

Distribution and ecology: *Boronia verecunda* is restricted to Kakadu N.P., Northern Territory, in the sandstone escarpment country of the South Alligator River catchment area (Fig. 15). Flowering: January–April; fruiting material collected only in April.

Conservation status: 2RC- (Briggs and Leigh 1996).

46. *Boronia xanthastrum* Duretto, *Austral. Syst. Bot.* 10: 292 (1997), figs 20g, h. *Type:* 25 km WNW of Twin Falls, 13°16.5'S 132°35'E, L.A. Craven 6226, 1.vi.1980 (holotype CANB 313880 [photographs DNA, MEL 2041228]).

Boronia sp. 4 (Craven 6226) *sensu* Lazarides *et al.* (1988, p. 23).

Erect, much branched subshrub to 40 cm tall; with a sparse to moderately dense stellate indumentum on the branches, leaves and inflorescence parts. Multiangular stellate hairs with 5–10(–14) rays per hair; rays yellow, becoming white and flexuous as the hair ages, 0.5–1 mm long, firm, glossy, smooth. Branchlets slightly quadrangular but becoming terete, young branches with a dense, yellow indumentum and glabrous as they age. Leaves 10–36 mm long, 2.5–6.5 mm wide; petiole 0.5–1.5 mm long; lamina elliptic to lanceolate, acute, attenuate to cuneate. Inflorescence 1(–3)-flowered; peduncle 0.5–1 mm long; prophylls minutely unifoliolate, 1.5–4 mm long, 0.5 mm wide; anthopodium 0.5–1.5 mm long. Sepals yellow-green, ovate to deltate, acuminate, 3.5–6 mm long, 1–2.5 mm wide, enlarging to 5–7 mm long as fruit matures; adaxial surface glabrous; abaxial surface with a sparse to moderately dense stellate indumentum. Petals yellow-green, 2.5–4 mm long, 1–1.5 mm wide, not enlarging significantly as fruit matures; adaxial surface with a sparse to moderately dense stellate indumentum, becoming glabrous towards base; abaxial surface with a sparse stellate indumentum mainly on the midrib and the distal portion. Antesepalous filaments 1.25–1.5 mm long, the distal 0.75 mm prominently glandular; antepetalous filaments slightly glandular, 0.75–1 mm long; abaxial surface of anther slightly frosty, anther-apiculum absent. Cocci 4–6 mm long, c. 2 mm wide. Seeds 4–4.5 mm long, c. 2 mm wide; tubercles 12–34 µm across.

Selected specimens examined (of eight collections): THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: Between Jim Jim Rd and Mt Basedow, Kakadu NP, c. 12°59'S 132°42'E, M.F. Duretto 538–540 and G. Howell, 30.vi.1993 (MEL); Half way up Mt Basedow, Kakadu NP, c. 12°59.5'S 132°41'E, M.F. Duretto 542–543 and G. Howell, 30.vi.1993 (MEL); Near summit of Mt Basedow, Kakadu NP, c. 12°59.5'S 132°41'E, M.F. Duretto 544–7 and G. Howell, 30.vi.1993

(MFD544: DNA, MEL; MFD545-547: MEL); Graveside Gorge, Kakadu, 13°17'S 132°33'E, *J. Russell-Smith* 2274 and *D. Lucas*, 3.v.1987 (DNA); saddle/ridge above side creek, just downstream and W of plunge pool, Barramundi Gorge, Kakadu NP, 13°19'S 132°26'E, *M.F. Duretto* 464-468, *J. Chappill* and *G. Howell*, 18.vi.1993 (MFD464: DNA, MEL; MFD465-467: MEL; MFD468: MEL, CANB).

Notes: *Boronia xanthastrum* differs from *B. verecunda* by its stiff white-yellow hairs, wider leaves, smaller flowers, and petals that are hirsute on the adaxial surface.

Distribution and ecology: *Boronia xanthastrum* is restricted to Kakadu N.P. (Northern Territory), on and around the Mt Basedow Range, and in the Barramundi and Graveside Gorge areas (Fig. 15). It is found growing on schists (Mt Basedow Range) and sandstones (escarpment country) in both heath and woodland communities. Flowering and fruiting: February-June.

Conservation status: 2RC- (Duretto and Ladiges 1997).

Boronia* sect. *Valvatae* subsect. *Grandisepalae* Duretto ser. *Grandisepalae* subser. 2. *Grandisepalae

Erect or spreading or pendulous shrubs, with a moderately dense to dense stellate indumentum on the branches, leaves, inflorescence parts and the abaxial surface of the perianth. Stellate hairs usually sessile, occasionally stalked; rays white to faintly yellow, to 0.5 mm long, firm, straight, glossy, smooth. Leaves isobilateral. Metaxyphylls absent or to 1 mm long. Sepal adaxial surface with a dense and minute simple/stellate-pubescence near the margins. Petal adaxial surface with a sparse to moderately dense indumentum. Anther-apiculum absent or minute. Style glabrous or hirsute. Cocci hirsute. Seeds striate, longitudinal ridges 12–52 µm apart and constructed of fused tubercles.

A subseries of five, possibly eight, species of the Northern Territory (Figs 16, 17), characterised by the usually sessile stellate hairs with rays to 0.5 mm long, and seed with a striate surface. These striations on the seed surface occur when the cellular projections on the seed surface, whether tubercles or collicles, fuse to form ridges (Duretto and Ladiges 1997). The structure of these ridges is similar to that of *Neobyrsesia suberosa* J.A. Armstr. (cf. Armstrong and Powell 1980, fig. 5), also found on the north-eastern Arnhem Land Plateau, and *Geleznovia verrucosa* Turcz. (unpublish. data) of south-western Australia.

Boronia subser. *Grandisepalae*, except *B. suberosa* and *B. amplectens*, was subjected to a phenetic analysis by Duretto and Ladiges (1997). This analysis identified, apart from a number of undescribed taxa, several specimens that could not be placed with confidence in any of the formally recognised taxa (see *B. aff. laxa* 1, *B. aff. laxa* 2, and *B. aff. proluxa*, species 50, 51 and 53 below). Further collections on the Arnhem Land Plateau (Northern Territory) and research are required to resolve the taxonomy of this group.

47. *Boronia suberosa* Duretto, *Austral. Syst. Bot.* 10: 288 (1997), fig. 22. *Type:* 11.5 km NE of Jabiru East, 12°35'S 132°58'E, *L.A. Craven* 5947, 26.v.1980 (holotype CANB 313890; isotypes A, CANB 313889, DNA 19572 [photographs HO, MEL 2041229, NSW], L, MEL 234382).

Boronia sp. 1 (*Lazarides* 9004) *sensu* Lazarides *et al.* (1988, p. 23).

Boronia D6852 Jabiru *sensu* Leach *et al.* (1992, p. 35); Dunlop *et al.* (1995, p. 100).

Boronia sp.8 (Jabiru; *C.R. Dunlop* 3305) *sensu* Briggs and Leigh (1996, p. 167).

Sprawling or pendulous, much branched subshrub to 50 cm long. Multiangular stellate hairs with (2-)7-14 rays per hair; rays clear to yellow, to 0.1(-0.3) mm long. Branchlets brittle, terete to slightly quadrangular, with a moderately dense to dense stellate indumentum and becoming glabrous with age, with massively developed cork on the older stems. Leaves 7-20 mm long, 3-11 mm wide; petiole absent or to 3 mm long; lamina elliptic to lanceolate, acute, attenuate, often appearing glabrous (to the unaided eye) but with a minute sparse to moderately dense stellate indumentum. Inflorescence 1-flowered, with a moderately dense to dense stellate indumentum; peduncle absent or to 1 mm long; prophylls 2-2.5 mm long, 0.5 mm wide; metaxyphylls 0.5-1 mm long; anthopodium 0.5-1 mm long. Sepals ovate to deltate, 3-5 mm long, 2-2.5 mm wide, enlarging to 6.5-7.5 mm long and 3-3.5 mm wide as fruit matures; adaxial surface with a sparse stellate indumentum; abaxial surface with a dense, stellate indumentum. Petals 2.5-3 mm long, 1.5-2 mm wide, enlarging to 4-5.5 mm long as fruit matures; adaxial surface with a sparse simple indumentum; abaxial surface with a sparse stellate indumentum. Antesepalous filaments 1.5-1.75 mm long, prominently glandular on the distal 0.5-1 mm; antepetalous filaments slightly glandular, c. 1 mm long; abaxial surface of anther not frosty, anther-apiculum absent, glabrous. Style glabrous. Cocci 3.5-5 mm long, 2-2.5 mm wide, with a sparse to moderately dense simple and stellate indumentum. Seeds 2.5-3.5 mm long, 1.5-2 mm wide; tubercles clearly visible at magnification.

Additional specimens examined: THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: 11.5 km NE of Jabiru East, 12°35'S 132°58'E, *M. Lazarides 9004*, 26.v.1980 (CANB, DNA); c. 8 km NNE of Jabiru East, 12°35'S 132°59'E, *J.L. Egan 4843*, 27.iv.1995 (DNA, MEL); ESE of Mudginberry, 12°36'S 132°58'E, *C. Dunlop 3305*, 19.ii.1973 (BRI, CANB, DNA, MEL, NSW, PERTH).

Notes: The older stems with massively developed cork is the diagnostic feature of this species.

Distribution and ecology: *Boronia suberosa* is known only from the southern end of the Ja Ja massive, Northern Territory (Fig. 15), where it is found on both sandstone pavements and cliff faces (collectors' notes). Flowering: February-April; fruiting: March-April.

Conservation status: 2RC- (Duretto and Ladiges 1997).

48. *Boronia grandisepala* F. Muell., *Fragm.* 1: 66 (1859). *Type:* McAdam Ranges near Fitzmaurice River [Macadam Ra., c. 14°32'S 129°57'E, Northern Territory], *F. von Mueller*, Oct. 1855 (lectotype (Duretto and Ladiges 1997): K n.v. (cibachrome MEL 2041208; photographs of cibachrome DNA, NSW; photograph AD 99537203); isolectotype MEL 727325).

Erect shrub to 1.5 cm tall and wide, with a moderately dense to dense stellate indumentum on the branches and leaves. Stellate hairs sessile, rarely stalked, with c. 10-20 rays; rays 0.1-0.3(-0.5) mm long. Leaves 7-55(-62) mm long, 1.5-14.5 mm wide; petiole 0.5-5 mm long; lamina narrowly elliptic to elliptic, sometimes sublanceolate, acute, ± slightly mucronate, attenuate to cuneate; juvenile leaves larger than adult leaves and with a sparse to moderately dense stellate indumentum that increases in density with each node until as adult leaves. Inflorescence 1(-3)-flowered, with a dense, stellate indumentum; peduncle absent or to 2.5(-7) mm long; prophylls linear, minutely unifoliate, 0.5-6 mm long, 1-2 mm wide; metaxyphylls to 0.5 mm long or sometimes absent; anthopodium 0.5-3(-4-5) mm long. Sepals white, pink or burgundy, broad-ovate, acuminate, (4-6-)7-10 mm long, 2-5.5 mm wide, enlarging to (6-)9.5-13 mm long and 5-7.5 mm wide as fruit matures; adaxial surface with a dense and minute simple and stellate indumentum near the margins, becoming glabrous towards base; abaxial surface

with a dense, stellate indumentum. Petals white, pink or burgundy, (3–)4–6 mm long, 1.5–3 mm wide, enlarging to (4–)5–7.5 mm long as fruit matures, midvein slightly raised at the base of the abaxial surface; adaxial surface with a moderately dense simple or stellate indumentum, sometimes becoming glabrous towards base; abaxial surface with a moderately dense to dense stellate indumentum. Antesepalous filaments 2–2.5 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments slightly glandular distally, 1–1.5 mm long; abaxial surface of anther sometimes slightly frosty, anther-apiculum absent or minute. Style hirsute at base or for full length, rarely glabrous. Cocci 4–5.5 mm long, 1.5–2.5 mm wide, with a moderately dense to dense simple and stellate indumentum. Seeds 3–4 mm long and 1.5–2 mm wide; surface ridges 27–44 μm apart; ridge units sometimes unclear.

Notes: *Boronia grandisepala* can be distinguished from the other members of the series by its moderately dense to dense stellate indumentum throughout and larger flowers. Thin-walled vesiculose sclereids have been reported for this species (Rao and Bhattacharya 1978, 1981).

Distribution: This species occurs from Deaf Adder Gorge to just south of Katherine (Arnhem Land plateau), and disjunctly in the Macadam and Yambarran Ranges to the east, Northern Territory (Figs 15, 16).

Key to subspecies

1. Leaves of adult plants grey, with a dense indumentum, epidermis not visible, 25–40 hairs per mm^2 , greater than 18 rays per hair on average**48a. subsp. *grandisepala***
1. Leaves of adult plants not grey, with a moderately dense indumentum, epidermis visible at magnification, 7–18 hairs per mm^2 , less than 17 rays per hair on average**48b. subsp. *acanthophida***

48a. *Boronia grandisepala* F. Muell. subsp. *grandisepala*

Illustrations: J. Brock, *Top End Native Plants*, 99 (1988, as *B. grandisepala*); J. Brock, *Native Plants of Northern Australia*, 99 (1993, as *B. grandisepala*).

Erect shrub to 1 m high and wide, adult plants with a dense, stellate indumentum on the branches and leaves. Leaves 7–45(–62 with juvenile leaves) mm long, 1.5–10 mm wide, epidermis not visible, c. 25–40 hairs per mm^2 , c. 18–20 rays per hair on average. Peduncle absent or to 1.5(–5–7) mm long; prophylls 1–2(–4.5–6) mm long; anthopodium 0.5–2.5(–5) mm long. Sepals (4–)7–10 mm long, (2–)3–5 mm wide, enlarging to (6–)9.5–12 mm long and 5–6 mm wide as fruit matures. Petals (3–)4–6 mm long, (1.5–)2.5–3 mm wide, enlarging to 4–7.5 mm long as fruit matures.

Selected specimens examined (of c. 35 collections): THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: Upper Deaf Adder Ck, 13°03'S 132°52'E, *I. Olsen* 2685, 2.vi.1976 (MELU, NSW); 10 km N of Twin Falls, 13°13.5'S 132°47'E, 5471-597373, *M. Lazarides* 9050, 28.v.1980 (CANB, DNA, MEL); Graveside Gorge, Kakadu, 13°17'S 132°33'E, *J. Russell-Smith* 2279 and *D. Lucas*, 3.v.1987 (DNA); Tributary of Barramundi Ck, Kakadu NP, S of Pine Creek Rd, 13°21'S 132°26'E, *H.S. Thompson* 516, 30.vi.1983 (CANB, NSW, PERTH); 20 km SE of Twin Falls, 13°27'S 132°54'E, 5471-725123, *L.A. Craven* 5882, 24.v.1980 (BRI, CANB, DNA, MEL, NSW); Birdie Ck, Kakadu NP, 13°57'S 132°53'E, *G.J. Leach* 2728 and *I.D. Cowie*, 18.iv.1990 (BRI, DNA, MEL, PERTH); On track to and near Biddlecombe Cascades, Nitmiluk NP, 14°15.37'S 132°25.84'E, *M.F. Duretto* 527-531, *J. Chappill* and *G. Howell*, 28.vi.1993 (MFD527: MEL, NSW; MFD528-531: MEL); Katherine Gorge NP, in gorge at first rapids, 14°19'S 132°28'E, *P.A. Fryxell* and *L.A. Craven* 4223, 20.v.1983 (AD, DNA); 70 km E of Port Keates, 14°20'S 130°10'54"E, *P.K. Latz* 13773, 10.v.1994 (MEL); VICTORIA RIVER DISTRICT: Macadam Ra.,

14°41'S 129°44'E, *J. Russell-Smith 7478* and *Lucas, 2.iii.1989* (DNA [transparency & photograph MEL]); Headwaters of Lalngong Ck, 15°05'S 130°10'E, *I. Cowie 5052* and *N.G. Walsh, 16.v.1994* (CANB, MEL).

Notes: Duretto and Ladiges (1997) noted that plants from the southern end of the Arnhem Land Plateau have slightly smaller inflorescences and floral parts than those from the Macadam Range/Lalngong Ck area; and that specimens from Nitmiluk N.P. have narrower leaves and sometimes much smaller flowers than other specimens.

Distribution and ecology: *Boronia grandisepala* subsp. *grandisepala* is found from the rocky outlier just north of Jim Jim Falls south to Nitmiluk N.P. (Fig. 16), and disjunctly at the headwaters of Deaf Adder Gorge, and in the Macadam Range and Lalngong Ck areas (Fig. 15). It is found in heath and woodland communities on rock pavements, outcrops, and deep sand. Flowering and fruiting: December-June.

Conservation status: Widespread, found in Nitmiluk N.P. and Kakadu N.P., and not under threat.

48b. *Boronia grandisepala* subsp. *acanthophida* Duretto, *Austral. Syst. Bot.* 10: 278 (1997). *Type:* 11 miles SW of Mt Gilruth, 13°04'S 132°56'E, *M. Lazarides 8007, 4.iii.1973* (holotype CANB 267569 (photographs HO, MEL 2041230); isotypes BRI AQ2244725, DNA 52722 (transparency MEL 2041225), NSW 244415).

Erect shrub to 1.5 m tall, with moderately dense indumentum on the branches and leaves. Leaves 8–55 mm long, 1.5–14.5 mm wide, epidermis visible, 7–18 hairs per mm², (4–)8–17 rays per hair on average. Peduncle 0.5–2.5 mm long; prophylls 0.5–2 mm long; anthopodium 1–3 mm long. Sepals (5.5–)7.5–9.5 mm long, 2.5–5.5 mm wide, enlarging to 9.5–13 mm long and 5–7.5 mm wide as fruit matures. Petals 4–4.5 mm long, 2–2.5 mm wide, enlarging to 5–6 mm long as fruit matures.

Selected specimens examined (of 12 collections): THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: Top of sandstone above creek flowing N at Deaf Adder Gorge, c. 10 km from mouth, 13°07'S 132°56'E, *D.J. McGillivray 3935* and *C.R. Dunlop, 18.viii.1978* (DNA, MEL, NSW); Near Mt Gilruth, 13°10'S 133°06'E, *L.A. Craven* and *G.M. Wightman 8307, 28.iii.1984* (CANB); 10 km N of Jim Jim Falls, 13°11'S 132°50'E, 5471-650419, *L.A. Craven 6076, 29.v.1980* (DNA, MEL, CANB); c. 17 miles N of Mt Evelyn, 13°21'S 132°54'E, *M. Lazarides 7993, 3.iii.1973* (CANB, DNA, MEL, NSW, PERTH); Top of Jim Jim Falls, Kakadu NP, 13°16.43'S 132°50.43'E, *M.F. Duretto 459, J. Chappill* and *G. Howell, 17.vi.1993* (CANB, DNA, MEL).

Distribution and ecology: *Boronia grandisepala* subsp. *acanthophida* occurs on the Arnhem Land Plateau surface between Deaf Adder Gorge and Jim Jim Falls, Northern Territory (Fig. 16), where found in sandstone heath and woodland communities. Flowering: January-June; fruits: February-June.

Conservation status: 2RC- (Duretto and Ladiges 1997).

49. *Boronia laxa* Duretto, *Austral. Syst. Bot.* 10: 279 (1997), figs 20a, b. *Type:* Site FF, c. 30 km SE of Jabiru, 12°55'S 132°58.5'E, 5472-801711, *L.A. Craven 6600, 30.iii.1981* (holotype CANB 338123; isotypes AD, DNA 20968 (transparency MEL 2041245), MEL 234407, P, US).

Boronia grandisepala (*Craven 2423*) *sensu Lazarides et al.* (1988, p. 23) *non* F. Muell.

Boronia sp. 3 (*Craven 5715*) *sensu Lazarides et al.* (1988, p. 23).

Semi-prostrate much branched shrub to 1.5 m long, with a sparse to moderately dense

stellate indumentum on the branches, leaves and inflorescence parts. Multiangular stellate hairs sessile (rarely stalked), 5–15 rays; rays yellow-white, 0.1–0.5 mm long. Leaves 10–45 mm long, 2.5–10 mm wide; petiole 0.5–3 mm long; lamina elliptic to sub lanceolate, acute, attenuate to cuneate, plane. Peduncle 0.5–2.5 mm long; prophylls 0.5–2.5 mm long, 0.5 mm wide, sometimes minutely unifoliolate; metaxyphylls to 0.5 mm long, sometimes absent; anthopodium 0.5–2 mm long. Sepals white to mauve, lanceolate-ovate, acuminate, 4–6 mm long, 2–3 mm wide, enlarging to 7–8 mm long and 3–5 mm wide as fruit matures; adaxial surface with a dense and minute indumentum near the margins, becoming glabrous towards base and the midrib; abaxial surface with a moderately dense stellate indumentum. Petals white to mauve, 2.5–4.5 mm long, 1–2 mm wide, enlarging to 4–5 mm long as fruit matures, midvein raised slightly at the base of the abaxial surface; adaxial surface sparsely simple and stellate indumentum sometimes becoming glabrous towards centre and base; abaxial surface with a moderately dense to dense stellate indumentum. Antesepalous filaments 1.5–1.75 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments smooth to prominently glandular distally, c. 1 mm long; abaxial surface of anther slightly frosty, anther-apiculum absent or minute. Style glabrous or hirsute at base to full length. Cocci 4–5.5 mm long, 2–2.5 mm wide, moderately simple and stellate indumentum. Seeds c. 4 mm long, c. 2 mm wide; longitudinal ridges 12–52 μm apart; ridge units, 9–41 μm across, sometimes unclear.

Selected specimens examined (of 16 collections): THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: Upper East Alligator R., Arnhem Land, 12°36'S 133°08'E, *J. Russell-Smith 5365* and *Lucas*, 26.iv.1988 (DNA); Sandstone plateau, Kakadu, c. 12°50'S 133°05'E, *L.A. Craven 2423*, 27.ii.1973 (CANB, DNA); 2.5 km NW of Koongarra Saddle, Kakadu NP, 12°45'S 132°55'E, *I.R. Telford 8112* and *J.W. Wrigley*, 24.iv.1988 (CANB, CANB, DNA, NSW); Koongarra area, 12°48'S 132°57'E, *C. Dunlop 4860*, 1.vi.1978 (CANB, DNA); Kakadu NP, Kuburra, NE of Nourlangie Rock, 12°50'S 132°51'E, *A.A. Muir 5721*, 17.v.1986 (AD, DNA, MEL); Just before Koongarra saddle, on track to mine site, Kakadu NP, 12°50.61 S 132°51.29'E, *M.F. Duretto 445*, *J. Chappill* and *G. Howell*, 16.vi.1993 (MEL); Lightning Dreaming, Arnhem Land, 12°55'S 133°02'E, *C. Dunlop 6585* and *G. Wightman*, 22.ii.1984, (CANB, DNA, NSW).

Notes: *Boronia laxa* differs from *B. prolixa* and *B. amplectens* by its elliptical leaves and short peduncle (< 3 mm), from *B. aff. laxa 2* by the moderately dense indumentum, and from *B. aff. laxa 1* and *B. grandisepala* by the lax habit and smaller flowers.

Distribution and ecology: *Boronia laxa* is restricted to the Mt Brockman outlier (Kakadu N.P.) and nearby Arnhem Land Plateau surface, Northern Territory (Fig. 16). It is a component of sandstone heath and woodland communities. Flowering and fruiting: February–June.

Conservation status: 2VC- (Duretto and Ladiges 1997).

50. *Boronia* aff. *laxa* 1 (Northern Plateau, Arnhem Land, Duretto and Ladiges 1997, 282).

Erect shrub to 1.5 m tall, with a moderately dense stellate indumentum on the branches and leaves. Multiangular stellate hairs with 3–15 rays; rays to 0.25 mm long. Leaves 10–58 mm long, 3–13 mm wide; petiole 1–5 mm long; lamina elliptic. Inflorescence 1(–3)-flowered, with a moderately dense to dense stellate indumentum; peduncle 0.5–4 mm long; prophylls 0.5–3.5 mm long, to 0.5 mm wide; metaxyphylls 0.5–2 mm long; anthopodium 1–6 mm long. Sepals deltate, white, 6.5–8 mm long and 3–5.5 mm wide enlarging to 11 mm long and 6 mm wide as fruit matures. Petals c. 3.5 mm long, c. 1.5 mm wide, enlarging to 5 mm long as fruit matures. Antesepalous filaments 1.75–2 mm long with the distal 0.75–1 mm being prominently glandular; antepetalous anther c. 1 mm

long; anther-apiculum absent. Style glabrous. Cocci 5–6.5 mm long, 2–2.5 mm wide, with a moderately dense indumentum. Seed not seen.

Specimens examined: THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: SE of Mt Howslip, West Arnhem Land, 12°34'S 133°10'E, *K.A. Menkorst 983*, 26.viii.1990 (DNA, MEL); Upper East Alligator R., Arnhem Land, 12°39'S 133°23'E, *J. Russell-Smith 8446* and *Brock*, 20.ii.1991 (DNA, MEL).

Notes: *Boronia* aff. *laxa* 1 differs from typical *B. laxa* by its erect habit and the slightly larger inflorescence and floral parts, and from *B. grandisepala* subsp. *acanthophida* by the moderately dense indumentum and smaller floral parts.

Distribution and ecology: *Boronia* aff. *laxa* 1 is known from the northern part of the Arnhem Land plateau east of the East Alligator River gorge, Northern Territory (Fig. 16). Flowering material has been collected in February and August.

51. *Boronia* aff. *laxa* 2 (Nabarlek, Arnhem Land, Duretto and Ladiges 1997, 282).

Semi-prostrate shrub. Multiangular stellate hairs with c. 6–25 rays; rays 0.1–0.2 mm long. Branches with a moderately dense stellate indumentum. Leaves with petiole 0.5–1.5 mm long; lamina narrowly elliptic, 10–35 mm long, 1.5–3.5 mm wide; adaxial surface with a moderately dense, stellate indumentum; abaxial surface with a dense, stellate indumentum. Inflorescence 1-flowered, with a dense, stellate indumentum; peduncle 0.5 mm long; prophylls c. 2 mm long, 0.5 mm wide; metaxyphylls minute to 1 mm wide; anthopodium c. 1.5 mm long. Sepals white, 3.5–4 mm long, c. 2 mm wide, enlarging to 6 mm long and 3.5 mm wide as fruit matures. Petals white, 3–3.5 mm long and 1–1.5 mm wide, enlarging to 4.5–5 mm long as fruit matures. Antesepalous filaments c. 1.5 mm long, the distal 0.75 mm glandular; antepetalous filaments c. 1 mm long; anther-apiculum absent. Style glabrous. Cocci c. 4 mm long, c. 2 mm wide, with a moderately dense indumentum. Seeds c. 3 mm long, c. 1.5 mm wide.

Specimen examined: THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: Nabarlek, Arnhem Land, 12°19'S 133°19'E, *Hinz 467*, 23.iii.1989 (CANB, DNA [transparency MEL 2041227]).

Notes: *Boronia* aff. *laxa* 2 differs from typical *B. laxa* by its smaller, narrower leaves with a dense indumentum on the abaxial surface (as in *B. grandisepala* subsp. *grandisepala*) but a moderately dense indumentum on the adaxial surface, and by its smaller hairs, inflorescence and floral parts.

Distribution and ecology: *Boronia* aff. *laxa* 2 is known only from near Nabarlek, Northern Territory (Fig. 16). Flowering and fruiting material was collected in March.

52. *Boronia prolixa* Duretto, *Austral. Syst. Bot.* 10: 283 (1997), figs 20c, d. *Type:* 15 km NNE of Jabiru East, 12°32'S 132°57'E, *L.A. Craven 6486*, 7.vi.1980 (holotype CANB 313887 (transparency & photograph MEL 2041224); isotypes A, AD, CANB 313888, DNA 19571, MEL 234380).

Boronia sp. 2 (*Craven 5957*) *sensu Lazarides et al.* (1988, p. 23).

Semi-prostrate, much branched subshrub to 50 cm long, with a moderately dense stellate indumentum on the branches, leaves and inflorescence parts. Multiangular stellate hairs with 5–10(–17) rays per hair; rays 0.1–0.5 mm long. Branches terete. Leaves sessile or petiolate; petiole absent or to 2(–4.5) mm long; lamina 4.5–32(–45) mm long, 2.5–16 mm wide, lanceolate to strongly ovate, acute, cuneate-truncate; adaxial surface of juvenile leaves with a sparse indumentum of appressed, straight, glossy, simple hairs that are

0.5–2 mm long. Inflorescence 1-flowered; peduncle 6–21 mm long; prophylls sometimes minutely unifoliolate, (0.5–)1–1.5 mm long, to 0.5 mm wide; metaxyphylls minute to 0.5 mm long; anthopodium 1–5 mm long. Sepals white to pink, ovate to deltate, acute to acuminate, 4–6 mm long, 1.5–3 mm wide, enlarging to 5.5–7 mm long as fruit matures; adaxial surface with a sparse and minute indumentum along the margins, becoming glabrous towards centre and base; abaxial surface with a moderately dense stellate indumentum. Petals white to pink, 3–3.5 mm long, 1–1.5 mm wide, enlarging to 4–5 mm long and 2.5–3 mm wide as fruit matures; adaxial surface with a sparse stellate indumentum becoming glabrous towards base; abaxial surface with a sparse to moderately dense stellate indumentum. Antesepalous filaments 1.5–1.75 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments slightly glandular, c. 1 mm long; abaxial surface of anther not frosty, anther-apiculum absent or minute. Style hirsute at base. Cocci 4–5 mm long, c. 2 mm wide, with a moderately dense simple and stellate indumentum. Mature seed not seen.

Selected Specimens examined (of nine collections): THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: East Alligator R., Arnhem Land, 12°29'S 133°03'E, *C. Dunlop 3234*, 15.ii.1973 (DNA, NSW); near 3 Pools, Kakadu NP, 12°29'S 132°54'E, *J. Russell-Smith 976*, 15.i.1984 (DNA); Nabarlek, escarpment country, 12°30'S 133°21'E, *M. Lazarides 9235*, 7.vi.1980 (A, CANB, DNA, L, MEL); 14.5 km NE of Jabiru East, 12°32'S 132°57'E, *L.A. Craven 5957*, 26.v.1980 (CANB, DNA, MEL); Ibangu Ck, SE of Ja Ja Massive, 12°33'S 132°55'E, *J. Russell-Smith 1120*, 9.ii.1984 (DNA); 5 km E of Winwuyerr Ck Crossing, Kakadu NP, 12°34'S 132°57'E, *J. Russell-Smith 1098*, 6.ii.1984 (DNA).

Notes: *Boronia prolixa* differs from *B. laxa* by having a relatively long peduncle (> 6 mm long) and elliptical to ovate leaves; from *B. aff. prolixa* by its smaller leaves; from *B. amplectens* by having non-appressed hairs, a moderately dense indumentum throughout, and wider leaves; and from *B. grandisepala* by its lax habit and moderately dense indumentum throughout.

Distribution and ecology: *Boronia prolixa* is restricted to the north-western portion of the Arnhem Land plateau, Northern Territory (Fig. 16). A component of sandstone heath and woodland communities. Flowering and fruiting: January–June.

Conservation status: 2RC- (Duretto and Ladiges 1997).

53. *Boronia* aff. *prolixa* (Red Lily Lagoon, Arnhem Land, Duretto and Ladiges 1997, 285).

Sprawling shrub to 50 cm wide, with a sparse to moderately dense stellate indumentum on the branches, leaves and inflorescence parts. Multiangular stellate hairs with 6–12 rays, rays 0.1–0.5 mm long. Leaves with a petiole 1.5–3 mm long; lamina 11–50 mm long, 4–15 mm wide, elliptical to ovate, tip acute. Inflorescence 1-flowered; peduncles 3.5–6(–11) mm long; prophylls c. 2 mm long; metaxyphylls minute; anthopodium 1–2 mm long. Sepals 3.5–5 mm long, 1.5–3 mm wide, enlarging to 6.5–7 mm long and 4.5 mm wide as fruit matures. Petals 2–2.5 mm long, c. 1 mm wide, enlarging to 4 mm long as fruit matures. Antesepalous filaments 1.5–1.75 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments slightly glandular, c. 1 mm long; abaxial surface of anther not frosty, anther-apiculum minute. Style hirsute. Mature fruit and seed not seen.

Specimens examined: THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: 9 km NE of East Alligator R. on Oenpelli Rd, 12°23'S 133°01'E, *S. Jacobs 1853*, 3.vi.1974 (CANB, DNA, NSW, PERTH); Red Lily Lagoon area between Cahills crossing and Oenpelli, 12°24'S 133°+4'E, *T.G. Hartley 13722*, 23.iii.1973 (CANB, DNA).

Notes: *Boronia* aff. *prolixa* may be an undescribed species; it differs from *B. prolixa* by its larger leaves, shorter peduncles, wider sepals and smaller petals.

Distribution and ecology: *Boronia* aff. *prolixa* is known from the Red Lily Lagoon area, south and west of Oenpelli, Arnhem Land, Northern Territory (Fig. 16). Flowering material has been collected in March and June.

54. *Boronia amplexens* Duretto, *Austral. Syst. Bot.* 10: 287 (1997). *Type:* Headwaters of the East Alligator River, 12°48'S 133°21'E, L.A. Craven and G.M. Wightman 8336, 31.iii.1984 (holotype CANB 399182; isotypes AD 99351079, MEL 722594).

Sprawling, much branched subshrub to 1 m wide. Multiangular stellate hairs with 6–10(–15) rays; rays appressed, 0.1–0.5 mm long. Branches terete, with a sparse to moderately dense stellate indumentum. Leaves with petiole 0.5–2.5 mm long; lamina narrowly elliptic, 15–52 mm long, 1.5–3 mm wide, with a sparse indumentum that is often confined to the margins and the midrib. Inflorescence 1-flowered, with a sparse to moderately dense stellate indumentum; peduncle 7–21 mm long; prophylls (0.5–)1–1.5 mm long, to 0.5 mm wide; metaxyphylls minute to 0.5 mm long; anthopodium 2–8 mm long. Sepals acute to acuminate, 3–5 mm long, 1.5–2 mm wide, enlarging to 7 mm long as fruit matures; adaxial surface with a moderately dense and minute indumentum along the margins, becoming glabrous towards centre and base; abaxial surface with a sparse to moderately dense stellate indumentum. Petals 3–4 mm long, enlarging to 5 mm long as fruit matures; adaxial surface with a sparse simple indumentum; abaxial surface with a sparse moderately dense stellate indumentum. Antesepalous filaments 1.5–1.75 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments slightly glandular, c. 1 mm long; abaxial surface of anther not frosty, anther-apiculum absent or minute. Style glabrous. Cocci c. 4.5 mm long, 2–2.5 mm wide, with a sparse to moderately dense stellate indumentum. Seed c. 4 mm long, c. 2 mm wide, .

Additional Specimen examined: THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: S of Magela Falls, c. 12°47'S 133°06'E, K. Brennan 2818, 21.v.1994 (MEL, OSS n.v.).

Notes: *Boronia amplexens* differs from other members of subseries *Grandisepalae* by having narrowly elliptical leaves (1.5–3 mm wide) with a sparse indumentum of appressed hairs.

Distribution and ecology: This species is known from two collections from the interior of the Arnhem Land plateau, Northern Territory (Fig. 16), where it is found growing in shrubby eucalypt woodland on rocky sandstone slopes. Flowering and fruiting material has been collected in March and May.

Conservation status: Duretto and Ladiges (1997) gave a ROTAP code of 1K to *B. amplexens*, but as more material has come to hand a ROTAP code of 2Y is more appropriate.

Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. 3. *Lanuginosae Duretto, ser. nov.
Folia pinnata. Filamenta antipetala laevia. *Sp. typica:* *B. lanuginosa* Endl.

Erect or spreading shrubs, glabrescent or with a sparse to dense, stellate indumentum on the branches, leaves, inflorescence parts and abaxial surfaces of the perianth. Multiangular stellate hairs sessile; rays to 1 mm long, smooth, straight. Branches terete to slightly quadrangular, decurrent leaf bases absent. Leaves imparipinnate or rarely simple (*B. pauciflora*), lamina discolourous, paler beneath, epicuticular wax platelets absent, the margins plane to revolute, dorsiventral or isobilateral; the midrib impressed on the adaxial surface, prominently raised on the abaxial surface or not, without secondary thickening (except sometimes *B. pauciflora*) in cells between midvein and abaxial epidermis. Prophylls minute or minutely unifoliate or minutely imparipinnate;

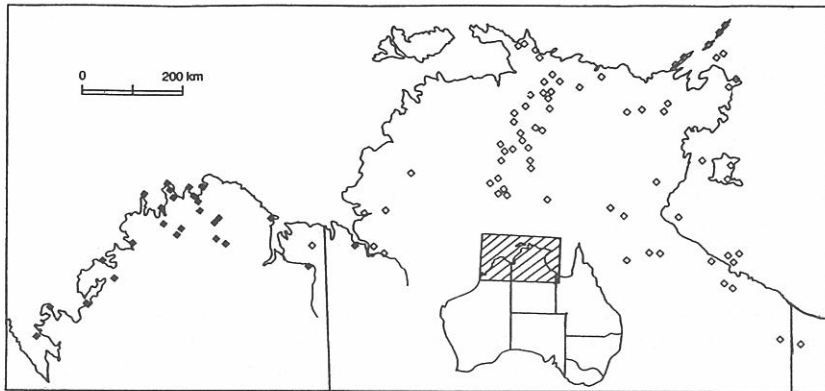


Fig. 17. Distribution of *Boronia* subseries *Lanuginosae*: *B. lanuginosa* (◇), *B. wilsonii* (◆). Adapted from Duretto (1997), fig. 1.

metaxyphylls absent or minute. Sepals as large or larger than petals (rarely smaller), acute or acuminate. Antepetalous filaments smooth; anther-apiculum absent or present. Style glabrous or hirsute. Seeds black, shiny; surface at magnification tuberculate-colliculate; tubercles unfused.

A series of three subseries and nine species of the Kimberley Region, Western Australia, the 'Top End' of the Northern Territory and north-western Queensland (Figs 17, 18). It is characterised by imparipinnate leaves (though adult foliage of *B. pauciflora* is simple) without secondary thickening in the midrib. This series corresponds to the *B. lanuginosa* group discussed in Duretto (1997).

Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. *Lanuginosae* Duretto subser. 1. *Lanuginosae

Erect shrubs, juvenile plants with a sparse to moderately dense stellate indumentum, adult plants with a dense, stellate indumentum. Leaves petiolate, sometimes sessile; rachis segments triangular; leaflets dorsiventral, narrowly elliptic to linear, the younger distal leaves not becoming unifoliolate, margins revolute or strongly recurved, the midrib raised on the abaxial surface. Sepals larger than petals. Cocci with a moderately dense to dense indumentum. Seeds black, concolourous.

A subseries of two widespread species of the Kimberley Region of Western Australia, the 'Top End' of the Northern Territory and north-western Queensland (Fig. 17). It is characterised by a dense indumentum throughout (at least on the adult foliage), narrow linear to elliptic leaflets with recurved to revolute margins and raised midribs on the abaxial surface. This subseries was the subject of the phenetic analysis presented by Duretto (1997).

- 55. *Boronia lanuginosa*** Endl. in Endl. *et al.*, *Enum. pl.* 16 (1837). *Type*: King George's Sound [probably Gulf of Carpentaria, Northern Territory], *Ferd Bauer* (lectotype (Duretto 1997): W n.v. (photograph PERTH 1610171)).

[*Boronia artemisioides* F. Muell., *Hooker's J. Bot. Kew Gard. Misc.* 9: 196 (1857). *nom. inval.*, provisional name only]

Boronia artemisiifolia F. Muell., *Fragm.* 1: 66 (1859) (as *B. artemisifolia*). *Types* (Duretto 1997): In montibus rapid fluvibus flum Fitzmarie River [c. 14°49' 130°E, Northern Territory], F. Muell., x.1855 (syntypes K n.v. (cibachrome MEL 2041209, photograph AD 99537192, right hand specimen), MEL 2041250); Sea Range [= Yambarran Ra., c. 15°20'S 130°10'E, Northern Territory], F. Mueller, xii.1855 (syntypes K n.v. (cibachrome MEL 2041209, photograph AD 99537192, left hand specimen), MEL 2041251); McAdam's Range [Macadam Ra., c. 14°32'S 129°57'E, Northern Territory], F. Mueller, October 1855 (syntype TCD (transparency MEL 2044561)).

Boronia affinis R.Br. ex Benth., *Fl. austral.* 1: 311 (1863). *Types* (Duretto 1997): Islands g, h [North Island - 15°35'S 136°52'E, and Vanderlin Island - 15°40'S 137'E, Sir Edward Pellew Group] of the Gulf of Carpentaria and mainland opposite Groote Island [Eylandt] [Northern Territory], *R. Brown No.* 5293, xii.1802-i.1803 (syntypes BM n.v. (transparencies DNA, MEL 2041222), CANB 278461, K n.v. (cibachrome MEL 2041210, photograph AD 99537210), MEL 2041248, NSW).

Illustrations: P. Wilson, *Austral. Pl.* 8: 200 (1975); K. Brennan, *Wildflowers of Kakadu*, 14, fig. 9 (1986, as *Boronia* sp.); J. Brock, *Top End Native Plants*, 99 (1988); J. Brock, *Native Plants of Northern Australia*, 99 (1993).

Erect, much branched shrub to 1.5 m high; ontogenetic sequence in indumentum density on the branches, leaves, inflorescence parts and abaxial surfaces of the perianth: juvenile plants initially glabrous or glabrescent or sparsely simple- and/or stellate-indumented, the density of the indumentum increasing with each node until with a dense, stellate indumentum with or without simple hairs, this gradation varies between the different organs and some plants never have a dense stellate indumentum. Multiangular stellate hairs with 2–15 rays; rays white to faintly yellow, to 1 mm long; simple hairs antrorse, 0.5–1(–2) mm long. Leaves 6–80 mm long, 5–50 mm wide in outline, with 11–27(–35) leaflets; petiole 0.5–3 mm long, not winged; rachis segments 0.5–10 mm long, 1–1.5 mm wide, winged, wedge shaped with the distal end wider; leaflets sessile, linear to narrowly elliptic, acute; terminal leaflet 5–26 mm long, 0.5–3 mm wide; lateral leaflets 4–26 mm long, 0.5–2 mm wide. Peduncle absent or to 1 mm long; prophylls linear, minute to minutely unifoliate, to 0.5 mm long; metaxyphylls absent or minute; anthopodium 4–10 mm long. Sepals white to deep pink or purple, ovate-deltate, acute to acuminate, (4–5–)7–14 mm long, 2–4 mm wide, enlarging to 8–15 mm long as fruit matures; adaxial surface densely and minutely pubescent sometimes becoming glabrous towards centre and base. Petals white to dark pink or purple, 3–9 mm long, 1–2 mm wide, enlarging to 5.5–10 mm long and 1.5–2.5 wide as fruit matures, midvein not or slightly raised at the base of the abaxial surface; adaxial surface with a sparse to moderately dense simple or stellate indumentum, becoming glabrous towards base. Antesepalous filaments 1.5–2 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments 1–1.5 mm long; abaxial surface of anther not or slightly frosty, anther-apiculum absent. Style glabrous. Cocci 4.5–6 mm long, 2–2.5 mm wide, with a moderately dense to dense simple and/or stellate indumentum. Seeds 4–4.5 mm long, 2–2.5 mm wide. *Engbajengbaja, Star Boronia.*

Selected specimens examined (of c. 200 collections): THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: Wessell Is., 11°13'S 136°38'S, *P.K. Latz* 3462, 10.x.1972 (CANB, DNA, PERTH); Nhulunbuy, Gove Peninsular, 12°10'S 136°46'E, *G.M. Wightman* 4283, 21.i.1988 (CANB, DNA); 5 miles NE of Goyder R. Crossing, 12°51'S 135°02'E, *J. Must* 1018, 17.vi.1972 (DNA, CANB); Groote Eylandt, 6 km S of Alyangula, 13°55'S 136°26'E, *I. Cowie*

2006 and I.C. Brocklehurst, 11.ix.1991 (CANB, MEL, PERTH); 8 km W of Roper Bar, 14°42'S 134°27'E, M.O. Parker 908, 22.vi.1977 (BRI, CANB, DNA, NSW); Nathan River Station, 15°35'S 135°22'E, G. Brown, 9.vii.1985 (DNA); 42.4 km from Borroloola towards Wollongorang, 16°8.01'S 136°36.70'E, M.F. Duretto 495-502, 21.vi.1993 (MFD495-498, 501, 502: MEL; MFD499: DNA, MEL; MFD500: DNA, CANB, MEL); c. 1.6 km W of Echo Gorge on the road from Wollongorang to 'Calvert Hills', 17°11'S 137°39'E, R. Pullen 9233, 12.v.1974 (AD, BRI, CANB, DNA); Tin Camp Ck, c. 20 miles S of Nabarlek mining camp, 12°28'S 133°15'E, T.G. Hartley 13828, 30.v.1973 (CANB, DNA); Mt Cahill, Kakadu NP, SE of summit, 12°52.00'S 132°42.27'E, M.F. Duretto 448-453, J. Chappill and G. Howell, 16.vi.1993 (MEL); East Alligator R. headwaters, 12°48'S 133°21'E, G. Wightman 1374 and L. Craven, 31.iii.1984 (BRI, CANB, DNA, MEL); Sandstone outlier, 10 km N of Twin Falls, 13°13.5'S 132°47'E, M. Lazarides 9044, 28.v.1980 (AD, CANB, DNA); 14 km E of Slesbeck, Kakadu NP, 13°46'S 132°58'E, G.J. Leach 2757 and I.D. Cowie, 18.iv.1990 (BRI, MEL, PERTH); c. 500 m W of Upper Falls, c. 600 m (by track) E of Edith Falls camp ground, Nitmiluk NP, 14°10'50"S 132°11'15"E, B.J. Conn 3709 and A.N.L. Doust, 15.iii.1993 (DNA, MEL, NSW); 7 km E of 'Beswick' Homestead along road to Mainora, 14°32'S 133°16'E, J. D. Briggs 879, 10.v.1983 (CANB, MEL); VICTORIA RIVER REGION: 4 km W of Kodendong Valley, 14°38'51"S 130°10'55"E, I. Cowie 4874 and D.E. Albrecht, 13.v.1994 (DNA, MEL); Victoria R., Gregory NP, 15°28'S 130°07'E, M. Clark 436 and G. Wightman, 7.ii.1986 (DNA); 20 km S of Daly R. Police Station (3 km S of Mt Boulder), 13°57'S 130°42'E, P.A. Fryxell, L.A. Craven and J. McD.Stewart 4907, 23.vi.1985 (CANB); WESTERN AUSTRALIA, KIMBERLEY REGION: Limestone hills W of Weaber Range, c. 50 km N of Kununurra and c. 13 km NW of Point Springs, M. Lazarides 8426, 8.iii.1978 (CANB, DNA, PERTH); QUEENSLAND, BURKE REGION: Westmoreland, off road past Hells Gate, 17°22'59"S 138°16'57"E, P. Forster 21066, 21069 & R. Booth, 23.v.1997 (BRI n.v., MEL).

Possible hybrids: *Boronia lanuginosa* X *B. tolerans* (see Duretto 1997). On track to and near Biddlecombe Cascades, Nitmiluk NP, 14°16'S 132°26'E, M.F. Duretto 525-526, 28.vi.1993 (MFD525: DNA, MEL; MFD526: MEL).

Notes: The density of the indumentum of *B. lanuginosa* is variable. It is not unusual for glabrescent plants to be found alongside plants with a dense indumentum (see discussion in Duretto 1997). Plant size is also variable and some populations, e.g. at Mt Cahill (Kakadu N.P.) and on the sandplains north of the Arnhem Land Plateau, consist of very small plants that may possibly behave as annuals. Plants from the south-western portion of the Arnhem Land plateau and western Northern Territory have larger flowers than the typical form. These forms appear to grade into each other (Duretto 1997). More collections and further research are required to determine if any of these forms require formal recognition.

Boronia lanuginosa is called *Engbajengbaja* by the Warnindilyakwa people of Groote Eylandt who use a preparation made from the leaves to treat headaches, body aches and pains, and chest colds (Levitt 1981).

Duretto (1997) erred when stating that one of the syntypes of *B. artemisiifolia*, viz. 'McAdam Ranges, F. Mueller, October 1855', was lodged at BM and MEL: only the collection at TCD has been seen.

Distribution and ecology: *Boronia lanuginosa* is common and widespread throughout the 'Top End' of the Northern Territory from Wollongorang to the Arnhem Land plateau and Cobourg Peninsula areas (Fig. 17). Isolated collections have also been made further east in the Macadam Range and Victoria River areas (NT) and the Weaber Range (WA), and the species was recently collected in north-western Queensland. It grows on sandstone and sands in heath, open woodland and forest. Flowering: January-September; fruiting: January-November.

Conservation status: Common, widespread, not under threat: found in a number of reserves including Kakadu N.P. and Nitmiluk N.P. (Duretto 1997).

56. *Boronia wilsonii* (F. Muell. ex Benth.) Duretto, *Nuytsia* 11: 320 (1997). *B. artemisiifolia* var. *wilsonii* F. Muell. ex Benth., *Fl. austral.* 1: 311 (1863). *Type:* Vansittart's Bay [c. 14°S 126°15'E, Western Australia], *Alan Cunningham* 432, 1819 (lectotype (Duretto 1997) PERTH 1610198; isolectotypes BM *n.v.* (transparencies MEL 2041234, PERTH), K x2 *n.v.* (cibachrome MEL 2041211, left hand specimen; MEL 2041212, left hand specimen)); Victoria River [c. 15°31'S 131°E, Northern Territory], *Wilson* (residual syntypes K *n.v.* (cibachrome MEL 2041213; photograph AD 99537195), MEL 2041252); N.W. Coast, *Bynoe* (residual syntype K *n.v.* (cibachrome MEL 2041212, right hand specimen; MEL 2041211, right hand specimen)).

Illustration: J.R. Wheeler, *Fl. Kimberley Region*, 669, Figs 206 B1-2 (1992, as *B. lanuginosa*).

Erect, much branched shrub to 1 m high, with a dense, stellate indumentum on the branches, leaves, inflorescence parts and abaxial surface of the perianth. Multiangular stellate hairs with 4–12 rays; rays white to faintly yellow, 0.05–0.1(–0.25) mm long; simple hairs present, antrorse, 0.5–2 mm long. Branches becoming glabrous as they age. Leaves 17–34(–61) mm long, 6–21 mm wide in outline, with 13–23 leaflets; petiole 0.5–7 mm long, not winged; rachis segments 2–6 mm long, 1–2.5 mm wide, winged, wedge shaped with the distal end wider; leaflets sessile to subsessile, narrowly elliptic to elliptic or lanceolate, acute, the margins recurved to revolute; terminal leaflet 3–23 mm long, 1–6 mm wide; lateral leaflets 1.5–12 mm long, 1–4 mm wide. Inflorescence 1(–3)-flowered; peduncle absent; prophylls 0.5–1(–9) mm long, up to 4 mm wide; anthopodium 2.5–7 mm long. Sepals cream to pink, ovate-deltate, acuminate, 5–9 mm long, 2–3 mm wide, enlarging to 6–10 mm long and 3–4.5 mm wide as fruit matures; adaxial surface with a dense stellate and simple indumentum near the margins, becoming sparse simple towards centre and glabrous towards base. Petals cream to pink, 4–5 mm long, 1.5–2.5 mm wide, enlarging to 5.5–6 mm long as fruit matures, midvein not or slightly raised at the base of the abaxial surface; adaxial surface with a sparse simple indumentum, becoming glabrous towards base. Antesepalous filaments 1.5–2 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments 1–1.5 mm long; abaxial surface of anther not or slightly frosty, anther-apiculum minute. Style glabrous or rarely hirsute. Cocci 4–5 mm long, 2–2.5 mm wide, with a moderately dense to dense simple and/or stellate indumentum. Seeds 3.5–4.5 mm long, 2–2.5 mm wide.

Selected specimens examined (of c. 50 collections): WESTERN AUSTRALIA; KIMBERLEY REGION: Lachlan Is., Buccaneer Archipelago, 16°38'S 123°29'E, *K.F. Kenneally* 8319, 14.vi.1982 (CANB, PERTH); Koolan Is., 16°7'S 123°46'E, *P.A. Fryxell, L.A. Craven* and *J. McD.Stewart* 4600, 2.vi.1985 (CANB, PERTH); Uwins Is., Brunswick Bay, 15°18'S 124°48'E, *P.G. Wilson* 11434, 7.vii.1973 (PERTH); Peninsula NE of Fredrick Harbour at mouth of Hunter R., 15°1'S 125°23'E, *P.A. Fryxell, L.A. Craven* and *J. McD.Stewart* 4685, 8.vi.1985 (CANB, MEL, PERTH); Bougainville, on plateau, 13°54'S 126°4'E, *J.S. Beard* 8260, 10.ix.1978 (CANB, PERTH); King Edward R., 14°54'S 126°12'E, *C.R. Dunlop* 5380, 1.iii.1980 (DNA, PERTH); Anjo Peninsula separating Napier Broome Bay and Vansittart Bay, c. 3.5 km SSW Sharp Point, 13°57'30"S 126°31'E, *J.H. Willis s.n.*, 31.v.1984 (BRI, CANB, MEL, NSW, PERTH); 2 km N of Kalumburu Mission, 14°16'S 126°37'E, *P.A. Fryxell* and *L.A. Craven* 4134, 14.v.1983 (CANB, MEL, PERTH); Napier Broome Bay, West Governor Is., South Bay, 13°57'S 126°41'E, *S.J. Forbes* 2059, 19.v.1984 (MEL, NSW); Planigale Ck, Drysdale R. NP, 14°43'S 126°54'E, *K.F. Kenneally* 4455, 19.viii.1975 (CANB, PERTH); Above the headwaters of the Helby R., 14°41'S 128°4'E, *T.G. Hartley* 14829, 27.iii.1978 (CANB, PERTH); Middle Springs, 18 km NW of Kununarra, 15°38'S 128°40'E, *P.A. Fryxell* and *L.A. Craven* 4002, 8.v.1985 (AD, BRI, CANB, DNA, MEL,

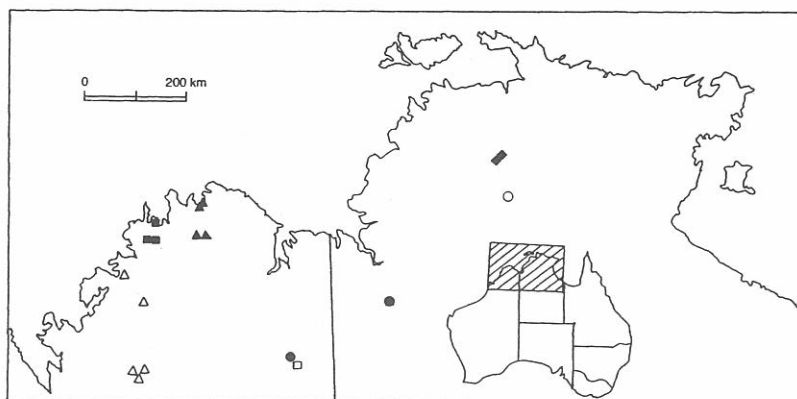


Fig. 18. Distribution of *Boronia* subseries *Jucundae*: *B. decumbens* (◆), *B. tolerans* (○), *B. jucunda* (●); subseries *Filicifoliae*: *B. pauciflora* (△), *B. kalumburuensis* (▲), *B. filicifolia* (■), *B. minutipinna* (□). Adapted from Duretto (1997), fig. 12.

PERTH); Parry Harbour on the Mainland near Troughton Is., *F. Lullfitz* 6109, 16.vi.1968 (PERTH); Lawley R., *G.A. Gardner* 963, 4.iv.1921 (PERTH); THE NORTHERN TERRITORY; VICTORIA RIVER REGION: Victoria R. area, 15°16'S 129°35'E, *G.J. Leach* 2399 and *C. Dunlop*, 9.iii.1989 (BRI, DNA).

Notes: *Boronia wilsonii* differs from *B. lanuginosa* by having wider and usually shorter leaflets and longer anthopodia. The many references to *B. lanuginosa* in the Kimberley can probably be referred to *B. wilsonii* (see Duretto 1997 and references therein).

Distribution and ecology: *Boronia wilsonii* is common in the Kimberley Region and adjacent islands (Western Australia), though rarely collected far from the coast, and from few collections from the lower Victoria River, Northern Territory (Fig. 17). It grows on sand, sandstone, quartzite and rarely limestone. Flowering: January-September; fruiting: March-September.

Conservation status: Common, widespread and under no immediate threat. Found in several reserves.

Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. *Lanuginosae* subser. 2. *Jucundae

Duretto, subser. nov. Indumento sparso ubique. Folia sessilia; foliola plana abaxiale, margine plano vel recurvo leviter. *Sp. typica:* *B. jucunda* Duretto

Erect or decumbent shrubs, glabrescent or with a sparse to moderately dense stellate indumentum on the branches, leaves and inflorescence parts. Leaves sessile, the younger distal leaves not becoming unifoliolate; rachis segments triangular; leaflets linear to narrowly elliptic, the margins plane to slightly recurved, the midrib not or slightly raised on the abaxial surface, sometimes impressed on the adaxial surface, dorsiventral or isobilateral. Peduncle absent or rarely to 0.5 mm long; metaxophylls minute to 1 mm long. Sepals larger than petals. Cocci glabrous or with a sparse to moderately dense indumentum. Seeds black, usually concolourous (see *B. jucunda*, species 59 below).

A subseries of three rare species of the Northern Territory with one extending into the south-eastern Kimberley Region of Western Australia (Fig. 18). It is characterised by having a sparse indumentum, and sessile leaves with plane, linear leaflets.

57. *Boronia decumbens* Duretto, *Nuytsia* 11: 323 (1997), figs 10A-E. Type: c. 70 km NE of Pine Creek, El Sharana Rd, 13°33'S 132°18'E, C. Dunlop 6752 and G. Wightman, 5.iii.1985 (holotype CANB 363098; isotypes DNA, MEL 250904, NSW).

Decumbent, much branched subshrub to 10 cm high and 40 cm wide, resprouting from a woody rootstalk, with a sparse to moderately dense simple indumentum on the branches, leaves and inflorescence parts. Multiangular stellate hairs rare, with 2–6 rays; rays to 0.1 mm long. Branches weak, terete to slightly quadrangular, becoming glabrous as they age. Leaves 6–20 mm long, 8–25 mm wide in outline, with (3)–5–7 leaflets, not obviously glandular; rachis segments 2–8 mm long, 0.5–1 mm wide; leaflets linear to narrowly elliptic, acute, attenuate, dorsiventral, the midrib not or slightly raised on the abaxial surface and not impressed on the adaxial surface; terminal leaflet 6–12 mm long, 0.5–1 mm wide, larger than preceding lateral leaflets; lateral leaflets 4–11 mm long, 0.5–1 mm wide. Inflorescence 1-flowered; peduncle absent; prophylls linear, minute to minutely unifoliolate, 0.5–2 mm long; metaxyphylls minute to 1 mm long; anthopodium 1–4 mm long. Sepals white to pink, deltate, acute, 4–6 mm long, 1.5–3 mm wide, enlarging to 5.5–8 mm long and 2–4 mm wide as fruit matures; adaxial surface with a moderately dense simple indumentum and becoming glabrous towards the base; abaxial surface with a sparse simple indumentum. Petals white to pink, 3–5 mm long, 1–2 mm wide, enlarging to 4–5.5 mm long as fruit matures; adaxial surface with a sparse to moderately dense simple indumentum, becoming glabrous towards base; abaxial surface with a sparse to moderately dense simple indumentum. Antesepalous filaments c. 1.5 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments c. 1 mm long; abaxial surface of anther not frosty, anther-apiculum minute or large and erect. Style glabrous. Cocci 5–6 mm long, 2–2.5 mm wide, with a sparse to moderately dense simple and stellate indumentum. Seeds 4.5–5 mm long, c. 2 mm wide.

Selected specimens examined (of 15 collections): THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: Kakadu NP, 3 km SW of Mary River Ranger Station, 13°24'S 132°05'E, A. V. Slee and L.A. Craven 2494, 17.iv.1990 (AD, CANB); N of Waterfall Ck turn off on Pine Creek-Oenpelli Rd, Kakadu NP, 13°33'S 132°17'E, M.F. Duretto 473-475, J. Chappill and G. Howell, 18.vi.1993 (MFD473: MEL; MFD474: CANB, DNA, MEL; MFD475: DNA, MEL); Mary River Ranger Station, 13°33'S 132°16'E, M.F. Duretto 548b-550, J. Chappill and G. Howell, 1.vii.1993 (MFD548b, 549: DNA, CANB, MEL; MFD550: MEL); Kombolgie Ck, Fern Gully, Fern Ck, 13°34'S 132°18'E, G.J. Leach 3407, iv.1993 (BRI, PERTH); Moline Rockhole area, Kakadu Hwy, 13°35'S 132°15'E, M.J. Clark 835, 19.iii.1987 (DNA).

Notes: *Boronia decumbens* differs from *B. lanuginosa* by its sessile leaves, few (if any) stellate hairs and decumbent habit; the last two features also distinguish it from *B. tolerans* and *B. jucunda*.

Distribution and ecology: This species is restricted to Kakadu N.P. to the area north of Mary River around the Mary River Ranger Station and the Waterfall Creek turnoff on the Pine Creek-Oenpelli Rd, Northern Territory (Fig. 18). It grows on deep sand as well as on sandstone in eucalypt open woodland. Flowering: November-August. Fruiting: March-August.

Conservation status: 2RC- (Duretto 1997).

58. *Boronia tolerans* Duretto, *Nuytsia* 11: 326 (1997), figs 10 F-J. Type: On track to and near Biddlecombe Cascades, Nitmiluk NP, 14°16'S 132°26'E, M.F. Duretto 516, J. Chappill and G. Howell, 28.vi.1993 (holotype MEL 2040275; isotypes DNA, MEL 2040276).

Erect, much branched shrub to 50 cm high. Multiangular stellate hairs sessile, 4–12 rays;

rays white to faintly yellow, 0.05–0.25(–0.5) mm long; simple hairs on vegetative organs antrorse, 0.5–1 mm long. Branches terete to slightly quadrangular, with a sparse to moderately dense simple and stellate indumentum, becoming glabrous as they age. Leaves 7–50 mm long, 8–17 mm wide in outline, with (1–3–)5–7(–9) leaflets, slightly glandular, glabrous to glabrescent; rachis segments 2–10 mm long, 1–2 mm wide; lamina isobilateral; terminal leaflet 8–25 mm long, 1–2.5 mm wide; lateral leaflets 5–16 mm long, 1–2 mm wide. Inflorescence 1-flowered, glabrous or with a sparse simple and stellate indumentum; peduncle absent; prophylls linear, minute, to 0.5 mm long; metaxyphylls absent or minute; anthopodium 1–2 mm long. Sepals white, ovate-deltate, acute, 4–5 mm long, c. 1.5 mm wide, enlarging to 5.5–6 mm long and 2–2.5 mm wide as fruit matures; adaxial surface with a moderately dense and minute indumentum, becoming glabrous towards the base; abaxial surface glabrous or with a sparse simple or stellate indumentum. Petals white, 3.5–4.5 mm long, c. 1 mm wide, enlarging to 5 mm long as fruit matures; adaxial surface with a sparse to moderately dense simple or stellate indumentum, becoming glabrous towards base; abaxial surface glabrous to glabrescent. Antesepalous filaments c. 1.5 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments c. 1 mm long; abaxial surface of anther not or slightly frosty, anther-apiculum minute to large, erect. Style glabrous. Cocci 5–6 mm long, 2–3 mm wide, glabrous or with a sparse indumentum. Seeds 4–4.5 mm long, 2–2.5 mm wide.

Selected specimens examined (of three collections): THE NORTHERN TERRITORY; DARWIN and GULF COUNTRY: Biddlecombe Cascades, Katherine Gorge NP, *S. King*, 16.vi.1981 (DNA); 3 km E of Biddlecombe Cascades, Katherine Gorge NP, *S. King*, 20.vi.1981 (DNA).

Possible hybrids: *Boronia tolerans* X *B. lanuginosa* (see *B. lanuginosa* species 55 above; Duretto 1997).

Notes: *Boronia tolerans* differs from *B. jucunda* by having up to seven leaflets and smooth stems, from *B. decumbens* by its erect habit, and from *B. lanuginosa* by its sessile and isobilateral leaves.

Distribution and ecology: This species is restricted to the Biddlecombe Cascades area of Nitmiluk N.P., Northern Territory (Fig. 18), where it grows on deep sand in eucalypt woodland on the plateau top. Flowering and fruiting material collected in June.

Conservation status: 2VC- (Duretto 1997).

59. *Boronia jucunda* Duretto, *Nuytsia* 11: 328 (1997), figs 10 K–O. *Type:* Mabel Downs, Winnama Gorge, Kimberley Region, WA, 17°11'S 128°15'E, *E.A. Chesterfield 214*, 14.v.1984 (holotype MEL 1534494; isotypes CANB [CBG 8503155], DNA 56026, NSW 166827, PERTH 1622609).

Boronia ? *pauciflora sensu* Forbes and Kenneally (1986, p. 161); Menkhurst and Cowie (1992, p. 44).

Boronia sp. A *sensu* Wheeler (1992, pp. 669, 670).

Illustrations: J.R. Wheeler, *Fl. Kimberley Region*, 669, figs 206 D1–3 (1992, as *Boronia* sp. A).

Erect, much branched shrub to 50 cm high. Multiangular stellate hairs sessile, 4–12 rays; rays 0.05–0.1 mm long; simple hairs antrorse, 0.5–1 mm long. Branches slightly quadrangular, glandular, with a sparse to moderately dense simple and stellate indumentum or glabrescent (NT, *Napier 7*, DNA). Leaves trifoliolate, slightly glandular, glabrous to glabrescent, lamina isobilateral; terminal leaflet 8–42 mm long, 1–3 mm wide, midvein straight; lateral leaflets 6–23 mm long, 1–2 mm wide. Inflorescence 1-

flowered, glabrous or with a sparse simple and stellate indumentum; peduncle absent or 0.5 mm long; prophylls linear, minute, to 0.5 mm long; metaxyphylls absent or minute; anthopodium 0.5–3 mm long. Sepals white, ovate-deltate, acute, (3–)4–5 mm long, 1.5–2.5 mm wide, enlarging to (3.5–)5.5–6 mm long and 2–2.5 mm wide as fruit matures; adaxial surface with a moderately dense stellate indumentum, becoming glabrous towards the base; abaxial surface glabrous or with a sparse indumentum. Petals white, (2–)3.5–4 mm long, c. 1 mm wide, not enlarging significantly as fruit matures; adaxial surface with a moderately dense simple or stellate indumentum, becoming glabrous towards base; abaxial surface glabrous or with a sparse simple and stellate indumentum. Antesepalous filaments 1.5–2 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments c. 1 mm long; abaxial surface of anther not frosty, anther-apiculum minute to large, erect. Style hirsute at base or for full length. Cocci 5–6 mm long, 3–3.5 mm wide, with a sparse indumentum. Seeds black, rarely mottled, 4.5–5 mm long, 2–3 mm wide.

Additional specimens examined: WESTERN AUSTRALIA, KIMBERLEY REGION: SE Kimberley, Winnama Spring c. 17.5 km S of Turkey Ck, 17°11'S 128°15'E, *J.H. Willis*, 15.v.1984 (CANB, MEL, PERTH); Escarpment edge, S side of Winnama Gorge, 17°11'S 128°15'E, *M.F. Duretto* 505-509 and *G. Howell*, 25.vi.1993 (*MFD505*: DNA, MEL, PERTH; *MFD506*: MEL; *MFD507*, 509: CANB, DNA, MEL, NSW, PERTH; *MFD508*: DNA, MEL); NORTHERN TERRITORY, VICTORIA RIVER REGION: Gregory N.P., 16°29'S 130°28'E, *D.L. Napier* 7, 12.x.1997 (DNA).

Notes: *Boronia jucunda* differs from *B. tolerans* and *B. decumbens* by always being trifoliolate and by having obviously glandular stems.

The collection from Gregory N.P. in the Northern Territory (*Napier* 7, DNA) differs from the Winnama population in its glabrescent stems and smaller floral parts: the sepals are 3–3.5 mm long (as apposed to 4–6 mm long) and the petals are 2–2.5 mm long (as apposed to 3.5–4 mm long). Further surveys are required to ascertain if these differences warrant taxonomic recognition.

Distribution and ecology: When Duretto (1997) described *B. jucunda* it was then known only from the edge of Winnama Gorge (south-east Kimberley Region, Western Australia). There it grows on small, quartzite outcrops in open eucalypt woodland that has an understorey of *Triodea* spp. Recently, *B. jucunda* was collected c. 250 km east-north-east of Winnama Gorge in Gregory N.P. (Northern Territory) where it was growing on a sandstone range (collectors notes). Flowering and fruiting material has been collected in May, June and October.

Conservation status: A ROTAP code of 2R was applied to *B. jucunda* by Duretto (1997) but with the recent, disjunct collection of the species in Gregory N.P. a ROTAP code of 3RC- is more appropriate.

Boronia* sect. *Valvatae* subsect. *Grandisepalae* ser. *Lanuginosae* subser. 3. *Filicifoliae

Duretto, subser. nov. Indumentum sparsum ad moderatum ubique. Anthopodium longum. Semina maculosa. *Sp. typica:* *B. filicifolia* A. Cunn. ex Benth.

Erect shrubs, glabrous or with a sparse to moderately dense stellate indumentum on the branches, leaves, inflorescence parts and the abaxial surface of the perianth. Branch hair distribution even or concentrated in areas below leaf base. Leaves imparipinnate or simple (*B. pauciflora*), ± sessile, with 1–51 leaflets; rachis segments triangular or elliptical; leaflets rhombic to elliptical, dorsiventral, the margins plane to recurved, the midrib raised on the abaxial surface if only slightly, usually impressed on the adaxial surface. Peduncle absent; prophylls to 1 mm long; metaxyphylls absent or minute. Sepals as large or larger than petals or rarely smaller (*B. filicifolia*). Cocci glabrous or with a sparse indumentum. Seeds mottled.

A subseries of four species endemic to the Kimberley Region of Western Australia (Fig. 18), that is characterised by a sparse to moderately dense indumentum, long anthopodia and mottled seeds.

60. *Boronia pauciflora* W. Fitzg., *J. Proc. Roy. Soc. Western Australia* 3: 158 (1918).

Type: Mount Broome, 1000 feet above the base, 17°21'0"S 125°22'42"E, W.V. Fitzgerald 825, v.1905 (lectotype (Duretto 1997): PERTH 1099701; isolectotypes K n.v. (transparencies MEL 2041221, PERTH; photograph AD 99548129), NSW).

Illustration: J.R. Wheeler, *Fl. Kimberley Region*, 669, Fig. 206 C (1992).

Erect, much branched shrub to 60 cm high. Multiangular stellate hairs with 2–8 rays; rays 0.1–0.2 mm long. Branches quadrangular, slightly glandular, with a sparse (sometimes moderately dense) stellate indumentum, the hairs mainly between the decurrent leaf bases, becoming glabrous as they age. Leaves simple and petiolate at maturity, juvenile leaves sessile and trifoliolate and produced for very few nodes; petiole 0.5–7 mm long, not winged; leaflets petiolate, petiolule 1–2 mm long; leaves or leaflets elliptical to lanceolate, acute, attenuate, glabrescent with a few scattered stellate and simple hairs, mainly on the midrib; the midrib raised on the abaxial surface, with or without secondary thickening in the cells between midvein and epidermis; simple leaves and terminal leaflet 12–80 mm long, 2–12 mm wide, longer than laterals; lateral leaflets 7–13 mm long, 2–4 mm wide. Inflorescence 1(–3)-flowered, glabrous or with a sparse stellate indumentum; prophylls minute-minutely unifoliolate, to 1 mm long; metaxyphylls absent or to 0.5 mm long; anthopodium 4–22 mm long. Sepals white to pink, c. same size as petals, ovate-deltate, acute to acuminate, 2.5–4.5 mm long, 1–2 mm wide, enlarging to 4.5–5 mm long as fruit matures; abaxial surface with a sparse simple indumentum becoming glabrous towards base; abaxial surface glabrous to glabrescent. Petals white to pink, 2–4.5 mm long, 1–1.5 mm wide, scarcely enlarging as fruit matures; adaxial surface with a sparse to moderately dense stellate indumentum, becoming glabrous towards base; abaxial surface with a sparse stellate indumentum. Filaments pilose below glandular tip; antesepalous filaments c. 2 mm long, the distal 1–1.5 mm prominently glandular; antepetalous filaments c. 1.5 mm long; abaxial surface of anther not or slightly frosty; anther-apiculum absent, glabrous. Style hirsute for full length. Cocci 5–6 mm long, 2–2.5 mm wide, glabrous. Seeds 4–4.5 mm long, 2–2.5 mm wide.

Additional specimens examined: WESTERN AUSTRALIA; KIMBERLEY REGION: Bold Bluff, King Leopold Ra., 17°16'S 125°15'E, N. Byrnes 2260, 25.v.1971 (CANB, DNA, PERTH); Leopold Ra., towards base of Bold Bluff, 17°17'S 125°25'E, D.E. Symon 7037, 26.v.1971 (MEL, PERTH); Foot of Bold Bluff, C.H. Gittens 1443, vii.1967 (NSW); Edkins Ra., c. 132 km from 'Mount Elizabeth' homestead along the Walcott inlet track, 16°02'S 125°28'E, I.R. Telford 11627, 1.v.1992 (PERTH); c. 10 km NE of Prince Regent R. mouth, 15°26'S 125°10'E, L.A. Craven 9212, J. McD.Stewart and C.L. Brubaker, 27.v.1993 (CANB, DNA, E, L, MEL, PERTH).

Notes: The Prince Regent River material differs from the King Leopold and that from the Edkins Ranges in having a greater hair density on the branches, longer anthopodia (on average), less acuminate sepals, and less hirsute staminal filaments. As the Prince Regent River collections are of seedlings, it is not known whether these differences are taxonomic or ontogenetic (Duretto 1997). The taxon referred to as *B. ? pauciflora* by Forbes and Kenneally (1986) and Menkhorst and Cowie (1992) is *B. jucunda*. *Boronia pauciflora* can be distinguished from the other *Boronia* species found in the Kimberley region by its simple, glabrescent, adult leaves.

Distribution and ecology: *Boronia pauciflora* is found in the King Leopold and Edkins Ranges, and from the Prince Regent River area, western Kimberley Region, Western

Australia. It grows in rocky (sandstones and quartzites) areas with spinifex (*Triodea* spp.) Flowering and fruiting: May–July.

Conservation status: *Boronia pauciflora* was given a ROTAP code of 3K Briggs and Leigh (1996) and a Priority Three rating, following the Western Australian Department of Conservation and Land Management for Western Australian taxa, by Hopper *et al.* (1990).

61. *Boronia kalumburuensis* Duretto, *Nuytsia* 11: 334 (1997), figs 10 P–S. *Type:* Outcropping sandstone immediately N of Kalumburu airstrip, 14°17'S 126°37'E, E.D. Edwards LAC9247, 22.v.1993 (holotype CANB 463023; isotypes DNA, MEL 234516, PERTH).

Erect, much branched shrub to 50 cm high, with a sparse to moderately dense stellate indumentum on the branches and leaves. Multiangular stellate hairs with 4–10 rays; rays to 0.5 mm long. Branches slightly quadrangular but becoming terete and glabrous as they age. Leaves 8–40 mm long, 4–14 mm wide in outline, with 15–27 leaflets, leaflets number gradually increasing along axillary branches, the younger distal leaves not becoming unifoliolate; rachis segments 0.5–1.5 mm long, 0.5–1.5 mm wide, winged, wedge shaped with the distal end wider; petiole 1–2 mm long, not winged; leaflets subsessile, elliptic to lanceolate, acute; terminal leaflet lanceolate, 3–11 mm long, 1–3 mm wide, longer than laterals; lateral leaflets elliptic, 1–9 mm long, 0.5–2.5 mm wide. Inflorescence 1(–3)-flowered; anthopodium with a sparse to dense, stellate indumentum, 7–24 mm long. Sepals white to pink, longer and wider than petals, ovate-deltate, acute to acuminate, 3.5–5 mm long, 1.5–2.5 mm wide, enlarging to 5–6 mm long as fruit matures; adaxial surface with a moderately dense stellate indumentum, sometimes along the margins only; abaxial surface with a sparse stellate indumentum. Petals white to pink, 2.5–4 mm long, 1–2 mm wide, not enlarging significantly as fruit matures; adaxial surface with a sparse simple and stellate indumentum, becoming glabrous towards base; abaxial surface glabrous or with a sparse stellate indumentum. Filaments bearing stiff stellate and some simple hairs below glandular tip; antesealous filaments c. 1.5 mm long, prominently glandular on the distal 0.5–1 mm; antepetalous filaments c. 1 mm long; abaxial surface of anther not frosty; anther-apiculum absent or present, minute or large and erect, sometimes with few stiff simple hairs. Style hirsute at base or for full length. Cocci 5–5.5 mm long, 2–2.5 mm wide, glabrescent or with a sparse stellate indumentum. Seeds c. 4.5 mm long, c. 2.5 mm wide.

Selected specimens examined (of seven collections): WESTERN AUSTRALIA; KIMBERLEY REGION: c. 10 km N of Kalumburu Mission, 14°11'S 126°40'E, P.A. Fryxell and L.A. Craven 4131, 14.v.1983 (CANB, DNA, MEL, PERTH); quartzite outcrop between Kalumburu Mission and Longini Landing, 14°16'S 126°37'E, D.E. Symon 10184, 26.v.1975 (AD, CANB, PERTH); 4 km N Kalumburu, 14°17'S 126°37'E, A.S. George 15199, 24.vi.1978 (CANB, MEL, NSW, PERTH); Theda Station near Homestead on banks of Morgan R., 14°49'S 126°43'E, P.A. Fryxell, L.A. Craven and J. McD.Stewart 4858, 18.vi.1985 (CANB, MEL, PERTH).

Notes: *Boronia kalumburuensis* differs from *B. filicifolia* and *B. minutipinna* by a smaller number of leaflets and hirsute cocci. This last feature also distinguishes it from *B. pauciflora*. *Boronia kalumburuensis* can be distinguished from *B. wilsonii* (with which it is sympatric) by its sparse to moderately dense indumentum, much longer anthopodia, and smaller and less hirsute flowers.

Distribution and ecology: *Boronia kalumburuensis* is found in the Kalumburu area and south to Theda Station, north Kimberley Region, Western Australia (Fig. 18), where it grows mainly on sandstones and quartzites. Flowering and fruiting: May–July.

Conservation status: 2RC- (Duretto 1997).

- 62. *Boronia filicifolia*** A. Cunn. ex Benth., *Fl. austral.* 1: 311 (1863). *Type*: Montague and York Sounds, N.W. Australia, A. Cunningham 220, third voyage of the 'Mermaid', 1820 (lectotype (Duretto 1997): K n.v. (cibachrome MEL 2041207, photograph AD 99537201); isolectotype BM n.v. (transparencies MEL 2041235, PERTH)); York Sound, N.W. Australia, A. Cunningham 219, third voyage of the 'Mermaid', 1820 (residual syntype BM n.v. (transparencies MEL 2041244)).

Illustration: J.R. Wheeler, *Fl. Kimberley Region*, 669, Figs 206 A1 and A2 (1992).

Erect, much branched shrub to 50 cm high, with a sparse to moderately dense stellate indumentum. Multiangular stellate hairs with 2–10 rays; rays to 0.25 mm long. Branches quadrangular, becoming terete and glabrous as they age. Leaves (7–11–)30–75 mm long, (3–)6–12 mm wide in outline, opposite decussate to subopposite, with (5–)15–55 leaflets, leaflets number gradually increasing along axillary branches, the younger distal leaves not becoming unifoliolate; petiole absent or to 2 mm long, not winged; rachis segments (0.5–)2–7 mm long, 0.5–1 mm wide, winged, the distal end wider; leaflets acute, petiolule absent or to 1 mm long; terminal leaflet lanceolate, (1.5–)3–8 mm long, 1–5 mm wide, longer than laterals; lateral leaflets elliptic to rhombic, 0.5–5(–7) mm long, 0.5–3 mm wide. Inflorescence 1(–3)-flowered; prophylls minute; metaxyphylls absent or minute; antheridium glabrous or with a sparse to moderately dense stellate indumentum, (2–)6–22 mm long. Sepals white to pink, c. equal in size to or rarely smaller (Port Warrenda, *Keneally 7763*) than petals, ovate-deltate, acute, 2–3.5 mm long, 1.5–2 mm wide, not enlarging significantly as fruit matures; adaxial surface with a moderately dense stellate indumentum; abaxial surface glabrous or with a sparse stellate indumentum. Petals white to pink, 2.5–3.5 mm long, 1–1.5 mm wide, enlarging to 4 mm long as fruit matures; adaxial surface with a dense, stellate indumentum, becoming glabrous towards base; abaxial surface glabrous or with a sparse stellate indumentum. Filaments bearing stiff bifid and some simple hairs below glandular tip; antesealous filaments c. 1.5 mm long, prominently glandular on the distal 0.5 mm; abaxial surface of anther not or slightly frosty, glabrous; anther-apiculum absent or present, minute or large and erect, glabrous or bearing few simple erect hairs. Style hirsute for full length. Cocci c. 5 mm long, 2–2.5 mm wide, glabrous to glabrescent. Seed c. 4 mm long, c. 2 mm wide.

Selected specimens examined (of eight collections): WESTERN AUSTRALIA; KIMBERLEY REGION: E side of Mindjau Ck, Port Warrender, Admiralty Gulf, 14°40'S 125°56'E, *K.F. Keneally 7763*, 16.i.1982 (CANB, PERTH); along Mitchell R. S of Mitchell Plateau [14°47'S 125°44'E], *P.A. Fryxell, L.A. Craven and J. McD.Stewart 4735*, 10.vi.1985 (CANB, MEL, PERTH); 6 km W of Mitchell R. Falls, 14°49'20"S 125°38'30"E, *I. Cowie 4346* and *C. Brubaker*, 29.iv.1993 (CANB, PERTH); Mitchell R. Falls, Mitchell Plateau, N Kimberley, 14°49'20"S 125°41'40"E, *K.F. Keneally 7903*, 22.i.1982 (CANB, PERTH); Mitchell R., 14°50'S 125°42'E, *C.R. Dunlop 5262*, 22.ii.1980 (CANB, DNA, NSW, PERTH); Porosus Ck above confluence of fresh and salt water, Hunter R., 14°57'S 125°24'E, *K.F. Keneally 11191*, 2.vi.1992 (PERTH); 300 m upstream of junction of tidal and fresh water interface, 14°59'09"S 125°29'14"E, *A.A. Mitchell and T. Willing 2418*, 10.iv.1992 (PERTH).

Notes: As noted by Wheeler (1992) and Duretto (1997) the collections from Port Warrender have smaller sepals and narrower leaflets than typical *B. filicifolia* and require further investigation. *Boronia filicifolia* differs from *B. minutipinna* by larger and more numerous leaflets, longer antherodia and fewer hairs on the abaxial leaf-surface; from *B. kalumburuensis* by leaves with a larger number of leaflets and glabrous to glabrescent cocci; and from *B. pauciflora* by having leaves with more than five leaflets.

Distribution and ecology: *Boronia filicifolia* occurs in the catchment area of the Mitchell River, and in the Port Warrender area, western Kimberley Region, Western

Australia (Fig. 18). It is found in heath and open woodland on sandstones and quartzites. Flowering: January-June; fruiting: June-July.

Conservation status: 2R (Duretto 1997).

63. *Boronia minutipinna* Duretto, *Nuytsia* 11: 335 (1997), figs 10 T-X. *Type:* Osmond Plateau, WA, 17°16'S 128°22'E, *I. Cowie 1991*, 19.vii.1991 (holotype CANB 412831; isotypes DNA 59392, MEL 229246, PERTH 1881515).

Erect, much branched shrub to 50 cm high. Multiangular stellate hairs with 6–15 rays; rays 0.1–0.25(–0.5) mm long. Branches slightly quadrangular, becoming terete as they age, with a moderately dense to dense stellate indumentum, becoming glabrous as they age. Leaves sessile, 5–34 mm long, 2–4 mm wide in outline, with 17–35 leaflets, leaflets number gradually increasing along axillary branches, the younger distal leaves not becoming unifoliolate; rachis segments winged, elliptical, 0.5–12 mm long, 0.5–1.5 mm wide; leaflets with a petiolule c. 0.5 mm long, acute, adaxial surface with a moderately dense stellate indumentum, abaxial surface with a moderately dense to dense stellate indumentum; terminal leaflet lanceolate to elliptic, longer than but the same width as laterals, 1–2 mm long, midvein straight, 0.5–1.5 mm wide; lateral leaflets rhombic, overlapping, 0.5–1.5 mm long, 0.5–1.5 mm wide. Inflorescence 1-flowered, with a moderately dense stellate indumentum; anthopodium 1–6 mm long. Sepals white to pink, longer and wider than petals, deltate, acute, 3–4 mm long, 1.5–2 mm wide, enlarging to 3.5–5 mm long as fruit matures; adaxial surface with a sparse simple and stellate indumentum; abaxial surface with a sparse stellate indumentum. Petals white to pink, 2.5–3 mm long, 1–1.5 mm wide, enlarging to 4–4.5 mm long as fruit matures; adaxial surface with a moderately dense to dense stellate indumentum, becoming glabrous towards base; abaxial surface with a sparse to moderately dense stellate indumentum. Filaments bearing stiff bifid or stellate hairs below glandular tip; antesealous filaments 1.5–2 mm long, prominently glandular on the distal 0.5 mm; antepetalous filaments c. 1 mm long; abaxial surface of anther not frosty; anther-apiculum minute or large and erect, glabrous. Style glabrous or hirsute at base. Cocci (mature not seen) c. 6 mm long, c. 2.5 mm wide, with a moderately dense stellate and simple indumentum. Seed not seen.

Specimen seen: Known from the type material only.

Notes: *Boronia minutipinna* differs from *B. filicifolia* by its smaller and fewer leaflets that have a moderately dense to dense indumentum on the abaxial surface, smaller anthopodia (5–6 mm long), and perianth parts with a sparse indumentum.

Distribution and ecology: *Boronia minutipinna* has been collected once on the Osmond Plateau, south-east Kimberley Region, Western Australia (Fig. 18). It was found growing in sand amongst boulders (collectors' notes). Flowering and fruiting material was collected in July.

Conservation status: 1K (Duretto 1997).

Nomen dubium

Boronia ledifolia* var. *denticulata F. Muell. ex C. Moore & Betche, *Handbook Flora New South Wales*: 41 (1893). *Type citation:* "Calgoa, Hickey" (syntype MEL?, *n.v.*). *nomen dubium*

Boronia ledifolia var. *denticulata* was published by Moore and Betche (1893) who cite the locality 'Cobar' (which is located at 28°33'S 151°59'E, NSW) but no collector. Maiden and Betche (1916) cite two references for this taxon in their New South Wales census: Mueller, 1890, p. 16; and Moore and Betche, 1893, p. 41. Mueller (1890) does not describe *B. ledifolia* var. *denticulata* but lists three specimens of *B. ledifolia* that had come to his attention:

“*B. ledifolia*, Clyde (Bauerlen), the variety *Triphylla*; Culgoa (Hickey), a var. with somewhat denticulated leaflets; Cobar (H. Andrae).”

From the above references a number of important points can be made: firstly, it would appear that the correct authority for *B. ledifolia* var. *denticulata* is F. Muell. ex C. Moore & Betche (Cheel, 1928, p. 411, says that Moore and Betche implied the taxon from Mueller); secondly, it is not the Cobar specimen that has denticulate leaflets, but the Hickey collection from Culgoa; and thirdly, Mueller says that the Culgoa specimen has leaflets.

Maiden and Betche (1916) state that specimens of *B. ledifolia* var. *denticulata* were in Mueller's Herbarium (MEL). It is conceivable that Moore and Betche did not actually see these specimens, but described this taxon to complete their Handbook. A Cobar specimen has been located at MEL (Cobar, Lachlan River, Hans Andrae) that has simple leaves with smooth margins. This specimen can be assigned to *B. glabra*, or more accurately to the hirsute ‘Pilliga’ form of *B. glabra* (see above).

Culgoa (northern NSW) is far removed from areas where members of *Boronia* sect. *Valvatae* have been collected. The closest collections to this area can be assigned to *B. glabra* and are c. 60 or 70 km to the east. *Boronia glabra* has smooth margins. No Culgoa collections by Hickey (or anyone else) have been located in the holdings of *Boronia* at MEL. Edwin Hickey is known to have collected in the Maryland/Stanthorpe area on the NSW/Queensland border (card catalogue of collectors, MEL). Cheel (1928) suspected that *B. ledifolia* var. *denticulata* was a form of *B. repanda*. There are collections of *B. repanda* by Hickey at MEL but this species has simple leaves with glandular margins (see above). As it is not known which specimens, if any, *B. ledifolia* var. *denticulata* was based on, the name would best be treated as a *nomen dubium*.

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New names published herein:

Boronia sect. *Alatae* Duretto

Boronia sect. *Algidae* Duretto

Boronia sect. *Valvatae* subsect. *Bowmaniae* Duretto

Boronia sect. *Valvatae* subsect. *Grandisepalae* Duretto

Boronia sect. *Valvatae* subsect. *Grandisepalae* ser. *Quadrilatae* Duretto

Boronia sect. *Valvatae* subsect. *Grandisepalae* ser. *Grandisepalae* subser. *Verecundae*
Duretto

Boronia sect. *Valvatae* subsect. *Grandisepalae* ser. *Lanuginosae* Duretto

Boronia sect. *Valvatae* subsect. *Grandisepalae* ser. *Lanuginosae* Duretto subser.
Jucundae Duretto

Boronia sect. *Valvatae* subsect. *Grandisepalae* ser. *Lanuginosae* Duretto subser.
Filicifoliae Duretto

Boronia sect. *Valvatae* subsect. *Ternatae* Duretto

Boronia sect. *Valvatae* subsect. *Ternatae* ser. *Ericifoliae* Duretto

Boronia sect. *Valvatae* subsect. *Valvatae* ser. *Erianthae* Duretto

Boronia sect. *Valvatae* subsect. *Valvatae* ser. *Fraseriae* Duretto

Boronia sect. *Valvatae* subsect. *Valvatae* ser. *Rupicolae* Duretto

Boronia angustisepala Duretto

Boronia anomala Duretto

Boronia ternata var. *promiscua* Duretto

Boronia ternata var. *austrofoliosa* Duretto

Table 1. Infrageneric classification of *Boronia* section *Valvatae sensu lato* in phyletic sequence (except taxa of subsection *Valvatae*). Numbering corresponds to taxa numbering in text. Authorities of all taxa given in text.

Section 1. *Alatae*1. *B. alata*Section 2. *Algidae*2. *B. algida*, 3. *B. edwardsii*, 4. *B. corynophylla*Section 3. *Valvatae*5. *B. anomala* subsect. *incertae sedis*Subsection 1. *Ternatae*Series 1. *Ternatae*6. *B. ternata*, 7. *B. adamsiana*Series 2. *Ericifoliae*8. *B. ericifolia*, 9. *B. revoluta*Subsection 2. *Bowmaniae*10. *B. bowmanii*, 11. *B. squamipetala*Subsection 3. *Valvatae*Series 1. *Erianthae (sedis mutabilis)*12. *B. rubiginosa*, 13. *B. eriantha*, 14. *B. warrumbunglensis*,
15. *B. aff. granitica* (Bolivia Hill), 16. *B. granitica*,
17. *B. repanda*Series 2. *Fraseriae (sedis mutabilis)*18. *B. fraseri*, 19. *B. keysii*Series 3. *Rupicolae (sedis mutabilis)*20. *B. rupicola*Series 4. *Valvatae (sedis mutabilis)*21. *B. ledifolia* sp. group *incertae sedis*22. *B. chartacea* sp. group *insertae sedis*The *B. alulata* species group (*sedis mutabilis*)23. *B. angustisepala*., 24. *B. umbellata*, 25. *B. mollis*,
26. *B. amabilis*, 27. *B. obovata*, 28. *B. alulata*, 29.
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50. *B. aff. laxa* 1, 51. *B. aff. laxa* 2, 52. *B. prolixa*,
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Series 3. *Lanuginosae*Subseries 1. *Lanuginosae*55. *B. lanuginosa*, 56. *B. wilsonii*Subseries 2. *Jucundae*57. *B. decumbens*, 58. *B. tolerans*, 59. *B. jucunda*Subseries 3. *Filicifoliae*60. *B. pauciflora*, 61. *B. kalumburensis*, 62. *B. minutipinna*,
63. *B. filicifolia*

Appendix 1. Voucher specimens for leaf anatomical data. Principle collector given only. All vouchers logged at MEL unless otherwise stated. An ‘*’ indicates that material was removed from a herbarium sheet and rehydrated. All other material was removed from pickled collections.

- B. adamsiana* (Duretto 172, Smith 597 [MEL 678905]*)
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B. algida (Duretto 7)
B. alulata (Duretto 395, 399)
B. amabilis (Duretto 58, 353)
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B. anomala (Harwood 169 [MEL 2044558]*)
B. bella (Duretto 269)
B. bowmanii (Duretto 400)
B. chartacea (Duretto 107)
B. decumbens (Duretto 474, 548b, Clark 835 [DNA 9000121]*)
B. duiganiae (Duretto 320)
B. edwardsii (Duretto 125)
B. ericifolia (Duretto 154)
B. eriantha (Duretto 369)
B. excelsa (Forster 17248)
B. filicifolia (Fryxell 4735 [CANB 377231]*)
B. foetida (Duretto 263)
B. forsteri (Forster 11429)
B. fraseri (Blakely & Shiress, x.1924 MELU*)
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B. grandisepala subsp. *grandisepala* (Duretto 483, 527, Chappill 4756, Russell-Smith 7478 [DNA 48654]*)
B. granitica (Duretto 350)
B. hoipolloi (Clarkson 10473)
B. jensziae (Duretto 409)
B. jucunda (Duretto 509, Chesterfield 214 [MEL 1534494]*)
B. kalumburuensis (Edwards 9247 [CANB 463023]*)
B. keysii (Duretto 369)
B. lanceolata (Duretto 533, Chappill 4835)
B. lanuginosa (Duretto 424, 441, 445, 448, 454, 479, 480, 491, 500, 501, 503, 504, Dunlop 8216 [DNA 42766]*)
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B. minutipinna (Cowie 1911 [MEL 229246]*)
B. mollis (Duretto 62)
B. obovata (Duretto 301, 302)
B. odorata (Duretto 282, 289)
B. palasepala (Duretto 279)
B. pauciflora (Byrnes 2260 [DNA 3625]*, Craven 9212 [CANB 461131]*)
B. prolixa (Craven 5957 [CANB 313892]*, Russell-Smith 1098 [DNA 23816]*)
B. aff. prolixa (Hartley 13722 [CANB 245049]*)
B. quadrilata (Brennan 1567*)
B. quinkanensis (Duretto 385, Clarkson 9619)
B. repanda (Duretto 345)
B. revoluta (Duretto 210)

- B. rosmarinifolia* (Duretto 102, 257)
B. rubiginosa (Albrecht 5359 [MEL 2017219]*)
B. rupicola (Brennan 2356, Hartley 13819 [CANB 245052]*, Craven 6646 [CANB 338121 & 338122]*)
B. splendida (Duretto 337)
B. squamipetala (Clarkson 10112)
B. suberosa (Craven 5947 [CANB 313890]*)
B. ternata var. *elongata* (Duretto 198)
B. ternata var. *foliosa* (Duretto 167)
B. ternata var. *glabrifolia* (Wilson 10154 [AD 97404332]*)
B. ternata var. *promiscua* (Duretto 223)
B. ternata var. *ternata* (Duretto 186, 190)
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B. tolerans X *B. lanuginosa* (Duretto 526)
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