

A reassessment of *Boronia* (Rutaceae) in the Northern Territory with a key to species, the description of one new species and the reduction, in synonymy, of another species

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ABSTRACT

Boronia (Rutaceae) is reassessed for the Northern Territory of Australia. Three informal names, *B. aff. laxa* 1 (Northern Plateau, Arnhem Land), *B. aff. laxa* 2 (Nabarlek, Arnhem Land) and *B. aff. proluxa* 1 (Red Lily Lagoon, Arnhem Land), are re-evaluated in the light of the significant number of new collections made over the previous decade. Of the three, only one, *B. aff. laxa* 2 (Nabarlek, Arnhem Land), is considered to be worthy of formal taxonomic recognition and is here newly described as *B. zeteticorum* Duretto. The remaining two informal taxa are conspecific with *B. laxa* Duretto. Additional collections of *B. gravicocca* Duretto have shown that the taxonomic boundary between it and *B. filicifolia* A.Cunn. ex Benth. is not clear and thus *B. gravicocca* is synonymised under *B. filicifolia*. *Boronia filicifolia* was previously considered to be endemic to the Kimberley region of Western Australia. High levels of endemism of *Boronia* in the Northern Territory are discussed. The north-west portion of the Arnhem Land Plateau is determined to be a centre of diversity and endemism for the genus in the Territory and so is an area of high conservation value. A key to the species and subspecies of *Boronia* found in the Northern Territory is provided.

KEYWORDS: Rutaceae, *Boronia*, *Boronia filicifolia*, *B. gravicocca*, *B. laxa*, *B. zeteticorum* sp. nov.

INTRODUCTION

Boronia Sm. (Rutaceae) is an Australian genus of approximately 150 species found in all states and mainland territories (Wilson 1998; Duretto 1999, 2003). The Northern Territory is a minor centre of diversity for the genus with 17 currently accepted species (12 endemic; one with two endemic subspecies) (Duretto 1999, 2003; Kerrigan and Albrecht 2007). In addition, three taxa, *B. aff. laxa* 1 (Northern Plateau, Arnhem Land), *B. aff. laxa* 2 (Nabarlek, Arnhem Land) and *B. aff. proluxa* 1 (Red Lily Lagoon, Arnhem Land), were informally recognised by Duretto and Ladiges (1997) and Duretto (1999). These taxa were not formally described at the time as there was insufficient material available and the names have not been adopted in the literature (e.g. Kerrigan and Albrecht 2007).

Since 1997, a significant number of botanical surveys have occurred that have resulted in additional material for many rare species of *Boronia*, including *B. amplexans* Duretto, *B. gravicocca* Duretto and *B. laxa* Duretto. This additional material has allowed several taxonomic problems to be re-evaluated for the Northern Territory including the status of the informal taxa. Of the three informal taxa, two, *B. aff. laxa* 1 (Northern Plateau, Arnhem Land) and *B. aff. proluxa* 1 (Red Lily Lagoon, Arnhem Land), are assignable to *B. laxa*. *Boronia aff. laxa* 2 (Nabarlek, Arnhem Land) is distinct enough to warrant formal taxonomic recognition, and is formally described below as *B. zeteticorum* Duretto,

despite being known only from a single collection. *Boronia zeteticorum* sp. nov. is placed in *B.* subseries *Grandisepalae* and differs from all other species in that subseries (and *B.* subsection *Grandisepalae*) by the leaves having distinctly different indumentum densities on the abaxial and adaxial surfaces. The species is similar to *B. amplexans* in that both have very narrow leaves; a character that could be considered an apomorphy for the two species and has proven to be robust with the addition of many collections of both *B. amplexans* and *B. laxa* over the last decade. *Boronia amplexans* has stellate hairs with appressed rays while the stellate hairs of *B. zeteticorum* are multi-angular (viz. not appressed).

Boronia gravicocca Duretto was described from a small number of collections from Bradshaw Station (western Northern Territory) (Duretto 2003). It was subsequently targeted for population surveys by the staff of the Northern Territory Herbarium. Their collections have rendered *B. gravicocca* impossible to maintain as distinct from *B. filicifolia* A.Cunn. ex Benth. and so the former is here synonymised under the latter (see below).

MATERIALS AND METHODS

Herbarium material from mainly DNA, but also CANB, MEL and HO, were studied for this study. Herbarium abbreviations follow Holmgren *et al.* (1990).

CLASSIFICATION AND ENDEMISM OF *BORONIA* IN THE NORTHERN TERRITORY

Boronia is widely distributed across the 'Top End' of the Northern Territory, which is part of a biogeographical region that includes north-western Queensland and the Kimberley region of Western Australia. *Boronia* is classified into six sections (Wilson 1998; Duretto 1999, 2003, In press) of which only *B.* section *Valvatae* occurs in north-western Australia. The species of *Boronia* in the Northern Territory are placed in either *B.* subsection *Valvatae* (*B. lanceolata* F. Muell., *B. rupicola* Duretto) or *B.* subsection *Grandisepalae* (remaining 16 species) (Duretto 1999, 2003) (Table 1).

Boronia subsection *Valvatae*

Within *B.* subsection *Valvatae*, *B. lanceolata* (Northern Territory, north-western Queensland) is most closely related to two species from central Queensland in *B.* series *Valvatae* subseries *Lanceolatae* (Duretto and Ladiges 1999; Duretto 1999, In press). *Boronia rupicola* (Northern Territory) is the sole representative of *B.* series *Rupicolae* (Duretto and Ladiges 1999; Duretto 1999). Interestingly, the only other member of *B.* subsection *Valvatae* in north-western Australia, *B. hoipolloi* Duretto (north-western Queensland), is placed in *B.* series *Valvatae* subseries *Valvatae*, and is closely related to species on Cape York Peninsula (Queensland) (Duretto and Ladiges 1999; Duretto 1999). *Boronia* subsection *Valvatae* is not found in the Kimberley region of Western Australia and the three representatives found in the Northern Territory and north-western Queensland represent three quite distinct lineages. This relationship is in contrast to what is found in *B.* subsection *Grandisepalae*.

Boronia subsection *Grandisepalae*

Boronia subsection *Grandisepalae* contains 20 species, is restricted to north-western Australia (i.e. northern Western Australia, Northern Territory, north-western Queensland) and has three series, *Quadrilatae*, *Grandisepalae* and *Lanuginosae* (Duretto and Ladiges 1999; Duretto 1999). The first two series are endemic to the Northern Territory. *Boronia* series *Quadrilatae* (*B. quadrilata* Duretto, *B. viridiflora* Duretto) is restricted to the north-western Arnhem Land Plateau.

Boronia series *Grandisepalae* is more widespread and is classified into two subseries. *Boronia* subseries *Verecundae* (i.e. *B. verecunda* Duretto, *B. xanthastrum* Duretto) is found on the Arnhem Land Plateau and a few outliers to the west mainly in southern Kakadu National Park though *B. xanthastrum* is also found in eastern Arnhem Land. *Boronia* subseries *Grandisepalae* is more widespread, though only *B. grandisepala* F. Muell. is found outside the north-west portion of the Arnhem Land Plateau in eastern Arnhem Land and south of Mount Brockman to Nitmiluk National Park and also in the north-western parts of the Northern Territory. The remaining taxa (i.e. *B. amplexens*, *B. laxa*, *B. prolixa* Duretto, *B. suberosa* Duretto, *B. zeteticorum* sp. nov.) are narrow endemics of the north-western Arnhem Land Plateau and nearby outliers, an area that virtually matches the catchment area of the East Alligator River.

Boronia series *Lanuginosae* is classified into three subseries that are all found in the Northern Territory and the Kimberley Region (northern Western Australia). *Boronia* subseries *Lanuginosae* contains two widespread species, *B. lanuginosa* Endl. (Western Australia, Northern Territory, north-western Queensland) and *B. wilsonii*

Table 1. Classification of *Boronia* in the Northern Territory.

<i>Boronia</i> (all Australian states and mainland territories; c. 150 spp. in 6 sections)
<i>Boronia</i> section <i>Valvatae</i> (W.A., N.T., Qld, N.S.W., Vic.; 62 spp. in 5 subsections)
subsection <i>Valvatae</i> (N.T., Qld, N.S.W., Vic.; 35 spp. in 4 series)
series <i>Rupicolae</i> (N.T.; 1 sp.)
<i>B. rupicola</i>
series <i>Valvatae</i> (N.T., Qld, N.S.W., Vic.; 24 spp. in 3 subseries)
subseries <i>Lanceolatae</i> (N.T., Qld; 7 spp.)
<i>B. lanceolata</i> (N.T., NW Qld)
subsection <i>Grandisepalae</i> (N.W.A., N.T., NW Qld; 20 spp. in 3 series)
series <i>Quadrilatae</i> (N.T.; 2 spp.)
<i>B. quadrilata</i> , <i>B. viridiflora</i>
series <i>Grandisepalae</i> (N.T.; 8 spp. in 2 subseries)
subseries <i>Verecundae</i> (N.T.; 2 spp.)
<i>B. verecunda</i> , <i>B. xanthastrum</i>
subseries <i>Grandisepalae</i> (N.T.; 6 spp.)
<i>B. amplexens</i> , <i>B. grandisepala</i> (2 subsp.: <i>acanthopsida</i> and <i>grandisepala</i>), <i>B. laxa</i> , <i>B. prolixa</i> , <i>B. suberosa</i> , <i>B. zeteticorum</i> sp. nov.
series <i>Lanuginosae</i> (N.W.A., N.T., NW Qld; 10 spp. in 3 subseries)
subseries <i>Lanuginosae</i> (N.W.A., N.T., NW Qld; 2 spp.)
<i>B. lanuginosa</i> (NE W.A., N.T., NW Qld), <i>B. wilsonii</i> (N.W.A., NW N.T.)
subseries <i>Jucundae</i> (N.W.A., N.T.; 3 spp.)
<i>B. decumbens</i> (N.T.), <i>B. jucunda</i> (N.W.A., NW N.T.), <i>B. tolerans</i> (N.T.)
subseries <i>Filicifoliae</i> (N.W.A., NW N.T.; 5 spp.)
<i>B. filicifolia</i> (N.W.A., NW N.T.)

(F. Muell. ex Benth.) Duretto (Western Australia, Northern Territory), the first species being the only representative of *B.* subsection *Grandisepalae* in north-western Queensland. *Boronia* subseries *Jucundae* contains three species. Two, *B. tolerans* Duretto and *B. decumbens* Duretto, are rare species of Nitmiluk and Kakadu National Parks. The third species, *B. jucunda* Duretto, is found in north-western parts of the Northern Territory and the eastern Kimberley region. *Boronia* subseries *Filicifoliae* contains five species of the Kimberley region, one of which, *B. filicifolia*, extends to the north-western parts of the Northern Territory.

Of the 18 species of *Boronia* found in the Northern Territory, 13 are endemic; eight of these endemics are restricted to the north-western area of the Arnhem Land Plateau and nearby outliers roughly within the catchment area of the East Alligator River. This area measures approximately 75 x 75 km with the Mount Brockman outlier in the south-west corner. The remaining endemics are found to the south of this area on or near the western parts the Arnhem Land Plateau and outliers south to Nitmiluk National Park, though *B. grandisepala* and *B. xanthastrum* are found further afield (see above). The distributional pattern of the species of *Boronia* found in the Northern Territory matches that found for all endemic species of the Northern Territory as presented by Woinarski *et al.* (2006). That is, the greatest diversity is found on the north-west portion of the Arnhem Land Plateau and outliers with the number of taxa increasing dramatically from south to north (see also discussion in Duretto and Ladiges 1997). This area, or rather the catchment area of the Alligator River, was also identified as a minor hot-spot of endemism in an Australia-wide study on endemism by Crisp *et al.* (2001) and other studies (e.g. Bowman *et al.* 1988; Dunlop and Webb 1991). The north-west is typified by many species with very narrow distributional ranges. In some cases they do represent aggregates of closely related species.

Boronia subseries *Grandisepalae* is an excellent example of an aggregate of many narrow endemics over a small area with five of its six species restricted to the north-west plateau area (see above). The four species with scrambling or lax habit (i.e. *B. amplexans*, *B. laxa*, *B. prolixa*, *B. zeteticorum* sp. nov.) form a monophyletic clade within this group (Duretto and Ladiges 1999: Fig. 10). The relationships of this clade of scrambling species with *B. grandisepala* and *B. suberosa* is equivocal as they form a trichotomy (see Duretto and Ladiges 1999). As *B. grandisepala* is also found outside the region the subseries may be represented in the area by more than one lineage.

The remaining three species of *Boronia* endemic to the north-west Arnhem Plateau area are classified into two different series, *B.* series *Quadrilatae* (with two narrow endemics) and *B.* series *Rupicolae* (monotypic), both of which are endemic to the region and taxonomically isolated in their subsections (Duretto and Ladiges 1999; Duretto 1999; Table 1). In a cladistic analysis presented by Duretto and Ladiges (1999), these series, plus the species in *B.* series

Quadrilatae, each have a large number of autapomorphies (see also Duretto 1999) suggesting a long period of isolation and/or a rapid accumulation of apomorphies.

Also present in the north-west Arnhem Plateau region are two widespread species, *B. lanceolata* and *B. lanuginosa*, each placed in a different series to the taxa discussed above (Table 1). Both species show considerable morphological variation over their ranges (Duretto 1997, 1999).

Neobyrnesia J.A. Armstr., a monotypic genus closely related to *Zieria* Sm. (a genus of eastern Australia and New Caledonia) and *Boronia*, is also restricted to the north-west Arnhem Plateau region. Interestingly this genus shares a number of characters with species of *Boronia* section *Valvatae*, particularly those of *B.* subseries *Grandisepalae*, in the region – the valvate and persistent petals and similar seed morphology (Paul G. Wilson pers. comm.; Stace and Leach 1994; Duretto and Ladiges 1997); the longitudinal rows on the seed testa are each made of a single line of tubercles (Armstrong and Powell 1980) as in *B.* subseries *Grandisepalae* and in contrast to *Zieria* (Duretto and Ladiges 1997). These characters may indicate a closer relationship than the current classification suggests or parallel adaptations to similar niches in the dissected sandstone landscape. *Neobyrnesia suberosa* J.A. Armstr. is a cliff specialist, as are *B. suberosa* (which superficially resembles *N. suberosa* as both are shrubs with corky stems and simple, opposite leaves), *B. viridiflora*, *B. rupicola* and species in other families found in the area (see discussion under species in Duretto (1999)). Cliff faces are a specialist niche exploited in a variety of ways by divergent taxa in the north-west Arnhem Land Plateau region.

Woinarski *et al.* (2006) reviewed the literature and discussed several possible mechanisms behind the high level of endemism found in the north-west region of the Arnhem Land Plateau. Within *Boronia*, the diversity seen in the region may be the combination of recent species radiation in conjunction with long-term isolation or refugia. A recent species radiation, where a large number of closely related species are found in close proximity, may be what is seen in *B.* subseries *Grandisepalae*. The endemic series (and *Neobyrnesia*) probably also represent autochthonous taxa that have been in the region and/or isolated for a longer time. In effect, for these taxa, the region has acted as a refugium. In addition, the region is also home to widespread species that may be relatively recent additions to the local flora.

When the species of *Boronia* found in the north-west portion of the Arnhem Land Plateau are highlighted on the cladogram of *B.* section *Valvatae* presented by Duretto and Ladiges (1999: Figs 9 and 10) at least five distinct lineages are identified: *B. lanceolata*, *B. lanuginosa*, *B. rupicola*, *B.* series *Quadrilatae*, *B.* subseries *Grandisepalae* (see above). Only two of these lineages are represented by more than one species. The area is not only the most diverse area of the Northern Territory (and north-western Australia) in terms of the number of species of *Boronia*, but it is also the most diverse in terms of the number of infrageneric taxa present.

Thus the north-west portion of the Arnhem Land Plateau (i.e. the catchment area of the East Alligator River) is an area of extremely high conservation value.

TAXONOMY

Boronia filicifolia A.Cunn. ex Benth., *Fl. Austral.* 1: 311 (1863)

Type: Australia, Western Australia, Montague and York Sounds, N.W. Australia, 1820, *A. Cunningham* 220, third voyage of the "Mermaid" (lectotype, *fide* Duretto *Nuytsia* 11: 332 (1997); K n.v. (photograph AD, cibachrome MEL); isolectotype: BM n.v. (transparency MEL, photograph PERTH).

Synonymy.

Boronia gravicocca Duretto (2003): 123, *syn. nov.*

Illustrations. Wheeler *et al.*, (1992) *Fl. Kimberley Region* 669, Figs 206 A1 and A2; Duretto (2003) *Muelleria* 17: 102, figs 12 K–M, as *B. gravicocca*; Duretto (2005) *Australian Plants* 23 (183): 90 (2005).

Remarks. For a full description on this species see Duretto (1997, 1999, 2003).

Distribution and ecology. *Boronia filicifolia* occurs in the Mitchell River and Port Warrender areas (north-west Kimberley region, Western Australia) and disjunctly at Bradshaw Station (Victoria River area, Northern Territory). It is found in heath and open woodland on sandstones and quartzites. Flowering December–June; fruiting (December, Feb.) June–July.

Boronia laxa Duretto, *Austral. Syst. Bot.* 10: 279 (1997)

Type. Australia, Northern Territory, Site FF, c. 30 km SE of Jabiru, 12°55'S 132°59'E, 30 March 1981, *L.A. Craven* 6600 (holotype: CANB 338123 (photograph HO); isotypes: AD, DNA 20968 (transparency MEL), MEL 2041245, P, US).

Synonymy.

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

Boronia aff. *prolixa* 1 (Red Lily Lagoon, Arnhem Land), Duretto and Ladiges (1997): 285.

Illustration. Duretto and Ladiges (1997), *Austral. Syst. Bot.* 10: 280, fig. 20 a–b.

Remarks. For full descriptions as well as ecological and distributional data on this species see Duretto and Ladiges (1997) and Duretto (1999).

Boronia zeteticorum Duretto, *sp. nov.*

(Fig. 1)

A B. laxa Duretto *foliis angustioribus* (1.5–3.5, non 2.5–10 mm latis) *indumento abaxiali denso, adaxiali moderate denso differt.*

Differs from *B. laxa* by its narrower leaves (1.5–3.5 mm wide, not 2.5–10 mm wide) with a dense indumentum on

the abaxial surface and a moderately dense indumentum on the adaxial surface.

Type. Australia, Northern Territory, Nabarlek, Arnhem Land, 12°19'S 133°19'E, 23 March 1989, *R. Hinz* 467 (holotype: DNA 43905 (transparency MEL); isotype: CANB).

Synonymy.

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

Illustration. Duretto and Ladiges, *Austral. Syst. Bot.* 10: 270, fig. 16i–j (leaf hairs); 276, fig. 19i (seed surface) (1997), all as *B. sp. aff. laxa* 2.

Specimen examined. Known from the type material only.

Description. Semi-prostrate, much branched subshrub to 50 cm long; multi-angular stellate hairs sessile, 6–25+ rays per hair; rays unicellular, unfused, firm, straight, glossy, smooth, yellow-white, 0.1–0.2 mm long. Branches not obviously glandular, with little cork development, with a moderately dense stellate indumentum. Leaves simple; petiole 0.5–1.5 mm long; lamina 10–35 mm long, 1.5–3.5 mm wide, narrowly elliptic, tip acute, base attenuate, margins flat, slightly discolorous, paler beneath, not obviously to slightly glandular, midrib raised abaxially, slightly impressed adaxially; adaxial surface with moderately dense stellate indumentum (Duretto and Ladiges 1997: Fig 16i); abaxial surface with dense stellate indumentum (Duretto and Ladiges 1997: Fig 16j). Inflorescence axillary, 1-flowered, with a dense stellate indumentum; peduncle 0.5 mm long; prophylls to 2 mm long and 0.5 mm wide; metaxyphylls minute to 1 mm long; pedicels c. 1.5 mm long. Sepals white, longer and wider than petals, 3.5–4 mm long, c. 2 mm wide, enlarging to 6 mm long and 3.5 mm wide with fruit, ovate to deltate, tip acute to acuminate, valvate in bud, persistent with mature fruit; adaxial surface with dense and minute indumentum along margins, becoming glabrous towards centre and base; abaxial surface with moderately dense stellate indumentum. Petals white, 3–3.5 mm long, 1–1.5 mm wide, enlarging to 4.5–5 mm long in fruit, valvate in bud, persistent with mature fruit; adaxial surface with sparse stellate indumentum becoming glabrous towards base; abaxial surface with moderately dense to dense stellate indumentum. Stamens: filaments bearing stiff, simple hairs abaxially and on margins below glandular tip; antesealous filaments clavate and suddenly narrowing to anther connective, 1.5 mm long, distal 0.75 mm prominently glandular; antepetalous filaments slightly glandular, c. 1 mm long; antepetalous anthers much larger than antesealous anthers. Ovary glabrous; style glabrous. Cocci with moderately dense simple and stellate indumentum, c. 4 mm long, c. 2 mm wide. Seeds black, shining, c. 3 mm long, 1.5 mm wide, elliptical with adaxial side flattened and with prominent ridge; testa striated, at magnification tuberculate to colliculate with units fused to form longitudinal ridges 33–50 µm apart; ridge units

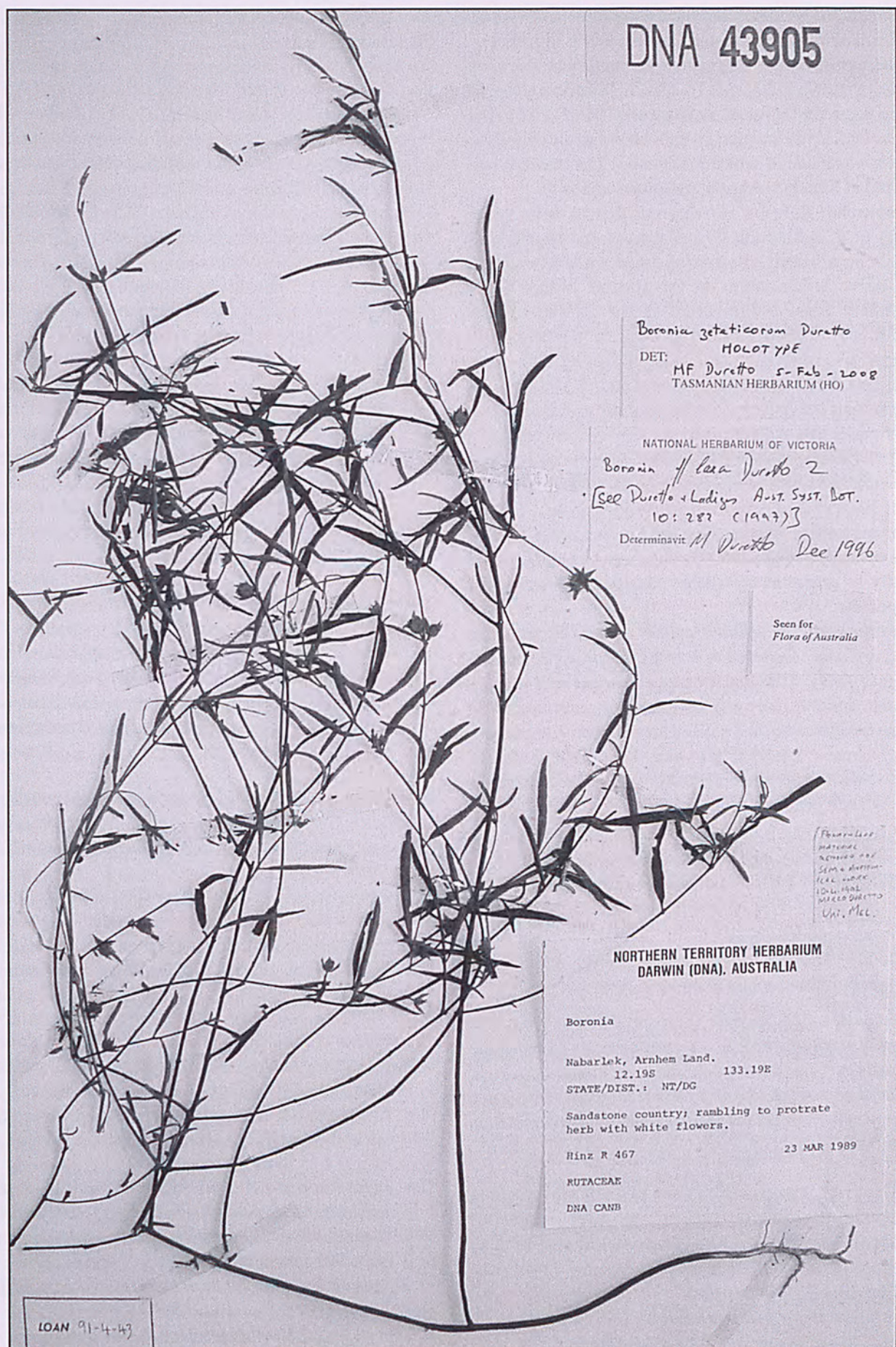


Fig. 1. Holotype of *Boronia zeteticorum* sp. nov. (Hinz 467, DNA 43905). Illustration 55% actual size.

unicellular, smooth, anticlinal walls more or less visible, 30–43 µm across (Duretto and Ladiges 1997: Fig 19i).

Distribution and ecology. *Boronia zeteticorum* is known only from the Nabarlek area (Northern Territory) (Duretto and Ladiges 1997: Fig. 2; or Duretto 1999: Fig 16). The only ecological information given with the single collection is that it was made in sandstone country. The material was collected in March and has both flowers and fruit.

Remarks. *Boronia zeteticorum* differs from other species in *B.* subsection *Grandisepalae* by the surfaces of the leaves having contrasting indumentum densities, i.e. a dense indumentum on the abaxial surface but a moderately dense indumentum on the adaxial surface (Duretto and Ladiges 1997: Fig. 16i,j). It is placed in *B.* subseries *Grandisepalae* and is semiprostrate with weak stems, as are *B. amplexens*, *B. laxa* and *B. prolixa* with which it is probably forms a monophyletic group. It differs from *B. laxa* and *B. prolixa* by its very narrow leaves: a character it shares with *B. amplexens*. *Boronia amplexens* has stellate hairs with rays appressed to the surface while the stellate hairs of *B. zeteticorum* are multi-angular.

Conservation Status. The species is known from a single collection made in 1989. Field surveys are required urgently to ascertain the correct conservation status for this species.

Etymology. The specific epithet is derived from the Greek, *zetetikos* (disposed to search), as coined by Craven and Jones (1991: 529), and ‘honours those persons who for their enjoyment explore natural vegetation communities to become familiar with, and collect, their constituent species’. The systematic study of *Boronia*, like many genera of plants, would not be where it is today without the collections made by such people in remote places.

KEY TO SPECIES AND SUBSPECIES OF *BORONIA* FOUND IN THE NORTHERN TERRITORY

For descriptions, ecology and distributional data see Duretto (1999); for *B. filicifoliae* see also Duretto (2003) to include information given under *B. gravicocca*.

- 1a. Sepals much shorter than petals (< ½ length); antepetalous anthers c. equal to antesepalous anthers 2
- 1b. Sepals nearly as long (> ½) to much longer than petals; antepetalous anthers much larger than antesepalous anthers 3
- 2a. Leaves simple, midrib on the abaxial surface prominently raised; erect or very rarely pendulous shrubs; petals 2–7 mm long; staminal filaments glabrous or with 1–3 hairs *B. lanceolata*
- 2b. Leaves 1–7-foliate, midrib of abaxial surface not prominently raised; pendulous shrubs growing on cliff faces; petals 2–3 mm long; staminal filaments hirsute *B. rupicola*
- 3a. Leaves pinnate 4
- 3b. Leaves simple 9
- 4a. Sepals shorter and narrower than petals, 2–3.5 mm long; at least some leaves 27–41-foliate, with a sparse to moderately dense indumentum (epidermis clearly visible); lateral leaflets c. rhombic to circular to broadly elliptic; petiole to 2 mm long *B. filicifolia*
- 4b. Sepals longer and wider than petals, 3–15 mm long; leaves 3–27(–35)-foliate (if > 30 leaflets then some petioles > 3 mm long), glabrous to densely stellate tomentose; lateral leaflets linear to narrow-elliptic, rarely elliptic; petiole to 7 mm long 5
- 5a. Leaves petiolate, though petiole sometimes as small as c. 0.5 mm long; leaflets linear-elliptic to elliptic, the margins plane or recurved to revolute; lamina glabrescent or with a sparse to dense, stellate indumentum 6
- 5b. Leaves sessile; leaflets linear-elliptic, plane or slightly recurved along margins; lamina glabrescent or with a sparse, stellate indumentum 7
- 6a. Leaflets linear to narrowly elliptic, so revolute that abaxial surface not usually visible; sepals (4–)5–14 mm long, glabrous or with a sparse to dense indumentum (Top End) *B. lanuginosa*
- 6b. Leaflets elliptic to lanceolate, abaxial surface visible; sepals 5–9 mm long, with a dense indumentum (Victoria River area) *B. wilsonii*
- 7a. Branches obviously glandular; leaves 3-foliate *B. jucunda*
- 7b. Branches eglandular; leaves (3–)5–9-foliate 8
- 8a. Plants decumbent, with a sparse to moderately dense, simple indumentum, stellate hairs rare; leaflet-margins slightly recurved *B. decumbens*
- 8b. Plants erect, with a sparse stellate indumentum; leaflets plane *B. tolerans*
- 9a. Plants, other than flowers, glabrous, glaucous (especially leaves); stems distinctly quadrangular, at least on young shoots 10
- 9b. Plants sparsely to densely hirsute, not glaucous; stems terete to slightly quadrangular 11
- 10a. Erect shrub growing on ridges; leaves sessile; sepals 6–13 mm long; petals 4–5 mm long *B. quadrilata*
- 10b. Horizontal shrub growing from cliff faces; leaves petiolate; sepals and petals 2.5–3 mm long *B. viridiflora*

- 11a. Stellate hairs prominently stalked, rays 0.5–1 mm long; cocci glabrous 12
- 11b. Stellate hairs without prominent stalks, rays to 0.5 mm long; cocci hirsute 13
- 12a. Hairs white and flexuous, new shoots pinkish to white; leaves narrowly elliptic; adaxial surface of petal glabrous or hirsute *B. verecunda*
- 12b. Hairs yellow and straight, new shoots yellow; leaves elliptic; adaxial surface of petal hirsute *B. xanthastrum*
- 13a. Older stems with massively developed cork; indumentum of leaves usually difficult to see with the unaided eye, rays of hairs to 0.1–0.3 mm long... *B. suberosa*
- 13b. Older stems not corky; indumentum of leaves clearly visible to the unaided eye, rays of hairs 0.1–0.5 mm long 14
- 14a. Plants erect (rarely sprawling but then with a hoary, dense indumentum), with a moderately dense to dense indumentum; sepals greater than 7 mm long at anthesis (rarely less than 7 mm long but then plant with a hoary, dense indumentum) 15
- 14b. Plants sprawling, sparsely to moderately hirsute (rarely densely hirsute on the abaxial leaf-surface only); sepals less than 8 mm long at anthesis, sometimes enlarging to 11 mm long as fruit matures 16
- 15a. Leaves with a very dense indumentum, epidermis not visible *B. grandisepala* subsp. *grandisepala*
- 15b. Leaves with a moderately dense indumentum, leaf epidermis visible *B. grandisepala* subsp. *acanthopsida*
- 16a. Leaves narrow-elliptic, 1–4 mm wide 17
- 16b. Leaves elliptic, lanceolate, ovate, > 5 mm wide... 18
- 17a. Leaves: indumentum of both abaxial and adaxial surfaces similar, sparse; rays of hairs appressed *B. amplexens*
- 17b. Leaves: indumentum of abaxial and adaxial surfaces markedly different; that of the abaxial surface dense; that of the adaxial surface moderately dense; hairs multi-angular, rays not appressed *B. zeteticorum*
- 18a. At anthesis flowers stalks (peduncle and pedicel) 2–7 mm long, not bent at prophylls (bracts); leaves elliptic to lanceolate *B. laxa*
- 18b. At anthesis at least some flowers stalks (peduncle and pedicel) > 10 mm long, often bent at prophylls (bracts); leaves ovate to lanceolate *B. proluxa*

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