

Boronia hapalophylla (Rutaceae), a new and restricted species from north-eastern New South Wales

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Abstract

Duretto, Marco F.¹, John Edwards and Patricia Edwards² (¹Tasmanian Herbarium, Tasmanian Museum and Art Gallery, Private Bag 4, Hobart, Tasmania 7001. Email: marco.duretto@tmag.tas.gov.au; ²PO Box 179, South Grafton, New South Wales 2460) 2004. *Boronia hapalophylla* (Rutaceae), a new and restricted species from north-eastern New South Wales. *Telopea* 10(3): 705–710. ***Boronia hapalophylla*** Duretto, F.J. Edwards & P.G. Edwards, a narrow endemic of the Grafton area, north-eastern New South Wales, is newly described and illustrated, and notes on its relationships are given.

Introduction

Fieldwork in the Grafton area by two of the authors (J. & P. Edwards) located an undescribed species of *Boronia* series *Valvatae* that is newly described and named below as *B. hapalophylla* Duretto, F.J. Edwards & P.G. Edwards. This species is one of a number of undescribed taxa, eg. in *Grevillea* (Proteaceae) and *Bertya* (Euphorbiaceae), that have been identified from the area. The opportunity is taken here to publish a formal description and a more detailed account of the species before the forthcoming *Flora of Australia* treatment of the genus. A cladistic analysis of *B.* section *Valvatae* was completed to help ascertain the relationships of the species within *B.* series *Valvatae*.

Materials and Methods

Field surveys were conducted by J. and P. Edwards in 2002 and 2003 and herbarium material was collected in 2003.

To determine the phylogenetic position of *B. hapalophylla*, it was scored for the data set of *B.* section *Valvatae sensu lato* that was analysed by Duretto and Ladiges (1999) with the additions of Duretto (2003). All taxa and characters of these analyses were used following the methods as outlined for the third analysis of Duretto and Ladiges (1999). The data set was analyzed using PAUP 4.03ba (Swofford 1998) and *B.* section *Alatae*, *B.* section *Algidae* and *B.* subsection *Ternatae* were used as outgroups. As it is difficult in some species of *Boronia*, including this one, to determine if the leaves are petiolate or sessile a number of analyses were completed: leaves were scored as being both sessile and petiolate, just sessile or just petiolate (Character 12).

Taxonomy

Boronia hapalophylla Duretto, F.J. Edwards & P.G. Edwards, *sp. nov.*

A *Boronia rosmarinifolia* Endl. et *B. ledifolia* (Vent.) DC. sepalis maioribus (5–10 mm longis, 3–7 mm latis; cf. 2–4.5 mm longis, 1.5–3.5 mm latis) et foliis indumento stellato sparso vel denso superficiali (cf. glabris vel indumento sparso) differt.

Type: Near Grafton [precise information withheld], 16 Sep 2003, *F.J. Edwards A* (holo HO 523452; iso BRI, NSW).

Erect, much branched shrub to 3 m tall, very open and spindly, often supported by other species when tall. Multiangular stellate hairs sessile, with up to 15 rays; rays to 0.5 mm long, unicellular, free, firm, straight, glossy, smooth, white to yellow. Branches terete to slightly quadrangular in cross section, decurrent leaf bases lacking, not obviously glandular, with no massive cork development, with a moderately dense stellate indumentum, becoming glabrous with age, regrowing from a rootstock after disturbance. Leaves simple, opposite, rarely sub-opposite or in whorls of three, not conspicuously glandular, sessile to subsessile, leaf base so strongly attenuate as to appear petiolate, apparent petiole to 1.5 mm long; lamina narrow-elliptic to elliptic to lanceolate, (13–)18–50(–70) mm long, (1–)3.5–12 mm wide, strongly discolourous, paler beneath, dorsiventral, with palisade mesophyll above and spongy mesophyll below; tip acute; base strongly attenuate; margins entire, slightly recurved to revolute; midrib prominently raised abaxially, with tightly packed parenchyma with secondary thickening between midvein and abaxial epidermis, impressed adaxially; adaxial surface with a sparse to moderately dense, stellate indumentum; abaxial surface with a dense, heterogenous indumentum of two hair types: a moderately dense layer of multiangular stellate hairs over a dense layer of peltate stellate hairs. Inflorescence axillary, 1–5-flowered, with a dense stellate indumentum; peduncle absent, or sometimes 2–5 mm long in inflorescences with 3–5 flowers; prophylls minutely unifoliate, often leaf-like, 1.5–7(–20) mm long, with a dense stellate indumentum, or indumentum as leaves; anthopodia [pedicels] 2–6.5 mm long. Sepals broadly ovate-deltate, shorter and narrower than petals, acuminate, valvate in bud, 5–7 mm long, 3–4.5 mm wide, enlarging to 10 mm long and 7 mm wide with mature fruit, persistent; adaxial surface densely and minutely pubescent, becoming glabrous towards base; abaxial surface with a dense stellate indumentum. Petals pink, valvate in bud, (6–)8–10 mm long, enlarging to 15 mm long with mature fruit, with midvein raised abaxially, persistent; adaxial surface sparsely pilose, becoming glabrous towards base; abaxial surface with a dense stellate indumentum. Stamens all fertile, filaments bearing stiff, simple hairs abaxially and on margins below glandular tip; sepaline filaments clavate, tapering to anther connective, 2–2.5 mm long, the distal 0.5–1 mm prominently glandular; petaline filaments, c. 1.5 mm long, the distal end glandular; anthers monomorphic, glabrous; anther appendage erect or reflexed. Disc entire, glabrous, rarely with slight swelling opposite sepaline stamens. Ovary glabrous or rarely with few stellate hairs at apex; style glabrous or rarely with scattered stellate hairs at base; stigma slightly wider than style. Cocci c. 7 mm long, c. 3.5 mm wide, glabrous or hirsute. Seeds black, shiny, 5–6 mm long, 2.5–3 mm wide; surface at magnification tuberculate; tubercles free. (Fig. 1).

Specimens examined [precise information withheld]: Near Grafton, 16 Sep 2003, *F.J. Edwards B* (HO, NSW); *ibid*, 16 Aug 2003, *P.G. & F.J. Edwards 1*, 4–7 (HO); *ibid*, 16 Aug 2003, *P.G. & F.J. Edwards 2*, 3 (HO, NSW); *ibid*, Aug 2003, *F.J. & P.G. Edwards 1–4* (HO).

Distribution and ecology: *Boronia hapalophylla* is restricted to a single sandstone rise near Grafton, north-eastern New South Wales. Populations are usually found in open Eucalypt woodland generally with an open understorey though the species is sometimes found in thick gully vegetation dominated by *Leptospermum* and *Banksia*. The species appears to flower throughout the year with a main flowering and fruiting period in Spring.

Conservation status: *Boronia hapalophylla* occurs in scattered numbers in a very limited area of approximately five by three kilometers. Some areas do have dense populations, eg. one with 200 plants in a 300 m × 20 m area has been recorded. It is found sparingly in one Nature Reserve. Supporting infrastructure (roads etc) for a proposed dam in the



Fig. 1. Holotype of *Boronia hapalophylla*: herbarium specimen $\times 0.4$; flowers $\times 2$ (F.J. Edwards A, HO 523452).

area threatens a significant number of the known populations. *Boronia hapalophylla* appears to be isolated, taxonomically, in *B.* series *Valvatae*, and does have any close relatives in New South Wales (see 'Relationships' below): increasing its conservation significance for the state. A conservation code (following Briggs and Leigh 1996) of 2E seems appropriate.

Boronia hapalophylla is found with other rare and restricted species such as *Eucalyptus tetrapleura* L.A.S.Johnson, *Angophora robur* L.A.S.Johnson & K.D.Hill, the endangered *Melichrus hirsutus* J.B.Williams MS, and the undescribed taxa in *Grevillea* and *Bertya* as mentioned above. It is also found with the *Corymbia trachyphloia* (F.Muell.) K.D.Hill & L.A.S.Johnson subsp. *trachyphloia* / *Eucalyptus psammitica* L.A.S.Johnson & K.D.Hill (Brown Bloodwood/Sandstone Mahogany) community which has been recently declared as an Endangered Ecological Community.

Derivation of name: The epithet is derived from the Greek, *hapalo* (soft to touch), and *phyllus* (leaf), and refers to the stellate indumentum on the adaxial surface of the leaves that can make them soft in appearance and to the touch unlike the other species of *Boronia* in the area.

Notes: *Boronia hapalophylla* differs from the closely related species *B. rosmarinifolia*, *B. ledifolia* and *B. chartacea* P.H.Weston by the large sepals (5–10 mm long, 3–7 mm wide; cf. 2–4.5 mm long, 1–3.5 mm wide) and the sparse to dense indumentum on the adaxial surface of the leaves (cf. glabrous, *B. rosmarinifolia* and *B. chartacea*, or with a sparse indumentum, *B. ledifolia*).

The density of the indumentum on the adaxial surface of the leaves is variable with plants to the south generally having a denser indumentum. Plants from the more southern populations may also have a stellate indumentum on the ovary tip and/or style, and hirsute fruit whereas these organs are usually glabrous.

Relationships: The species, with two different types of stellate hairs on the abaxial surface of the leaves, axillary inflorescences, sepals and petals that are both valvate in bud and persistent with mature fruit, and petals with a prominently raised midrib, clearly belongs in *B.* series *Valvatae* (as defined by Duretto 1999). This is a large series that in previous cladistic analyses (Duretto & Ladiges 1999; Duretto 1999, 2003) has proven to be very sensitive to character and taxon deletions and additions. Indeed, the internal structure of the clade is supported mainly by homoplasious characters and/or reversals. *Boronia hapalophylla* is similar to the *B. rosmarinifolia* species-group (Qld, NSW) in that it usually has sessile, simple leaves. Some specimens of *B. hapalophylla*, though, do have subsessile leaves and the leaves are very attenuate and so can appear petiolate, as found in the *B. foetida* Duretto species-group (Qld), but not to the same degree. With this latter group *B. hapalophylla* shares the acuminate sepals. It differs from both the *B. rosmarinifolia* and *B. foetida* species-groups, and from *B. chartacea* (north-eastern NSW), by having an indumentum on the adaxial surface of the leaves as do some members of the *B. lanceolata* F.Muell. species-group (NT, Qld) and *B. ledifolia* (NSW, Vic.). It differs from the other species-group found in series *Valvatae* (viz. the *B. alulata* Benth. species-group) in having broadly ovate-deltate sepals and simple leaves.

The cladistic analysis, where *B. hapalophylla* was scored as having both sessile and petiolate leaves, produced 55 most parsimonious trees, each of 205 steps. The strict consensus tree (not shown) is exactly like the strict consensus tree as shown by Duretto (2003: p. 117) except for the addition of *B. hapalophylla*. This species was placed in *B.* series *Valvatae* in the *B. foetida* species-group where it formed a trichotomy with *B. jensziae* Duretto and another trichotomy containing *B. bella* Duretto, *B. excelsa* Duretto and *B. foetida*. The *B. foetida* species-group, with *B. hapalophylla*, is part of a trichotomy with *B. chartacea* and the *B. rosmarinifolia* species-group. This clade of simple-leaved

species is sister to a clade containing all the pinnate-leaved taxa in *B.* series *Valvatae* and *B. lanceolata* (viz. *B. ledifolia*, *B. lanceolata* species-group, *B. alulata* species-group). When the leaves of *B. hapalophylla* were scored as being petiolate the results did not change except, of course, for the length of the trees. When the leaves were scored as being sessile then 2161 most parsimonious trees were found, each of 206 steps. In the strict consensus tree of this analysis the clade containing the simple-leaved species identified above collapsed and formed a polytomy with *B. ledifolia* and another polytomy of the *B. lanceolata* species-group and a resolved clade of the *B. alulata* species-group. The 50% majority-rule consensus tree of this analysis was identical to the strict consensus trees of previous analyses.

The analyses confirm the placement of *B. hapalophylla* in *B.* series *Valvatae* and indicate it is part of the simple-leaved clade that contains *B. chartacea* and the *B. rosmarinifolia* and *B. foetida* species-groups. It appears to be more closely related to the *B. foetida* species-group than to the *B. rosmarinifolia* species-group or *B. chartacea*. The geographically closest member of the *B. foetida* species-group, *B. foetida*, is found nearly 500 km to the north. Interestingly, *B. rosmarinifolia* and *B. chartacea* are each found only a few tens of kilometers away.

Boronia series *Valvatae* was redefined and revised in 1999 (Duretto 1999) and since then two additional species have been described, *B. beeronensis* Duretto (Duretto 2003) and *B. hapalophylla* here. In *Boronia* section *Valvatae* the series is notable for its size (24 species, of c. 65 in the section, and c. 150 in the genus), the poor support of the internal structure within the series, and the associated lack of a formal internal classification. *Boronia beeronensis* was easily classified into one of the informal species-groups but offered little additional information regarding the classification of the series. *Boronia hapalophylla*, on the other hand, is not easy to classify in the series and if anything offers poorer elucidation of relationships. Like *B. beeronensis* though, it is a large flowered species restricted to a small, though hardly isolated, area of south-eastern Australia highlighting again that much needed basic field survey work and research are still required to accurately document Australia's biodiversity.

Keys

Previously published keys for *Boronia* section *Valvatae* (Duretto 1999) and for *Boronia* in New South Wales (Weston & Duretto 2002) can be amended to accommodate *B. hapalophylla* by inserting the following.

For Duretto (1999, p. 12):

Note: additions have already been made to this area of the key by Duretto (2003).

60. Leaf with glandular punctate margin; sepals narrowly ovate-deltate, at least twice as long as wide; rays of stellate hairs usually dull and flexuous 17. **B. repanda**
60. Leaf with smooth margin; sepals ovate-deltate, less than twice as long as wide; rays of stellate hairs shiny and usually more or less straight
- 61A. Adaxial surface of leaves with a sparse to dense indumentum
- 61AA. Sepals acute, 2.5–3 mm long; petals 4–7(–10 with fruit) mm long (western slopes of NSW) 38. **B. glabra**
- 61AA. Sepals acuminate, 5–10 mm long; petals (6–)8–10(–15 with fruit) mm long (NE NSW) **B. hapalophylla**
- 61A. Adaxial surface of leaves glabrous or glabrescent
61. Leaves usually glabrescent, slightly discoloured; fruit hirsute (inland Qld, western slopes of NSW) 38. **B. glabra**
61. Leaves strongly discoloured, adaxial surface of leaves glabrous and shiny, abaxial surface with a dense, stellate indumentum; fruits glabrous or densely hirsute.....

For Duretto (1999, p. 13):

70. Adaxial surface of petals with a sparse to moderately dense indumentum of simple hairs
73. Adaxial surface of leaves glabrous or with few hairs along midrib; petals 5.5–7(–8.5 with fruit) mm long; leaf base strongly attenuate (Hinchinbrook Is. of N Qld) **39. B. jensziae**
73. Adaxial surface of leaves with a sparse to dense stellate indumentum; petals (4–)6–12(–15 with fruit) mm long; leaf base strongly attenuate or obtuse (central Qld, NSW, Vic.)
- 73A. Sepals acuminate, 5–10 mm long, 3–4.5(–7 with fruit) mm wide; leaf base strongly attenuate (north coast of NSW) **B. hapalophylla**
- 73A. Sepals acute, sometimes acuminate, 2–4.5 mm long, 1.5–2.5(–3.5 with fruit) mm wide; leaf base usually obtuse (central Qld, NSW, Vic.)
74. Leaf-lamina elliptic, plane or margin slightly recurved (becoming revolute on drying); peduncle less than 2 mm long; anthopodium 1–5 mm long; petals 5–7 mm long (central inland Qld) **32. B. odorata**
74. Leaf-lamina narrowly elliptic to elliptic, plane or margin recurved to revolute; peduncle (1–)2–10 mm long; anthopodium 7–11 mm long; petals (5–)8.5–12 mm long (central coastal ?Qld, NSW, Vic.) **21. B. ledifolia**

For Weston and Duretto (2002, p. 266; GROUP 1):

- 1* All leaves simple or 1-foliolate
- 11A Sepals broadly ovate-deltate, acuminate, 5–10 mm long, 3–7 mm wide; upper surface of leaves with a sparse to dense indumentum of large stellate hairs **B. hapalophylla**
- 11A* Sepals ovate-deltate or narrowly deltate, acute, 2–5 mm long, 1–3 mm wide; upper surface of leaves glabrous, glabrescent or with a sparse indumentum, or rarely with a dense indumentum of minute stellate hairs
- 11 Leaves sessile.....

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