

Hebe paludosa (Scrophulariaceae)—a new combination for an endemic wetland *Hebe* from Westland, South Island, New Zealand

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Abstract A new combination, *Hebe paludosa*, is made for plants first described as *Veronica salicifolia* var. *paludosa* and later treated as *Hebe salicifolia* var. *paludosa*. *H. paludosa* is typically a plant of lowland mesotrophic wetlands and is most abundant in south Westland around and immediately north of the glaciers district. *H. paludosa* is readily distinguished from *H. salicifolia* through its cytology, distinctive diffusely branching habit, brittle branchlets, yellow-green faintly glaucous-tinged leaves, conspicuous decurved and twisted acumen, flowers which have a longer corolla tube, acute corolla lobes which usually project forward, and preference for mesotrophic wetland habitats.

Keywords Scrophulariaceae; *Hebe*; *Hebe paludosa*; *Veronica salicifolia* var. *paludosa*; *Hebe salicifolia* var. *paludosa*; new combination; Westland; New Zealand flora

INTRODUCTION

In his review of *Veronica salicifolia* G.Forst., Cockayne (1916) proposed a new variety, var. *paludosa*, to encompass a distinctive wetland-inhabiting race of this widespread species. Cheeseman (1925) retained *paludosa* as a variety of *Veronica salicifolia*, commenting that it was “a very distinct variety”. This variety was later transferred to *Hebe* by Cockayne & Allan (1926) without further comment. Moore (in Allan 1961), in her treatment of *Hebe*, confined *H. salicifolia* (G.Forst.) Pennell to New Zealand’s South and Stewart Islands and the Chilean coast of South America. In the process she carried out the necessary typification of *H. salicifolia* var. *paludosa* (Cockayne) Cockayne et Allan, including this variety within her revised concept of *H. salicifolia* and noting that it “resembles *H. gracillima* (Kirk) Cockayne et Allan; it may be a hybrid between these two species”. Wardle (1975) described the distribution of *H. salicifolia* var. *paludosa* in Westland and noted that in north Westland it appeared to grade into *H. gracillima*. Heads (1993) considered *H. salicifolia* var. *paludosa* worthy of recognition as a distinct taxon and provided a map of its distribution.

During field work in south Westland, it became evident to us that *H. salicifolia* var. *paludosa* is clearly distinct from *H. salicifolia* s.s., both ecologically, in that it is primarily a plant of wetland habitats, as well as morphologically and cytologically. We have seen no evidence to suggest that it is a hybrid involving *H. gracillima*. In this paper the taxon known as *H. salicifolia* var. *paludosa* is treated at species level, and the necessary combination is made. An extended description of this Westland endemic is provided, and its habitat, ecology, and conservation status are reviewed.

TAXONOMY

Hebe Juss. Gen. Pl., 105 (1789)

TYPE SPECIES: *H. magellanica* J.F.Gmel. (*vide* Greuter et al. 1993).

Fig. 1 Lectotype of *Hebe paludosa*.



TYPE SPECIMEN HERB. T. F. CHEESMAN.
Hebe salicifolia var. *paludosa* (Ck.)
 Cn & Allan
 Swamp, Lake Ianthe, Wairarapa
 Cockayne no 8118

ex Herb. L. Wairarapa

Veronica salicifolia Forst. f.
 var. *paludosa* Cockayne
 (Type Specimen)
 Swamp, Lake Ianthe,
 Wairarapa.
 Cock! L.C. No. 8118



AK 7776 AUSTRALASIAN INSTITUTE OF BOTANY
 AUSTRALASIAN HERBARIUM

SCHOPHULARIACEAE 50.03
Hebe salicifolia (G. Forst.) Pennell

Hebe paludosa (Cockayne) D.A. Norton et de Lange,
 comb. et stat. nov.

≡ *Veronica salicifolia* var. *paludosa* Cockayne,
Trans. Proc. N. Z. Inst. 48: 202 (1916).

≡ *Hebe salicifolia* var. *paludosa* (Cockayne)
 Cockayne et Allan, *Trans. Proc. N. Z. Inst.* 57: 18
 (1926).

LECTOTYPE (Fig. 1): Swamp nr. Lake Ianthe, L.
 Cockayne 8118, AK 7776!

ISOLECTOTYPE: WELT 16439!

NOTES: Moore (in Allan 1961, p. 902) selected AK
 7776 as the type. Moore's selection of type consti-
 tutes lectotypification under Art. 7.10 and 8 of the
 ICBN (Greuter et al. 1994). AK 7776 was labelled
 in Cockayne's hand (A. Thomson pers. comm.) as
 "ex herb" and "type" (Fig. 1). At this stage of his
 life Cockayne was routinely sending specimens of
 his newly described taxa to Thomas Cheesman

(Thomson 1990), an action that may have been taken to ensure that the type specimen would be deposited in a recognised herbarium, AK, rather than in Cockayne's private herbarium which at the time was in his own home and not at WELT (E. Edgar pers. comm.). That Moore was of the same opinion is clear from her observation (in Allan 1961, p. 902) that further type material was in existence, i.e., that specimens of *Veronica salicifolia* var. *paludosa* "numbered L.C. 7165 in other herbaria" are "apparently the same gathering". The only specimen that we can find which fits this statement is WELT 16439, numbered by Cockayne "7165". Although we cannot be certain that Moore saw this specimen, her reference to it implies that she probably did and nevertheless remained of the opinion that it was not a suitable lectotype. The WELT specimen is of some significance because it was originally labelled by Cockayne as *Veronica gracillima* and then again with the name *Veronica salicifolia* var. *paludosa* and annotated "Type". However, despite Rec. 9A.3 of the ICBN (Greuter et al. 1994) which advises that in the selection of types any indication of intent by the author should be given preference, we find that neither this recommendation nor the fact that Cockayne labelled AK 7776 as "ex herb" (P. J. Brownsey, E. Edgar, and P. J. Garnock-Jones pers. comm.) is sufficient reason to overrule Moore's original typification. Accordingly, we uphold Moore's original typification and treat WELT 16439 as an isolectotype.

DESCRIPTION (Fig. 2): Erect, sparingly branched shrub up to 5 m tall. Mature stems light red to reddish brown; branchlets slender, brittle, greenish yellow tinged red (drying black), terete, pubescent; internodes 1–10× diameter. Leaf bud green often with a slight glaucous tinge, midrib pale green, sinus lanceolate. Leaves 55–70(–80) × 9–10(–19) mm, aggregated towards branch apices. Lamina membranous, narrow to broadly lanceolate, tapering, decurved, often forming a twisted acumen 4–15(–20) mm long; apex cream or yellow; acute; base broad-attenuate; adaxial surface dull yellow-green or dark green, usually faintly glaucous, ± glabrous, midrib yellow; abaxial surface dull pale green; lamina margin sparsely toothed in upper two thirds, rarely entire, pubescent. Inflorescence 55–70 mm long, lateral, racemose, usually decurved, distal flower buds often aborted and withered (often falling and leaving a truncated raceme); flowers loosely spiralled on rachis (some of these aborted), occasionally crowded towards apex of raceme, pedicellate. Peduncle and rachis uniformly yellow-green, con-

spicuously pubescent; peduncle 12–18 mm long; rachis 42–54 mm long. Bracts 2–3(–4) mm long, lanceolate, surface and margins ciliolate. Pedicels 3–4 mm long; erect, yellow-green, often spotted brown, with dense prominent, hyaline hairs. Flowers protandrous, hermaphrodite, faintly scented. Calyx lobes 2–3 mm long, overlapping at edges, dull green, narrowly lanceolate, involute, apices acute, base glandular hairy, otherwise glabrous, margin ± alternating glandular-eglandular ciliolate. Corolla pure white; tube 3–4(–5) mm long, narrow-cylindrical, inner surface densely covered in eglandular hairs; lobes 4–5(–6) mm long, projecting forwards, sometimes suberect, narrowly lanceolate, bases not overlapping, margins involute, ± minutely ciliolate at base, apices acute. Anthers c. 2 mm long, dark blue, turning orange at anthesis, pollen cream; filaments 5–6 mm long, white, base puberulent, curving outwards after dehiscence. Nectarial disc glabrous, light green. Style 5–6 mm long, white, glabrous; stigma globose. Ovary c. 1 × 0.6 mm, ovoid, light green. Capsule c. 5 × 3 mm, light brown, narrow-oblong to obovate, style often persistent, glabrous, septicial to base. Seeds c. 1 × 1 mm, pale yellow to amber, orbiculate, faintly papillate with a conspicuous marginal wing. Chromosome number $2n = 80$ (AK 231325; B. G. Murray pers. comm.). FL Jan–Mar, FR Mar–May.

DISTRIBUTION (Fig. 3): Endemic to Westland, extending from the Grey Valley in the north (CANU 37522) to Jackson Bay in the south (CHR 205930), most common between Lake Ianthe and the Cook River (cf. Wardle 1975).

REPRESENTATIVE SPECIMENS: SOUTH ISLAND: WESTLAND: Blackball Ck, *D. A. Norton & J. M. Stilwell*, 27 October 1996, CANU 37522; Otira Valley, *L. C[ockayne]*, Mar 1894, WELT 13534; Harihari, *W. R. B. Oliver*, 20 Jan 1950, WELT 9811; North of the Poerua River, *R. Mason & N. T. Moar*, 26 Feb 1958, CHR 107284; Mt Hercules Track, *E. K. Cameron 8717*, 13 Jan 1997, AK 231023; Lake Ianthe, *L. Cockayne*, no date, WELT 16440; Waitangiroto River, *P. Wardle*, 4 Dec 1970, CHR 208380; Okarito Lagoon, Deep Creek, *P. J. de Lange & D. A. Norton*, 21 Apr 1996, AK 228432; Lake Wahapo, *P. J. de Lange & D. A. Norton*, 20 Apr 1996, AK 228431; Lake Mapourika, *R. Mason & N. T. Moar*, 17 February 1958, CHR 107058; Waiho Beach, *P. Wardle*, 22 Oct 1973, CHR 218965; Gibb Ck, *P. Wardle & I. R. Fryer*, 1 Jul 1967, CHR 179014; Waihopi Creek, *P. Wardle & I. R. Fryer*, 27 Jun 1967, CHR 179013; Hapuka Lagoon, *D. A.*

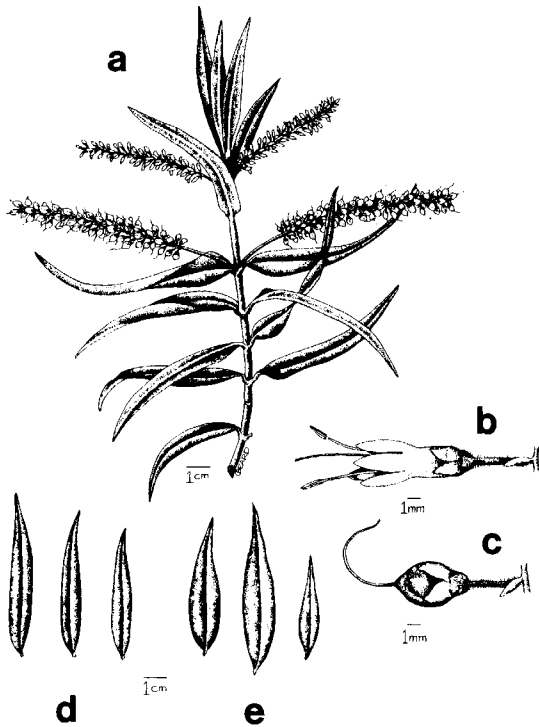


Fig. 2 *Hebe paludosa*. a, flowering and fruiting branch; b, flower; c, capsule; and a range of leaves from d, Mt Hercules and e, Lake Wahapo.

Norton, 15 Dec 1990, CANU 35236; Between Arawhata River & Jackson Bay, W. R. Sykes & L. B. Moore, 7 May 1970, CHR 205930.

HABITATS: *Hebe paludosa* is typically a species of lowland mesotrophic wetlands (Fig. 4), especially where they are transitional to open *Dacrycarpus dacrydioides* (A. Rich.) de Laub. forest (Wardle 1977), a vegetation type termed "shrub swamp" by Cockayne (1928). *Phormium tenax* J.R. Forst. et G. Forst. is often, but not always, dominant, and *Astelia grandis* Kirk, *Carex coriacea* Hamlin, *Carex secta* Boott, and *Blechnum novae-zelandiae* T.C. Chambers et P.A. Farrant are often prominent in the herb layer. Woody species present include *Cordyline australis* (G. Forst.) Endl., *Coprosma propinqua* A. Cunn., *Coprosma parviflora* var. *dumosa* Cheeseman (*sensu* Cheeseman 1925), *Carpodetus serratus* J.R. Forst. et G. Forst., *Coprosma foetidissima* J.R. Forst. et G. Forst., *Carmichaelia australis* R. Br., *Myrsine divaricata* A. Cunn., and *Pseudopanax crassifolius* (A. Cunn.) C. Koch, as well as *Hebe paludosa*. *Hebe paludosa* also occurs at the edges of lagoons, especially where there is a ready

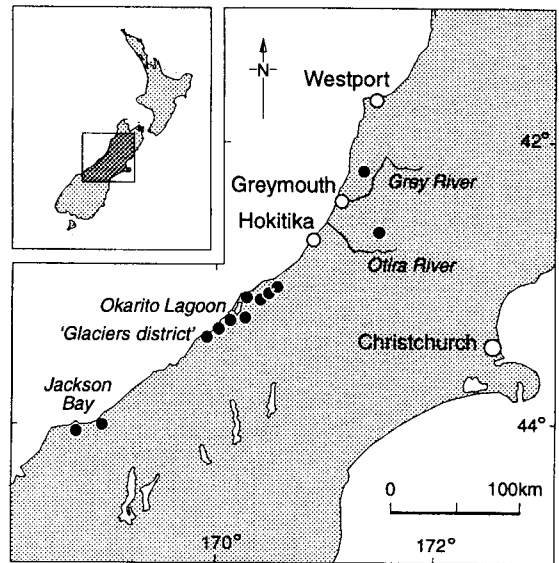


Fig. 3 Distribution of *Hebe paludosa*.

influx of freshwater, where it grows with *Leptocarpus similis* Edgar, *Phormium tenax*, and *Coprosma propinqua* in a very narrow zone between open water and the fringing *Dacrycarpus dacrydioides* trees. Within these habitats *H. paludosa* is occasionally sympatric with *H. salicifolia* (e.g., Lake Wahapo). In these situations both species remain ecologically separated, with *H. salicifolia* avoiding waterlogged ground, such that it often grows epiphytically on *Carex secta* stumps and tree trunks, whereas *H. paludosa* usually dominates the woody vegetation of permanently wet habitats.

ETYMOLOGY: The epithet *paludosa* was chosen by Cockayne (1916) to reflect the unusual wetland habitat of his new variety.

RELATIONSHIPS AND RECOGNITION: The presence of a leaf bud sinus and the lateral arrangement of the inflorescence place *Hebe paludosa* within the informal series "Apertae" of Moore (in Allan 1961). *Hebe paludosa* is perhaps most similar to *H. salicifolia* (Table 1), from which it may be distinguished by its cytology, preference for mesotrophic wetland habitats, distinctive diffusely branching habit, brittle branchlets, yellow-green faintly glaucous-tinged leaves, conspicuous decurved and twisted acumen, and the flowers, which have a longer corolla tube and acute corolla lobes which usually project forward.

Cockayne (1916, 1928) considered his var. *paludosa* to be most closely allied to another unnamed entity which he proposed to call "*H. salicifolia* var.

Fig. 4 Wetland habitat of *Hebe paludosa*, Mt Hercules Scenic Reserve.



egmontiana". This name was mentioned in several of Cockayne's publications (e.g., Cockayne 1928) but was never effectively published. However, L. B. Moore took up the name when she provided the combination *H. stricta* var. *egmontiana* L.B. Moore (Moore in Allan 1961). The close relationship between these taxa was appreciated by Cheeseman (1925) who considered Cockayne's proposed "var. *egmontiana*" conspecific with the entity here named *H. paludosa*. That *H. paludosa* might be allied with *H. stricta* var. *egmontiana* is a possibility for they both share the same chromosome number and have similar flowers and the same tapering, often twisted, lanceolate leaves (Table 1). However, there are significant vegetative and floral differences. In particular, *H. paludosa* has a diffuse branching habit, a leaf bud sinus, yellow-green, membranous, acuminate leaves, invariably aggregated toward the branchlet ends, flowers with a slightly longer and narrower corolla tube, and differently shaped corolla lobes (Table 1).

Moore (in Allan 1961) included *H. paludosa* within her revised concept of *H. salicifolia*, noting that it shared features with *H. gracillima* and was possibly a hybrid involving that species. Wardle (1975) observed that *H. paludosa* was distinct in south Westland but graded into *H. gracillima* further north. We consider it unlikely that *H. paludosa* is a hybrid on genetic grounds because it is too widespread; also, the main area of distribution occurs outside the accepted range of *H. gracillima* (Moore in Allan 1961; Heads 1993). Furthermore, we have found no herbarium or field evidence of intergrades

between either species, which are easily distinguished morphologically and ecologically (Table 1). Lastly, *H. paludosa* is fully fertile and seedlings come true to type.

CONSERVATION STATUS: Although wetland habitats have been severely impacted by agricultural activities in Westland (Awimbo et al. 1996), the majority of currently known populations of *Hebe paludosa* occur in protected areas, including scenic reserves and Westland Tai Poutini National Park. While it is likely that the number of sites containing *Hebe paludosa* would have been greater in the past as much suitable habitat for this species has been lost, the status of the majority of current populations appears secure. There are no apparent constraints to its continued existence at these sites and this taxon should not be regarded as a threatened species.

DISCUSSION

Hebe paludosa is one of a small group of taxa including *Chionochloa juncea* Zotov, *Euphrasia wettsteiniana* Du Rietz, *Lepidium naufragorum* Garn.-Jones et D.A. Norton, and *Podocarpus totara* var. *waihoensis* Wardle, known to be endemic to the west coast of South Island (excluding Fiordland and north-west Nelson endemics). The small number of endemics in this area, especially in south Westland, is usually attributed to extensive glaciation during the Otiran and preceding glacial periods with little unglaciated habitat available for the survival of local endemics at these times (e.g., Wardle 1963; Burrows

Table 1 Differences between *Hebe paludosa*, *H. gracillima*, *H. salicifolia*, and *H. stricta* var. *egmontiana*.

	<i>H. paludosa</i>	<i>H. gracillima</i>	<i>H. salicifolia</i>	<i>H. stricta</i> var. <i>egmontiana</i>
Habitat	<i>Phormium</i> / <i>Carex</i> dominated lowland (<350 m a.s.l.) wetlands	coastal, lowland to montane (<700 m a.s.l.) forest and wetlands. In disturbed sites, open forest, slip scars and rock outcrops	coastal, lowland to subalpine scrub (<900 m a.s.l.). In disturbed sites and within regenerating forest, usually on well drained sites	subalpine scrub and tussock grassland, at altitudes above 800 m a.s.l.)
Growth form	diffusely branched shrub up to 5 m tall. Branchlets, spreading and brittle usually with foliage aggregated toward branchlet tips	erect sparingly branched shrub up to 3 m tall. Branchlets, erect to suberect, rarely spreading, foliage evenly spaced along branchlets.	erect to compact densely branched shrub, reaching 6 m tall. Branchlets, erect, rarely spreading, foliage evenly spaced along branchlets	compact, densely branched, round-headed shrub up to 3 m tall. Branchlets stout, foliage sufficiently dense to obscure branching pattern
Stem colour	light red-brown	yellow-green	yellow-green or orange	dark red-brown
Stem pubescence	pubescent (10× magnification)	pubescent (10× magnification)	± glabrous	pubescent (10× magnification)
Leaf bud sinus	sinus present, small, lanceolate, hairy (10× magnification)	sinus present, small, oblong, hairy (10× magnification)	sinus usually present, large, ovoid, fringed with hairs, otherwise glabrous (10× magnification)	sinus absent
Leaf blade	broadly lanceolate to linear lanceolate, lamina distinctly decurved, often twisted, membranous (leaf wilting easily and tearing readily)	narrowly lanceolate, lamina erect to erecto-patent, subcoriaceous (firmly fleshy, leaf not tearing easily)	broadly lanceolate to elliptic, blade submembranous (sometimes rather fleshy, leaf tearing readily)	broadly lanceolate to linear lanceolate, distinctly twisted, subcoriaceous (firmly fleshy, leaf not tearing easily)
Leaf margin	sparsely toothed, rarely entire	entire, margins often distinctly thickened	variable, either distinctly denticulate or entire	± entire, occasionally sparsely toothed
Leaf tip	distinctly acuminate, acumen 4–13 mm long	acute to subacute, occasionally obtuse	acute to subacute	tapering, acute
Leaf colour	yellow-green, often with a distinct glaucous tinge, surface dull	yellow-green, surface glossy	variable, yellow-green, green to dark green, surface usually glossy	olive-green to dark green, surface ± glossy
Inflorescences	racemes decurved; flowers usually evenly spaced along rachis, occasionally crowded, often with many aborted flowers	racemes erect to suberect, occasionally pendulous, flowers crowded on rachis	racemes ± pendulous, occasionally suberect to erect, flowers densely crowded on rachis	racemes erect to suberect, flowers densely crowded on rachis
Calyx	2–3 × 1.5–2 mm, narrowly lanceolate, base ciliate otherwise glabrous	1.5–2 × 2 mm, obtuse to subacute, ciliate	2 × 2 mm long, lanceolate, acute, ciliate	1.5–2 × 1.5–2 mm long, obtuse, ciliate
Flower colour	pure white	pure white	white flushed lilac	pure white
Corolla tube	3–5 × 2 mm, narrowly cylindrical	1–2 × 2 mm, ± truncate	1–2 × 2 mm, cylindrical	2–3 × 2 mm, broadly cylindrical

Corolla lobes	4–6 mm, narrowly lanceolate, lobes projecting forwards, occasionally suberect	3–4 mm, acute, erect to suberect	2–4 mm, broadly lanceolate, erect to suberect	2 mm, obtuse, erect to suberect
Chromosome number	$2n = 80$	$2n = 80$ (Hair 1967)*	$2n = 40$ (Hair 1967)*	$2n = 80$ (Hair 1967)*

* Diploid chromosome numbers calculated from the haploid counts provided by Hair (1967).

1965). It is therefore interesting to note that of the endemic plants known from the South Island's west coast, some (e.g., *Chionochloa juncea*) occur on sites with unusual substrate conditions in areas not directly affected by glaciation, while others may be the result of more recent speciation. For example, *Podocarpus totara* var. *waihoensis* is thought to be a stable hybrid resulting from introgression between *Podocarpus totara* D. Don and *Podocarpus acutifolius* Kirk subsequent to the last period of glacial activity (Wardle 1972), and Garnock-Jones & Norton (1995) suggested that *Lepidium naufragorum* may be a result of local speciation and survival through glacial periods in milder coastal sites.

Hebe paludosa may also be an example of recent speciation, possibly derived from *Hebe salicifolia* through chromosome doubling (Hair 1967). Full glacial conditions in central and southern Westland (McGlone 1988) are unlikely to have provided much suitable habitat for a lowland species such as *H. paludosa*. The origin of *H. paludosa* could have been coincident with the expansion of lowland vegetation as temperatures warmed at the start of the present interglacial, as Wardle (1972) postulated for the origin of *Podocarpus totara* var. *waihoensis* (although this latter taxon is thought to have resulted from introgressive hybridisation). The limited distribution of *H. paludosa* in an environment where all other vascular plants have much wider ranges, also suggests a recent origin.

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