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Hebe bishopiana (Scrophulariaceae) – an endemic species of the Waitakere Ranges, west Auckland, New Zealand

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Abstract *Hebe bishopiana* (Petrie) Hatch, first described as the hybrid *Veronica ×bishopiana* by Petrie in 1926, was transferred by Hatch in 1966 to the genus *Hebe* as *H. ×bishopiana*. This paper supports the suggestion made by Hatch that this taxon may not be a hybrid; it is regarded here as a distinct and uncommon species endemic to the Waitakere Range west of Auckland City in the North Island, New Zealand. *Hebe bishopiana* is most similar to *H. obtusata* but is a larger shrub with widely branching stems, distinctive maroon-green foliage and stems, lanceolate-elliptic leaves, and longer racemes with only sparsely hairy calyces. The conservation status of *Hebe bishopiana* is discussed and the current IUCN ranking of "Vulnerable" supported.

Keywords *Veronica ×bishopiana*; *Hebe bishopiana*; *Hebe obtusata*; *Hebe stricta* var. *stricta*; Scrophulariaceae; Waitakere Ranges; New Zealand flora

INTRODUCTION

In a series of papers Oliver (1925), Cockayne & Allan (1926), and Cockayne (1929) adopted the genus *Hebe* for most of the woody shrubby taxa previously treated as *Veronica*. However, several taxa were not formally transferred, possibly because at that time they were poorly known or were considered hybrids (see Moore in Allan 1961; Heads 1987; Garnock-Jones 1993; Garnock-Jones & Clarkson 1994). One of these taxa was the presumed hybrid *Veronica ×bishopiana* of Petrie (1926) which was lectotypified by Moore (in Allan 1961).

Since its formal description by Petrie (1926), *Veronica ×bishopiana* has been treated either as a natural hybrid between *Hebe obtusata* (Cheesem.) Cockayne et Allan and *H. stricta* (Benth.) L.B. Moore var. *stricta* * (Petrie 1926; Moore in Allan 1961) or as a distinct but unnamed species awaiting formal transfer to *Hebe* (Eagle 1982; Smith-Dodsworth 1991; Druce 1993). However, during the course of research for this paper I discovered that Hatch (1966) had already inadvertently transferred *Veronica ×bishopiana* to *Hebe* as *H. ×bishopiana* in a short popular account discussing the presumed hybrid status of this species. This publication appears to have been overlooked because it was made within the *Auckland Botanical Society Newsletter*, an obscure place of publication, further compounded by the fact that Hatch (pers. comm.) did not intend, or even realise he had made the new combination. Nevertheless, under the terms specified within the International Code of Botanical Nomenclature (Art. 33.2, Ex. 33.2, Greuter et al. 1994) this publication was effective, because the basionym and a full and direct reference to its author and place of valid publication were provided (P. J. Garnock-Jones and R. K. Brummitt pers. comm.); also, the newsletter in which this was published is widely accessible to botanists both within New Zealand and overseas (S. McKay pers. comm.). Finally, as a nothotaxon *Hebe ×bishopiana* occupies the same rank as a species, so no further combination is required to remove its suggested hybrid status (see ICBN Art. 50, Ex. 2).

Nevertheless, because of Hatch's unconventional choice of publication and its subsequent failure to be recognised by the botanical community, *H. bishopiana* has continued to be treated either as a

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*The most likely candidate of the several species then included within *H. salicifolia* (Forst.f.) Pennell (Moore in Allan 1961).

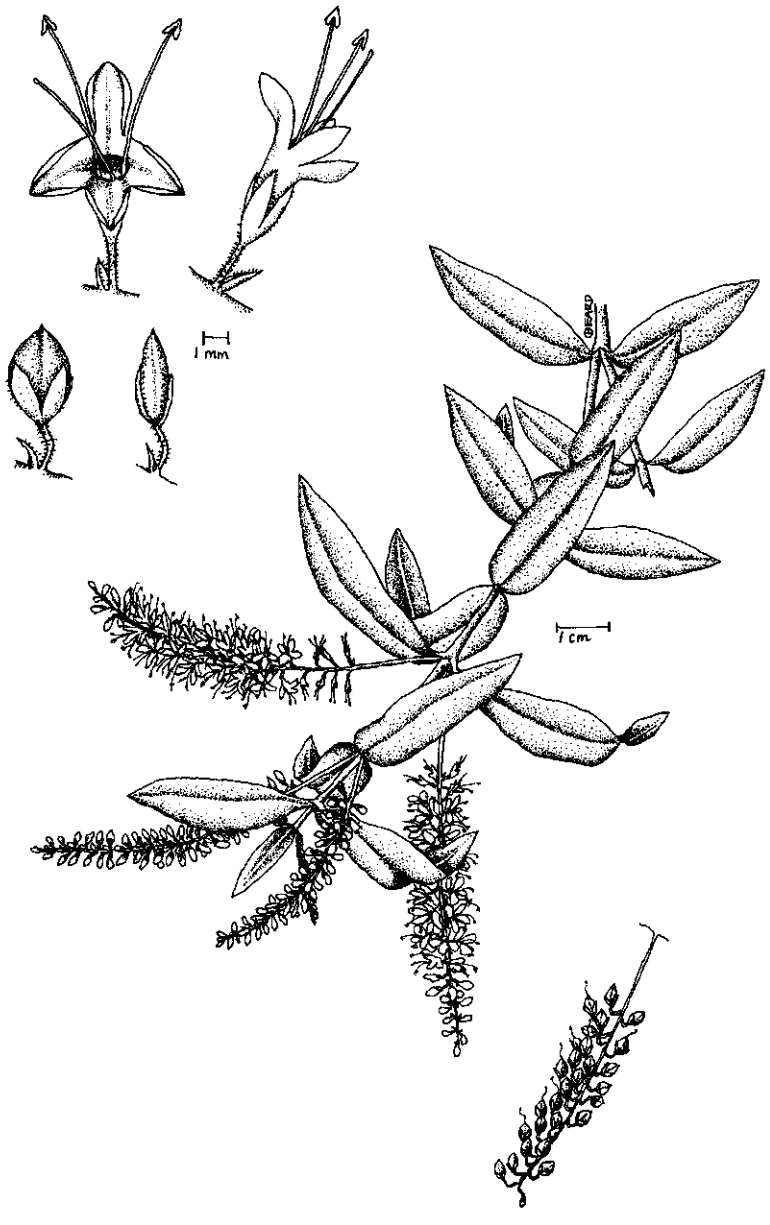

Fig. 1 *Hebe bishopiana*: flowering branch (central), fruiting raceme (bottom right), individual flowers (top left) and capsules (centre left).

natural hybrid or an undescribed species (see above references). This unfortunate situation may have prejudiced its conservation (T. Stein pers. comm.).

This paper is intended to serve two purposes: to add additional evidence to support Hatch's proposed treatment of this taxon at specific level, and to clarify its conservation status, distribution, and ecology.

Hebe bishopiana (Petrie) Hatch, *Auck. Bot. Soc. newsl. 23(1)*:P.1(1966, pro hybr.) Fig. 1

≡*Veronica* ×*bishopiana* Petrie *Trans. N.Z. Inst. 56*:15 (1926).

LECTOTYPE: Hill at Huia near Manukau Heads, April 1924, *J. J. Bishop, H. Carse, E. Jenkins*, WELT

5329! This, the only apparently wild gathering of *H. bishopiana* examined by Petrie, was selected as lectotype by Moore (in Allan 1961). The sheet consists of a single flowering piece. In the same folder are four other collections based on cultivated specimens (WELT 16620!, 16621!, 16622!, 16623!) taken from J. J. Bishop's garden at Titirangi, Auckland. These were presumably seen by Petrie as they include fruiting material which was mentioned in Petrie's description.

DESCRIPTION: Low spreading shrub up to 1 m tall but usually much less. Branches widely angled, spreading, often ascending at tips and then rooting from nodes. Old stems grey-black; branchlets maroon-black, drying black, minutely puberulent when young; internodes 1–11× stem diameter. Leaf bud without sinus, dark maroon in colour. Leaves lanceolate-elliptic (20–)40–90 × (8–)13–18(–22) mm, maroon-green or dark-green; glabrous except for sparse minute eglandular hairs on the midrib and lamina; apex acute or acuminate, acumen (2–)6–10 mm; base cuneate; margin entire, greenish-maroon or maroon. Inflorescences lateral, racemose, 5–7(–11) cm long; flowers crowded, shortly pedicellate, tightly spiralled and drooping toward raceme apex. Peduncle and rachis maroon-black, covered in sparse white strigose, eglandular hairs; peduncle 4–9 cm long. Bracts linear-elliptic, acute, ciliolate, usually equal or slightly longer than pedicels. Pedicels spreading, sparsely covered in white strigose hairs, 2–4 mm long. Flowers faintly sweet-scented. Calyx lobes ovate, subacute, overlapping at edges 1.5–3 mm long; glabrous except for basal covering of sparse white eglandular hairs; margin more or less alternating glandular-eglandular ciliolate. Corolla white tinged purple, fading to white after anthesis; tube 2–4 mm long, narrow, inner surface puberulent; lobes suberect, ovate to lanceolate, acute, 2–4 × 2–3 mm. Anthers purple, acute, 2.5 mm long; filaments purple, fading white, 6–8 mm long, curving outwards after dehiscence. Nectarial disk glabrous, fleshy, maroon-green. Style purple, glabrous, 6–8 mm long; stigma capitate. Ovary cylindrical, minutely puberulent. Capsule ovate, acute, dark maroon-brown, 3–4.5 × 2.5–4 mm, apex minutely puberulent, septicidal to base. Seeds honey-brown, circular, smooth with conspicuous marginal wing, 0.75–1 mm diameter. Chromosome number $2n = 40$ (CHR 462362, slide no. 21928). FL Mar–Aug, however sporadic flowering may be noted at any time of the year.

DISTRIBUTION: Endemic to the Waitakere Ranges (Fig. 2): Waitakere Ecological District; Upper Anawhata Stream, Anawhata, Waitakere Stream, Piha Gorge, Ahuahu Point, Huia Stream, Huia (Mt Donald McLean), Goat Hill, Karamatura Track, Omanawanui Ridge, Jackie Hill.

REPRESENTATIVE SPECIMENS: WAITAKERE RANGES: Anawhata Stream, *P. J. de Lange 2585*, Aug 1994, AK 220460; Waitakere Stream, *P. J. de Lange 2586*, Aug 1994, AK 220459; Anawhata, *?L. Cranwell*, CHR 8400; Piha Gorge, *P. J. de Lange 2583 & G. M. Crowcroft*, Aug 1994, AK 220461; Centennial Stream, *P. J. de Lange 2590 & G. M. Crowcroft*, Aug 1994, AK 220455; Ahuahu Point, *A. D. Mead*, Dec 1967, CHR 181667; Buck Taylor Track, *P. J. de Lange 2588 & G. M. Crowcroft*, Aug 1994, AK 220457; Pararaha Stream below 'Baldy', *P. J. de Lange 2587 & G. M. Crowcroft*, Aug 1994, AK 220458; Goat Hill Track, *E. M. Miller*, Oct 1972, AKU 11167; Top of Karamatura Gorge, Open Space, *K. Wood*, Aug 1949, AK 27654; Marama Track, near Mt Donald McLean, 300 m, *V. A. L. May*, Apr 1991, AKU 22668; Mt Donald McLean, *A. D. Mead*, Jul 1968, CHR 180777; Jackie Hill, *P. J. de Lange 2589*, Aug 1994, AK 220456; Destruction Gully, *P. J. de Lange 2600 & R. O. Gardner*, Aug 1994, AK 220740.

HABITAT: *Hebe bishopiana* occupies three distinct habitats, all with abundant moisture: stream sides, seepages on eroded and exposed igneous outcrops, and shaded cliff faces. Within its streamside habitat *Hebe bishopiana* often forms a conspicuous band immediately above the flood zone, where it is typically associated with the sedge *Machaerina sinclairii** and *Hebe macrocarpa* var. *macrocarpa*. In the southern part of its range, around Huia, populations also extend out of the catchments and onto the summit peaks of the area, while near Karekare and Anawhata plants grow in seepages above the sea (Cranwell 1981; pers. obs. 1994). In these non-riparian locations *Hebe bishopiana* is primarily found in semi-shaded sites associated with seepages, e.g., Mt Donald McLean Access Road. However, occasional plants have also been found in exposed situations, typically with their roots immersed within dense *Astelia banksii* swards and, less frequently, amongst low scrub adjacent to track-sides. Since the 1950s *Hebe bishopiana* populations around Huia have undergone a decline following the

* Unless otherwise stated nomenclature follows Allan (1961), Moore & Edgar (1970), and Webb et al. (1988).

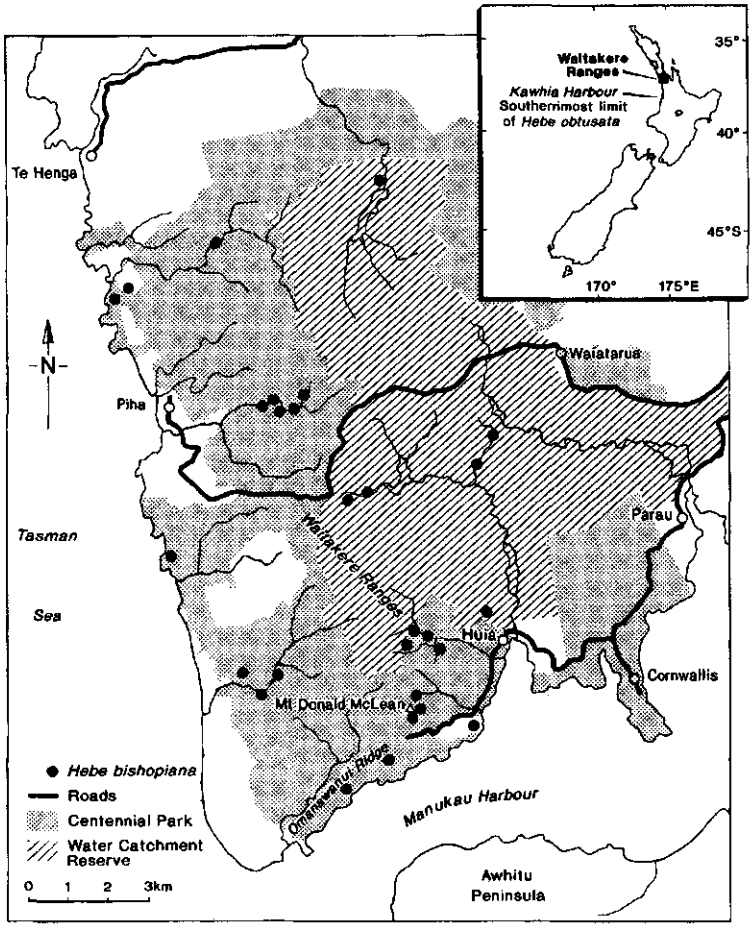

Fig. 2 Distribution of *Hebe bishopiana*.

regeneration of taller vegetation (V. A. May pers. comm.). It is primarily in these more disturbed situations that the ranges of *H. bishopiana*, *H.obtusata*, and *H. stricta* var. *stricta* overlap, a pattern which may have led Petrie (1926) to suggest a hybrid origin for *H. bishopiana*.

ETYMOLOGY: *Hebe bishopiana* is named after Mr J. J. Bishop, a resident of Titirangi, Auckland, who first recognised the species as distinct. He cultivated it at his home "Dunvegan" (T. Stein pers. comm.), and provided material and information on which Petrie (1926) based his description.

ILLUSTRATION: Fig. 1. See also Eagle (1982, plate 315) as *Hebe* sp. "h". Eagle's illustration exaggerates several features, for example, the laminal serrations, which were not evident in the plants I examined.

RECOGNITION: The absence of a leaf bud sinus and the lateral arrangement of the inflorescences places *Hebe bishopiana* within the informal section "Occlusae" of Moore (in Allan 1961). Of those *Hebe* species currently included within this section (see Moore in Allan 1961) *H. bishopiana* is readily distinguished by the open, low sprawling shrub habit, maroon pigmentation of the foliage and young branchlets, lanceolate-elliptic leaves, these usually with acuminate apices, and by the sparse covering of white strigose hairs on the calyces (Table 1). Within "Occlusae" *H. bishopiana* is most closely allied to *H. obtusata* (Petrie 1926; Moore in Allan 1961), which also has a sprawling growth form and similar white hairs on the calyces. However, the obtuse leaves, conspicuous marginal pubescence of the lamina, and thicker covering of hairs on the calyces readily distinguish this species from *H. bishopiana*, as does its preference for dry coastal cliff faces, associated rocky ground, and coastal scrub.

Aside from *Hebe obtusata* three other *Hebe* species have been reported from the Waitakere Ranges: *H. macrocarpa* var. *macrocarpa*, *H. stricta* var. *stricta*, and *H. pubescens* (Gardner 1982). Of these *H. pubescens* is excluded from Table 1 because this species has a leaf bud sinus, and evenly pubescent leaves and young stems. Furthermore, the solitary Waitakere record of *H. pubescens* (*B. E. G. Molesworth*, AK 22185!) from the Piha Creek is considered doubtful as the collection details are suspect and repeated searches of the Piha area have not discovered further plants (R. O. Gardner pers. comm.; P. J. de Lange unpubl. data). The remaining two taxa are readily distinguished from *H. bishopiana* by their differences in growth form, green rather than maroon foliage pigmentation, and floral details (Table 1).

TAXONOMIC STATUS: The postulated hybrid nature of *H. bishopiana* (Petrie 1926; Moore in Allan 1961) is not substantiated by herbarium and field evidence. Plants of *H. bishopiana* are fully fertile, the pollen having 100 % stainability (R. O. Gardner pers. comm.). Seed germinates readily, and, as first observed by Hatch (1966), gives plants that are true to type (e.g., *P.J.de Lange*, AK225992). Morphologically, *Hebe bishopiana* is not intermediate between any known pair of *Hebe* species in the Waitakere Ranges, while all known populations are relatively homogeneous. Furthermore, ecologically, *H. bishopiana* occupies a distinct habitat not frequented by either of its postulated *Hebe* parents (Table 1). Indeed, sympatric occurrences of *H. bishopiana* with other *Hebe* are infrequent and more usually involve *H. macrocarpa* var. *macrocarpa* and *H. stricta* var. *stricta* than *H. obtusata*.

Table 1 Differences between *Hebe bishopiana* and other Waitakere species of *Hebe*

	H. bishopiana	*H. macrocarpa* var. *macrocarpa*	*H. obtusata*	*H. stricta* var. *stricta*
Habitat	lowland forest within gorges, streamsides and on damp seepages within rock outcrops	coastal shrubland, bluffs, slips, and exposed headlands	coastal shrubland, bluffs, and associated rockfalls, particularly in sunny sites	lowland forest in scrub, on slips, riverbanks, and streamsides
Growth form	semi-erect, sprawling shrub	erect shrub	prostrate sprawling shrub	erect shrub
Branching habit	branchlets few, widely spaced along branches and lax	branchlets numerous, erect	branchlets numerous, aggregated toward stem tips, decumbent	branchlets numerous, erect
Stem colour	maroon-black	orange-yellow	reddish-green to maroon	yellow-brown
Leaf blade	lanceolate-elliptic	elliptic-oblong	obtuse	linear-lanceolate
Leaf tip	acuminate or acute	acute or sometimes rounded	obtuse	acute
Leaf margin	minutely and sparsely pubescent (40× magnification)	glabrous or sparsely pubescent at leaf base and tip (40× magnification)	conspicuously pubescent	pubescent (10× magnification)
Leaf colour	maroon-green	olive green	olive green	yellow-green
Inflorescence	racemes tapering, ± pendulous	racemes either erect or ± pendulous	racemes pendulous, apices blunt-ended	racemes tapered, pendulous
Calyx	1.5–3 mm, ovate-subacute, sparsely covered in white strigose hairs (10× magnification)	2–2.5 mm, short, broadly obtuse, ciliate (10× magnification)	2 mm, subacute, conspicuously ciliate (10× magnification)	1–1.5 mm, narrowly obtuse to subacute, finely pubescent (10× magnification)
Corolla tube	2–4 × 2–3 mm, narrowly cylindric	2–4 × 4 mm broad	3 × 3 mm broad	4 × 6 mm, narrowly cylindric
Corolla lobes	acute	obtuse, cordate	obtuse	obtuse-subacute
Chromosome number	$2n = 40$ (CHR 462362, slide no. 21928)	$2n = 80$ (Hair 1967)	$2n = 40$ (Hair 1967)	$2n = 40$ (Hair 1967)

However, sympatric occurrences between two of the suggested parents of *H. bishopiana*, i.e., *H. obtusata* and *H. stricta* var. *stricta*, are common, although hybrids between these taxa appear to be genuinely scarce (cf. Cranwell 1981). Of the few hybrids with this parentage that I have seen, none has the distinctive maroon colouration, sprawling, widely branching habit, sparse covering of hairs on the calyces, or the acute corolla lobes of *H. bishopiana*. Furthermore, plants with these characters have not been observed at Kawhia (Fig. 2), c. 125 km south of the southern-most collecting of *H. bishopiana*, where putative hybrids between *H. obtusata* and *H. stricta* have been collected.

A search of eight major New Zealand herbaria (AK, AKU, CANU, CHR, NZFRI, WAIK, WELT, WELTU) located only five putative hybrid collections thought to involve *H. obtusata* and *H. stricta* var *stricta*. The first of these, AK 219762, was collected from Anawhata on the Waitakere coast, by E. K. Cameron on 21 May 1994. Anawhata is one of the few locations where the ranges of *H. bishopiana* and *H. obtusata* overlap and has been cited as a site of rife hybridism between *H. obtusata* and *H. stricta* (Cranwell 1981). Although AK 219762 was identified as *H. obtusata* × *H. stricta* var. *stricta*, it appears to be an example of *H. bishopiana* × *H. obtusata*. Features of *H. obtusata* include the conspicuously hairy lamina, more or less blunt-ended, crowded racemes, obtuse calyces which are densely covered in white strigose hairs, and obtuse corolla lobes; those of *Hebe bishopiana* are most evident in the stated erect (1 × 1.5 m) habit, open branching system of the collection, and the maroon tinged foliage, which, while variable in shape, has distinctly acuminate leaf apices. The collection has no similarity to *H. stricta* var. *stricta*, in particular lacking the copious covering of fine hairs on the calyx lobes and pedicels which is a feature of hybrids involving *H. stricta*.

The remaining four putative hybrid collections of *H. obtusata* × *H. stricta* var. *stricta* were collected from Whatipu at the southern end of the Waitakere Coast and from Tiritirimatangi near Kawhia (Fig. 2) where *Hebe obtusata* reaches its southern limit (de Lange 1986). None of these collections bears any resemblance to *H. bishopiana*.

The Whatipu specimens (AK 217456–57) consist of several flowering pieces. The racemes are long and downcurved, with rounded corolla lobes. The calyces of these collections are finely pubescent with occasional prominent white strigose hairs. The leaf lamina, midrib, and stems are conspicuously puberulent. The leaves are variable, ranging from mostly obovate-oblong to broadly elliptic-oblanceolate. The white strigose hairs of the calyx, leaf laminae, and stems are typical features of *H. obtusata*, while the long downcurved racemes and finely pubescent calyces are suggestive of *H. stricta* var. *stricta*. At Kawhia, putative hybrids have been recorded from a single site (AK 179192, 200962) in a location where *H. obtusata* grows intertangled with *H. stricta* var. *stricta*. *H. obtusata* has been recorded from a further four localities around the harbour (de Lange 1986; P. J. de Lange pers. obs.), in situations where it is sympatric with *H. stricta* var. *stricta*, but no hybrids have been seen at these sites. Plants of the putative hybrid at Kawhia have been cultivated by the author for over ten years. As with the Waitakere collections of hybrids, the Kawhia hybrid plant has conspicuously hairy stems, leaf lamina, and midribs, and the leaves are broadly elliptic and usually apetiolate. The Kawhia hybrid plant has racemes which are notably longer than the Waitakere collections and somewhat more pendulous, while the calyces are finely puberulent with occasional prominent white hairs. In cultivation, the Kawhia plant forms a heavily branched semi-compact shrub 1.5–2 m tall. The branches are either erect or semi-erect, never ascending, and generally coloured dark-brown. The foliage is a distinctive yellow-green colour, and often subject to infections of the rust *Aecidium disciforme*, which is otherwise only known within New Zealand from *Hebe stricta* and *Veronica plebeia* (E. H. C. McKenzie pers. comm.).

CONSERVATION STATUS: *Hebe bishopiana* is listed as "Vulnerable" by Cameron et al. (1995). All known populations of *H. bishopiana* occur either within the Centennial Park or on adjacent land within the Water Catchment Reserve area of the Waitakere Ranges. Both estates are administered by the Auckland Regional Council (Morton 1993; D. Randal pers. comm.). Fieldwork suggests that *Hebe bishopiana* is under severe threat from the spread of mist-flower (*Ageratina riparia*) and the pampas grasses (*Cortaderia jubata* (Lem.) Stapf. and *C. selloana* (Schultes et Schultes f.) Asch. et Graebner). Several smaller populations located within areas of high public usage are threatened by damage resulting from road works, trampling, and track clearance. With respect to the threat posed by weeds, the plight of *H. bishopiana* is not dissimilar to that of *H. acutiflora*, another vulnerable species (Cameron et al. 1995) occupying a similar riparian habitat in Northland (Wilson & Given 1989). For both species

effective control of these weeds would significantly improve their conservation status.

From field surveys of *H. bishopiana* I estimate that the national population of this species comprises c. 2000–2500 plants with the most significant populations (>300 plants) occurring within the upper Piha and Karamatura catchments, and on Mt Donald McLean (Fig. 2). The most vulnerable populations are at the Waitakere Reservoir, Jackie Hill, Destruction Gully, and on the nearby Omanawanui Ridge (Fig. 2). These localities each have fewer than five plants, all in the process of being overwhelmed by mist-flower and pampas. Unfortunately, several of the larger populations are also being threatened by the spread of these exotics, most notably in the lower Piha Gorge and Karamatura Stream.

As these weeds are present in the majority of the populations surveyed, and as several *Hebe bishopiana* populations have declined as a result of this, the current IUCN Red List category of "Vulnerable" is still appropriate.

INCERTAE SEDIS

A specimen collected from the Wairua Wildlife Management Reserve, Tangihua Ecological District, near Hikurangi, Northland (*L. J. Forester & A. P. Druce*, 12 Apr 1991, AK 202263) was tentatively identified as *H. bishopiana* because of the faint purple foliage pigmentation (A. P. Druce pers. comm.). The herbarium specimen is in poor condition, with shrivelled, extremely narrow lanceolate leaves and old racemes. The label states that young foliage had purple undersides, and that the single flower observed was mauve.The stems, laminae, and midrib of this plant are densely puberulent (10× magnification), while the calyces and bracts are only sparsely so. The capsules are reflexed while the racemes are long and slightly down curved. Material cultivated from the original gathering at Percy Reserve, Petone (P. J. de Lange pers. obs.) grew into an erect densely branched shrub, with extremely narrow drooping leaves. The purple pigmentation of cultivated material is only evident on the young buds and the undersides of emerging leaves. Similarly the flower colour of cultivated specimens is white not mauve, while the corolla lobes are obtuse not acute. The status of this plant is not certain, although it does not appear to be closely related to *H. bishopiana* based on leaf shape, length, pubescence, raceme length, flower colour, and corolla shape. Based on current knowledge of Northland *Hebe* species (Moore in Allan 1961) the relationship of this plant to other named taxa remains to be clarified.

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