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Haloragis milesiae (Haloragaceae), a new species from the Australian Alps

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Abstract

A reassessment of specimens of *Haloragis exalata* subsp. *exalata* from near Geehi, in Kosciuszko National Park, revealed that they were consistently different from typical examples of that taxon in stem, leaf and indumentum characters. It is here concluded that this population merits recognition at specific rank, a conclusion that is strongly supported by preliminary DNA sequence analysis. The species is named *Haloragis milesiae* in honour of the discoverer of the population.

Introduction

Haloragis exalata F.Muell. subsp. *exalata* is an uncommon subshrub distributed from south-eastern Queensland to southern Victoria (Australia) that is currently (November 2014) listed as vulnerable under both the New South Wales *Threatened Species Conservation Act* 1995 (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). It is usually found in coastal-lacustrine situations. The ecology and conservation status of this taxon has recently been reviewed by Miles and Cameron (2007). These authors note that, although the taxon is rare and the populations often widely separated, plants can be locally abundant. They also suggest that the species may be "at a relatively early stage of colonisation and speciation" in southern Australia because of the young age of the coastal habitats it occupies (p. 270). Surprisingly, the authors also report the presence of plants, which show some morphological similarities to those in these coastal communities, in the montane Kosciuszko National Park near Geehi, at c. 1100m altitude. One of their conclusions was that "the Geehi population should be investigated as a possible discrete taxon" (p. 267).

The present paper presents evidence that the Geehi populations are indeed discrete morphologically and that the plants of this population should be recognised at specific rank. This conclusion is also supported by DNA sequence data from two chloroplast and two nuclear markers (Wilson and Heslewood, unpublished analysis) which places the species outside a lineage that includes *Haloragis exalata*, *H. serra* Brongn. and the New Zealand taxon *H. erecta* (Murray) Oken.

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Taxonomy

Haloragis milesiae Peter G.Wilson & Makinson, sp. nov.

Diagnosis: This species differs from *Haloragis exalata* by having stems that are terete or ridged rather than prominently 4-angled, and by having rather dense fine, spreading hairs on the leaves, stems and hypanthia, and fruits that are more strongly 4-angled. The teeth on the leaf margin are coarser and usually larger, being (2–)3–5 mm in length, as compared to 1–2(–3)mm in both subspecies of *H. exalata*. The leaves are relatively broader than in *H. exalata*.

Type: New South Wales: Southern Tablelands: Munyang–Geehi road, 2 km SSW of bridge over Geehi River, *J. Miles s.n.*, 9 Jun 2005 (holo NSW678476).

Woody, robust subshrub to 1.2 m tall; stems erect, terete to ridged but not prominently 4-angled, greenish to brown, densely covered with fine, spreading hairs c. 0.2 mm long. Leaves opposite on vegetative growth, becoming alternate on flowering shoots; petiole tapering from the lamina base, (7–)10–17 mm long; lamina elliptical to ovate or oblong-ovate (rarely narrowly so), (3.5–)4–8.2 cm long, (1.7–)2.5–4.2 cm wide, base obtuse to somewhat cordate, margin serrate or sparingly biserrate (17–41-toothed; teeth (2–)3–5 mm long), surface glabrous or with an open to sparse indumentum of short hairs. Inflorescence a cluster of 3–7-flowered dichasia in the axils of reduced leaves, resulting in a dense spike-like conflorescence. Lateral axillary conflorescences are sometimes also borne in the axils of these reduced leaves. Leaves of flowering shoots much reduced, serrate, decreasing in size from 22–28 mm long at the base of the flowering shoot to c. 10 mm long (or less in lateral conflorescences). Inflorescence bracts membranous, brownish, linear–lanceolate, toothed, 1.1–1.7 mm long, persistent. Flowers 4-merous; pedicel 0.5–1 mm long. Sepals 4, deltoid, 1.1–1.4 mm long, 0.5–0.9 mm wide, ± entire, sparingly hairy. Petals 4, greenish, hooded and keeled, 3.5–4 mm long, bearing hairs along the keel. Stamens 8, filaments 1.1–1.4 mm long; anthers yellowish, 2.5–2.9 mm long. Styles 4, to 1 mm long, stigmas fimbriate, purplish. Hypanthium cup-shaped, distinctly 4-angled opposite petals, c. 1 mm long, 1 mm wide, clothed with spreading hairs; ovary 4-locular, ovules 1 per loculus. Fruit shortly hairy, obpyramidal to pyriform, 2.2–2.8 mm long, 1.7–2.4 mm wide, 4–ribbed opposite petals, slightly concave opposite sepals, with irregular transverse to oblique calluses on the surface. Sepals persistent, erect, deltoid, 1.3–1.5 mm long, 0.8–1.4 mm wide. Seeds 1 or more. Fig. 1.

Notes: This species is most readily distinguished from *H. exalata* subsp. *exalata* by the lack of markedly 4-angled stems and the presence on stems and leaves of rather dense fine, spreading hairs. These hairs are 3 or 4 (rarely 5)-celled and, particularly on the adaxial surfaces of the leaves, the basal cells can become slightly enlarged so that the leaves are slightly scabrous. This is in contrast with *Haloragis exalata* subsp. *exalata* var. *exalata*, which is distinctly scabrous: the hairs have a strongly thickened basal cell, topped by a couple of small, unthickened cells. *Haloragis exalata* subsp. *exalata* var. *laevis* (Schindl.) Orchard is glabrous.

In his treatment of *Haloragis exalata*, Orchard (1975) reported the presence of 2 ovules per loculus, with 1 aborting at an early stage. Dissection of unopened flowers of *Haloragis milesiae* found a total of only 4 ovules, with no evidence of others that had aborted. Dissection of one mature fruit showed that only a single seed had set.

Haloragis milesiae has larger teeth on the leaf margin than the following in eastern New South Wales: *H. exalata* subsp. *exalata*, *H. exalata* subsp. *velutina* Orchard, and *H. serra*. In *H. milesiae* the largest teeth on mature leaves are (2–)3–5 mm long (measured as sinus depth at distal edge of the tooth), compared to 1–2 (very rarely –3) mm long for the other species.

There is also a subtle difference in leaf venation between *H. milesiae* and the New South Wales, South Coast populations of *H. exalata subsp exalata*. In dried specimens of the latter, the secondary and tertiary veins of the abaxial leaf surface usually remain slightly prominent all the way to the marginal teeth (note that this character is not exhibited in Victorian populations currently assigned to this taxon). In *H. milesiae* (and in Victorian subsp. *exalata*, and all populations of *H. exalata* subsp. *velutina* and *H. serra*) these veins are slightly prominent near the midvein but distally become flush with the lamina surface before reaching the marginal teeth.

Modification to identification keys: In *Flora of New South Wales* (Wilson 2002a) and in *PlantNET* (Wilson 2002b), *H. milesiae* will 'key out' in couplet 5 with the relatively common species of semi-arid lands, *H. odontocarpa*. *Haloragis milesiae* is readily distinguished from this taxon by being a robust subshrub to 1.2 m tall vs. annual herb to 0.5 m, and by the vegetative leaf width (17–)25–42 mm wide vs. 10–15 mm wide.

Etymology: The species is named for Jackie Miles, ecological consultant, of Brogo, New South Wales, who discovered this species in January 2002.

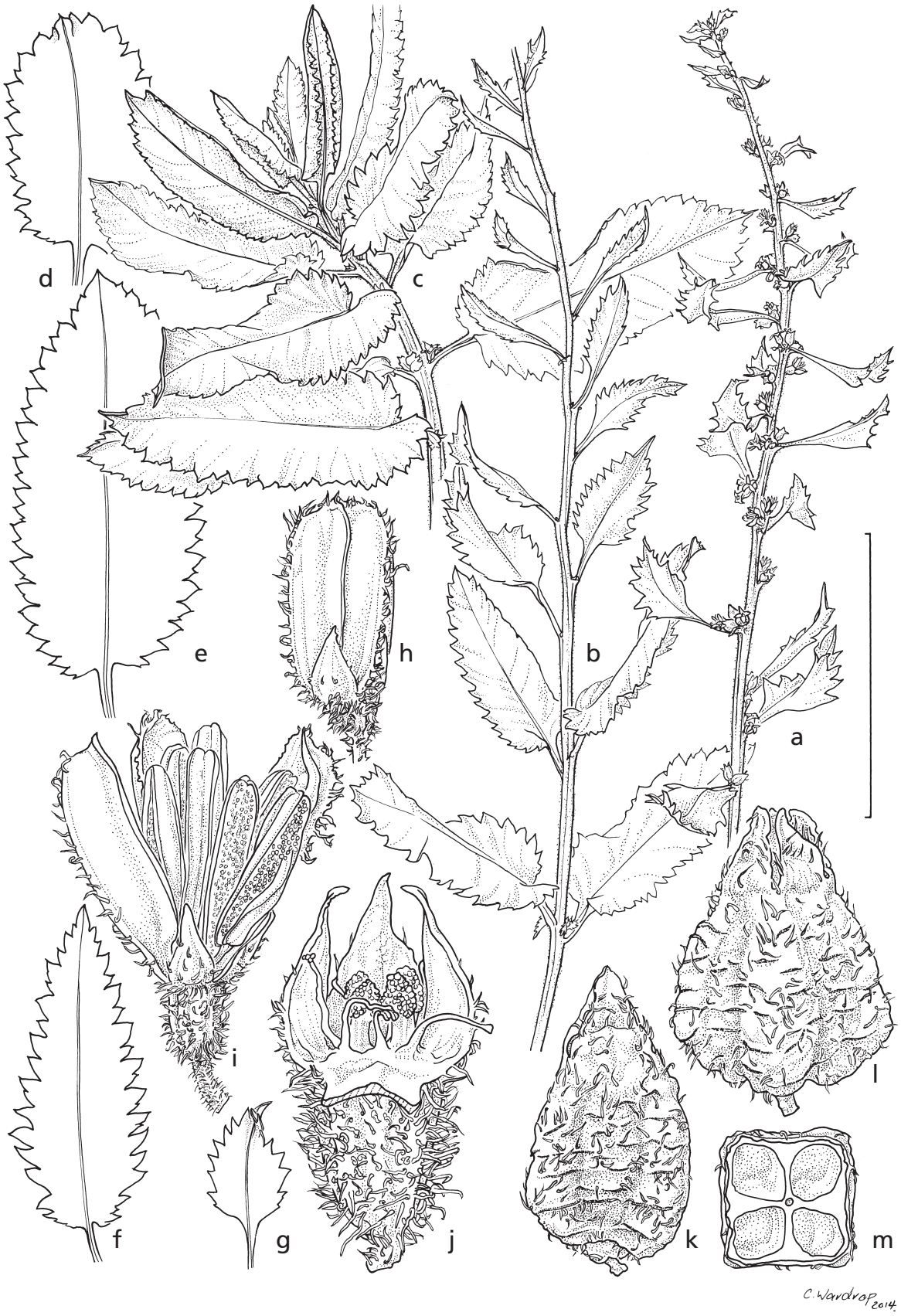

Fig. 1. *Haloragis milesiae*. **a**, habit (flowering stem); **b**, habit (showing transition from opposite to alternate leaves); **c**, habit (pre-flowering) ; **d**, **e**, **f**, **g**, leaf silhouettes showing variation; **h**, bud; **i**, flower (male phase with one petal removed); **j**, flower (female phase with one sepal removed); **k**, **l**, fruits; **m**, fruit cross-section. (a, c–e, g from *Miles s.n.,* NSW678476; b, k–m from *Miles s.n.,* NSW678475; f, h–j from *Miles s.n.,* NSW497937). Scale bar: a = 52 mm; b, c = 75 mm; d–g = 60 mm; h, i, k–m = 4 mm; j = 2 mm.

Habitat and ecology: Most specimens were collected from areas of disturbance within wet sclerophyll forest dominated by *Eucalyptus delegatensis* and *E. dalrympleana* with shrubby understorey of taxa that include *Acacia rubida*, *Bossiaea foliosa*, *Prostanthera lasianthos*, *Kunzea ericoides*, *Coprosma hirtella* and *Lomatia myricoides*. The species is recorded as being locally common in areas subject to occasional human disturbance (track edges, power line easements) or after fire. Miles and Cameron (2006, 2007, and J. Miles *in litt.*) describe the response to fire of the populations around Geehi dam, having observed a strong recruitment pulse from soil seed bank after fire, including massive recruitment well up-slope from pre-fire occurrence sites within a year of the fire. They postulated a gradual decline in frequency of plants as the habitat regenerates after fire, persistence of plants mainly in areas of canopy break and occasional earth disturbance, and the development of a localised soil seed bank of considerable longevity and size after a long enough period between fires (perhaps >10 years). They also noted that no plants were found in nearby riparian disturbance zones.

Conservation status: The species is probably adequately conserved in terms of tenure. Although it is restricted in distribution, it is adequately protected because it occurs within the Kosciuszko National Park. Factors that threaten other species that have restricted distributions, like disturbance and fire, may enhance, rather than decrease, this taxon's chances of survival. Miles and Cameron (2006, p. 23) consider that it is "unlikely that too frequent fire would be an issue in the management of this species" but the frequency and other details of clearing and slashing under powerline easements are unknown and their impact uncertain.

Distribution: Apparently restricted to the Geehi area where the metapopulation extends "discontinuously over at least 14 kilometres" (Miles and Cameron 2006). It is possible that investigation of other valleys in the area could locate further populations. Other inland records attributed to *Haloragis exalata* (eg, from Tumut and Bungonia) are still under investigation but it is evident that they do not represent further occurrences of this new species.

Other specimens examined: New South Wales: Southern Tablelands (as per Jacobs and Pickard 1981): Geehi Dam, *Miles s.n.*, 4 Jan 2002 (NSW497919, NSW497937); Lower edge of Grey Mare Fire Trail, c. 1 km W of Geehi Dam wall, *Miles s.n.*, 10 Jun 2005 (NSW678473, NSW739564, CANB); Slope above Middle Creek, c. 1 km W of Geehi Dam wall, *Miles s.n.*, 10 Jun 2005 (NSW678475).

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