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Selliera rotundifolia (Goodeniaceae), a new, round-leaved, species from New Zealand

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Abstract A new species of *Selliera* is described from New Zealand. *S. rotundifolia* is a rhizomatous perennial herb, and is distinguished from *S. radicans* by rotund leaves which are appressed to the ground, a shorter pedicel, and smaller flowers. *S. rotundifolia* occurs on sand plains along the western coast of Wellington province and is considered to be an endangered species.

Keywords Goodeniaceae; *Selliera*; *S. rotundifolia*; *S. radicans*; new species; taxonomy; conservation; New Zealand flora

INTRODUCTION

Selliera radicans Cav. occurs in Australia (Carolin 1992), Chile (Reiche 1910), and New Zealand (Allan 1961). Allan (1961) considered the species in New Zealand to be polymorphic, with the leaves assuming a variety of forms which can often be found on the same plant. Several populations of *S. radicans* from New Zealand have been studied for variation in growth form, leaf shape, and anatomy (Cross 1910), and growth response to saline and nutrient concentrations, drought tolerance, and variation in leaf shape, size, and thickness (Lyttle 1978). Carolin (1992) noted the occurrence of ecotypes, presumably in Australia, and suggested that some may warrant taxonomic recognition. Ogden (1974) conducted experimental garden studies with round-leaved 'dune' and spatulate-leaved 'estuarine' forms of

Selliera collected from the Manawatu coast. The leaf shape and dimensions of the two forms remained distinct when cultivated under identical conditions. Ogden concluded that the two forms are genetically distinct, but he regarded them as ecotypes rather than species. Recently, P. J. de Lange has deposited in CHR herbarium collections of the round-leaved plant (e.g., CHR 497587) which sometimes grows with the common, widespread, and spatulate-leaved *S. radicans* (e.g., CHR 497588) on the Manawatu coast. Similar collections of the two species growing together, including the first of the round-leaved plant, were made by A. L. Poole in Mar 1940 from the Manawatu (e.g., CHR 23737, 505719). This round-leaved plant is here named and described as a new species.

TAXONOMY

Selliera Cav., *Anales Hist. Nat.* 1: 41 (1799)

Selliera rotundifolia Heenan sp. nov.

DIAGNOSIS: A *S. radicante* foliis rotundis et apice et base obtuso, pedicello brevior, corolla et ovario et stylo minore distinguitur.

Distinguished from *S. radicans* by rotund leaves with an obtuse apex and base, a shorter pedicel, and smaller corolla, ovary, and style.

HOLOTYPE: New Zealand, Manawatu, Hokio Beach, sand plain behind foredunes, P. B. Heenan 4/96, 30 Jan 1996, CHR 507535. Isotypi: AK, WELT.

DESCRIPTION (Fig. 1, 2): Prostrate herb, forming densely matted patches up to 70 cm diameter, or occasionally creeping amongst other vegetation. Stems 1–2 mm diameter, glabrous, white, rhizomatous, and only rarely above ground. Leaves 8–24 mm long, glabrous, alternate, sometimes in fascicles or on short erect stems, appressed to the ground; lamina 3.2–7.0 × 2.5–5.0 mm, rotund, sometimes orbicular, rarely obovate, coriaceous, entire, apex obtuse, base obtuse or rarely cuneate; petiole

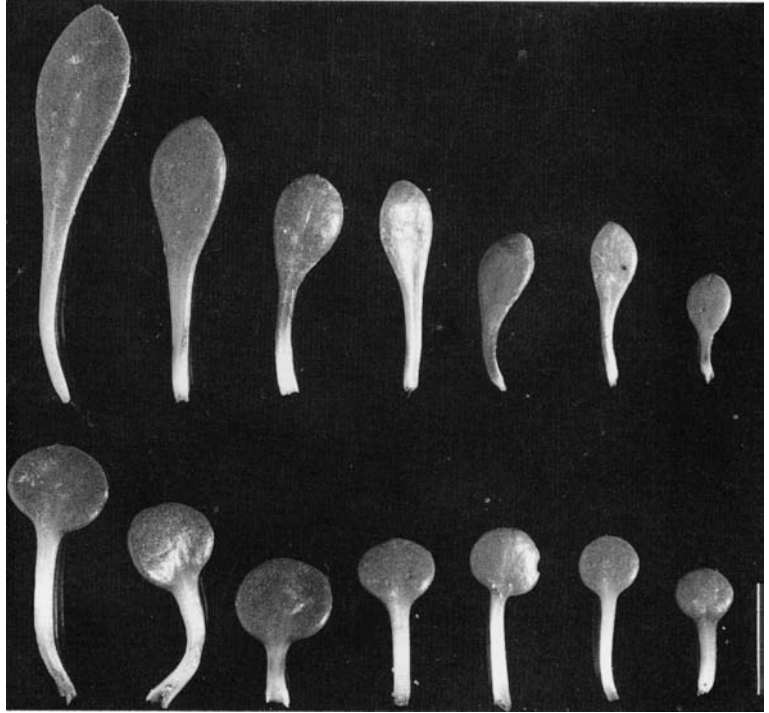


Fig. 1 *Selliera rotundifolia* (above) and *S. radicans* (below) grown in pots to highlight the difference in leaf shape and orientation and in growth habit. Plants of both species originally collected from Whangaehu River mouth, Wanganui.

3.0–6.5(–17.0) × 0.5–1.0 mm, distinct from lamina. Flowers single, arising in leaf axils. Pedicel 3–9 mm long, glabrous, green to red-green, erect or spreading; bracts 1.5–2.3 × 0.7–0.9 mm, lanceolate, usually falcate, green, erect. Sepals 1.0–1.4 × 0.7–0.9 mm, narrow-triangular, distal part flushed red, apex subacute. Corolla 6.5–7.6 × 8.3–9.2 mm,

5 petals joined only in proximal part, with few scattered hairs in throat, inner surface white, outer surface flushed pale red with the veins distinctly so; petals 3.0–3.5 × 1.5–1.7 mm, lanceolate, petals sometimes weakly falcate. Ovary 1.4–1.6 mm long, green, glabrous, bilaterally compressed, base obtuse; ovules 15–21. Style 3.2–4.0 mm long, purple-red,

Fig. 2 Leaves of various sizes of *Selliera radicans* (above) and *S. rotundifolia* (below) from Whangaehu River mouth, Wanganui. Bar scale = 10 mm.



hairs <0.6 mm long on distal part; stigma 0.7–0.8 mm long, glabrous, orange-brown. Stamens 3–3.2 mm long; anthers 0.8–1 mm long, yellow-brown; filament 2.0–2.2 mm long, white. Fruit 2–3(–3.3) × 1.8–2.8(–3.2) mm, ovoid, green, base obtuse, sepals persistent. Seeds 1.4–1.6 × 0.8–1.1 mm, laterally compressed, cream-white, one face convex the other flat or weakly convex, surface with pits. FL Dec–Feb; FT Jan–May.

CHROMOSOME NUMBER: $2n = 16$ (M. I. Dawson pers. comm. May 1996; voucher CHR 507535, cultivated at Lincoln, ex Hokio Beach, P. B. Heenan 4/96). This number is the same as *S. radicans* from New Zealand (Hair & Beuzenberg 1960) and Chile (Moore 1963). Two chromosome numbers, $2n = 16$ and $2n = 48$, have been reported for *S. radicans* from Australia and Tasmania by both Jackson (1958) and Peacock (1963).

DISTRIBUTION (Fig. 3): *S. rotundifolia* is restricted to the southern half of the North Island along the western coast of the Wellington province. The northern limit is the Waitotara River to the west of Wanganui (C. C. Ogle pers. comm.), and the southern limit is near the Ohau River in the Manawatu district.

S. rotundifolia is endemic to an area that is regarded as having few such species (Wardle 1963;

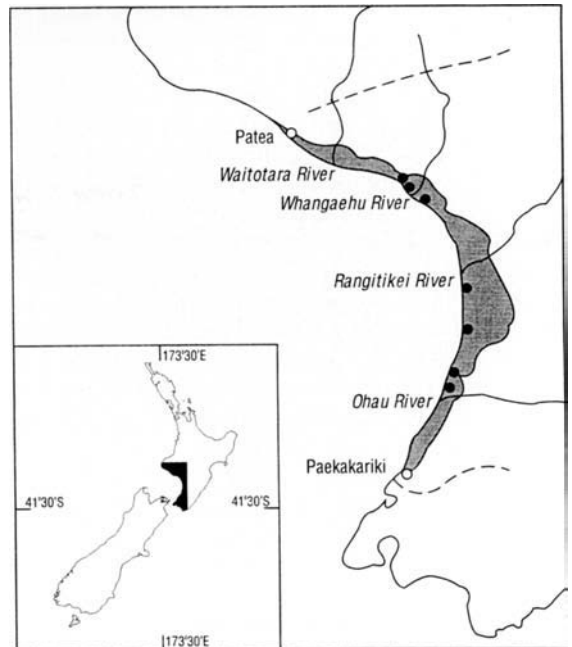


Fig. 3 Distribution of *Selliera rotundifolia* as represented by herbarium voucher specimens. Dunes of the Himatangi Series less than 5000 years old are represented by stippling (adapted from Cowie 1963); and the western part of the lower North Island floristic gap is indicated by dashed lines (adapted from Rogers 1989).



Fig. 4 A sand plain (centre) at Hokio Beach is typical habitat for *Selliera rotundifolia*. To the left of the sand plains is a dune slack dominated by *Leptocarpus similis*, and on the foredunes behind are planted *Cupressus macrocarpa* and *Pinus radiata*, which are self-seeding toward the sand plain.

McGlone 1985; Rogers 1989). The Himatangi Series dunes and the distribution of *S. rotundifolia* correlate very well with Rogers's (1989) "lower North Island floristic gap" as defined by endemic and disjunct distributions (Fig. 3).

HABITATS (Fig. 4): *S. rotundifolia* is restricted to sand plains and the ecotone between sand plains and sand slacks in the largest sand dune system in New Zealand (Molloy 1988), which extends along 190 kilometres of coast between Paekakariki and Patea (Cowie 1963). These dunes and associated slacks and plains are of an unusual structure (Partridge 1992), the parabolic dunes having their longer axis almost at right angles to the coast (Esler 1969). This dune formation is known as the Himatangi Series (Adkin 1948), and within it *S. rotundifolia* is restricted to sand plains of the Waitare Phase (Cowie 1963). This phase forms a coastal belt 0.4–3.2 km wide, and is characterised by weak soil profile development and sands that are relatively unweathered (Cowie 1963).

Along the Manawatu coast *S. rotundifolia* occurs behind the foredunes on sand plains which are formed when sand has deflated to near the water table; these are moist in summer, and when it rains water flows (or ponds) several inches deep across their surface (Esler 1969). Esler described the vegetation of a sand plain at Himatangi, noting that *S. rotundifolia* (as *S. radicans*) "is the most widespread of the sand plain species and also occupies moist sites near the foredune where few other species grow. It tolerates submersion in water and can survive where the water-table is more than 2 ft. below the

surface in summer." When growing near the foredune *S. rotundifolia* tolerates moving sand and a wide fluctuation in the water table between summer and winter (Esler 1969).

Occasionally *S. rotundifolia* occurs as small and scattered patches on more organic substrates among short turf and with *Leptocarpus similis*. In these situations it is probably persisting as a remnant of an earlier vegetation sequence when it was the dominant species of the newly formed sand plains.

RECOGNITION (Fig. 1, 2): *S. rotundifolia* is distinguished from *S. radicans* by a number of characters (Table 1). The most obvious differences are that *S. rotundifolia* has rotund leaves with an obtuse base and apex, and the petiole is distinct from the lamina; the pedicel is shorter, and the flowers smaller; and the fruit has an obtuse base.

Habitat-induced small-leaved forms of *S. radicans* and *S. rotundifolia* could be confused in the field, but *S. rotundifolia* consistently has rotund leaves with the base and apex obtuse (Fig. 2). *S. radicans* and *S. rotundifolia* have both been collected from Hokio Beach, Foxton Beach, and Whangaehu River mouth. *S. radicans* usually occurs on coastal and estuarine silts, mud flats, and peaty soils.

Several other names have been published in *Selliera*, and the original descriptions of these do not embrace *S. rotundifolia* with its rotund leaves and obtuse apex and base. The leaves of *S. herpystica* Schltld. are described as "ex inferiori attenuata lineari parte petiolarum sensim dilatata in laminam spatulato-lanceolatam plerumque obtusam crassiusculam" (Schlechtendal 1847); those of

S. microphylla Colenso from Mt Tongariro, New Zealand, as “broadly lanceolate or sub-obovate-lanceolate ... petioles long, flexuous, twice the length of leaf” (Colenso 1890); and those of *Goodenia repens* Labill., the basionym of *S. repens* (Labill.) de Vriese as “infra attenuatis, ellipticis aut lanceolatis” (Labillardière 1804). Carolin (1992) placed *S. herpystica* and *S. repens* in synonymy of *S. radicans*.

REPRESENTATIVE SPECIMENS: WELLINGTON: Hokio, Levin, *F. Duguid*, 30 Aug 1949, CHR 65376; Hokio Beach, *P. J. de Lange* 2062, 26 Jun 1993, CHR 497564; Foxton Beach, *A. L. Poole*, Mar 1940, CHR 505719; Himatangi Beach, *P. N. Johnson*, 28 Jan 1981, CHR 363686; Waiwiri Stream, *P. J. de Lange* 2085, 9 Apr 1993, CHR 497587; Whangaehu River mouth, *P. B. Heenan* 82/95, 11 Oct 1995, CHR 506176; Kaitiata Stream, Wanganui, *S. Courtney*, 17 Aug 1985, AKU 20752; Kaitoke Prison coastline, Wanganui, *S. Courtney*, 16 Aug 1985, AKU 20751.

ASSOCIATED SPECIES: Esler (1969) recorded 19 species associated with *S. rotundifolia* at Himatangi, on a sand plain. Those especially associated with *Selliera* are *Myriophyllum votschii*, *Limosella lineata*, *Eleocharis neo-zelandica*, *Ranunculus acaulis*, *Isolepis cernua*, *Carex pumila*, *Leptocarpus similis*, *Epilobium billardierianum*, *Lobelia anceps*, *Lachnagrostis billardierei*, *Desmoschoenus spiralis*, and *Pseudognaphalium luteoalbum*.

On a sand plain at Hokio Beach *S. rotundifolia* was co-dominant with *Gunnera dentata*, whereas on a sand plain at Whitiua Scientific Reserve it was the sole dominant.

CONSERVATION STATUS: There has been significant loss of the Himatangi Series dune system due to development for farming and forestry (Esler 1969). Farming generally occurs on sandy soils with a developed A horizon and is not a serious threat to *S. rotundifolia*, which prefers sand flats with little soil

development. However, forestry is recommended for younger, unstable, sand dunes and plains with little soil horizon development (Molloy 1988), and it is on these sands that *S. rotundifolia* occurs. Large plantations of *Pinus radiata* have been established between the Turakina and Rangitikei rivers (Santoff Forest), south of the Rangitikei River (Tangimoana State Forest), and south of the Manawatu River (Waitarere State Forest). Scattered forestry development also occurs between the Waitotara and Turakina rivers. The extent of these coastal plantations is clearly apparent on the New Zealand topographic maps NZMS 260 R22, S23, S24, and S25. In many places pine plantings have encroached on to the sand plains, significantly reducing their botanical value (Partridge 1992).

Areas with no obvious forestry development occur between Himatangi and Foxton beaches and between Hokio and Waikawa beaches, and it is significant that these areas are where most collections of *S. rotundifolia* have been made. Small populations also occur on sand plains at the Waitotara (C. C. Ogle pers comm.) and Whangaehu river mouths. These four areas were identified by Partridge (1992) as priority areas for the conservation of sand dune and sand plain habitats. Of particular relevance is that Partridge (1992) recommended that the sand plain habitat be protected as a national priority. *S. rotundifolia* is present in the Department of Conservation-managed Whitiua Scientific Reserve at Whangaehu River mouth. The aggressive pampas grass (*Cortaderia selloana*) also poses a threat to *S. rotundifolia* as it is invading and successfully establishing on the sand slacks and associated sand plains (P. J. de Lange pers. comm.). *S. rotundifolia* and other small native herbs characteristic of the sand plain are unable to compete with *C. selloana*, and are quickly smothered.

As *S. rotundifolia* has a restricted distribution with few individuals at each location, occurs on a specific

Table 1 Differences between *Selliera rotundifolia* and *S. radicans*.

	<i>S. rotundifolia</i>	<i>S. radicans</i>
Leaves	rotund, spreading and appressed to ground; base and apex obtuse	spatulate, elongated, erect or ascending; base attenuate, apex subacute
Pedicel	3–9 mm long	up to 40 mm long
Flowers	small; ovary 1.4–1.6 mm long, style 3.2–4 mm long, style hairs <0.6 mm long, corolla 6.5–7.6 × 8.3–9.2 mm, petals 3–3.5 mm long	large; ovary approx. 4 mm long, style approx. 5 mm long, style hairs approx. 0.8 mm long, corolla approx. 10.5 × 12–13 mm, petals 4.8–5.2 mm long
Fruit base	obtuse	attenuate

habitat, and faces severe habitat threats, it is recommended that it be classified as endangered, following the definition of Cameron et al. (1995) (P. J. de Lange pers. comm.).

ETYMOLOGY: The epithet *rotundifolia* refers to the distinctive leaf shape, which has a length-to-width ratio of approximately 6:5 (Stearn 1993).

ILLUSTRATION: Ogden (1974, fig. 1a, 2a, 3, as *S. radicans* dune form).

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