



**FLORA OF NEW ZEALAND**  
**SEED PLANTS**

**CARDAMINE**



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**P.B. HEENAN**

Fascicle 6 – DECEMBER 2020

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Cover image: *Cardamine reptans* growing in a damp seepage on the summit of the Old Man Range, Otago.

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## Introduction

*Cardamine* in New Zealand has a long and complex taxonomic history, which is outlined below, based on a more detailed account provided by Heenan (2017). The first *Cardamine* species to be recognised in New Zealand was *Sisymbrium heterophyllum* G.Forst. (Forster 1786), and this was transferred to *Cardamine* by Schulz (1903). However, the combination *Cardamine heterophylla* (G.Forst.)

O.E.Schulz is preoccupied in *Cardamine*, and so the new name *C. forsteri* Govaerts was provided (Govaerts 1999). Candolle (1821) provided the name *C. debilis* DC., and although this was not widely used in the years after it was published (e.g., by Hooker 1844, 1864), it was adopted extensively in New Zealand for nearly 60 years (e.g., Allan 1961; Webb et al. 1988). *Cardamine debilis* DC. is an illegitimate name because it includes *Sisymbrium heterophyllum* in synonymy.

The name *Cardamine hirsuta* L. was applied to New Zealand plants by Hooker (1844, 1853, 1864), and this was followed by Kirk (1899) and Cheeseman (1906). Hooker (1844) named the new variety *C. hirsuta* var. *subcarnosa* Hook.f. and provided the new species names *C. corymbosa* Hook.f., *C. depressa* Hook.f. and *C. stellata* Hook.f. Only a few years later Hooker (1853) provided a treatment accepting only two species, and he did not accept any of the species he had named in 1844. He accepted *C. hirsuta* and included *Sisymbrium heterophyllum* and *C. debilis* DC. in synonymy. The second species Hooker (1853) accepted was the newly named *C. divaricata* Hook.f., but this was later treated as a synonym of *C. stylosa* DC. (Candolle 1821). This species is now placed in *Rorippa* as *R. divaricata* (Hook.f.) Garn.-Jones & Jonsell (Garnock-Jones & Jonsell 1988). For further discussion on the Australian and New Zealand *Cardamine* names now placed in *Rorippa*, see Garnock-Jones (1978) and Garnock-Jones & Jonsell (1988).

Hooker (1864) provided a treatment of *Cardamine* that was quite different from his 1844 and 1853 classifications. He continued to recognise *C. hirsuta* var. *subcarnosa*, but added three more varieties: *C. hirsuta* var. *debilis* (DC.) Hook.f. and *C. hirsuta* var. *corymbosa* (Hook.f.) Hook.f., and the new variety *C. hirsuta* var. *uniflora* Hook.f. He also reduced *C. stellata* to the rank of variety, providing the new combination *C. depressa* var. *stellata* (Hook.f.) Hook.f., and he accepted *C. stylosa* DC. and the newly named and described *C. fastigiata* Hook.f. *Cardamine stylosa* is treated by Garnock-Jones (1978) as a synonym of *Rorippa gigantea* (Hook.f.) Garn.-Jones (Garnock-Jones 1978), and *C. fastigiata* is treated as *Pachycladon fastigiatum* (Hook.f.) Heenan & A.D.Mitch. (Heenan et al. 2002).

In his treatment of *Cardamine*, Kirk (1899) followed Hooker (1864) in the recognition of *C. hirsuta* (five varieties), *C. depressa* (two varieties), *C. stylosa*, and *C. fastigiata*. Kirk (1899) also included *C. latesiliqua* Cheeseman (Cheeseman 1883) and *C. enysii* Cheeseman ex Kirk (Kirk 1899); both species are now treated in *Pachycladon* (Heenan et al. 2002). Kirk (1899) described the new species *C. bilobata* Kirk. Kirk's treatment of *C. hirsuta* is notable in that he recognised the autonym *C. hirsuta* var. *hirsuta*. This is the first recognition of this taxon being present in New Zealand and being distinguished from the indigenous varieties of *C. hirsuta*. In his treatment of *C. hirsuta*, Kirk (1899) emphasised variation in stamen number, stating for *C. hirsuta* var. *hirsuta* "stamens usually 4", thereby distinguishing this naturalised taxon from the indigenous varieties with six stamens. Cheeseman's (1906) treatment of *Cardamine* was based on that of Kirk (1899), with the only difference being that under *C. hirsuta* he did not include *C. hirsuta* var. *hirsuta*. The reason for this is quite straightforward, with Kirk (1899) including naturalised species, whereas Cheeseman (1906) comprised only indigenous species.

Cheeseman (1925) provided some significant changes to his 1906 treatment of *Cardamine*, introducing some of the taxonomy proposed in a worldwide revision of the genus by Schulz (1903). Two changes were that Schulz (1903) and Cheeseman (1925) both excluded *C. hirsuta* from the indigenous flora of New Zealand, and they also applied *C. heterophylla* (G.Forst.) O.E.Schulz. The treatment of *C. heterophylla* provided by Schulz (1903) included five infraspecific taxa at various ranks, but these were not mentioned by Cheeseman (1925), because he did not consider Schulz's treatment able to be applied to the diversity of *Cardamine* in New Zealand. The application of the taxonomy proposed by Schulz is still problematic today, because the type specimens of Schulz's five *C. heterophylla* varieties are missing, presumed to have been destroyed when the Berlin Herbarium was damaged by fire in a bombing raid during March 1943 (Heenan 2017). The Schulz (1903) names were published at various infraspecific ranks, so they would not have any priority over the new species names published by Heenan (2017).

Schulz (1903) also reinstated *Cardamine corymbosa* at species rank, and accepted *C. stellata*, *C. depressa* var. *depressa* and *C. depressa* var. *acaulis*. Cheeseman (1925) accepted *C. corymbosa*, but differed from Schulz (1903) in accepting *C. depressa* var. *depressa* and *C. depressa* var. *stellata*, as well as *C. bilobata*, which wasn't mentioned by Schulz (1903). Cheeseman (1925) accepted

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*C. heterophylla* var. *uniflora* (Hook.f.) Cockayne (Cockayne 1909), and Schulz treated *C. hirsuta* var. *uniflora* as a synonym of *C. heterophylla*. Cheeseman (1925) followed Schulz (1903) in treating *C. subcarnosa* as *C. glacialis* var. *subcarnosa* (Hook.f.) O.E.Schulz. Three species treated by earlier authors in *Cardamine* (*C. enysii*, *C. fastigiata*, and *C. latesiliqua*) were considered by Cheeseman (1925) to be species of *Nasturtium* Brown in Aiton (1812), having been formally transferred to that genus by Cheeseman (1911). These three species are now placed in *Pachycladon* (Heenan et al. 2002).

Pritchard (1957) studied morphological variation of *Cardamine* in New Zealand and recognised several unnamed entities that provided the basis for subsequent studies. Pritchard (1957) recognised three unnamed forest races in *C. debilis* ("glossy leaf", "long style" and "narrow petal"), *C. corymbosa* and an affiliated "mainland coastal race", and two alpine races ("tussock race" and "scree race"). The two most recent *Flora of New Zealand* treatments for *Cardamine* accepted six (Allan 1961) and five (Webb et al. 1988) species, with both treatments accepting *C. bilobata*, *C. corymbosa*, *C. debilis*, *C. depressa*, and *C. subcarnosa*. Allan (1961) also accepted *C. uniflora* (Hook.f.) Allan, but this was treated as a synonym of *C. corymbosa* by Webb et al. (1988); Allan (1961) also accepted *C. depressa* var. *stellata* but this was reduced to a synonym of *C. depressa* by Webb et al. (1988). Both of these treatments reinstated at species rank *C. subcarnosa* and recognised two distinct populations of this species. The population of *C. subcarnosa* from Auckland Islands was named as *C. latior* Heenan (Heenan 2008), with *C. subcarnosa* restricted to Campbell Island.

Phylogenetic analyses by Mitchell & Heenan (2000) and artificial hybrids (Heenan 2002) were used as the basis to transfer *Iti lacustris* Garn.-Jones & Johnson (Garnock-Jones & Johnson 1987) to *Cardamine* as *C. lacustris* (Garn.-Jones & P.N.Johnson) Heenan (Heenan 2002). The diminutive and much reduced *C. cubita* Molloy, Heenan & Smissen (Heenan et al. 2013) has been named and described as a new species. Most recently, a monograph of *Cardamine* in New Zealand was published, and this accepts 41 indigenous taxa, an additional four species are accepted as naturalised, and several putative unnamed taxa are discussed (Heenan 2017). One of these putative unnamed taxa was named as *C. panatohea* by Heenan & de Lange (2018).

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## **Cardamine L., Sp. Pl. 654 (1753)**

= *Iti* Garn.-Jones & P.N.Johnson, *New Zealand J. Bot.* 25: 603 (1987)

Herbs annual or perennial. Trichomes absent or present, when present simple. Stems erect, ascending, or decumbent, sometimes rhizomatous, branched or unbranched. Basal leaves rosulate, simple, pinnatifid or pinnatisect, petiolate; lateral leaflets petiolulate, subsessile or sessile. Cauline leaves present or absent, when present alternate, simple, pinnatifid or pinnatisect as basal leaves but usually smaller and narrower. Inflorescences corymbose or racemose, flowers sometimes solitary; ebracteate, elongated in fruit. Fruiting pedicels long and slender or shorter and thickened, erect or spreading. Sepals usually saccate, margin usually membranous. Petals absent or present; when present usually white, sometimes pink or purple; claw usually differentiated from blade and longer than sepals. Filaments 6 and tetradynamous, sometimes 2 or 4 and then equal in length, linear or rarely dilated. Anthers usually yellow or sometimes maroon, glabrous, held at a similar height to stigma. Nectar glands confluent and subtending bases of all stamens. Ovules few to many. Style distinct or sometimes indistinct; stigma capitate, entire. Fruit explosively dehiscent silique or an indehiscent silicle; weakly latiseptate or  $\pm$  terete, smooth or weakly torulose, sessile; valves not veined, glabrous or hairy, dehiscing elastically acropetally, coiled or indehiscent and remaining flattened; replum strongly flattened; septum complete, membranous, translucent. Seeds uniseriate, winged or wingless, flattened; seed coat minutely reticulate; embryo white, venation rarely violet-purple.

**Taxonomy:** *Cardamine* belongs to the family Brassicaceae, tribe Cardamineae, a tribe of 10 genera and over 340 species (Al-Shehbaz et al. 2006). *Cardamine* and *Rorippa* are the largest genera of the tribe, with *Cardamine* comprising about 230 species (Al-Shehbaz et al. 2006; Heenan 2017).

Species of *Cardamine* in New Zealand are morphologically diverse and offer a variety of morphological characters for taxonomic circumscription and identification (Heenan 2017). Some of the more important taxonomic characters include: leaves simple or pinnate and coriaceous or membranous, the presence or absence of leaflet axillary hydathodes, the length and width of the sepals, petals, siliques and seeds, seed size and shape, and the presence or absence of a margin wing.

1	Fruit a silicle or silique, <4.0 mm long.....	2
	Fruit a silique, >6.0 mm long.....	3
2	Leaves broadly orbicular, <2.2 mm long; 2 stamens, bent at distal end; silique <4.0 mm long.....	<i>cubita</i>
	Leaves simple and linear-spathulate or pinnatifid with narrow-spathulate lobes, 20.0–50.0 mm long; 4(–6) stamens, straight; silicle <3.5 mm long.....	<i>lacustris</i>
3	Inflorescence decumbent or prostrate, axillary rosettes present in nodes.....	<i>panatohea</i>
	Inflorescence erect or spreading, axillary rosettes absent from nodes.....	4
4	Leaves simple with a length to width ratio of >1.5 : 1, or pinnatifid with the terminal leaflet having a length to width ratio of >1.5 : 1 and 1–4 basal lobes, usually coriaceous.....	5
	Leaves simple with a length to width ratio $\pm$ 1 : 1 or pinnatisect with the terminal leaflet having a length to width ratio $\pm$ 1 : 1 and 1–14 lateral leaflets with distinct petiolules, usually membranous.....	13
5	Anthers maroon or yellow and flushed maroon.....	6
	Anthers yellow.....	8
6	Sepals 0.8–1.1 mm wide; petals 4.0–7.0 mm long; silique style 0.3–0.5 mm long.....	<i>dimidia</i>
	Sepals 1.3–1.8 mm wide; petals 7.0–11.0 mm long; silique style 1.0–3.5 mm long.....	7
7	Leaves red-brown to brown or occasionally green; filaments linear their entire length, 0.15–0.35 mm wide; silique style 1.7–3.5 mm long.....	<i>bilobata</i>
	Leaves grey-green to green; filaments conspicuously dilated at base, 0.35–0.65 mm wide; silique style 1.0–1.2 mm long.....	<i>dilatata</i>
8	Leaves always simple.....	9
	Leaves simple and pinnatisect or pinnatifid.....	10

<b>9</b>	Leaves membranous, matt, up to 90 mm long, lamina obovate, elliptic, broadly elliptic, petiole up to 60 mm long; sepals 1.9–2.0 mm long; petals 2.6–4.2 mm long; filaments 1.8–2.7 mm long; siliques 7.5–8.0 mm long.....	<i>alticola</i>
	Leaves coriaceous, glossy, up to 45 mm long, lamina narrowly obovate to spatulate, petiole up to 25 mm long; sepals 1.6–1.8 mm long; petals 2.1–3.2 mm long; filaments 1.2–1.3 mm long; siliques 7.0–14.0 mm long.....	<i>sciaphila</i>
<b>10</b>	Leaves usually pinnatisect or pinnatifid, sometimes simple, terminal lobe or simple pinna 2–8 mm long and 0.5–5.0 mm wide; cauline leaves occasionally present, usually pinnatifid or pinnatisect; inflorescence spreading to ascending.....	<i>mutabilis</i>
	Leaves usually simple, sometimes pinnatifid, terminal lobe or simple pinna 3.0–45 mm long and 2.0–23.0 mm wide; cauline leaves usually simple; inflorescence ascending to erect.....	11
<b>11</b>	Leaves membranous, lamina surface glabrous or hairy; inflorescence usually short and held just above the leaves, flowers clustered towards distal end in a corymb; plants of Subantarctic Islands.....	<i>depressa</i>
	Leaves coriaceous, lamina surface glabrous; inflorescence usually elongated and held well above the leaves, flowers distributed along inflorescence, plants of South Island.....	12
<b>12</b>	Leaves grey-green, matt, 4.0–45.0 mm long, 2.5–23.0 mm wide; sepals 2.9–3.0 mm long; inflorescence up to 300 mm long.....	<i>pachyphylla</i>
	Leaves green, purple-brown, brown-green or bronze, glossy, 5.0–20.0 mm long, 2.0–9.5 mm wide; sepals 2.0–2.5 mm long; inflorescence up to 110 mm long.....	<i>dimidia</i>
<b>13</b>	Leaves with axillary hydathodes.....	14
	Leaves without axillary hydathodes.....	20
<b>14</b>	Siliques glabrous.....	15
	Siliques hairy.....	18
<b>15</b>	Leaves coriaceous, terminal leaflet 3.0–7.7 mm long and 2.8–8.6 mm wide; seed wing present, reticulate cells conspicuously thick-walled.....	<i>eminentia</i>
	Leaves membranous, terminal leaflet 3.5–21.0 mm long and 4.7–23.0 mm wide; seed wing absent, reticulate cells not obviously thick-walled.....	16
<b>16</b>	Lateral leaflets 1–2, green to dark green, with indistinct petiolules 0.2–1.5 mm long; petals broadly obovate, 4.2–4.5 mm wide; siliques 2.1–2.4 mm wide; seeds 1.0–1.2 mm wide.....	<i>megalantha</i>
	Lateral leaflets 2–8, light green to green, with distinct petiolules 2.0–20.0 mm long; petals obovate to narrowly obovate, 0.7–3.6 mm wide; siliques 0.7–1.4 mm wide; seeds 0.6–0.9 mm wide.....	17
<b>17</b>	Leaf axillary and marginal hydathodes usually associated with additional hairs; sepals 2.4–3.2 mm long; petals obovate, 4.5–8.0 mm long, 2.5–3.6 mm wide.....	<i>coronata</i>
	Leaf axillary and marginal hydathodes solitary and not associated with additional hairs; sepals 1.3–1.6 mm long; petals narrowly obovate, 2.8–4.5 mm long, 0.7–1.4 mm wide.....	<i>forsteri</i>
<b>18</b>	Terminal leaflet 2.6–7.0 mm long, 3.2–10.0 mm wide; lateral leaflets 2.0–5.0 mm long, 1.8–5.8 mm wide; leaflet margins entire to weakly lobed; siliques 13.0–25.0 mm long.....	<i>bisetosa</i>
	Terminal leaflet 3.5–21.0 mm long, 4.7–26.0 mm wide; lateral leaflets 2.0–20.0 mm long, 2.0–18.0 mm wide; leaflet margins shallowly to deeply lobed; siliques 20.0–38.0 mm long.....	19



<b>19</b>	Leaf axillary and marginal hydathodes usually associated with additional hairs; sepals 2.4–3.2 mm long; petals obovate, 4.5–8.0 mm long, 2.5–3.6 mm wide.....	<i>coronata</i>
	Leaf axillary and marginal hydathodes solitary and not associated with additional hairs; sepals 1.3–1.6 mm long; petals narrowly obovate, 2.8–4.5 mm long, 0.7–1.4 mm wide.....	<i>forsteri</i>
<b>20</b>	Seeds winged.....	21
	Seeds not winged.....	23
<b>21</b>	Leaves membranous; silique 1.5–2.3 mm wide; seed oblong to oblong-elliptic, green to green-brown, wing at apex.....	<i>unguiculus</i>
	Leaves coriaceous; silique 1.1–1.9 mm wide; seed orbicular, broadly oblong to oblong, henna, wing at apex and lateral margin.....	22
<b>22</b>	Leaves glossy, terminal pinna usually with prominent triangular lobes, petiolule <2.5 mm long; inflorescence up to 120 mm long; petals 2.6–7.5 mm long, 0.8–3.8 mm wide; seeds 0.9–1.5 mm long.....	<i>alalata</i>
	Leaves matt, terminal pinna usually irregularly lobed, petiolule 2.0–15.0 mm long; inflorescence up to 350 mm long; petals 5.0–11.0 mm long, 2.5–5.5 mm wide; seeds 1.2–2.1 mm long.....	<i>verna</i>
<b>23</b>	Siliques hairy.....	24
	Siliques glabrous.....	28
<b>24</b>	Silique hairs sparse, patent, 0.35–0.6 mm long.....	<i>hirsuta</i>
	Silique hairs moderate to dense, appressed to spreading, up to 0.35 mm long.....	25
<b>25</b>	Petals 4.5–8.0 mm long, 2.5–3.6 mm wide; sepals 2.4–3.2 mm long, 1.1–1.3 mm wide; median filaments 2.5–4.0 mm long.....	<i>coronata</i>
	Petals 2.7–4.5 mm long, 0.7–1.4 mm wide; sepals 1.2–1.9 mm long, 0.5–0.9 mm wide; median filaments 1.6–2.7 mm long.....	26
<b>26</b>	Leaves 2.6–7.0 mm long, 3.2–10.0 mm wide, petiolule 0.5–5.3 mm long; petals 2.7–3.5 mm long, 0.7–0.8 mm wide; anthers cream to pale yellow or maroon.....	<i>bisetosa</i>
	Leaves 3.1–25.0 mm long, 4.7–25.0 mm wide, petiolule 2.0–16.0 mm long; petals 3.0–4.5 mm long, 0.7–1.4 mm wide; anthers cream or pale yellow.....	27
<b>27</b>	Sepals 1.7–1.9 mm long; median filaments 2.6–2.7 mm long, lateral filaments 2.2–2.3 mm long; silique 1.0–1.4 mm wide; seeds 1.0–1.2 mm long.....	<i>intonsa</i>
	Sepals 1.3–1.6 mm long; median filaments 1.6–2.5 mm long, lateral filaments 1.6–2.0 mm long; silique 0.7–1.1 mm long; seeds 1.2–1.4 mm long.....	<i>forsteri</i>
<b>28</b>	Inflorescence corymbose.....	29
	Inflorescence racemose.....	40
<b>29</b>	Petals >6.5 mm long.....	<i>reptans</i>
	Petals <6.5 mm long.....	30
<b>30</b>	Petals <3.5 mm long.....	31
	Petals 3.5–6.5 mm long.....	33
<b>31</b>	Leaves membranous, green or green-brown, terminal leaflet usually broader than long, adaxial surface usually sparsely to moderately hairy, margins with conspicuous patent hairs; sepals 0.4–0.6 mm wide, with conspicuous spreading hairs; siliques 0.7–0.8 mm wide, usually red-brown, weakly torulose, seed outlines usually visible through valve walls; seeds 0.5–0.7 mm wide.....	<i>heleniae</i>
	Leaves coriaceous or semi-coriaceous, green, terminal leaflet usually with ± equal length to width or longer than broad; adaxial surface glabrous, margin sometimes with a few sparse, inconspicuous hairs; sepals 0.5–1.0 mm wide, usually glabrous; siliques 0.9–1.5 mm wide, green, not torulose, seed outlines not visible through valve walls; seeds 0.9–1.0 mm wide.....	32

<b>32</b>	Leaves with conspicuous marginal hydathodes, terminal leaflet 3.0–11.0 mm long, 1.5–8.0 mm wide; siliques 5.7–14.0 mm long; style 0.3–0.5 mm long.....	<i>exigua</i>
	Leaves with inconspicuous marginal hydathodes, terminal leaflet 1.5–2.5 mm long, 1.0–2.5 mm wide; siliques 13.0–25.0 mm long; style 0.9–1.5 mm long.....	<i>parvula</i>
<b>33</b>	Terminal leaflet longer than wide, base attenuate to cuneate, occasionally obtuse.....	34
	Terminal leaflet similar length to width, base obtuse, truncate or cordate.....	35
<b>34</b>	Leaves usually simple, seldom pinnate, green, membranous, glabrous or sparsely hairy, with 0–2 lateral pinnae; terminal pinna oblong-elliptic, broadly oblong-elliptic to oblong-orbicular, base cuneate to occasionally obtuse; peduncle up to 150 mm long, glabrous; silique 9.0–20.0 mm long.....	<i>integra</i>
	Leaves usually pinnate, seldom simple, green to green-brown, ± coriaceous, glabrous, with 0–6 lateral pinnae; terminal pinna elliptic, broadly elliptic, obovate, ovate or spatulate, base attenuate to cuneate; peduncle up to 30.0 mm long, glabrous or hairy; silique 6.0–11.0 mm long.....	<i>mutabilis</i>
<b>35</b>	Leaves coriaceous.....	36
	Leaves membranous.....	37
<b>36</b>	Leaves green-brown to purple-brown, lateral pinnae 0–2; terminal pinna 2.0–6.0 mm long, 1.8–8.0 mm wide; sepals 1.8–2.4 mm long; siliques 12.0–20.0 mm long.....	<i>serpentina</i>
	Leaves green to green-brown, lateral pinnae 0–4; terminal pinna 2.0–25.0 mm long, 2.0–30.0 mm wide; sepals 2.3–3.0 mm long; siliques 20.0–40.0 mm long.....	<i>glara</i>
<b>37</b>	Sepals 1.1–1.6 mm long; silique 8.0–13.5 mm long.....	<i>unicaulis</i>
	Sepals 1.3–3.0 mm long; silique 12.0–32.0 mm long.....	38
<b>38</b>	Inflorescence up to 180 mm long, with 1–9 corymbs, corymbs 2–19-flowered, occasionally with solitary flowers; leaf terminal pinna 3.0–27.0 mm long, 3.0–30.0 mm wide.....	<i>grandiscapa</i>
	Inflorescence with 1–3 corymbs, corymbs 2–8-flowered, often with solitary flowers; leaf terminal pinna 2.0–18.0 mm long, 2.0–16.0 mm wide.....	39
<b>39</b>	Leaves light green, leaf margin usually shallowly sinuate; sepals 1.8–2.2 mm long; petals 2.1–3.0 mm wide; silique style 0.8–1.0 mm long.....	<i>sinuatifolia</i>
	Leaves green, leaf margin entire; sepals 1.4–2.0 mm long; petals 1.8–2.3 mm wide; silique style 0.2–0.4 mm long.....	<i>corymbosa</i>
<b>40</b>	Lateral pinnae ≥10.....	41
	Lateral pinnae ≤8.....	43
<b>41</b>	Terminal pinna 3.4–4.7 mm long, 3.5–4.1 mm wide; inflorescence up to 50 mm long; silique 1.7–2.2 mm wide.....	<i>latior</i>
	Terminal pinna 2–25 mm long, 2–27 mm wide; inflorescence up to 350 mm long; silique 1.0–1.7 mm wide.....	42
<b>42</b>	Leaf terminal pinna larger than lateral pinnae; sepals 2.5–4.0 mm long, 1.0–2.4 mm wide; petals 7.0–11.0 mm long, 2.1–6.0 mm wide; median filaments 3.2–4.0 mm long, lateral filaments 2.0–2.7 mm long; seeds 1.5–1.7 mm long.....	<i>pratensis</i>
	Leaf terminal pinna similar size to lateral pinnae; sepals 1.5–3.5 mm long, 0.7–1.4 mm wide; petals 2.5–4.0 mm long, 1.0–1.7 mm wide; median filaments 2.3–2.4 mm long, lateral filaments 2.7–2.7 mm long; seeds 0.8–1.0 mm long.....	<i>flexuosa</i>
<b>43</b>	Lateral pinnae ≤2.....	44
	Lateral pinnae ≥3.....	46

44	Leaves coriaceous, grey-green to blue-grey, broadly ovate or broadly orbicular-deltoid, base truncate; sepals sparsely hairy.....	<i>caesiella</i>
	Leaves membranous, green, pandurate, pandurate-orbicular or rhomboid-pandurate, base cordate; sepals glabrous.....	45
45	Sepals 2.7–3.1 mm long; petals 6.0–7.0 mm long, 4.2–4.5 mm wide; silique 2.1–2.4 mm wide; embryo cotyledons without coloured veins.....	<i>megalantha</i>
	Sepals 2.0–2.4 mm long; petals 4.1–4.5 mm long, 1.9–2.3 mm wide; silique 1.1–1.3 mm wide; embryo cotyledons with violet-purple veins.....	<i>porphyroneura</i>
46	Anthers maroon or violet.....	47
	Anthers cream, yellow, pale yellow, sometimes flushed maroon.....	49
47	Lateral pinnae up to 8, petiolules 3.0–20.0 mm long; seed 1.2–1.8 mm long.....	<i>coronata</i>
	Lateral pinnae up to 4, petiolules 0.1–1.5 mm long; seed 0.8–1.3 mm long.....	48
48	Leaves glossy; terminal leaflet orbicular-reniform to deltoid-reniform, base strongly cordate to occasionally ± truncate; cauline leaves 2.0–3.5 mm wide.....	<i>basicola</i>
	Leaves matt; terminal leaflet orbicular-pandurate, weakly pandurate to orbicular-rhomboid, base obtuse, truncate or weakly cordate; cauline leaves up to 1.5 mm wide.....	<i>dactyloides</i>
49	Petals >4.5 mm.....	50
	Petals <4.5 mm.....	54
50	Silique width >1.5 mm.....	51
	Silique width <1.5 mm.....	52
51	Leaves coriaceous, lateral pinnae 2–6; terminal pinna 3.0–7.0 mm long, 2.8–8.6 mm wide, 1–3 marginal hydathodes; petals 4.2–7.0 mm long, 0.9–2.0 mm wide; siliques 1.5–2.0 mm wide; seeds 1.0–1.4 mm long, reticulate cells conspicuously thick-walled.....	<i>eminentia</i>
	Leaves membranous, lateral pinnae 1–2(–4); terminal pinna 4.7–36.0 mm long, 5.5–33.0 mm wide, up to 11 marginal hydathodes; petals 7.5–9.0 mm long, 2.5–5.0 mm wide; siliques 1.8–2.5 mm wide; seeds 1.8–2.2 mm long, reticulate cells not obviously thick-walled.....	<i>polyodontes</i>
52	Sepals 1.2–1.6 mm wide; ovules 22–28; silique style 0.7–1.2 mm long; seeds green.....	<i>chlorina</i>
	Sepals 1.0–1.3 mm wide; ovules 8–20; silique style 1.2–8.5 mm long; seeds henna.....	53
53	Siliques 1.0–1.2 mm wide; style 1.8–8.5 mm long; seeds 0.9–1.2 mm wide.....	<i>dolichostyla</i>
	Siliques 1.1–1.4 mm wide; style 1.2–2.5 mm long; seeds 0.6–0.9 mm wide.....	<i>coronata</i>
54	Sepals 0.3–0.7 mm wide.....	55
	Sepals 0.7–1.4 mm wide.....	57
55	Stamens 4 (rarely 5–6).....	<i>hirsuta</i>
	Stamens 6.....	56
56	Annual herb; petals 1.8–2.3 mm long, 0.4–0.9 mm wide; silique style 0.3–0.5 mm long; seeds 0.7–0.9 mm long, 0.5–0.6 mm wide.....	<i>occulta</i>
	Perennial herb; petals 3.0–4.5 mm long, 0.7–1.4 mm wide; silique style 1.2–1.4 mm long; seeds 1.2–1.4 mm long, 0.6–0.9 mm wide.....	<i>forsteri</i>
57	Leaves membranous; inflorescence slightly flexuose.....	<i>flexuosa</i>
	Leaves coriaceous or subcoriaceous; inflorescence straight.....	58
58	Leaves sparsely hairy, green; silique 9.0–20.0 mm long, style 1.0–1.4 mm long.....	<i>subcarnosa</i>
	Leaves glabrous, grey to grey-green; silique 21.0–34.0 mm long, style 0.7–1.0 mm long.....	<i>thalassica</i>

**Distribution:** *Cardamine* is a worldwide genus that occurs on all continents with the exception of Antarctica (Al-Shehbaz et al. 2006). The New Zealand species occur on the main islands (North, South and Stewart Islands), numerous inshore islands (e.g., Hauraki Gulf islands), as well as many of the offshore islands such as Chatham Islands and the subantarctic Campbell Islands and Auckland Islands (Heenan 2017). They occur from the coast to the alpine zone, and occupy wetlands, forests, scree and rock bluff habitats.

**Biostatus:** Indigenous (Non-endemic).

**Table 1:** Number of species in New Zealand within *Cardamine* L.

Category	Number
Indigenous (Endemic)	41
Indigenous (Non-endemic)	1
Exotic: Fully Naturalised	4
<b>Total</b>	<b>46</b>

**Recognition:** The following two tables provide habitat (Table 2) and character (Table 3) that may help distinguish between the species.

**Table 2:**

Synopsis of some major habitat types occupied and characters shared by species of *Cardamine* in New Zealand. o, obligate; f, facultative.

Habitat	Species
Alpine scree	<i>C. alalata</i> , <i>C. eminentia</i> , <i>C. glara</i> , <i>C. parvula</i> , <i>C. serpentina</i> , <i>C. thalassica</i>
Alpine bluffs, bouldery rubble	<i>C. alticola</i> , <i>C. basicola</i> , <i>C. corymbosa</i> , <i>C. dimidia</i> , <i>C. intonsa</i> , <i>C. megalantha</i> , <i>C. sciaphila</i>
Alpine wetland, seepages	<i>C. exigua</i> , <i>C. reptans</i>
Forest, shrubland	<i>C. chlorina</i> , <i>C. corymbosa</i> , <i>C. dolichostyla</i> , <i>C. forsteri</i> , <i>C. intonsa</i> , <i>C. polyodontes</i> , <i>C. unguiculus</i>
Limestone or marble	<i>C. basicola</i> (o), <i>C. bilobata</i> (f), <i>C. bisetosa</i> (o), <i>C. caesiella</i> (o), <i>C. coronata</i> (o), <i>C. grandiscapa</i> (f), <i>C. integra</i> (o), <i>C. verna</i> (o)
Low-elevation bluffs	<i>C. dilatata</i> , <i>C. pachyphylla</i>
River gravels	<i>C. corymbosa</i> , <i>C. glara</i> , <i>C. verna</i>
Shrubland, herbfield (main New Zealand islands)	<i>C. corymbosa</i> , <i>C. dolichostyla</i> , <i>C. forsteri</i> , <i>C. polyodontes</i> , <i>C. unguiculus</i> , <i>C. unicaulis</i>
Shrubland, herbfield (subantarctic islands)	<i>C. corymbosa</i> , <i>C. depressa</i> subsp. <i>depressa</i> , <i>C. depressa</i> subsp. <i>stellata</i> , <i>C. latior</i> , <i>C. subcarnosa</i>
Ultramafic outcrops	<i>C. dactyloides</i> (o), <i>C. eminentia</i> (f), <i>C. porphyroneura</i> (o), <i>C. serpentina</i> (o)
Weedy habitats occupied by indigenous species	<i>C. corymbosa</i> , <i>C. forsteri</i> , <i>C. grandiscapa</i> , <i>C. heleniae</i> , <i>C. unicaulis</i>
Weedy habitats occupied by naturalised species	<i>C. flexuosa</i> , <i>C. hirsuta</i> , <i>C. occulta</i> , <i>C. pratensis</i>
Wetland, seepages (often ephemeral)	<i>C. cubita</i> , <i>C. exigua</i> , <i>C. lacustris</i> , <i>C. mutabilis</i> , <i>C. panatohea</i> , <i>C. reptans</i> , <i>C. sinuatifolia</i> , <i>C. unguiculus</i> , <i>C. unicaulis</i>

**Table 3:** Synopsis of some major characters shared by species of *Cardamine* in New Zealand.

Characters	Species
Anthers maroon or yellow and flushed maroon	<i>C. basicola</i> , <i>C. bilobata</i> , <i>C. bisetosa</i> , <i>C. coronata</i> , <i>C. dactyloides</i> , <i>C. dilatata</i> , <i>C. dimidia</i> , <i>C. polyodontes</i>
Hydathodes in leaflet axils	<i>C. bisetosa</i> , <i>C. coronata</i> , <i>C. eminentia</i> , <i>C. forsteri</i> , <i>C. megalantha</i>
Coriaceous leaves, usually with lobes	<i>C. bilobata</i> , <i>C. dilatata</i> , <i>C. dimidia</i> , <i>C. pachyphylla</i>
Glossy leaves	<i>C. alalata</i> , <i>C. basicola</i> , <i>C. dimidia</i> , <i>C. eminentia</i> , <i>C. sciaphila</i>
Pinnate leaves, membranous/subcoriaceous	<i>C. alalata</i> , <i>C. bisetosa</i> , <i>C. chlorina</i> , <i>C. coronata</i> , <i>C. corymbosa</i> , <i>C. cubita</i> , <i>C. dactyloides</i> , <i>C. dolichostyla</i> , <i>C. exigua</i> , <i>C. forsteri</i> , <i>C. heleniae</i> , <i>C. integra</i> , <i>C. intonsa</i> , <i>C. lacustris</i> , <i>C. megalantha</i> , <i>C. mutabilis</i> , <i>C. porphyroneura</i> , <i>C. sinuatifolia</i> , <i>C. subcarnosa</i> , <i>C. unguiculus</i> , <i>C. unicaulis</i>
Pinnate leaves, coriaceous	<i>C. basicola</i> , <i>C. caesiella</i> , <i>C. eminentia</i> , <i>C. exigua</i> , <i>C. glara</i> , <i>C. grandiscapa</i> , <i>C. latior</i> , <i>C. parvula</i> , <i>C. reptans</i> , <i>C. serpentina</i> , <i>C. subcarnosa</i> , <i>C. thalassica</i> , <i>C. verna</i>
Seeds with wings	<i>C. alalata</i> , <i>C. eminentia</i> , <i>C. unguiculus</i> , <i>C. verna</i>
Siliques hairy	<i>C. bisetosa</i> , <i>C. coronata</i> , <i>C. forsteri</i> , <i>C. hirsuta</i> , <i>C. intonsa</i>
Simple leaves	<i>C. alticola</i> , <i>C. basicola</i> , <i>C. depressa</i> subsp. <i>depressa</i> , <i>C. depressa</i> subsp. <i>stellata</i> , <i>C. mutabilis</i> , <i>C. sciaphila</i>

**Hybridisation:** *Cardamine verna* × *C. corymbosa*. A single plant has features that indicate it may be a putative hybrid between *C. verna* (female) and *C. corymbosa* (male) (CHR 618326). This plant was collected from Isolation Creek, Marlborough, where it was growing among other seedlings of *C. verna* and with *C. corymbosa* growing nearby; this putative hybrid plant was cultivated at Lincoln. A hybrid origin is indicated by features of *C. corymbosa*, such as corymbose inflorescence; patent hairs on sepals and leaf margins; and rounded cauline leaflets. Features of *C. verna* include large and robust growth habit; leaves upright to spreading, brown-green, slightly irregular in shape, up to 120 mm long and coriaceous; and the inflorescences branched, upright, and up to 200 mm high. In addition, using Alexander's Differential Stain, pollen stainability of the putative hybrid was moderate (54.7%), whereas plants of the putative parents from this site have high percentages of pollen stainability (*C. verna* 98.6%; *C. corymbosa* 99.6%).

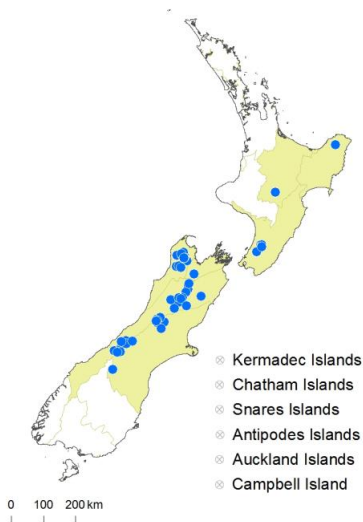
*Cardamine corymbosa* × *C. verna*. Three plants have features that indicate they may be putative hybrids between *C. corymbosa* (female) and *C. verna* (male) (e.g., CHR 618324–618325). These plants were collected from Isolation Creek, Marlborough, where they were growing among other plants of *C. corymbosa* and with *C. verna* growing nearby; the putative hybrid plants were cultivated at Lincoln. These plants resemble *C. corymbosa* in having a compact growth habit; leaves low and spreading and with patent marginal hairs; corymbose inflorescences; and apetalous flowers. Features of *C. verna* include the robust growth habit; leaves up to 140 mm long and the leaflets irregularly shaped; and inflorescences up to 180 mm long. Using Alexander's Differential Stain, pollen stainability of the three putative hybrids was low to moderate (27.4%, 29.4%, and 62.1%), whereas plants of the putative parents from this site have close to 100% pollen stainability (see above).

## ***Cardamine alalata* Heenan, *Phytotaxa* 330: 33–36 (2017)**

Holotype: North side Mount Annan, forming close clump, c. 14 cm across, nival zone rock face, 8120', 27 February 1971, H. D. Wilson s.n., CHR 254277!

**Etymology:** The specific epithet *alalata* (Latin: winged) refers to the marginal wing of the seed.

Perennial herb, single rosette or multiple rosettes on short lateral branches, rhizomatous. Leaves up to 100 mm long, simple or pinnatisect; lamina 5.0–36.0 × 6.0–16.0 mm, green to grey-green, often flushed purple, coriaceous, glabrous on abaxial surface, glabrous to sparsely hairy on adaxial surface, margin and petiole, glossy; hairs 0.4–0.5 mm long, spreading to patent; petiole up to 80 mm long, sparsely to moderately hairy or occasionally glabrous. Terminal pinna 3.0–13.0 × 4.0–17.0 mm, simple to slightly 3-lobed, broadly orbicular, broadly reniform; orbicular-deltoid to orbicular-rhomboid; margin entire or with 2 lateral triangular lobes, 2(–4) distinct hydathodes; apex obtuse with a distinct hydathode; base cordate, truncate or occasionally obtuse. Lateral pinnae 2–6 or absent, 1.3–9.0 × 0.7–10.0, simple to sometimes slightly 2-lobed, orbicular to broadly elliptic-orbicular; margin with 0(–2) distinct hydathodes; apex obtuse with a distinct hydathode; base obtuse, often oblique; sessile or petiolule up to 2.5(–8.0) mm long. Cauline leaves similar to rosette leaves but smaller and narrower, with fewer lateral pinnae, pinnae bases attenuate to cuneate; terminal pinna up to 18.0 × 5.4 mm; lateral pinnae up to 4.2 × 2.6 mm. Inflorescence racemose to cymose-racemose, each 1–12-flowered; peduncle up to 120 mm long, 0.5–2.0 mm diam. at base, spreading to ascending, glabrous. Pedicels 6.0–9.0 mm long, 0.2–0.7 mm diam., glabrous. Sepals 1.8–3.2 × 0.8–1.4 mm, elliptic-oblong, saccate, green to red-brown, glabrous, margin white and membranous, apex obtuse, base truncate. Petals 2.6–7.5 × 0.8–3.8 mm, white, limb obovate; apex obtuse; base attenuate to obtuse, tapering to a 1.0–2.5 mm long claw. Stamens 6; median filaments (3–)4, 1.9–4.0 mm long; lateral filaments 2, 1.7–3.2 mm long; anthers 0.4–0.8 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 2.2–4.3 mm long, 0.4–0.7 mm diam., ± terete, green to reddish green, glabrous; ovules 20–28; style 0.2–0.4 mm long, ± terete; stigma 0.4–0.5 mm diam. Siliques 9.0–38.0 × 1.1–1.9 mm, glabrous, style 0.8–2.6 mm long; valves green, purple-green to purple-brown at maturity and when dehiscent; replum 0.3–0.5 mm wide. Seeds 0.9–1.5 mm long, 0.8–1.1 mm wide, 0.3–0.5 mm thick, orbicular, oblong to broadly oblong, henna; wing present at apex and lateral margin, <0.1 mm wide.



**Fig. 1:** *Cardamine alalata* distribution map based on databased records at AK, CHR, OTA & WELT.

This species was also previously referred to as *C.* "high altitude glossy green" (Wilson 1976), *C.* "high altitude" (Wilson 1978), and *C.* "aff. *uniflora* Mt Cook" (P. Wardle, specimens in Allan Herbarium, CHR).

**Distribution:** North Island: Gisborne, Volcanic Plateau, Southern North Island.

South Island: Western Nelson, Sounds Nelson, Marlborough, Canterbury, Westland.

**Biostatus:** Indigenous (Endemic).

*Cardamine alalata* is assessed as having a conservation status of Not Threatened (de Lange *et al.* 2018).

**Habitat:** *Cardamine alalata* occurs on ledges and crevices of alpine rock bluffs, but has also been collected from river gravels, rocky ground, cliffs, scree, damp seepages, and herbfield. It is known from a single lower altitude (600 m) stony site in the Karangarua Valley, Westland.

**Phenology:** Flowering December–March; Fruiting December–March.

**Notes:** Specimens referable to *C. alalata* were included in *Cardamine* "Scree Race" by Druce (1993), although Pritchard (1957) specifically mentioned in his description that the plants he referred to *C.* "Scree Race" had inconspicuous leaf hydathodes; the hydathodes of *C. alalata* are conspicuous.



**Fig. 2:** *Cardamine alalata*. Plant with rosette leaves.



**Fig. 3:** *Cardamine alalata*. Rosette leaf variation.



**Fig. 4:** *Cardamine alalata*. Cauline leaf.



**Fig. 5:** *Cardamine alalata*. Inflorescence with flower buds and newly opened flowers.



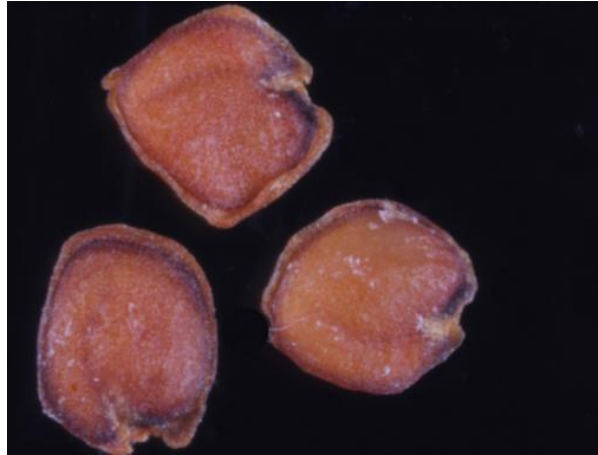
**Fig. 6:** *Cardamine alalata*. Side view of open flowers.



**Fig. 7:** *Cardamine alalata*. Top view of open flowers.



**Fig. 8:** *Cardamine alalata*. Siliques dehiscent and indehiscent.



**Fig. 9:** *Cardamine alalata*. Seeds, with prominent wing.

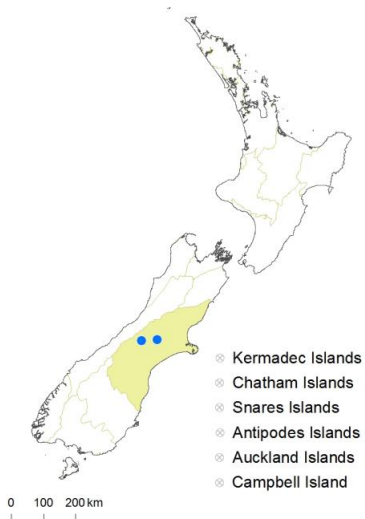
### ***Cardamine alticola* Heenan, *Phytotaxa* 330: 36–38 (2017)**

Holotype: Canterbury Land District, Mt Hutt Skifield, South Peak, Mount Hutt Range, 1900 m, greywacke rock in cracks around the lower parts of the cliffs, 1 February 2006, *P. B. Heenan s.n.*, CHR 504412!

**Etymology:** The specific epithet *alticola* (Latin: dweller in the heights) refers to the high alpine habitat and distribution of this species.

Perennial herb, single rosette or multiple rosettes on short lateral branches, stem and branches 1.2–1.7 mm diam. Leaves up to 90 mm long, simple; pinna 9.0–30.0 × 3.0–11.0 mm, green, glabrous or sparsely hairy, matt, membranous, obovate, elliptic to broadly elliptic, margin entire, apex subacute or occasionally obtuse and with a hydathode; base attenuate to cuneate; petiole up to 60 mm long, plano-convex, glabrous. Cauline leaves absent. Inflorescence a corymb, 2–4-flowered, flowers sometimes solitary; peduncle 7–30 mm long, 0.7–0.9 mm diam. at base, ascending, glabrous. Pedicels 50.0–90.0 mm long, 0.4–0.5 mm diam., flexuose, glabrous. Sepals 1.9–2.0 × 0.8–1.4 mm, elliptic-oblong to broadly elliptic, ± saccate, green and sometimes flushed red-brown at apex, glabrous, margin white and membranous, apex obtuse, base truncate. Petals 2.6–4.2 × 0.9–2.0 mm, white, limb obovate to broadly obovate; apex obtuse; base cuneate, tapering to a 0.9–1.0 mm long claw. Stamens 6; median filaments 4, 2.1–2.7 mm long; lateral filaments 2, 1.8–2.2 mm long; anthers 0.25–0.4 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 2.1–2.6 mm long, 0.3–0.4 mm diam., ± terete, green, glabrous; ovules 8–10; style 0.2–0.3 mm long, ± terete; stigma 0.3–0.4 mm diam. Siliques 7.5–8.0 × 0.9–1.1 mm, glabrous, style 1.0–1.2 mm long; valves green at maturity; straw-coloured when dehiscent, replum 0.3–0.4 mm wide. Seeds 1.1–1.2 mm long, 0.8–1.0 mm wide, 0.3–0.4 mm thick, obovate-oblong to oblong, pale yellow-brown to henna; wing absent.





**Fig. 10:** *Cardamine alticola* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** South Island: Canterbury.

**Biostatus:** Indigenous (Endemic).

*Cardamine alticola* is assessed as having a conservation status of Threatened, Nationally Critical (A2), with the qualifier Data Poor (de Lange *et al.* 2018). The qualifier Data Poor is applied since there is considerable suitable alpine habitat for this species between the Rangitata and Rakaia rivers (central Canterbury) in the vicinity of the two known populations, and field survey is likely to locate further populations.

**Habitat:** *Cardamine alticola* is known from two localities (Mt Hutt and Mt Potts) in the eastern Southern Alps. At both sites it occurs on shaded ledges and crevices on high alpine cliffs at an altitude of 1850–2000 m.

**Phenology:** Flowering February; Fruiting March–April.



**Fig. 11:** *Cardamine alticola*. Fruiting plant.



**Fig. 12:** *Cardamine alticola*. Rosette leaves.



**Fig. 13:** *Cardamine alticola*. Rosette leaves.



**Fig. 14:** *Cardamine alticola*. Flower.



Fig. 15: *Cardamine alticola*. Flower.

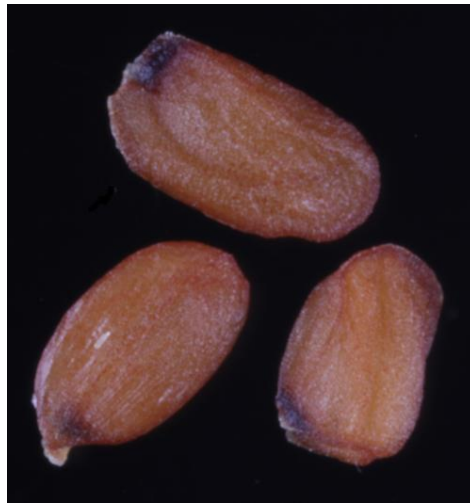


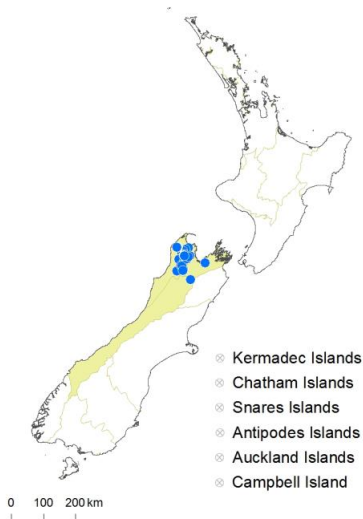
Fig. 16: *Cardamine alticola*. Seeds.

### ***Cardamine basicola* Heenan, *Phytotaxa* 330: 38–39 (2017)**

Holotype: Mt Owen, 6100', herbfield, January 1972, A. P. Druce s.n., CHR 249807!

**Etymology:** The specific epithet *basicola* (Latin: base-rich dwelling place) refers to its distribution and preference for habitats on limestone and marble substrates.

Perennial herb, single rosette or with short lateral branches, stem and branches 1.0–1.6 mm diam. Leaves up to 95 mm long, simple or pinnatisect; lamina 2.0–38.0 × 2.0–16.5 mm, glossy, dark green, rarely purple-brown, glabrous or rarely sparsely hairy, coriaceous. Terminal pinna 2.0–15.0 × 2.0–16.5 mm, orbicular-reniform to deltoid-reniform, margin entire or with 2 lateral hydathodes, apex obtuse and entire or with a distinct hydathode; base usually strongly cordate, sometimes ± truncate. Lateral pinnae 1–4 or absent, 1.0–5.0 × 1.0–6.5 mm, orbicular to broadly orbicular, sessile or petiolule up to 1.0 mm long; petiole up to 80 mm long, plano-convex, glabrous. Cauline leaves often subtending lower pedicels, elliptic to linear-lanceolate, smaller, with fewer lateral pinnae than rosette leaves; upper leaves 5.0–10.0 × 2.0–3.5 mm, pinna increasingly linear, pinnatisect, pinnatifid or simple, glabrous or rarely sparsely hairy. Inflorescence racemose, with 1–3 lateral racemes, each raceme 2–12-flowered and often with scattered flowers lower down the peduncle, flowers occasionally solitary; peduncle up to 250 mm long, 0.5–1.5 mm diam. at base, spreading to ascending, glabrous. Pedicels 6.0–30.0(–50) mm long, 0.3–0.7 mm diam., glabrous. Sepals 1.8–3.3 × 0.9–1.5 mm, elliptic-oblong to broadly elliptic, ± saccate, green and sometimes flushed red-brown, glabrous or sparsely hairy, hairs 0.4–0.7 mm long; margin white and membranous, apex obtuse, base truncate. Petals 4.8–8.0 × 2.2–4.6 mm, white, limb obovate to broadly obovate; apex obtuse; base cuneate, tapering to a 1.0–1.5 mm long claw. Stamens 6; median filaments 4, 2.7–4.0 mm long; lateral filaments 2, 2.2–3.3 mm long; anthers 0.5–0.8 mm long, maroon or cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 3.2–4.0 mm long, 0.4–0.6 mm diam., ± terete, green, glabrous; ovules 26–32; style 0.2–1.0 mm long, ± terete; stigma 0.4–0.6 mm diam. Siliques 11.0–36.0 × 1.0–1.7 mm, glabrous, style 0.5–3.3 mm long; valves green or red-brown at maturity; straw-coloured when dehiscent, replum 0.4–0.5 mm wide. Seeds 0.9–1.3 mm long, 0.7–0.9 mm wide, 0.3–0.4 mm thick, orbicular to oblong, yellow-brown to henna; wing absent.



**Fig. 17:** *Cardamine basicola* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** South Island: Western Nelson, Sounds Nelson, Westland.

**Biostatus:** Indigenous (Endemic).

*Cardamine basicola* is assessed as having a conservation status of Not Threatened (de Lange *et al.* 2018).

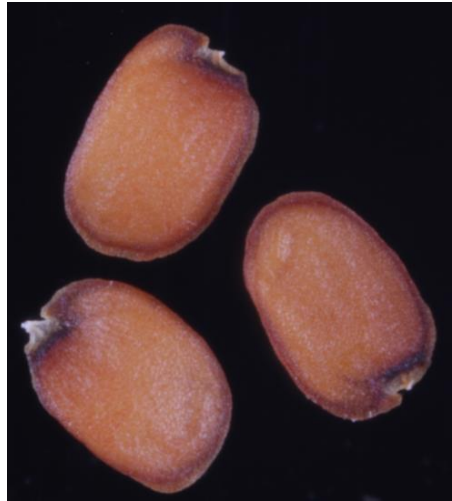
**Habitat:** *Cardamine basicola* most commonly grows on shaded crevices and ledges on limestone and marble cliffs and rock outcrops in forest and open habitats, and less commonly on conglomerate boulders, grassland, and scree. On Dun Mountain (north-eastern Nelson) *C. basicola* occurs on ultramafic soils, where it grows in shaded and/or moist crevices and overhangs among rock outcrops and bluffs; in open, sparsely vegetated areas among *Chionochloa defracta* where there is good soil moisture; and in forest.

**Phenology:** Flowering December–April; Fruiting January–May.

**Notes:** Previously known by the tagname *C. "calcicole"*.



**Fig. 18:** *Cardamine basicola*. Plant with rosette leaves.



**Fig. 19:** *Cardamine basicola*. Seeds.

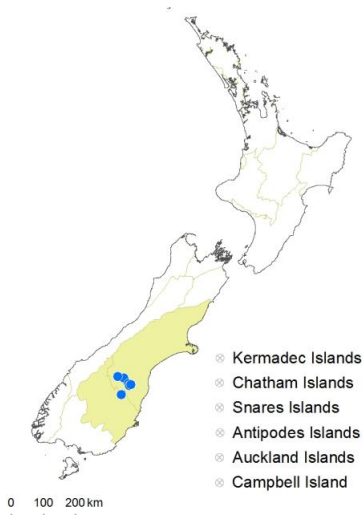
### ***Cardamine bilobata* Kirk, *Stud. Fl. New Zealand* 27 (1899)**

Lectotype (designated by Heenan 2017): Kurow, 400 to 2000 ft., *D. P[etrie] s.n.*, WELT 27982!

**Etymology:** The specific epithet *bilobata* (Latin: two lobed) probably refers to the lobed leaves.

Perennial herb, single rosette or multiple rosettes on short lateral branches, stem and branches up to 3.5 mm diam. Leaves up to 115 mm long, simple, pinnatifid or pinnatisect; lamina 4.3–34.0 × 2.5–13.5 mm, red-brown to brown, occasionally green, glabrous, glabrate or sparsely hairy, glossy, coriaceous, ovate, obovate or oblong; apex obtuse, the hydathode distinct or indistinct; base cuneate, occasionally ± obtuse or attenuate; margin entire or sometimes with 2–4 irregular basal lobes or pinnae; margin and adaxial surface occasionally with hairs up to c. 0.4 mm long; petioles up to 95 mm long, plano-convex, glabrous. Cauline leaves absent. Inflorescences racemose or flowers in loose whorls, often branched, 4–20-flowered; up to 150 mm high, up to 1.2 mm diam. at base, upright, glabrous, green, red-brown to brown. Pedicels up to 30 mm long, c. 0.6 mm diam., stout, glabrous. Sepals 2.3–3.1 × 1.3–1.8 mm, oblong to oval, ± saccate, green, green-brown to red-brown, glabrous, margin white and membranous, apex obtuse, base truncate. Petals 7.0–10.5 × 2.7–5.5 mm, white, limb obovate; apex obtuse; base attenuate, tapering to a 1.0–2.0 mm long claw. Stamens 6, linear along their length, 0.15–0.3 mm wide; median filaments 4, 3.3–5.5 mm long, lateral filaments 2,

2.2–4.8 mm long; anthers 0.6–1.3 mm long, maroon or yellow and flushed maroon, held below or at a similar height to the stigma. Ovary 2.3–6.0 mm long, 0.6–0.8 mm diam., terete, green, glabrous; ovules 24–34; style 1.0–1.8 mm long, terete, compressed slightly; stigma 0.5–0.7 mm diam. Siliques 10.0–29.0 × 1.2–1.7 mm, upright, glabrous, valves brown or green-brown at maturity, style 1.7–3.5 mm long, replum 0.3–0.4 mm wide. Seeds 1.0–1.3 mm long, 0.9–1.0 mm wide, 0.4–0.5 mm thick, orbicular to oblong, henna; wing absent.



**Fig. 20:** *Cardamine bilobata* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** South Island: Canterbury, Otago.

*Cardamine bilobata* occurs in North Otago and South Canterbury, with early collections indicating it was once common in the vicinity of Kurow, Waitaki River valley, but it is currently known from only one site at Awahokomo limestone (near Kurow). Two collections from Mt Edward, South Canterbury, may be referable to *C. bilobata* or *C. dimidia* as they have leaves with a large, elongate terminal lobe and smaller basal lobes; flowering plants from this area are necessary to confirm their identity (Heenan 2017).

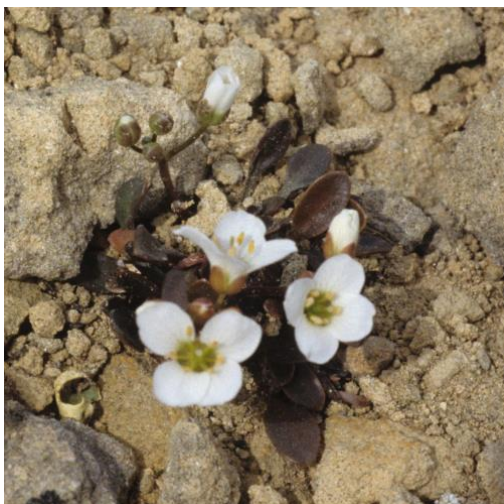
**Biostatus:** Indigenous (Endemic).

*Cardamine bilobata* is assessed as having a conservation status of Threatened, Nationally Critical (A1), with the qualifiers Conservation Dependent and Data Poor (de Lange *et al.* 2018). The qualifier Conservation Dependent is applied because at the largest known population at Awahokomo limestone outcrop (North Otago) hand weeding is regularly undertaken to control naturalised species. Data Poor is applied because further field surveys are required to locate additional populations, and in particular to revisit sites where *C. bilobata* has previously been collected (e.g., West Eweburn

Dam, North Otago).

**Habitat:** *Cardamine bilobata* grows in shallow limestone soils at Awahokomo.

**Phenology:** Flowering September–December; Fruiting September–December.



**Fig. 21:** *Cardamine bilobata*. Flowering plant.



**Fig. 22:** *Cardamine bilobata*. Fruiting plant.



**Fig. 23:** *Cardamine bilobata*. Rosette leaves.



**Fig. 24:** *Cardamine bilobata*. Inflorescence with flower buds and flowers.



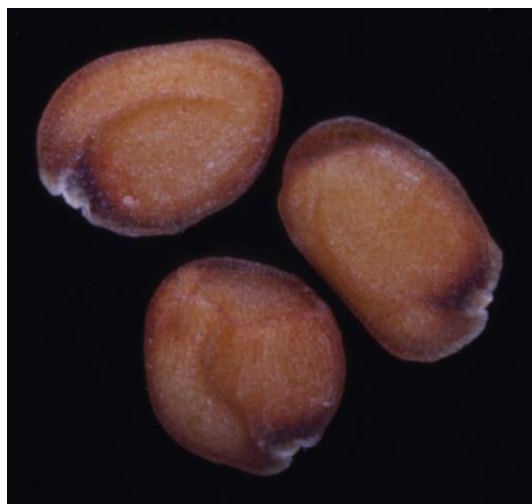
**Fig. 25:** *Cardamine bilobata*. Side view of open flower.



**Fig. 26:** *Cardamine bilobata*. Top view of open flower.



**Fig. 27:** *Cardamine bilobata*. Flower with the petals removed to show the long style.



**Fig. 28:** *Cardamine bilobata*. Seeds.

## *Cardamine bisetosa* Heenan, *Phytotaxa* 330: 42–44 (2017)

Holotype: Taraponui, Maungaharuru Range, 3800 ft., limestone ravine, December 1970, A. P. Druce s.n., CHR 221118!

**Etymology:** The specific epithet *bisetosa* (Latin: two hair types) refers to the ovary, silique and pedicels usually having short, appressed, retrorse hairs and the leaves and stems usually having longer, spreading hairs.

Perennial herb, single rosette or with lateral branches. Leaves up to 70 mm long, pinnatisect; lamina 10.0–35.0 × 7.0–15.0 mm, green, membranous, glabrous to sparsely hairy on abaxial surface, sparsely to moderately hairy on adaxial surface, margin and petiole; hairs 0.2–0.5 mm long, spreading to patent; hydathode in leaflet axil, c. 0.1 mm long; petiole up to 36 mm long, with sparse, weakly spreading hairs. Terminal pinna 2.6–7.0 × 3.2–10.0 mm, simple, broadly orbicular to broadly reniform; margin usually shallowly lobed, with 2–4 distinct hydathodes; apex obtuse with a distinct hydathode; base cordate, truncate or occasionally obtuse. Lateral pinnae 2–6, 2.0–5.0 × 1.8–5.8 mm, orbicular to broadly elliptic-orbicular; margin usually shallowly lobed, with 1–2 distinct hydathodes; apex obtuse with a distinct hydathode; base cordate, truncate or obtuse; petiolule 0.5–5.3 mm long. Cauline leaves similar to rosette leaves but smaller, narrower, with fewer lateral pinnae, pinnae bases attenuate to cuneate; terminal pinna up to 4.0 × 4.2 mm, lateral pinnae up to 3.5 × 2.5 mm. Inflorescence corymbose to corymbose-racemose, with lateral corymbs, each corymb 1–3-flowered; peduncle up to 150 mm long, 0.5–0.8 mm diam. at base, spreading to ascending, sparsely to densely hairy, occasionally glabrous. Pedicels 1.0–25.0 mm long, 0.2–0.3 mm diam., sparsely to densely hairy, hairs appressed and retrorse. Sepals 1.2–1.6 × 0.6–0.8 mm, elliptic-oblong, saccate, green to red-brown, sparsely hairy, hairs spreading to patent, margin white and membranous, apex obtuse, base truncate. Petals 2.7–3.5 × 0.7–0.9 mm, white, limb narrowly obovate; apex obtuse; base attenuate, tapering to a c. 0.2 mm long claw. Stamens 6; median filaments 4, 1.8–2.3 mm long; lateral filaments 2, 1.2–2.0 mm long; anthers 0.3–0.4 mm long, cream to pale yellow or maroon, when dehiscent held at a similar height to or slightly below the stigma. Ovary 2.5–2.7 mm long, 0.3–0.4 mm diam., ± terete, green, moderately to densely hairy; hairs <0.1 mm long, retrorse; ovules 14–18; style c. 0.2 mm long, ± terete; stigma 0.2–0.3 mm diam. Siliques 13.0–25.0 × 0.9–1.2 mm, hairs moderate to dense, appressed and retrorse, style 0.4–2.2 mm long; valves yellow-green to green-brown at maturity and when dehiscent; replum 0.2–0.3 mm wide. Seeds 1.0–1.3 mm long, 0.6–1.0 mm wide, 0.2–0.25 mm thick, oblong to broadly oblong, henna-green to henna; wing absent.

**Distribution:** North Island: Volcanic Plateau, Southern North Island.

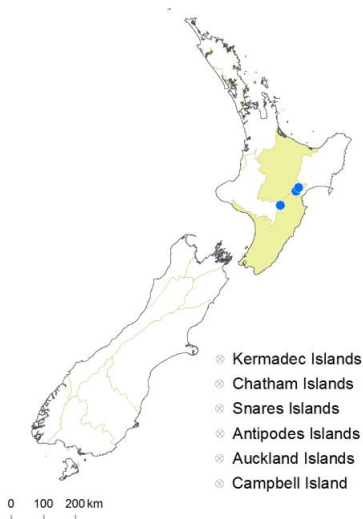
**Biostatus:** Indigenous (Endemic).

*Cardamine bisetosa* is assessed as having a conservation status of Threatened, Nationally Endangered (B1), with the qualifier Data Poor (de Lange *et al.* 2018). The qualifier Data Poor is applied because further field survey is required to determine the number of plants occurring at the known populations and to survey other suitable limestone habitat for new populations.

**Habitat:** *Cardamine bisetosa* occurs on limestone, usually in shade at the margin of sinkholes, cliffs, and ravines.

**Phenology:** Flowering November–January; Fruiting November–January.

**Notes:** Three specimens from Titapu, on the western flank of the Ruahine Range, have glabrous to very sparsely hairy leaves and stems. These differ from specimens to the east of the Ruahine Range that have sparsely to moderately hairy leaves and stems.



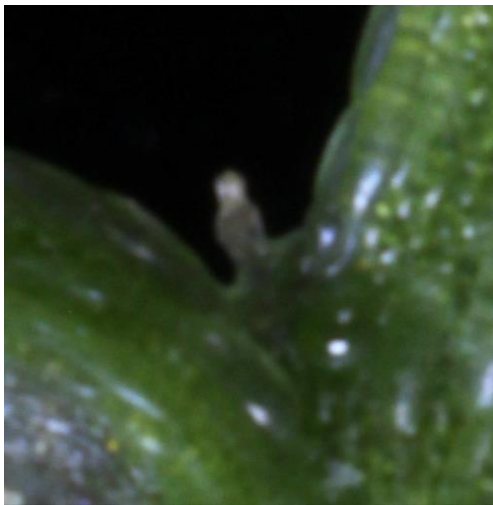
**Fig. 29:** *Cardamine bisetosa* distribution map based on databased records at AK, CHR, OTA & WELT.



**Fig. 30:** *Cardamine bisetosa*. Rosette leaves.



**Fig. 31:** *Cardamine bisetosa*. Cauline leaves.



**Fig. 32:** *Cardamine bisetosa*. Leaflet axillary hydathode.



**Fig. 33:** *Cardamine bisetosa*. Side view of flower.



**Fig. 34:** *Cardamine bisetosa*. Side view of flower.



**Fig. 35:** *Cardamine bisetosa*. Top view of flower.

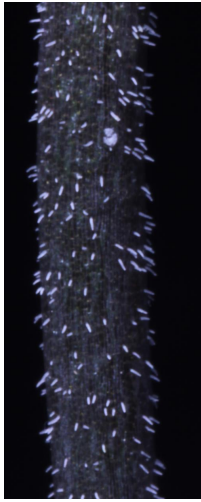


Fig. 36: *Cardamine bisetosa*. Siliques hairs.



Fig. 37: *Cardamine bisetosa*. Inflorescence with siliques.



Fig. 38: *Cardamine bisetosa*. Seeds.

### ***Cardamine caesiella* Heenan, *Phytotaxa* 330: 44–46 (2017)**

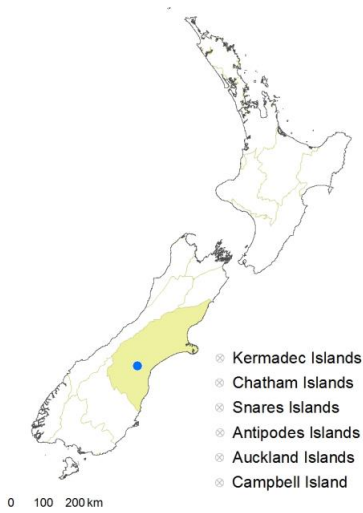
Holotype: Canterbury Land District, South Canterbury, Waratah Road, Manahune, 520 m, among limestone boulders on slope and bluffs and scattered among herbs, 16 December 2015, *P. B. Heenan s.n.*, CHR 640339!

**Etymology:** The specific epithet *caesiella* (Latin: somewhat blue-grey) refers to the colour of the leaves.

Perennial herb, single rosette or with short lateral branches. Leaves up to 90 mm long, simple or pinnatisect; lamina 1.8–45.0 × 1.8–32.0 mm, grey-green to blue-grey, coriaceous, glabrous or margin with spreading to patent hairs 0.3–0.4 mm long, petiole up to 27 mm long, sparsely hairy, hairs 0.3–0.4 mm long, spreading to patent. Terminal pinna 1.8–45.0 × 1.8–32.0 mm, simple, broadly ovate, broadly orbicular-deltoid; margin entire to shallowly sinuate, with 5–6 indistinct hydathodes; apex obtuse with an indistinct hydathode; base truncate or occasionally obtuse. Lateral pinnae absent or 1–2, 3.0–16.0 × 2.0–10.0, obovate, broadly elliptic, broadly ovate, or broadly elliptic-rhomboid; apex obtuse; base often oblique; petiolule 0.2–1.0 mm long. Cauline leaves similar to rosette leaves but smaller, narrower, pinnae bases attenuate to cuneate; terminal pinna up to 20.0 × 11.5 mm, often with 1–2 lateral teeth, lateral pinnae up to 10.5 × 3.5 mm. Inflorescence racemose, sometimes with lateral racemes, each raceme 3–12-flowered; peduncle up to 230 mm long, 0.3–1.6 mm diam. at base, spreading to ascending, glabrous. Pedicels 2.5–32.0 mm long, 0.3–0.9 mm diam., glabrous. Sepals 2.2–2.9 × 0.7–0.9 mm, elliptic-oblong, saccate, green to red-brown, sparsely hairy, hairs spreading to patent, margin white and membranous, apex obtuse, base truncate. Petals 4.9–5.6 × 1.9–2.4 mm,



white, limb obovate; apex obtuse; base attenuate, tapering to a c. 0.5 mm long claw. Stamens 6; median filaments 4, 2.0–2.3 mm long; lateral filaments 2, 1.7–2.0 mm long; anthers 0.5–0.6 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 1.9–2.5 mm long, 0.4–0.6 mm diam., ± terete, green, glabrous; ovules 15–26; style c. 1.0 mm long, ± terete; stigma 0.3–0.4 mm diam. Siliques 13.0–25.0 × 1.2–1.6 mm, glabrous, style 0.5–0.8 mm long; valves green to yellow-green at maturity and when dehiscent; replum 0.5–0.6 mm wide. Seeds 0.8–1.5 mm long, 0.8–1.0 mm wide, 0.4–0.5 mm thick, oblong to broadly oblong, henna-green to henna; wing absent.



**Fig. 39:** *Cardamine caesiella* distribution map based on databased records at AK, CHR, OTA & WELT.

widespread unnamed calcicole *Geranium* 'Manahune' (e.g., CHR 505532).

**Distribution:** South Island: Canterbury.

*Cardamine caesiella* is restricted to limestone habitats at Manahune in South Canterbury.

**Biostatus:** Indigenous (Endemic).

*Cardamine caesiella* is assessed as having a conservation status of Threatened, Nationally Critical (A2), with the qualifier Data Poor (de Lange *et al.* 2018). The qualifier Data Poor is applied because it is only known from Manahune and there is other limestone habitat that may be suitable for the species in South Canterbury, and further field survey is required.

**Habitat:** *Cardamine caesiella* occurs on ledges and in crevices on limestone bluffs and rock outcrops.

**Phenology:** Flowering November–December; Fruiting December.

**Notes:** The Manahune limestone outcrop and escarpment is a hotspot for vascular plant endemism, as two other limestone endemics occur there, *Gentianella calcis* subsp. *manahune* (Glenny 2004) and *Ranunculus* aff. *stylosus* (CHR 515131). Manahune is also a stronghold for the more



**Fig. 40:** *Cardamine caesiella*. Plant with Inflorescences.



**Fig. 41:** *Cardamine caesiella*. Cauline leaves.



**Fig. 42:** *Cardamine caesiella*. Inflorescence with cauline leaves and siliques.



**Fig. 43:** *Cardamine caesiella*. Top view of flower.



**Fig. 44:** *Cardamine caesiella*. Side view of flower.

### ***Cardamine chlorina* Heenan, *Phytotaxa* 330: 46–48 (2017)**

Holotype: Mangakotukutuku Stream, Tararua Ra., 600 ft., strm bank (wet), A. P. Druce s.n., Nov 1976, CHR 324108!

**Etymology:** The specific epithet *chlorina* (Latin: green) refers to the usually green-coloured seeds.

Perennial herb, single rosette or with short lateral branches, stem and branches 0.8–1.4 mm diam. Leaves up to 130 mm long, pinnatisect; lamina 20.0–60.0 × 10.0–50.0 mm, green to dark green, usually semi-coriaceous, glabrous on abaxial surface, glabrous or sometimes sparsely hairy on adaxial surface, margin and petiole glabrous or sparsely hairy; hydathodes on leaflet margin, conspicuous. Terminal pinna 6.0–21.0 × 7.0–25.0 mm, simple, usually with 1–2 shallow lobes, orbicular-reniform to orbicular-rhomboid, apex obtuse and usually with a conspicuous hydathode, base weakly cordate to truncate. Lateral pinnae 2–4(–6), 3.0–20.0 × 3.0–22.0, orbicular-reniform, orbicular-rhomboid, to broadly elliptic, usually with 1–2 shallow lobes, base often oblique, petiolule 1.0–11.0 mm long; petiole up to 80.0 mm long; hairs up to 0.4 mm long. Cauline leaves similar to rosette leaves but smaller and with fewer lateral pinnae, leaflet lobes becoming more triangular. Inflorescence racemose, with lateral racemes, each raceme 10–13-flowered; peduncle up to 250 mm long, 1.0–3.0 mm diam. at base, upright, glabrous. Pedicels 2.0–15.0 mm long, 0.4–1.0 mm diam., quadrangular, glabrous, ascending, spreading or curved downward. Sepals 2.2–3.0 × 1.2–1.6 mm, elliptic-oblong to elliptic, saccate, green or red-brown, glabrous or sparsely hairy distally, margin white and membranous, apex obtuse, base truncate. Petals 4.5–6.0 × 2.1–3.0 mm, white, limb obovate to broadly elliptic; apex

obtuse; base cuneate, tapering to a 0.5–1.2 mm long claw; sometimes apetalous. Stamens 6; median filaments 4, 2.7–2.9 mm long; lateral filaments 2, 2.0–2.7 mm long; anthers 0.4–0.5 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 2.7–3.7 mm long, 0.4–0.5 mm diam., ± terete, green, glabrous; ovules 22–28; style 0.1–0.2 mm long, ± terete; stigma 0.6–0.7 mm diam. Siliques 21.0–35.0 × 1.1–1.5 mm, glabrous, style 0.7–1.2 mm long; valves green at maturity and when dehiscent, replum 0.3–0.4 mm wide. Seeds 1.2–1.8 mm long, 0.8–1.0 mm wide, 0.4–0.5 mm thick, oblong to broadly oblong, green to light brown-green; wing absent.

**Distribution:** North Island: Auckland, Volcanic Plateau, Taranaki, Gisborne, Southern North Island.

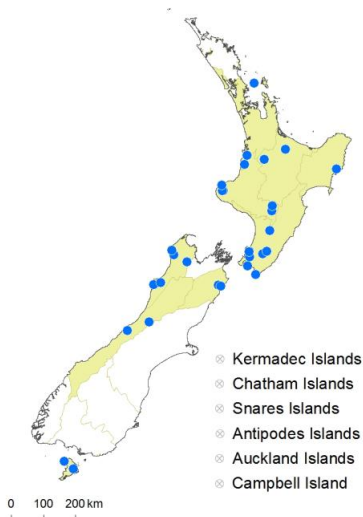
South Island: Western Nelson, Westland, Marlborough. Stewart Island.

**Biostatus:** Indigenous (Endemic).

*Cardamine chlorina* is assessed as having a conservation status of Not Threatened (de Lange *et al.* 2018).

**Habitat:** *Cardamine chlorina* usually grows on moist or wet ground in swampy areas, seepages, flushes and damp depressions along track edges, on stream and river banks and adjacent terraces, riverbeds and cliffs, in sinkholes, among tussockland, scrub and forest.

**Phenology:** Flowering September–March; Fruiting November–March.



**Fig. 45:** *Cardamine chlorina* distribution map based on databased records at AK, CHR, OTA & WELT.



**Fig. 46:** *Cardamine chlorina*. Plant with rosette leaves.



**Fig. 47:** *Cardamine chlorina*. Rosette leaves.



**Fig. 48:** *Cardamine chlorina*. Leaflet from rosette leaf.



**Fig. 49:** *Cardamine chlorina*. Inflorescence with cauline leaf and siliques.



**Fig. 50:** *Cardamine chlorina*. Side view of flower.



**Fig. 51:** *Cardamine chlorina*. Top view of flowers.



**Fig. 52:** *Cardamine chlorina*. Dehiscent silique.



**Fig. 53:** *Cardamine chlorina*. Seeds.

## *Cardamine coronata* Heenan, *Phytotaxa* 330: 49–51 (2017)

Holotype: Canterbury, Mt Cass, above Waipara, on limestone outcrops, usually in sheltered sites, 480 m, 5 November 2009, P. B. Heenan s.n., CHR 616894!

**Etymology:** The specific epithet *coronata* (Latin: likeness of a crown) refers to the hairs positioned on and around the hydathodes of the leaflet margin and leaflet axil having a crown-like appearance.

Perennial herb, single rosette or with short lateral branches, stem and branches 0.5–1.4 mm diam. Leaves up to 140 mm long, pinnatisect; lamina 25.0–75.0 × 15.0–40.0 mm, light green to green, usually coriaceous, sparsely to moderately hairy on adaxial surface and margin, glabrous or sparsely hairy on abaxial surface and petiole; hydathodes on leaflet margin, conspicuous, usually with apical protuberance up to 0.2 mm long and 0–5 hairs up to 0.6 mm long; hydathode in leaflet axil, up to 0.3 mm long; petiole up to 70 mm long. Terminal pinna 10.0–20.0 × 12.0–26.0 mm, usually shallowly lobed, broadly orbicular, broadly orbicular-reniform, apex obtuse, base truncate to occasionally weakly cordate. Lateral pinnae 2–8, 5.0–13.0 × 5.0–18.0, broadly orbicular, orbicular-rhomboid to reniform-rhomboid, petiolule 3.0–20.0 mm long. Cauline leaves similar to rosette leaves but smaller, with fewer lateral pinnae, and leaflet lobes becoming angular. Inflorescence racemose, with lateral racemes, each raceme 6–12-flowered, flowers positioned toward apex; peduncle up to 400 mm long, 1.0–2.0 mm diam. at base, erect, glabrous. Pedicels 3.0–15.0 mm long, 0.4–0.7 mm diam., terete, glabrous. Sepals 2.4–3.2 × 1.1–1.3 mm, elliptic-oblong to elliptic, ± saccate, green, glabrous or sparsely hairy, margin white and membranous, apex obtuse, base truncate. Petals 4.5–8.0 × 2.5–3.6 mm, white, limb obovate; apex obtuse; base cuneate, tapering to a 1.0–2.0 mm long claw. Stamens 6; median filaments 4, 2.5–4.0 mm long; lateral filaments 2, 1.8–3.4 mm long; anthers 0.5–0.6 mm long, maroon or yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 2.4–5.0 mm long, 0.6–0.7 mm diam., ± terete, green, glabrous or rarely hairy; ovules 18–20; style 0.6–1.6 mm long, ± terete; stigma 0.5–0.6 mm diam. Siliques 25.0–38.0 × 1.1–1.4 mm, glabrous or occasionally hairy, style 1.5–2.5 mm long; valves green at maturity; red-brown when dehiscent, replum 1.1–1.2 mm wide. Seeds 1.2–1.8 mm long, 0.6–0.9 mm wide, 0.4–0.5 mm thick, oblong to broadly oblong, light green to yellow-green; wing absent.

**Distribution:** South Island: Canterbury.

**Biostatus:** Indigenous (Endemic).

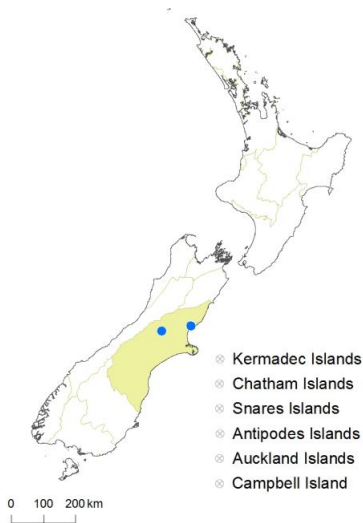
*Cardamine coronata* is assessed as having a conservation status of Threatened, Nationally Endangered (B1), with the qualifier Data Poor (de Lange *et al.* 2018). The qualifier Data Poor is applied because field survey of limestone in the Castle Hill area (Mid Canterbury) is required to determine the size of this population, and further field survey in North Canterbury of suitable limestone habitat for new populations is required.

**Habitat:** *Cardamine coronata* is known from the limestone ridge at Mt Cass, North Canterbury, and limestone at Castle Hill, Mid Canterbury. It usually occurs in sheltered sites on exposed limestone outcrops, and on limestone within the canopy of relatively open lowland forest and shrubland.

**Recognition:** *Cardamine coronata* is similar to *C. forsteri* but differs from that species by its larger and more robust growth habit and leaves, leaflet margin and axillary hydathodes usually with additional hairs at the base, larger petals and sepals, longer filaments, and maroon anthers.

**Phenology:** Flowering October–February; Fruiting

December–March.



**Fig. 54:** *Cardamine coronata* distribution map based on databased records at AK, CHR, OTA & WELT.



**Fig. 55:** *Cardamine coronata*. Plant with rosette leaves.



**Fig. 56:** *Cardamine coronata*. Rosette leaves.



**Fig. 57:** *Cardamine coronata*. Cauline leaves.



**Fig. 58:** *Cardamine coronata*. Leaflet of cauline leaf.



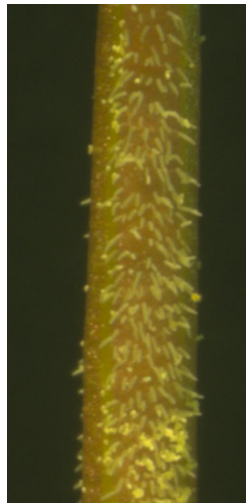
**Fig. 59:** *Cardamine coronata*. Leaflet axillary hydathode.



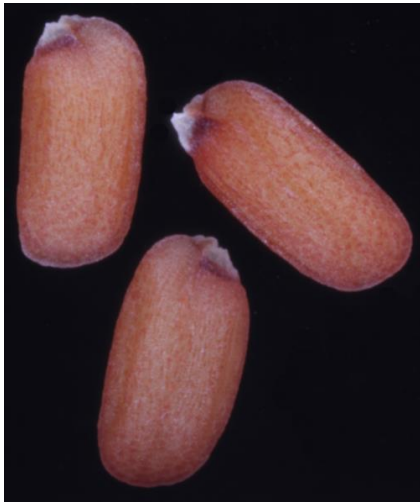
**Fig. 60:** *Cardamine coronata*. Inflorescence.



**Fig. 61:** *Cardamine coronata*. Side and top view of flowers.



**Fig. 62:** *Cardamine coronata*. Siliqua hairs.



**Fig. 63:** *Cardamine coronata*. Seeds.

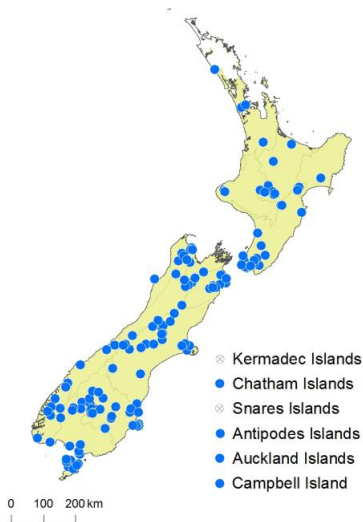
***Cardamine corymbosa* Hook.f., *Bot. Antarct. Voy. I. (Fl. Antarct.) Part I, 6 (1844)***

≡ *Cardamine hirsuta* var. *corymbosa* (Hook.f.) Hook.f., *Handb. New Zealand Fl.* 12 (1864)  
Lectotype (designated by Heenan 2017): *J. Hooker s.n.*, Campbells Id., K!

**Etymology:** The specific epithet *corymbosa* (Latin: corymb) refers to the inflorescence.

Perennial herb, single rosette or with short lateral branches. Leaves up to 120 mm long, pinnatifid or pinnatisect; lamina 4.0–55.0 × 2.5–25.0 mm, green, membranous to semi-coriaceous, glabrous to sparsely hairy on abaxial and adaxial surfaces, margin and petiole; hairs 0.3–0.4 mm long, spreading to patent; petiole up to 65 mm long. Terminal pinna 2.0–15.0 × 2.0–16.0 mm, simple, orbicular, broadly orbicular, orbicular-reniform to broadly orbicular-reniform; margin entire, sometimes shallowly lobed, with 2 usually indistinct hydathodes; apex obtuse, usually with a indistinct hydathode; base cordate, truncate or obtuse. Lateral pinnae 2–6, 1.0–8.0 × 1.0–10.0, orbicular, broadly orbicular, to broadly elliptic-orbicular; margin entire, occasionally weakly lobed; apex obtuse; base obtuse to cuneate, often oblique; petiolule 0.2–6.0 mm long, often appearing ± sessile. Cauline leaves similar to rosette leaves but smaller and with fewer lateral pinnae, pinnae bases attenuate to obtuse; terminal pinna up to 14.0 × 6.0 mm, lateral pinnae up to 8.0 × 4.5 mm. Inflorescence with solitary flowers or 1–5 corymbs, corymbs 2–8-flowered; peduncle up to 150 mm long, 0.5–1.0 mm diam. at base, spreading to ascending, glabrous to sparsely hairy near base. Pedicels 5.0–50.0 mm long, 0.3–0.7 mm diam., terete, glabrous to sparsely hairy. Sepals 1.4–2.9 × 0.5–1.8 mm, elliptic-oblong to obovate, saccate, green to red-brown; glabrous to sparsely hairy, hairs spreading to patent, 0.2–0.3 mm long; margin

white and membranous, apex obtuse, base truncate. Petals 1–4 or absent; 3.5–5.5 × 1.8–2.3 mm, white, limb obovate; apex obtuse; base cuneate, tapering to a 0.7–1.0 mm long claw. Stamens 4–6; median filaments 2–4, 1.8–2.4 mm long; lateral filaments 2, 1.5–1.7 mm long; anthers 0.3–0.4 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 1.9–2.3 mm long, 0.4–0.5 mm diam., ± terete, green, glabrous; ovules 28–34; style 0.1–0.2 mm long, ± terete; stigma 0.3–0.4 mm diam., white or rarely purple. Siliques 12.0–28.0 × 0.9–1.4 mm, glabrous, style 0.3–1.2 mm long; valves green to purple-brown at maturity and when dehiscent; replum 0.3–0.5 mm wide. Seeds 0.8–1.0 mm long, 0.7–0.9 mm wide, 0.3–0.4 mm thick, orbicular to broadly oblong, light green to light yellow-brown; wing absent.



**Fig. 64:** *Cardamine corymbosa* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** North Island: Auckland, Volcanic Plateau, Taranaki, Gisborne, Southern North Island.

South Island: Western Nelson, Sounds Nelson, Marlborough, Westland, Canterbury, Otago, Southland, Fiordland.

Stewart Island.

Chatham Islands.

Campbell Island.

Auckland Islands.

Antipodes Island.

*Cardamine corymbosa* indigenous to New Zealand as it also occurs on Macquarie Island (Copson 1984). In New Zealand, *C. corymbosa* has a widespread distribution, occurring throughout the North Island, South Island, Chatham Islands, Stewart Island, the subantarctic Campbell Island and Auckland Islands, as well as many smaller islands. The identity of plants from Macquarie Island has been problematic as they have been placed in three species. For example, Allan (1961) recorded *C. subcarnosa*, Hewson (1982) and Webb et al. (1988) treated the species as *C. depressa*, whereas Copson (1984) and Heenan (2017) considered it to be *C. corymbosa*.

*Cardamine corymbosa* is naturalised in Australia (Thompson 1996, 2003), North America (Post et al. 2009, 2011), Britain (Braithwaite 1991, as *C. uniflora*; Stace 1997), and western Europe (Netherlands and Belgium: Groom et al. 2011; Hoste et al. 2008). Hewson (1982) recorded *C. aff. corymbosa* from Tasmania, and Thompson (1996, 2003) regarded *C. corymbosa* as naturalised in Australia (including Tasmania), stating it occurred in gardens and urban areas. Therefore, *C. corymbosa* in Australia should be regarded as both indigenous (Macquarie Island) and naturalised (mainland Australia and Tasmania).

**Biostatus:** Indigenous (Non-endemic).

*Cardamine corymbosa* is assessed as having a conservation status of Not Threatened (de Lange et al. 2018).

**Habitat:** *Cardamine corymbosa* occurs in a wide variety of habitats, including crevices, ledges and shaded overhangs on rock outcrops and bluffs, among rocky debris, on stream banks, open sites in forest and forest margins, among herbs and grasses in turf vegetation, in muddy hollows, among damp rocks, on seasonally dry or periodically inundated surfaces of tarn and lake margins, and open and dry areas under mānuka and kānuka forest. It often occurs on disturbed surfaces associated with bird burrows, margins of scree, eroded cliff edges, slips and vehicle tracks. It is also a weed in urban areas, where it occurs in lawns, concrete drains, path edges, shadehouses and glasshouses, in potted plants, and on bare-soil ornamental gardens.

**Phenology:** Flowering August–May; Fruiting August–May.

**Notes:** The taxonomic circumscription of *C. corymbosa* has been refined by Heenan (2017) with the recognition of new species such as *C. grandiscapa*, *C. heleniae*, *C. integra* and *C. sinuatifolia*. These new species were previously included in a much broader concept of *C. corymbosa* (e.g., Pritchard 1957; Allan 1961; Webb et al. 1988), and can be distinguished on the basis of leaf, flower, and silique characters. However, there remains unresolved variation in *C. corymbosa* (Heenan 2017). Alpine forms of *C. corymbosa* typically have semi-coriaceous leaves and larger and stouter siliques (e.g., CHR 511692, Old Man Range, Otago; CHR 312893, Craigieburn Valley, Canterbury). In contrast, lowland forms of *C. corymbosa* tend to mostly have membranous leaves and slightly smaller and more



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slender siliques (e.g., CHR 636089, Pareora River gorge, Canterbury). Heenan (2017) recommended further study to resolve this variation.



**Fig. 65:** *Cardamine corymbosa*. Plant with developing inflorescence.



**Fig. 66:** *Cardamine corymbosa*. Inflorescence with cauline leaves and siliques.



**Fig. 67:** *Cardamine corymbosa*. Inflorescence with cauline leaves and siliques.



**Fig. 68:** *Cardamine corymbosa*. Rosette leaves from lowland form.



**Fig. 69:** *Cardamine corymbosa*. Rosette leaves from alpine form.



**Fig. 70:** *Cardamine corymbosa*. Apetalous flower with glabrous sepals and translucent stigma.



**Fig. 71:** *Cardamine corymbosa*. Apetalous flower with hairy sepals and purple stigma.



**Fig. 72:** *Cardamine corymbosa*. Top view of flower.



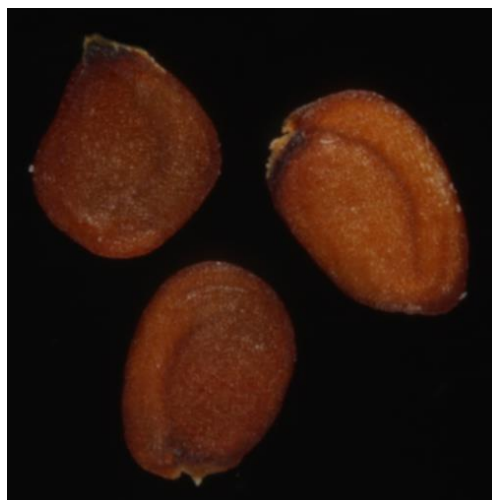
**Fig. 73:** *Cardamine corymbosa*. Side view of flower.



**Fig. 74:** *Cardamine corymbosa*. Inflorescence with flower, siliques and cauline leaf.



**Fig. 75:** *Cardamine corymbosa*. Mature siliques: left, alpine form; right, lowland form.



**Fig. 76:** *Cardamine corymbosa*. Seeds.

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## ***Cardamine cubita* Molloy, Heenan & Smissen in Heenan et al., *Phytotaxa* 140: 48–49 (2013)**

Holotype: North Canterbury, Lees Valley, wetland on floodplain of the Ashley River and its tributary streams, c. 400 m a.s.l., 2 March 2013, *B. P. J. Molloy s.n.*, CHR 612054!

**Etymology:** The epithet *cubita* (Latin: elbow) refers to the distally bent filaments of this species.

Annual herb, 3.0–5.5 mm across, single stem, not branched; stems glabrous. Cotyledons persistent, opposite, lamina 1.4–1.9 × 1.5–2.1 mm, pinkish purple, orbicular, apex retuse; petiole 0.7–0.8 mm long, pinkish. Leaves up to 2.2 mm long, simple or 1-pinnate; lamina green to purple-green, membranous, sparsely hairy on adaxial surface, glabrous on abaxial surface; hairs 0.2–0.25 mm long, spreading to patent, 1–2-septate; petiole 0.6–0.8 mm long. Terminal pinna 0.8–1.2 × 1.3–1.4 mm, simple, broadly orbicular, margins entire or shallowly 1–2-lobed, lobes with hydathodes, apex subacute to obtuse, usually with a distinct hydathode, base truncate to cordate. Lateral pinnae absent or 1–2, 0.2–0.3 × 0.2–0.3 mm, petiolule indistinct. Cauline leaves absent. Inflorescence single, racemose, racemes 1–2-flowered, flower 0.8–0.9 mm diam.; peduncle up to 1.4 mm long, c. 0.3 mm diam. at base, erect to ascending, glabrous. Pedicels c. 1.1 mm long, c. 0.2 mm diam., spreading to ascending, glabrous. Sepals 0.6–0.7 × 0.4–0.45 mm, elliptic-oblong, saccate, green or red-brown, glabrous, margin white and membranous, apex obtuse, base truncate; black-brown gland on adaxial surface of one sepal. Petals absent. Stamens 2; filaments 0.36–0.4 mm long, 0.06 mm diam., conspicuously bent 90° distally; anthers c. 0.14 mm long, cream to pale yellow, when dehiscent held slightly below the stigma. Ovary 0.5–0.55 mm long, 0.2–0.22 mm diam., ± terete, green, glabrous; ovules 2; style c. 0.03 mm long, ± terete; stigma c. 0.14 mm diam., white. Siliques c. 4.0 × c. 0.8 mm, glabrous, style c. 0.6 mm long, septum central vein absent; replum c. 0.3 mm wide, flattened. Seeds c. 0.8 mm long, c. 0.55 mm wide, shortly oblong, brown.

**Distribution:** South Island: Canterbury.

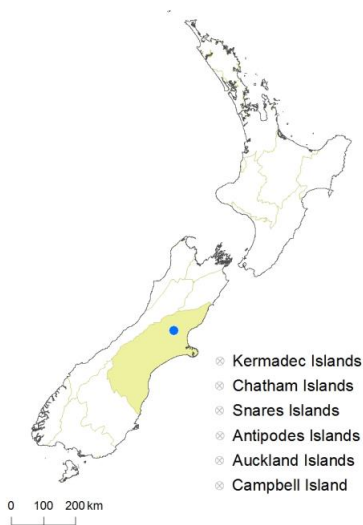
*Cardamine cubita* is known from a single locality near the upper Ashley River in Lees Valley, North Canterbury (Heenan et al. 2013).

**Biostatus:** Indigenous (Endemic).

*Cardamine cubita* is assessed as having a conservation status of Data Deficient (de Lange *et al.* 2018), because the size of the single population and its security and/or threats are not known with certainty. A search for *C. cubita* at the known site in Ashley River in September 2015 by P.B. Heenan and B.P.J. Molloy, in the vicinity of the original collection, failed to locate any additional plants.

**Habitat:** *Cardamine cubita* was originally collected from an area of about 20 m<sup>2</sup> in an extensive wetland with varying degrees of natural drainage, disturbance (including artificial drains), and plant composition (Heenan et al. 2013). This site is modified and occupied by indigenous and naturalised grasses, sedges, rushes, and herbs.

**Notes:** nrDNA ITS and cpDNA trnL intron and trnL–trnF intergenic spacer sequence data implies that *C. cubita* is related to *C. hirsuta* and not the other New Zealand species of *Cardamine* (Heenan et al. 2013).



**Fig. 77:** *Cardamine cubita* distribution map based on databased records at AK, CHR, OTA & WELT.

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related to *C. hirsuta* and not the other New Zealand species of *Cardamine* (Heenan et al. 2013).



**Fig. 78:** *Cardamine cubita*. Flowering plant.



**Fig. 79:** *Cardamine cubita*. Flower with two stamens.



**Fig. 80:** *Cardamine cubita*. Flower with two stamens.



**Fig. 81:** *Cardamine cubita*. Stamen with filament bent near apex.



**Fig. 82:** *Cardamine cubita*. Plant with inflorescence.



**Fig. 83:** *Cardamine cubita*. Siliqua.



**Fig. 84:** *Cardamine cubita*. Silique.

### ***Cardamine dactyloides* Heenan, *Phytotaxa* 330: 58–60 (2017)**

Holotype: Marlborough, Richmond Range, Red Hills, 1140 m, beech forest on ultramafic rocks, January 1985, A. P. Druce *s.n.*, CHR 401665!

**Etymology:** The specific epithet *dactyloides* (Latin: finger-like) refers to the narrow pinnae of the cauline leaves

Perennial herb, single rosette or with lateral branches. Leaves up to 50 mm long, simple or pinnatisect; lamina 2.0–21.0 × 2.5–13.0 mm, green, matt, membranous to semi-coriaceous, glabrous or with a sparsely hairy margin; petiole up to 32 mm long. Terminal pinna 2.0–12.0 × 2.5–13.0 mm, orbicular-pandurate, weakly pandurate to obovate-rhomboid; margin entire, with 2–4 indistinct hydathodes; apex obtuse to retuse, with an indistinct hydathode; base obtuse, truncate or cordate. Lateral pinnae 1–4 or absent, 0.5–6.0 × 0.5–7.0 mm, orbicular to broadly elliptic-orbicular; apex obtuse; base obtuse, truncate or cordate; petiolule 0.2–1.5 mm long. Cauline leaves narrower than rosette leaves, terminal and lateral pinnae up to 13 mm long, up to 1.5 mm wide, base attenuate. Inflorescence racemose, each raceme 3–10-flowered; peduncle up to 180 mm long, 0.5–1.4 mm diam. at base, ascending to erect, glabrous. Pedicels 9.0–14.0 mm long, 0.3–0.5 mm diam., glabrous. Sepals 2.2–2.7 × 1.0–1.7 mm, elliptic-oblong to broadly elliptic-obovate, saccate, green, glabrous, margin white and membranous, apex obtuse, base truncate. Petals 4.2–6.5 × 2.2–3.9 mm, white, limb obovate; apex obtuse; base attenuate to cuneate, tapering to a 0.5–1.0 mm long claw. Stamens 6; median filaments 4, 3.4–4.0 mm long; lateral filaments 2, 1.8–3.2 mm long; anthers 0.5–0.6 mm long, maroon, when dehiscent held at a similar height to or slightly below the stigma. Ovary 3.0–5.2 mm long, 0.5–0.6 mm diam., ± terete, green, glabrous; ovules 15–19; style 0.4–0.5 mm long, ± terete; stigma c. 0.4 mm diam. Siliques 17.0–26.0 × 0.9–1.2 mm, glabrous, style 0.4–0.6 mm long; valves purple-brown to purple-green at maturity and when dehiscent; replum 0.4–0.5 mm wide. Seeds 0.8–1.2 mm long, 0.6–0.9 mm wide, 0.3–0.4 mm thick, broadly oblong to oblong-orbicular, henna-green to henna; wing absent.

**Distribution:** South Island: Sounds Nelson.

*Cardamine dactyloides* occurs on the ultramafic Red Hills in Sounds Nelson.

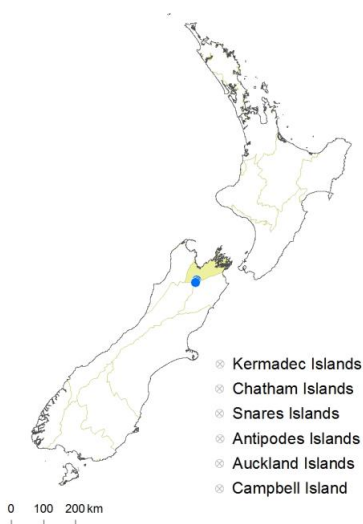
**Biostatus:** Indigenous (Endemic).

*Cardamine dactyloides* is assessed as having a conservation status of Threatened, Nationally Critical A(3) (de Lange *et al.* 2018).

**Habitat:** *Cardamine dactyloides* occurs on ultramafic rock outcrops in tussockland, open herbfield and beech (*Fuscospora* spp., Nothofagaceae) forest, where it usually grows on shaded ledges and crevices.

**Recognition:** *Cardamine dactyloides* is distinguished from *C. porphyroneura* by its smaller growth habit and leaves, cauline leaves with narrow pinnae, petals broader, anthers violet, seeds broader and slightly larger, and the cotyledons of the seed embryo lacking violet-purple veins.

**Phenology:** Flowering October–December; Fruiting October–February.



**Fig. 85:** *Cardamine dactyloides* distribution map based on databased records at AK, CHR, OTA & WELT.



**Fig. 86:** *Cardamine dactyloides*. Plant with rosette leaves.



**Fig. 87:** *Cardamine dactyloides*. Rosette leaves.



**Fig. 88:** *Cardamine dactyloides*. Upper cauline leaves.



**Fig. 89:** *Cardamine dactyloides*. Lower cauline leaves.



**Fig. 90:** *Cardamine dactyloides*. Flower and flower buds.



**Fig. 91:** *Cardamine dactyloides*. Flower.



Fig. 92: *Cardamine dactyloides*. Seeds.

***Cardamine depressa* Hook.f., *Bot. Antarct. Voy. I. (Fl. Antarct.) Part I, 6, t. 3 (1844)***

Lectotype (designated by Heenan 2017): Rendezvous Harbour, Lord Auckland's group, November 1840, K!

**Etymology:** The specific epithet *depressa* (Latin: flattened) probably refers to the low and compact growth habit.

Perennial herb, single rosette or multiple rosettes on short lateral branches, stem and branches 1.0–2.0 mm diam. Leaves up to 60 mm long, usually simple or occasionally pinnatifid with up to 4 lobes; lamina 3.0–20.0 × 2.4–12.5 mm, green, glabrous or hairy, coriaceous, obovate, elliptic to broadly elliptic, sinuate, margin entire; apex obtuse to subacute, hydathode obscure or absent; base cuneate; petiole up to 32 mm long, plano-convex, glabrous or hairy. Cauline leaves sometimes present, subtending corymbs or individual flowers or inserted on pedicel, similar to rosette leaves. Inflorescence corymbose, with 1–4 corymbs each 4–16-flowered, with flowers clustered toward distal end; peduncle 7–110 mm long, 1.0–2.5 mm diam. at base, ascending to erect, glabrous. Pedicels 2.5–25.0 mm long, 0.4–0.6 mm diam., stout, glabrous. Sepals 1.8–2.5 × 0.9–1.1 mm, elliptic-oblong to elliptic, ± saccate, green and sometimes flushed red-brown at apex, glabrous or hairy, margin white and membranous, apex obtuse, base truncate. Petals 1.5–2.7 × 0.6–1.3 mm, white, limb obovate to broadly obovate; apex obtuse; base cuneate, tapering to a 0.7–1.0 mm-long claw. Stamens 6; median filaments 4, 1.8–2.6 mm long; lateral filaments 2, 1.6–2.2 mm long; anthers 0.5–0.6 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 2.4–2.8 mm long, 0.5–0.6 mm diam., ± terete, green, glabrous; ovules 8–14; style 0.2–0.3 mm long, ± terete; stigma 0.2–0.3 mm diam. Siliques 6.0–15.0 × 1.0–1.2 mm, glabrous, style 0.3–0.8 mm long; valves green at maturity; straw-coloured when dehiscent, replum 0.4–0.6 mm wide. Seeds 0.6–0.7 mm long, 0.4–0.6 mm wide, 0.3–0.4 mm thick, orbicular to broadly oblong-orbicular, henna; wing absent.

- 1 Lamina glabrous, petiole glabrous or with a few sparse hairs near base; sepals glabrous; plants from Auckland Islands.....subsp. *depressa*  
 Lamina surface and margin moderately to sparsely hairy, petiole moderately to sparsely hairy; sepals hairy, rarely glabrous; plants from Campbell Islands..... subsp. *stellata*

**Biostatus:** Indigenous (Endemic).

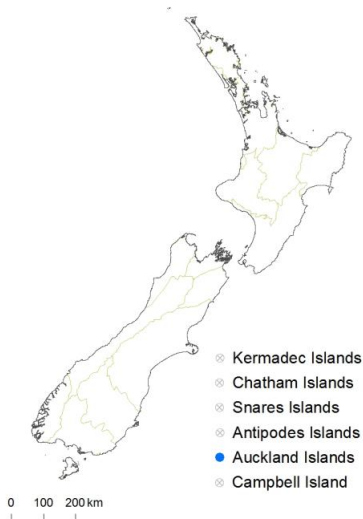
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***Cardamine depressa* Hook.f., *Bot. Antarct. Voy. I. (Fl. Antarct.) Part I, 6, t. 3 (1844) subsp. depressa***

= *Cardamine depressa* var. *acaulis* Hook.f., *Bot. Antarct. Voy. I. (Fl. Antarct.) Part I, 6 (1844)*

**Etymology:** Etymology: The specific epithet *depressa* (Latin: flattened) probably refers to the low and compact growth habit.

Leaf lamina surface and margin glabrous, petiole usually glabrous or occasionally sparsely hairy on the lower half; hairs spreading, up to 0.4 mm long. Sepals glabrous.



**Fig. 93:** *Cardamine depressa* subsp. *depressa* distribution map based on databased records at AK, CHR, OTA & WELT.



**Fig. 94:** *Cardamine depressa* subsp. *depressa*. Plant with rosette leaves, and inflorescence with mature siliques (CHR 134173).

**Distribution:** Auckland Islands.

*Cardamine depressa* subsp. *depressa* is known from Auckland Islands, including Adams Island and Auckland Island.

**Biostatus:** Indigenous (Endemic).

*Cardamine depressa* subsp. *depressa* is assessed as having a conservation status of At Risk–Naturally Uncommon, with the qualifiers Data Poor, Island Endemic and One Location (de Lange *et al.* 2018). The qualifier Data Poor is applied because information on the number and size of the populations is needed.

**Habitat:** *Cardamine depressa* subsp. *depressa* occurs among coastal herbfield and rocks and along stream margins.

**Phenology:** Flowering November–January; Fruiting November–February.



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***Cardamine depressa* subsp. *stellata* (Hook.f.) Heenan, *Phytotaxa*  
330: 65–66 (2017)**

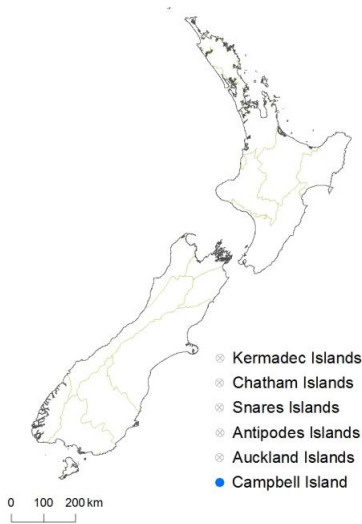
≡ *Cardamine stellata* Hook.f., *Bot. Antarct. Voy. I. (Fl. Antarct.) Part I*, 7, t. 4a (1844)

≡ *Cardamine depressa* var. *stellata* (Hook.f.) Hook.f., *Handb. New Zealand Fl.* 12 (1864)

Lectotype (designated by Heenan 2017): Campbell's Island, 1584, K!

**Etymology:** The subspecific epithet *stellata* (Latin: radiating from centre) refers to the leaf arrangement, as Hooker (1844) refers to this in his diagnosis and description.

Leaf lamina surface and margin and petiole sparsely to moderately hairy; hairs appressed to spreading, up to 0.9 mm long. Sepals sparsely to moderately hairy on abaxial surface; hairs spreading to patent, up to 0.8 mm long.



**Fig. 95:** *Cardamine depressa* subsp. *stellata* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** Campbell Island.

*Cardamine depressa* subsp. *stellata* is only known from Campbell Island.

**Biostatus:** Indigenous (Endemic).

*Cardamine depressa* subsp. *stellata* is assessed as having a conservation status of At Risk Naturally Uncommon, with the qualifiers Data Poor, Island Endemic and One Location (de Lange *et al.* 2018). The qualifier Data Poor is applied as there is no information on the number and size of the populations.

**Habitat:** *Cardamine depressa* subsp. *stellata* occurs on coastal cliffs, rocks at sea level, ridges, open peat, rock crevices and ledges, among rock debris, damp cliffs, and among scrub.

**Phenology:** Flowering November–March; Fruiting December–February.

**Hybridisation:** The putative hybrid *C. depressa* subsp. *stellata* × *C. subcarnosa* has been recorded (CHR 311526, Meurk & Given s.n.).



**Fig. 96:** *Cardamine depressa* subsp. *stellata*. Flowering plant with rosette leaves.



**Fig. 97:** *Cardamine depressa* subsp. *stellata*. Rosette leaves.



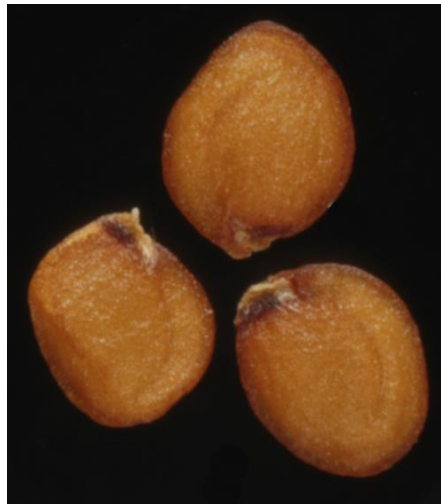
**Fig. 98:** *Cardamine depressa* subsp. *stellata*. Inflorescence with mature siliques (CHR 49860).



**Fig. 99:** *Cardamine depressa* subsp. *stellata*. Leaf hairs.



**Fig. 100:** *Cardamine depressa* subsp. *stellata*. Mature siliqua.



**Fig. 101:** *Cardamine depressa* subsp. *stellata*. Seeds.

### ***Cardamine dilatata* Heenan, *Phytotaxa* 330: 67–69 (2017)**

Holotype: Canterbury Land District, Pareora River gorge, Pareora River Reserve, shaded river bank bluff, 320 m, 19 December 2006, *P. B. Heenan s.n.*, CHR 505514!

**Etymology:** The specific epithet *dilatata* (Latin: spreading, broad) refers to the wide filaments.

Perennial herb, single rosette or with short lateral branches. Leaves up to 115 mm long, usually simple or irregularly pinnatifid; lamina 14.0–33.0 × 4.0–11.5 mm, grey to grey-green, coriaceous, glabrous; petiole up to 90 mm long. Terminal pinna 14.0–20.0 × 4.0–11.5 mm, simple, elliptic, broadly elliptic to obovate; margin entire, without hydathodes; apex obtuse with a ± distinct hydathode; base cuneate to attenuate. Lateral lobes 1–2, basal, 0.5–3.0 × 1.5–3.5 mm, broadly triangular to broadly elliptic; apex obtuse. Cauline leaves similar to rosette leaves but smaller, narrower, base attenuate. Inflorescence racemose, often with lateral racemes, each raceme 6–20-flowered; peduncle up to 140 mm long, 1.2–1.3 mm diam. at base, ascending, glabrous. Pedicels 15.0–26.0 mm long, 0.4–0.6 mm diam., ascending or divaricate, glabrous. Sepals 2.5–3.0 × 1.4–1.8 mm, broadly elliptic, saccate, green, glabrous, margin white and membranous, apex obtuse, base truncate. Petals 9.5–11.0 × 3.8–5.0 mm, white, limb obovate; apex obtuse; base attenuate, tapering to a c. 0.2 mm long claw. Stamens 6, dilated in lower half, 0.35–0.65 mm wide; median filaments 4, 3.6–4.4 mm long; lateral filaments 2, 2.3–2.9 mm long; anthers 0.7–0.8 mm long, maroon, when dehiscent held slightly below the stigma. Ovary 2.5–4.0 mm long, 0.5–0.6 mm diam., ± terete, green, glabrous; ovules 36–40; style 0.9–1.0 mm

long, ± terete; stigma 0.3–0.4 mm diam. Siliques 21.0–29.0 × 0.9–1.1 mm, glabrous, style 1.0–1.2 mm long; valves green when developing. Seeds not seen.

**Distribution:** South Island: Canterbury, Otago.

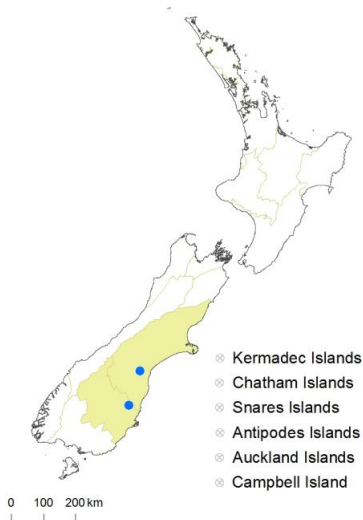
**Biostatus:** Indigenous (Endemic).

*Cardamine dilatata* is assessed as having a conservation status of Threatened, Nationally Critical (A1), with the qualifier Data Poor (de Lange *et al.* 2018). The qualifier Data Poor is applied as additional information on the number and size of the populations is required.

**Habitat:** *Cardamine dilatata* is known from two collections at the type locality in the Pareora River gorge, South Canterbury, and a subpopulation of 11 plants at Macraes, North Otago. At Pareora it was growing on a narrow, moss-covered ledge on a shaded, south-facing mudstone bluff beside the Pareora River, and at Macraes it was growing on the lower parts of large, south-facing schist bluffs that do not receive direct sunshine.

**Recognition:** *Cardamine dilatata* is distinguished from *C. bilobata* by its mostly simple to irregularly lobed grey to grey-green leaves, filaments conspicuously dilated at the base, and the silique with a short style.

**Phenology:** Flowering December; Fruiting December.



**Fig. 102:** *Cardamine dilatata* distribution map based on databased records at AK, CHR, OTA & WELT.



**Fig. 103:** *Cardamine dilatata*. Plant with rosette leaves and inflorescence.



**Fig. 104:** *Cardamine dilatata*. Filaments.



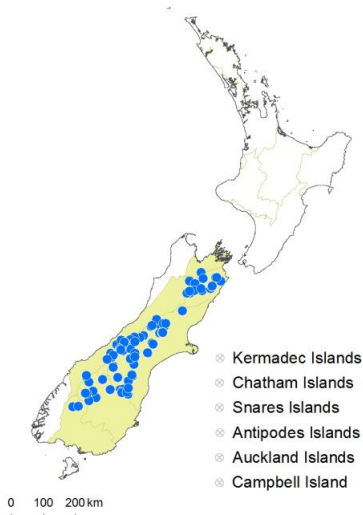
**Fig. 105:** *Cardamine dilatata*. Top view of flower. **Fig. 106:** *Cardamine dilatata*. Back view of flower.

### ***Cardamine dimidia* Heenan, *Phytotaxa* 330: 69–71 (2017)**

Holotype: Otago Land District, Dunstan Mountains, Lauder Ck., bluffs in tributary headwaters, crevices and rockfalls, 15 November 2005, *M. Thorsen & J. Barkla s.n.*, CHR 586035!

**Etymology:** The specific epithet *dimidia* (Latin: half) refers to the petals being about half the length of those of *C. bilobata*.

Perennial herb, single rosette or with short lateral branches, stem and branches up to 3 mm diam. Leaves up to 50 mm long, usually glabrous or rarely the lamina and petiole margins sparsely hairy; lamina 5.0–20.0 × 2.0–9.5 mm, green, purple-brown, brown-green or bronze, coriaceous, glossy, obovate, broadly obovate, obovate-orbicular, or oblong-elliptic, simple or pinnatifid; apex obtuse, usually with a distinct hydathode; base cuneate to attenuate, grading into petiole. Lateral lobes 1–4, basal, 1.3–3.0 × 1.0–1.7 mm, rarely with 1–4 teeth near apex. Petiole up to 35 mm long, plano-convex. Cauline leaves absent. Inflorescence usually racemose with 5–11 flowers, sometimes in loose whorls or almost corymbose; peduncle up to 110 mm long, 0.5–1.0 mm diam. at base, ascending to erect, glossy, glabrous, green to brown-green. Pedicels up to 30 mm long, 0.3–0.4 mm diam., terete, flexuose. Sepals 2.0–2.5 × 0.8–1.1 mm, oblong, ± saccate, purple-green or purple, glabrous or rarely sparsely hairy, margin white and membranous, apex obtuse, base truncate. Petals 4.0–7.0 × 1.0–2.5 mm, white, limb obovate; apex obtuse; base attenuate, tapering into the ± indistinct claw. Stamens 6; median filaments 4, 2.6–4.0 mm long; lateral filaments 2, 2.2–3.3 mm long; anthers 0.4–0.5 mm long, yellow or maroon, held at a similar height to or overtopping the stigma. Ovary 2.4–3.8 mm long, 0.4–0.7 mm diam., ± terete, green, glabrous; ovules 22–28; style 0.2–0.9 mm long, ± terete; stigma 0.2–0.4 mm diam. Siliques 17–32 × 1.1–1.2 mm, erect, glabrous, valves purple-brown to green at maturity, style 0.3–0.5 mm long. Seeds 0.9–1.3 mm long, 0.55–0.95 mm wide, 0.2–0.3 mm thick, broadly oblong, henna to pale yellow; wing absent or rarely present but very narrow.



**Fig. 107:** *Cardamine dimidia* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** South Island: Sounds Nelson, Marlborough, Westland, Canterbury, Otago, Southland.

*Cardamine dimidia* is a South Island endemic, being primarily confined to the Southern Alps and adjacent eastern South Island mountains.

**Biostatus:** Indigenous (Endemic).

*Cardamine dimidia* is assessed as having a conservation status of Not Threatened (de Lange *et al.* 2018).

**Habitat:** *Cardamine dimidia* primarily occurs on bluffs and rock outcrops, where it usually grows in shaded crevices and on ledges, and it also occurs in sheltered sites among large boulders.

**Recognition:** *Cardamine dimidia* is distinguished from *C. bilobata* by its more compact growth habit, shorter inflorescences, smaller sepals and petals, slightly shorter filaments, and usually longer siliqua with a short style.

**Phenology:** Flowering September–April; Fruiting December–April.

**Hybridisation:** Putative hybrids possibly involving *C. dimidia* have been collected in the field (Heenan 2017). These include *C. dimidia* × *C. glara* (CHR 514766, Yeo Stream, Marlborough; CHR 629749, Castle Hill Basin, Canterbury) and *C. dimidia* × *C. eminentia* (CHR 517634; Livingston Mountains, Southland).

**Notes:** There is some regional variation in leaf shape. Populations from the vicinity of Mt Cook (South Canterbury) are characterised by plants with leaves broader and more rounded in shape, being obovate-orbicular. Collections from Torlesse Range, Craigieburn Mountains and Puketeraki Range have distinctly pinnatifid to pinnatisect leaves.



**Fig. 108:** *Cardamine dimidia*. Plant with rosette leaves and fruiting inflorescence.



**Fig. 109:** *Cardamine dimidia*. Rosette leaves.



**Fig. 110:** *Cardamine dimidia*. Rosette leaves variation.



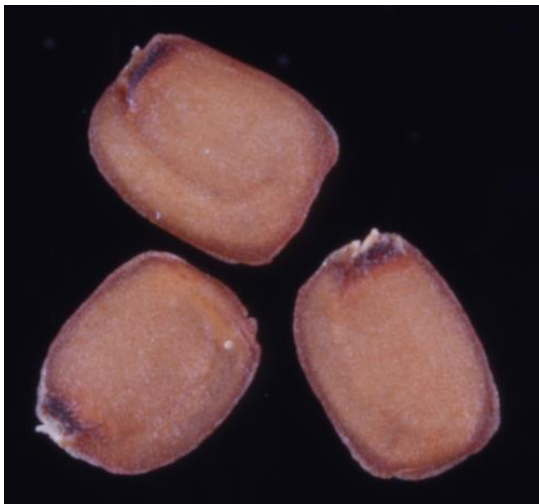
**Fig. 111:** *Cardamine dimidia*. Inflorescence with buds and flowers.



**Fig. 112:** *Cardamine dimidia*. Top view of flower.



**Fig. 113:** *Cardamine dimidia*. Developing silique.



**Fig. 114:** *Cardamine dimidia*. Seeds.

## *Cardamine dolichostyla* Heenan, *Phytotaxa* 330: 73–76 (2017)

Holotype: Mt Egmont, E. side, 2750 ft., forest margin, December 1961, A. P. Druce s.n., CHR 165182!

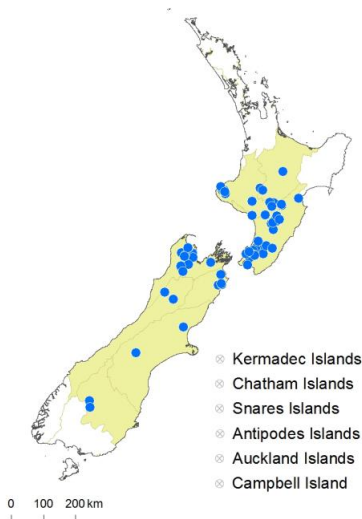
= *Cardamine debilis* DC., *Prodr. [A. P. de Candolle]* 2, 265 (1821) nom. illeg.

≡ *Cardamine hirsuta* var. *debilis* (DC.) Hook.f., *Handb. New Zealand Fl.* 12 (1864)

Holotype (see Heenan 2017 for discussion): Forster, GDC G00205230!

**Etymology:** The specific epithet *dolichostyla* (Greek: long style) refers to the characteristic long style of this species

Perennial herb, single rosette or with short lateral branches, stem and branches 0.8–1.3 mm diam. Leaves up to 130 mm long, pinnatisect, lamina 15.0–60.0 × 8.0–35.0 mm, green, sometimes purple on abaxial surface, membranous, sparsely to moderately hairy on adaxial surface, glabrous or occasionally sparsely hairy on abaxial surface, margin and petiole; hydathodes prominent on terminal and lateral leaflet margins. Terminal pinna 3.0–33.0 × 3.0–27.0 mm, simple, sometimes with several shallow lobes, broadly reniform, orbicular, orbicular-rhomboid, apex obtuse with a conspicuous hydathode, base obtuse, truncate to cordate; lateral pinnae 2–6, 2.0–20.0 × 2.0–20.0 mm, orbicular, orbicular-rhomboid, to broadly elliptic, base often oblique, petiolule 1.0–8.0 mm long; petiole up to 60 mm long; hairs 0.3–0.5 mm long, recurved. Cauline leaves similar to rosette leaves, but with fewer and narrower leaflets, becoming smaller in all parts; upper leaves 5.0–10.0 × 2.0–3.5 mm, increasingly linear, simple. Inflorescence racemose, sometimes with lateral racemes, each raceme 6–12-flowered; peduncle up to 430 mm long, 0.9–1.4 mm diam. At base, spreading to ascending, glabrous to sparsely hairy. Pedicels 7.0–17.0 mm long, 0.5–0.6 mm diam., glabrous. Sepals 2.1–2.5 × 1.0–1.2 mm, elliptic-oblong to broadly elliptic, saccate, green or red-brown, glabrous or sparsely hairy distally, margin white and membranous, apex obtuse, base truncate. Petals 4.8–7.0 × 2.0–3.0 mm, white, limb narrowly obovate to obovate; apex obtuse; base cuneate, tapering to an indistinct claw or claw up to c. 1.0 mm long. Stamens 6; median filaments 4, 3.4–3.5 mm long; lateral filaments 2, 2.7–3.2 mm long; anthers 0.4–0.7 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 4.3–4.5 mm long, 0.5–0.6 mm diam., ± terete, green, glabrous; ovules 8–14; style 0.6–1.0 mm long, ± terete; stigma 0.5–0.6 mm diam. Siliques 25.0–44.0 × 1.0–1.2 mm, glabrous, style (1.8–)2.5–8.5 mm long; valves green to red-brown at maturity, straw-coloured when dehiscent; replum 0.3–0.4 mm wide. Seeds 1.1–1.8 mm long, 0.9–1.2 mm wide, 0.3–0.4 mm thick, oblong, green-brown; wing absent.



**Fig. 115:** *Cardamine dolichostyla* distribution map based on databased records at AK, CHR, OTA & WELT.

Jerusalem, CHR 286937).

**Distribution:** North Island: Volcanic Plateau, Taranaki, Southern North Island.

South Island: Western Nelson, Sounds Nelson, Westland, Marlborough, Canterbury, Otago.

*Cardamine dolichostyla* is widespread in North and South Islands.

**Biostatus:** Indigenous (Endemic).

*Cardamine dolichostyla* is assessed as having a conservation status of Not Threatened (de Lange *et al.* 2018).

**Habitat:** *Cardamine dolichostyla* occurs in damp and moist situations in forest and on forest margins, and in open areas such as track margins and river flats and terraces.

**Recognition:** *Cardamine dolichostyla* is distinguished from *C. chlorina* by its narrower sepals, longer filaments, fewer ovules, longer and narrower siliques with a prominent style, and henna seeds.

**Phenology:** Flowering August–March; Fruiting August–April.

**Notes:** Some plants from the Whanganui–Mt Taranaki area have leaves with a conspicuous purple-violet abaxial surface (e.g., Mt Taranaki, CHR 189238;



**Fig. 116:** *Cardamine dolichostyla*. Rosette leaves.



**Fig. 117:** *Cardamine dolichostyla*. Lateral leaflet of rosette leaf.



**Fig. 118:** *Cardamine dolichostyla*. Inflorescence and cauline leaf.



**Fig. 119:** *Cardamine dolichostyla*. Top view of flower.



**Fig. 120:** *Cardamine dolichostyla*. Side view of flower.



**Fig. 121:** *Cardamine dolichostyla*. Inflorescence with siliques.





**Fig. 122:** *Cardamine dolichostyla*. Style on mature silique.



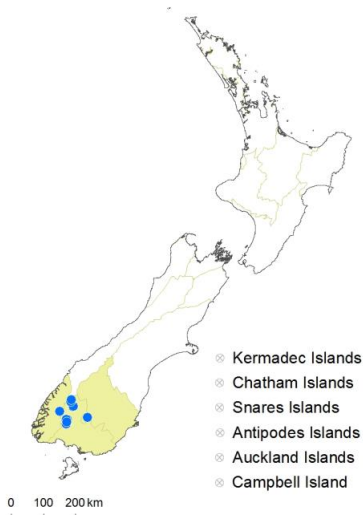
**Fig. 123:** *Cardamine dolichostyla*. Seeds.

### ***Cardamine eminentia* Heenan, *Phytotaxa* 330: 77–79 (2017)**

Holotype: Southland Land District, Mt Cerberus, Livingston Mountains, among boulders in ultramafic area, 27 January 1998, *P. B. Heenan s.n.*, CHR 514975!

**Etymology:** The specific epithet *eminentia* (Latin: protuberance) refers to the presence of a prominent hydathode protruding from the axil of the leaflet petiolules.

Perennial herb, single rosette or multiple rosettes on short lateral branches, stem and branches 1.0–2.0 mm diam., rhizomatous. Leaves up to 60 mm long, pinnatifid; lamina 3.5–12.0 × 2.4–9.0 mm, green, glabrous, coriaceous, obovate to broadly elliptic; petiole up to 46 mm long, plano-convex, glabrous. Terminal pinna 3.0–7.7 × 2.8–8.6 mm, orbicular-reniform to deltoid-reniform, sometimes with 1–2 shallow lobes, margin usually with 2 lateral hydathodes, apex obtuse with a distinct hydathode; base cuneate, obtuse or truncate. Lateral pinnae 2–6, 0.5–4.5 × 0.8–3.5 mm, orbicular, orbicular-obovate to obovate, petiolule up to 0.5 mm long, hydathode up to 0.3 mm in axil. Cauline leaves sometimes present, subtending proximal flowers or inserted on lower peduncle, smaller and narrower than rosette leaves. Inflorescence racemose, often with 2–5 lateral racemes, each 6–14-flowered; peduncle 8–150 mm long, 1.0–1.6 mm diam. At base, ascending, glabrous. Pedicels 4.0–15.0 mm long, 0.5–0.7 mm diam., stout, glabrous but often with axillary hydathodes. Sepals 2.2–4.2 × 1.0–1.4 mm, elliptic-oblong to elliptic, ± saccate, green and sometimes flushed red-brown at apex, glabrous, margin white and membranous, apex obtuse, base truncate. Petals 4.5–7.0 × 0.9–2.0 mm, white, limb obovate; apex obtuse; base cuneate, tapering to a 1.5–2.5 mm long claw. Stamens 6; median filaments 4, 2.8–3.8 mm long; lateral filaments 2, 2.4–3.6 mm long; anthers 0.6–0.7 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 2.5–4.5 mm long, 0.5–0.7 mm diam., ± terete, green, glabrous; ovules 10–16; style 0.9–1.2 mm long, ± terete; stigma 0.4–0.5 mm diam. Siliques 16.0–20.0 × 1.5–2.0 mm, glabrous, style 1.3–1.5 mm long, valves green at maturity, replum 0.5–0.6 mm wide. Seeds 1.0–1.4 mm long, 0.9–1.1 mm wide, 0.3–0.4 mm thick, broadly oblong-orbicular to orbicular-rectangular, orange-brown; wing present, usually towards base, c. 0.1 mm wide, pale grey; with thick-walled reticulate cells.



**Fig. 124:** *Cardamine eminentia* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** South Island: Otago, Southland, Fiordland.

*Cardamine eminentia* is known from the Livingston Mountains (e.g., Mt Cerberus), Tākitimu Mountains, East Dome, and Mt Luxmore (west of Lake Te Anau).

**Biostatus:** Indigenous (Endemic).

*Cardamine eminentia* is assessed as having a conservation status of At Risk–Naturally Uncommon, with the qualifiers Data Poor and Sparse (de Lange *et al.* 2018). The qualifier Data Poor is applied because although there are populations on different mountain ranges, the base-rich habitat seems quite specific and the number and size of the populations are not known with certainty.

**Habitat:** *Cardamine eminentia* grows on ultramafic, volcanic and limestone scree, rock debris and fellfield.

**Recognition:** *Cardamine eminentia* is distinguished from *C. coronata* by its compact growth habit, smaller, glabrous and coriaceous leaves, shorter inflorescences, cream to pale yellow anthers, broader siliques, and the seeds having a thick-walled reticulum.

**Phenology:** Flowering December–January; Fruiting January–February.



**Fig. 125:** *Cardamine eminentia*. Plant with rosette leaves.



**Fig. 126:** *Cardamine eminentia*. Rosette leaves.



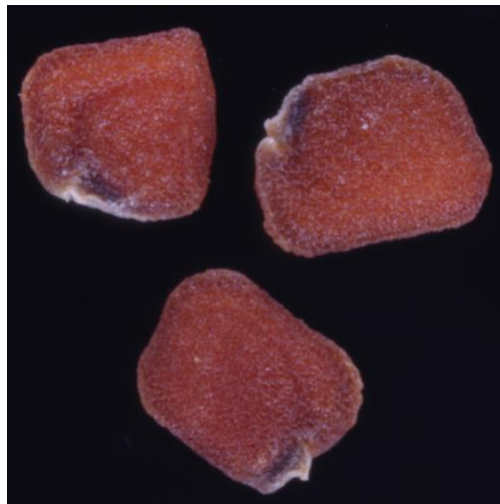
**Fig. 127:** *Cardamine eminentia*. Leaflet axillary hydathode.



**Fig. 128:** *Cardamine eminentia*. Top view of flowers.



**Fig. 129:** *Cardamine eminentia*. Side view of flowers.



**Fig. 130:** *Cardamine eminentia*. Seeds.

### ***Cardamine exigua* Heenan, *Phytotaxa* 330: 79–81 (2017)**

Holotype: Otago, Rock and Pillar Range, 3900 ft., damp turf on slope below snow patch, 1 December 1969, *B. H. Macmillan* 69/289, CHR 199634!

**Etymology:** The specific epithet *exigua* (Latin: small in all parts) refers to the diminutive size of the leaves, flowers and siliques.

Perennial herb, single rosette or with short lateral branches. Leaves up to 65 mm long, pinnatisect; lamina 3.0–13.0 × 1.5–7.0 mm, green, semi-coriaceous to coriaceous, glabrous or sparsely hairy on abaxial surface, glabrous or sparsely to moderately hairy on adaxial surface, margin and petiole; hairs 0.3–0.6 mm long, spreading to patent; petiole up to 52 mm long. Terminal pinna 3.0–11.0 × 1.5–8.0 mm, simple, orbicular-rhomboid, rhomboid, broadly elliptic-rhomboid to broadly elliptic; margin entire, with 1–4 distinct hydathodes; apex obtuse with a ± distinct hydathode; base obtuse to truncate. Lateral pinnae 1–8, 0.7–4.5 × 0.4–2.2, broadly elliptic-oblong to broadly elliptic-orbicular; apex obtuse; base obtuse; petiolule up to 0.2 mm long, or pinnae sessile. Cauline leaves absent. Inflorescence corymbose, each corymb 2–6-flowered or flowers solitary; peduncle up to 45 mm long, 0.5–1.3 mm diam. At base, spreading to ascending, glabrous to moderately hairy. Pedicels 6.0–70.0 mm long, 0.2–0.4 mm diam., glabrous to moderately hairy. Sepals 1.1–2.0 × 0.5–0.9 mm, elliptic-oblong, saccate, green to red-brown, usually glabrous to occasionally sparsely hairy, hairs spreading; margin white and membranous; apex obtuse; base truncate. Petals 1.3–3.5 × 0.9–2.2 mm, white, limb obovate, apex obtuse, base attenuate, tapering to a 0.2–0.4 mm long claw. Stamens 6; median

filaments 4, 1.2–2.1 mm long; lateral filaments 2, 1.2–1.8 mm long; anthers 0.4–0.5 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly above the stigma. Ovary 0.8–1.8 mm long, 0.3–0.5 mm diam., ± terete, green, glabrous; ovules 16–22; style 0.1–0.2 mm long, ± terete; stigma 0.3–0.4 mm diam. Siliques 5.7–14.0 × 0.9–1.3 mm, glabrous, style 0.3–0.5 mm long; valves green to yellow-green and sometimes flushed purple at maturity and when dehiscent; replum 0.5–0.7 mm wide. Seeds 1.0–1.2 mm long, 0.9–1.0 mm wide, 0.3–0.4 mm thick, oblong-orbicular to broadly oblong, henna; wing absent.

**Distribution:** South Island: Otago, Southland.

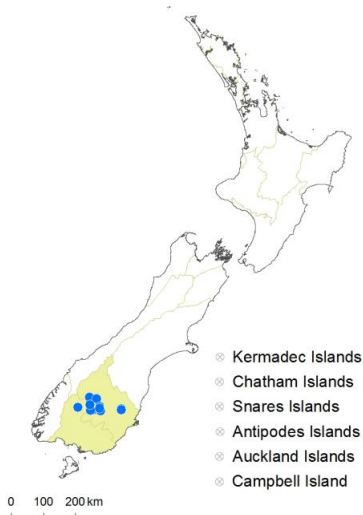
**Biostatus:** Indigenous (Endemic).

*Cardamine exigua* is assessed as having a conservation status of At Risk—Naturally Uncommon, with the qualifier Data Poor (de Lange *et al.* 2018). The qualifier Data Poor is applied because additional information on the number and size of the populations is required.

**Habitat:** *Cardamine exigua* is restricted to high alpine areas, where it occurs in a variety of habitats, including snowbanks, bogs, herbfields, and rock crevices.

**Recognition:** *Cardamine exigua* is distinguished from *C. reptans* by its tufted growth habit and absence of spreading stems and rhizomes, the peduncles, pedicels and petioles usually having spreading to patent hairs, and smaller flowers with shorter sepals, petals, filaments and silique style.

**Phenology:** Flowering November–February; Fruiting January–March.



**Fig. 131:** *Cardamine exigua* distribution map based on databased records at AK, CHR, OTA & WELT.



**Fig. 132:** *Cardamine exigua*. Plant with stems and leafy rosettes.



**Fig. 133:** *Cardamine exigua*. Plant with leafy rosettes.



Fig. 134: *Cardamine exigua*. Rosette leaves.



Fig. 135: *Cardamine exigua*. Top view of flower.



Fig. 136: *Cardamine exigua*. Side view of flower.

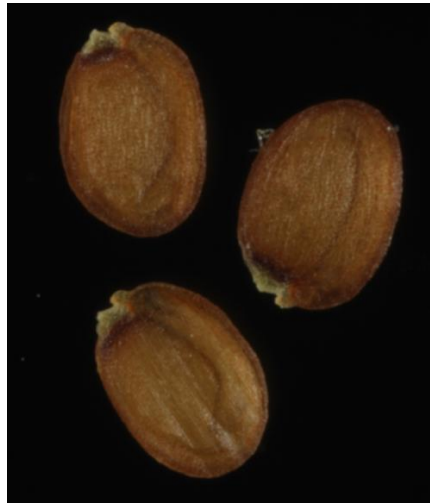
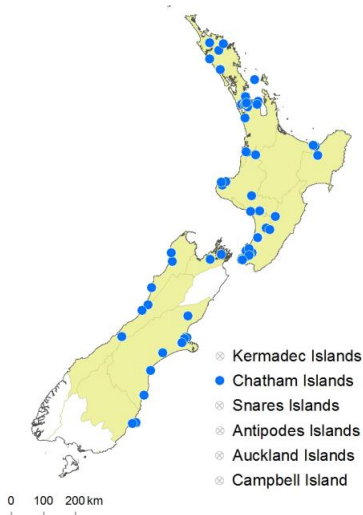


Fig. 137: *Cardamine exigua*. Seeds.

### ***Cardamine flexuosa* With., *Arr. Brit. Pl. ed. 3, 578 (1796)***

Annual or biennial herb, single rosette or with short lateral branches. Leaves up to 120 mm long, pinnatisect, not rosulate, withering in fruit; lamina 4.0–105.0 × 2.5–60.0 mm, green, membranous, glabrous to sparsely hairy on adaxial surface and margin, glabrous on abaxial surface and petiole; hairs 0.2–0.4 mm long, spreading to patent; petiole up to 35 mm long. Terminal pinna 2.0–24.0 × 2.0–27.0 mm, simple, orbicular, orbicular-reniform to broadly orbicular-reniform, repand; margin entire, sometimes shallowly and irregularly lobed, with 2–4 usually ± distinct hydathodes; apex obtuse, usually with a ± distinct hydathode; base weakly cordate, truncate or obtuse. Lateral pinnae 2–10, 1.0–23.0 × 1.0–19.0 mm, orbicular, orbicular-rhomboid, to broadly elliptic; margin entire, occasionally weakly lobed, with 2–4 usually ± distinct hydathodes; apex obtuse, usually with a ± distinct hydathode; base obtuse to cuneate, often oblique; petiolule 0.2–14.0 mm long, often appearing ± sessile. Cauline leaves similar to rosette leaves but becoming narrower, smaller, and deeper lobed to toothed; pinnae broadly elliptic to elliptic-rhomboid, bases cuneate to obtuse; terminal pinna up to 30.0 × 16.0 mm, lateral pinnae up to 24.0 × 14.0 mm; petiolules sessile or up to 10.0 mm long. Inflorescence racemose, with lateral racemes, each raceme 3–20-flowered, erect, ascending or decumbent, flexuous or straight; peduncle up to 200 mm long, 1.0–2.5 mm diam. At base, erect, sparsely hairy to glabrous. Pedicels 3.5–17.0 mm long, 0.3–0.6 mm diam., usually glabrous or rarely sparsely hairy, dorsiventrally compressed, at fruiting divaricate or ascending; axils with hydathode and 1–2 patent hairs. Sepals 1.5–3.5 × 0.7–1.4 mm, elliptic-oblong, saccate, green, glabrous or sparsely hairy, margin usually white and membranous, apex obtuse, base truncate. Petals 4; 2.5–4.0 × 1.0–1.7 mm, white, limb obovate; apex obtuse; base cuneate, tapering to a 0.8–1.0 mm long claw. Stamens 6(–4); median filaments 4, 2.3–2.4 mm long; lateral filaments 2, 2.6–2.7 mm long; anthers 0.3–0.5 mm long, pale

yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 2.5–2.9 mm long, 0.4–0.5 mm diam., ± terete, green, glabrous; ovules 18–40; style c. 0.1 mm long, ± terete; stigma 0.5–0.6 mm diam., white. Siliques 12.0–28.0 × 1.0–1.5 mm, glabrous, style 0.3–1.0 mm long; valves green at maturity and when dehiscent; replum 0.3–0.5 mm wide. Seeds 0.8–1.0 mm long, 0.7–0.9 mm wide, 0.3–0.4 mm thick, oblong-orbicular to broadly oblong, light green to light yellow-brown; wing absent.



**Fig. 138:** *Cardamine flexuosa* distribution map based on databased records at AK, CHR, OTA & WELT.

also Garnock-Jones 1979). Healy (1957) provides details of additional specimens collected from other parts of the North Island and also the first South Island collection from Dunedin in 1951 (CHR 71732).

**Phenology:** Flowering January–December; Fruiting January–December.

**Distribution:** North Island: Northland, Auckland, Volcanic Plateau, Gisborne, Taranaki, Southern North Island.

South Island: Western Nelson, Sounds Nelson, Westland, Canterbury, Otago.

Chatham Islands: Chatham Island.

Naturalised in New Zealand, originally from Europe.

*Cardamine flexuosa* occurs throughout the North Island and is more locally distributed in the South Island.

**Region of origin:** Europe

**Biostatus:** Exotic; fully naturalised.

**Habitat:** *Cardamine flexuosa* predominantly occurs in damp or wet and often shaded sites, where it can be found as a garden weed, within or on the margins of disturbed or open indigenous forest and scrub, in wasteland and exotic plantations, along the margins of stream banks, and at the edge of road cuttings and tracks.

**First record:** The specimen (CHR 70259) supporting the first record was collected from Marokopa River, near Te Anga, Kāwhia County (South Auckland), in 1947 (Healy 1957; see



**Fig. 139:** *Cardamine flexuosa*. Rosette leaves.



**Fig. 140:** *Cardamine flexuosa*. Upper cauline leaves.



**Fig. 141:** *Cardamine flexuosa*. Lower cauline leaves.



**Fig. 142:** *Cardamine flexuosa*. Flowers.



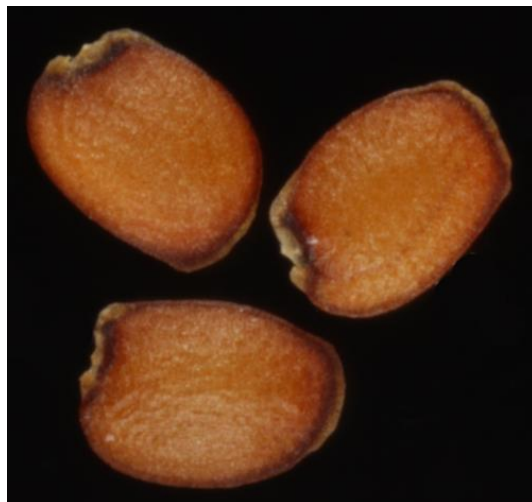
**Fig. 143:** *Cardamine flexuosa*. Flowers.



**Fig. 144:** *Cardamine flexuosa*. Inflorescence with flowers and siliques.



**Fig. 145:** *Cardamine flexuosa*. Stem with hairs.



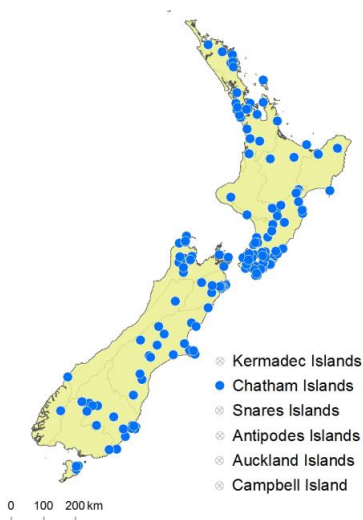
**Fig. 146:** *Cardamine flexuosa*. Seeds.

## ***Cardamine forsteri* Govaerts, *World Checkl. Seed Pl.* 13 (1999)**

nom. nov. pro *Sisymbrium heterophyllum* G.Forst. 1786  
= *Sisymbrium heterophyllum* G.Forst., *Fl. Ins. Austr.* 46 (1786)  
≡ *Cardamine heterophylla* (G.Forst.) O.E.Schulz, *Bot. Jahrb. Syst.* 32: 487–488 (1903) nom. illeg., non *Cardamine heterophylla* Host 1797  
Lectotype (designated by Heenan 2017): Habitat in New Zealand, The Forster Herbarium, K, image K000697757! See Heenan (2017) for further discussion on typification.

**Etymology:** The epithet *forsteri* presumably commemorates G. Forster, the author of *Sisymbrium heterophyllum* G.Forst.; etymology was not provided by Govaerts (1999).

Perennial herb, single rosette or several rosettes with short lateral branches. Leaves up to 110 mm long, pinnatisect; lamina 30.0–68.0 × 15.0–36.0 mm, light green to green, membranous, glabrous to sparsely or moderately hairy on abaxial surface, glabrate or sparsely to moderately hairy on adaxial surface, margin and petiole; hairs 0.2–0.6 mm long, retrorse, spreading, solitary or occasionally in pairs; hydathode in leaflet axil, up to 0.3 mm long; petiole up to 48 mm long. Terminal pinna 3.5–21.0 × 4.7–23.0 mm, simple, broadly orbicular or broadly deltoid; margin entire to often deeply lobed, often irregular in shape, with 2–4 distinct hydathodes; apex obtuse with a distinct hydathode; base cordate or truncate. Lateral pinnae 2–6, 2.0–20.0 × 2.0–15.0, broadly orbicular, broadly elliptic-orbicular or broadly deltoid; apex obtuse with a distinct hydathode; base shallowly cordate, ± truncate to obtuse, sometimes oblique; petiolule 2.0–8.0 mm long. Cauline leaves similar to rosette leaves but smaller, narrower, with fewer lateral pinnae, distinctly lobed, pinnae bases attenuate to obtuse, terminal pinna up to 20.0 × 20.0 mm, lateral pinnae up to 13.0 × 11.0 mm. Inflorescence racemose, sometimes with lateral racemes, each raceme 3–6-flowered; peduncle up to 750 mm long, 0.8–1.1 mm diam. at base, spreading to ascending, glabrous to sparsely or moderately hairy. Pedicels 1.2–8.5 mm long, 0.15–0.25 mm diam., glabrous or moderately to densely hairy, hairs retrorse. Sepals 1.3–1.6 × 0.5–0.7 mm, elliptic-oblong, saccate, green to red-brown, sparsely hairy, hairs spreading to patent, margin white and membranous, apex obtuse to subacute, base truncate. Petals 3.0–4.5 × 0.7–1.4 mm, white, limb narrowly obovate; apex obtuse; base attenuate, tapering to a c. 0.1 mm-long claw. Stamens 6; median filaments 4, 1.6–2.5 mm long; lateral filaments 2, 1.6–2.0 mm long; anthers 0.2–0.3 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly above the stigma. Ovary 1.5–2.5 mm long, 0.3–0.5 mm diam., ± terete, green, usually densely hairy; hairs <0.15 mm long, retrorse; ovules 18–22; style 0.2–0.3 mm long, ± terete; stigma 0.4–0.6 mm diam. Siliques 20.0–37.0 × 0.7–1.1 mm, style 1.2–1.4 mm long; valves purple-brown or green-brown at maturity and when dehiscent, glabrous or sparsely to moderately hairy; hairs retrorse, 0.15–0.35 mm long; replum 0.2–0.4 mm wide, glabrous or sparsely hairy. Seeds 1.2–1.4 mm long, 0.6–0.9 mm wide, 0.3–0.4 mm thick, oblong to broadly oblong, henna; wing absent.



**Fig. 147:** *Cardamine forsteri* distribution map based on databased records at AK, CHR, OTA & WELT.

and river beds (Heenan 2017). *Cardamine forsteri* also shows a preference for base-rich substrates such as limestone and sandstone.

**Distribution:** North Island: Northland, Auckland, Volcanic Plateau, Gisborne, Taranaki, Southern North Island.

South Island: Western Nelson, Sounds Nelson, Westland, Marlborough, Canterbury, Otago, Southland, Fiordland.

Stewart Island.

Chatham Islands: Chatham Island.

*Cardamine forsteri* is widespread throughout New Zealand, including the North Island, South Island, and Chatham Islands. *Cardamine forsteri* comprises glabrous and hairy siliqua forms, and both are widely distributed in New Zealand.

**Biostatus:** Indigenous (Endemic).

*Cardamine forsteri* is assessed as having a conservation status of Not Threatened (de Lange *et al.* 2018).

**Habitat:** *Cardamine forsteri* occurs in a wide variety of habitats, including moist or dry soils in open, grazed and/or disturbed areas of coastal and lowland forest, among seabird burrows on peaty soils (e.g., Herekopere Island), on or around rocky bluffs, amongst tussocks and scrubland, and in stream



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**Phenology:** Flowering August–April; Fruiting October–May.

**Notes:** Silique valve hairs vary throughout the distributional range, with plants either having hairy or glabrous siliques. This variation can occur with close geographic proximity, with, for example, plants from Pareora River gorge population (Canterbury) having mostly hairy silique valves but also some plants with glabrous valves. Flower colour is typically white, but collections with lilac-pink petals have been made from Upper Hutt, Wellington (CHR 82837, A. P. Druce s.n.; CHR 567795, P. Enright s.n.).

The presence of axillary leaflet hydathodes is an important character of *Cardamine forsteri*. However, their presence can vary as they are caducous, and so careful searching of the leaf axils is often needed to locate persistent hydathodes, especially on older leaves. A number of plants with young leaves in good condition collected from the western Wellington coast appear not to have axillary hydathodes, but in all other respects these plants have characters consistent with *C. forsteri*.

Plants included in *Cardamine forsteri* have previously been known by the tagnames *C.* "narrow petal" (Pritchard 1957; Allan 1961; Webb et al. 1988), *C.* "(b) slender var." (Allan 1961; Webb et al. 1988), *C.* "Wakatipu minute flower" (Druce 1993), and *C.* "Reporoa Bog" (CHR!). Plants that have been previously referred to *C.* "slender var." and *C.* "Reporoa Bog" are typically mature plants that are characterised by multiple stems and the absence of basal and lower cauline leaves, but they also have siliques clustered at the distal part of the inflorescences, lobed leaflets, sometimes hairy siliques and leaflets with axillary hydathodes (all features of *C. forsteri*).



**Fig. 148:** *Cardamine forsteri*. Growth habit with numerous inflorescence stems.



**Fig. 149:** *Cardamine forsteri*. Rosette leaves.



**Fig. 150:** *Cardamine forsteri*. Leaflet axillary hydathode.



**Fig. 151:** *Cardamine forsteri*. Side view of flower.



Fig. 152: *Cardamine forsteri*. Top view of flower.



Fig. 153: *Cardamine forsteri*. Flower and silique. Note silique with hairs.



Fig. 154: *Cardamine forsteri*. Silique with hairs.



Fig. 155: *Cardamine forsteri*. Seeds.

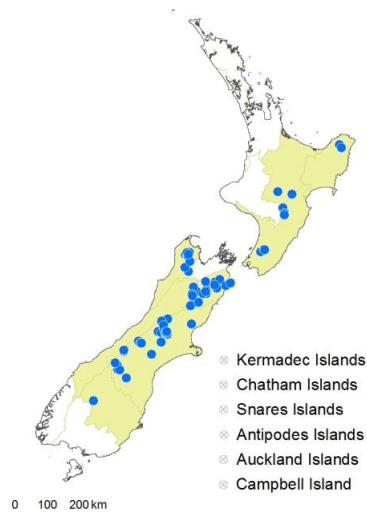
### ***Cardamine glara* Heenan, *Phytotaxa* 330: 90–94 (2017)**

Holotype: Canterbury Land District, Torlesse Range, Ghost Creek, scree, alluvial outwash terraces, 14 Dec. 1996, *P. Heenan* 63/96, CHR 511025!

**Etymology:** The specific epithet *glara* (Latin: scree) refers to the scree habitat the species commonly occupies.

Perennial herb, single rosette or with short lateral branches, stem and branches 0.8–1.2 mm diam., rhizomatous. Leaves up to 80 mm long, pinnatisect; lamina 10.0–38.0 × 8.0–17.0 mm, usually grey-green to brown-green, occasionally green, coriaceous, glabrous or sparsely hairy on abaxial and adaxial surfaces, margin and petiole. Terminal pinna 2.0–17.0(–25.0) × 2.0–20.0(–30.0) mm, usually simple, sometimes with 1–2 shallow lobes, orbicular, orbicular-rhomboid, to broadly elliptic, apex obtuse with an inconspicuous hydathode, base obtuse, truncate or weakly cordate and sometimes oblique. Lateral pinnae 2–4, 2.0–6.2 × 2.0–6.2, orbicular, orbicular-rhomboid, to broadly elliptic, petiolule 0.8–5.0 mm long; petiole up to 50 mm long; hairs septate and 0.5–0.7 mm long. Cauline leaves similar to rosette leaves but smaller and with fewer lateral pinnae. Inflorescence with 1–5 corymbs, each corymb 2–5-flowered and usually with a solitary flower lower down the peduncle, flowers occasionally solitary; peduncle up to 100(–180) mm long, 0.6–2.1 mm diam. at base, spreading to ascending, glabrous or occasionally sparsely hairy. Pedicels 9.0–16.0(–40.0) mm long, 0.2–0.4 mm diam., glabrous. Sepals 2.3–3.0 × 0.8–1.2 mm, elliptic-oblong to broadly elliptic, ± saccate, green or red-brown, glabrous or sparsely hairy distally, margin white and membranous, apex obtuse, base truncate. Petals absent or present, when present 4.5–6.5 × 1.9–2.5 mm, white, limb

obovate to broadly elliptic; apex obtuse; base cuneate, tapering to a c. 1 mm long claw. Stamens 6; median filaments 4, 2.8–3.4 mm long; lateral filaments 2, 2.4–2.6 mm long; anthers 0.5–0.6 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 3.0–4.0 mm long, 0.5–0.6 mm diam., ± terete, green, glabrous; ovules 28–36; style 0.3–0.4 mm long, ± terete; stigma 0.3–0.4 mm diam. Siliques 20.0–32.0(–40.0) × 1.0–1.2 mm, glabrous, style 0.6–0.9 mm long; valves green to red-brown at maturity; straw-coloured when dehiscent, replum 0.4–0.5 mm wide. Seeds 1.0–1.2 mm long, 0.8–0.9 mm wide, 0.3–0.5 mm thick, orbicular-oblong to broadly oblong, yellow-brown to henna; wing absent.



**Fig. 156:** *Cardamine glara* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** North Island: Gisborne, Volcanic Plateau, Southern North Island.

South Island: Western Nelson, Westland, Marlborough, Canterbury, Otago.

**Biostatus:** Indigenous (Endemic).

*Cardamine glara* is assessed as having a conservation status of Not Threatened (de Lange *et al.* 2018).

**Habitat:** *Cardamine glara* most commonly occurs in mountainous areas on scree and alluvial river beds, but it also grows on seepages in montane and subalpine turf, and on crevices and ledges on cliffs and bluffs. It usually occurs on greywacke and limestone substrates.

**Recognition:** *Cardamine glara* is distinguished from *C. corymbosa* by its robust, rhizomatous growth habit, coriaceous, usually grey-green to brown-green leaves, the terminal leaf base usually obtuse or truncate, and larger flowers and siliques.

**Phenology:** Flowering September–March; Fruiting November–March.

**Hybridisation:** Putative hybrids between *C. glara* and *C. dimidia* have been collected from the Yeo Stream, Marlborough (South Island). These plants (e.g., CHR 514766) have leaves intermediate in size, shape and number of lobes between the two putative parents.

**Notes:** Plants collected from limestone habitats (e.g., Castle Hill basin) appear to be slightly larger than those collected from greywacke habitats, but otherwise have the diagnostic features of *C. glara*. Previously referred to by the tagname *Cardamine* aff. *corymbosa* "scree race" (e.g., Pritchard 1957).



**Fig. 157:** *Cardamine glara*. Plant with rosette leaves and inflorescence with flowers.



**Fig. 158:** *Cardamine glara*. Plant with rosette leaves and inflorescence with siliques.



**Fig. 159:** *Cardamine glara*. Plant with underground stems.



**Fig. 160:** *Cardamine glara*. Rosette leaves.



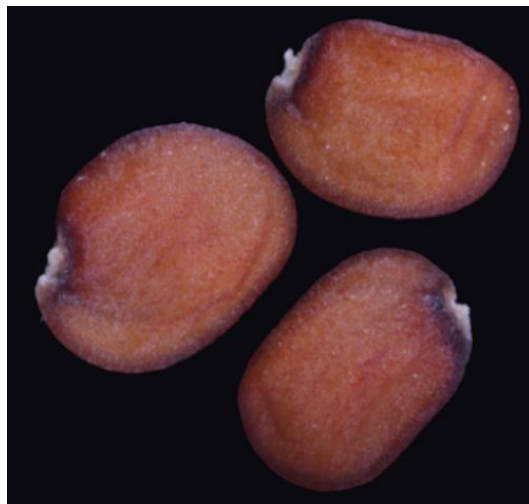
**Fig. 161:** *Cardamine glara*. Flowers.



**Fig. 162:** *Cardamine glara*. Apetalous flower.



**Fig. 163:** *Cardamine glara*. Upper part of inflorescence with apetalous flowers.



**Fig. 164:** *Cardamine glara*. Seeds.

## *Cardamine grandiscapa* Heenan, *Phytotaxa* 330: 94–96 (2017)

Holotype: Otago Land District, Remarkables, Wye Creek, 700 m, at edge of rocky bluff, 26 September 2009, P. B. Heenan s.n., CHR 617195!

**Etymology:** The specific epithet *grandiscapa* (Latin: large stem) refers to the large size of the inflorescence of this species in comparison to other members of the *C. corymbosa* complex.

Perennial herb, single rosette or with short lateral branches, stem and branches 0.6–1.2 mm diam. Leaves up to 160 mm long, pinnatifid or pinnatisect; lamina 8.0–85.0 × 3.0–40.0 mm, green, usually coriaceous, sparsely to moderately hairy or glabrate on adaxial surface, margin and petiole, glabrous or sparsely hairy on abaxial surface; terminal pinna 3.0–27.0 × 3.0–30.0 mm, simple, orbicular, orbicular-reniform to orbicular-deltoid, apex obtuse with an inconspicuous hydathode, base usually cordate, sometimes obtuse or truncate. Lateral pinnae 0–4, 2.0–19.0 × 2.0–13.0, orbicular, orbicular-rhomboid to broadly elliptic, petiolule absent or up to 1.0 mm long; petiole up to 75 mm long; hairs 0.5–0.7 mm long, spreading to patent. Cauline leaves similar to rosette leaves but smaller, narrower, with fewer lateral pinnae, pinnae bases obtuse to cuneate; terminal pinna up to 23.0 × 15.0 mm, lateral pinnae 0–2, up to 12.0 × 6.0 mm. Inflorescence with 1–9 corymbs, each corymb 2–19-flowered or flowers occasionally solitary; peduncle up to 120(–180) mm long, 0.5–2.0 mm diam. at base, spreading to ascending, glabrous or rarely hairy. Pedicels 6.0–9.0 mm long, 0.2–0.8 mm diam., glabrous or rarely hairy, ascending or divaricate. Sepals 2.2–3.0 × 1.0–1.3 mm, elliptic-oblong to narrowly elliptic-oblong, ± saccate, green or green-red; glabrous or sparsely to moderately hairy, hairs 0.6–0.7 mm long, spreading to patent; margin with a thin membranous white edge, apex obtuse with a prominent membranous white tip, base truncate. Petals 1–4 or absent; 5.5–6.5 × 2.5–3.0 mm, white, limb obovate to broadly elliptic-obovate; apex obtuse; base cuneate, tapering to a c. 1 mm-long claw. Stamens 6 on petalous flowers, 2–4 on apetalous flowers; median filaments 2–4, 2.4–3.2 mm long; lateral filaments 0–2, 2.2–2.9 mm long; anthers 0.4–0.5 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 2.4–2.8 mm long, 0.4–0.4 mm diam., ± terete, green, glabrous; ovules 20–28; style 0.2–0.3 mm long, ± terete; stigma 0.3–0.4 mm diam. Siliques 13.0–26.0 × 1.1–1.3 mm, glabrous, style 0.7–0.8 mm long; valves green at maturity and when dehiscent, replum 0.4–0.5 mm wide. Seeds 1.1–1.3 mm long, 0.7–0.8 mm wide, 0.4–0.5 mm thick, orbicular-oblong to broadly oblong, light green to yellow-green; wing absent.

**Distribution:** South Island: Canterbury, Otago, Southland, Fiordland.

**Biostatus:** Indigenous (Endemic).

*Cardamine grandiscapa* is assessed as having a conservation status of At Risk–Naturally Uncommon (de Lange *et al.* 2018).

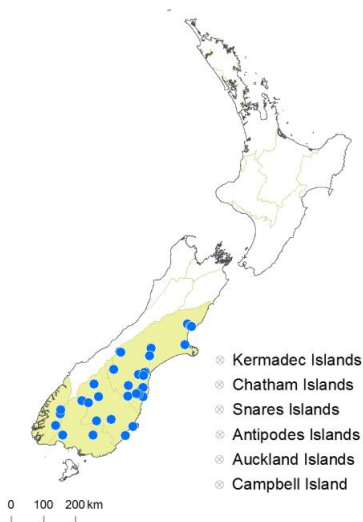
**Habitat:** *Cardamine grandiscapa* prefers fertile or base-rich sites and has been collected from rocky bluffs, sandstone and limestone cliffs, seepage in snow tussock, and in mānuka forest (Heenan 2017). It has been collected as a spontaneous weed in Dunedin and Christchurch gardens (e.g., CHR 616883).

**Recognition:** *Cardamine grandiscapa* is distinguished from *C. corymbosa* by its robust growth habit, larger leaves with a prominent terminal lobe, long inflorescence, and larger petals.

**Phenology:** Flowering October–February; Fruiting October–July.

**Notes:** Two collections from Fiordland (western Southland; CHR 636058, from Mt Luxmore, Kepler Mountains; OTA 54544, Takahē Valley, Murchison Mountains) are included in

the circumscription of *C. grandiscapa*, but differ in having sparsely to moderately hairy pedicels and inflorescence stems, whereas other plants of this species are glabrous for these characters (Heenan 2017). A further distinguishing character of the Fiordland plants is the lateral leaflets having more distinct petiolules.



**Fig. 165:** *Cardamine grandiscapa* distribution map based on databased records at AK, CHR, OTA & WELT.



**Fig. 166:** *Cardamine grandiscapa*. Plant with rosette leaves.



**Fig. 167:** *Cardamine grandiscapa*. Rosette leaves.



**Fig. 168:** *Cardamine grandiscapa*. Inflorescence with cauline leaves and siliques.



**Fig. 169:** *Cardamine grandiscapa*. Flowers with 2, 3 and 4 petals.



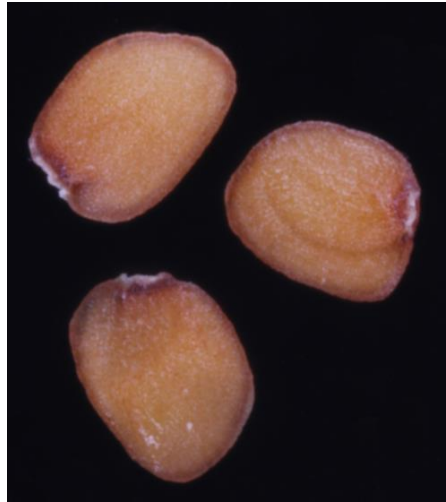
**Fig. 170:** *Cardamine grandiscapa*. Apetalous flower with hairy sepals.



**Fig. 171:** *Cardamine grandiscapa*. Inflorescence stem with hairs.



**Fig. 172:** *Cardamine grandiscapa*. Siliques crowded at apex of inflorescence.



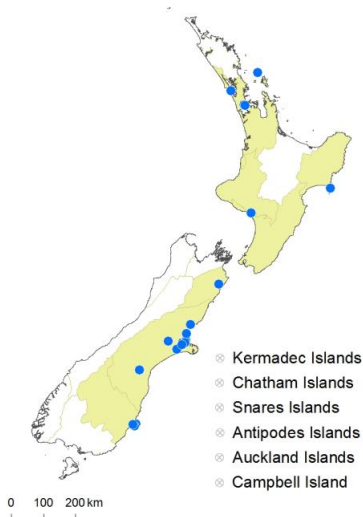
**Fig. 173:** *Cardamine grandiscapa*. Seeds.

### ***Cardamine heleniae* Heenan, *Phytotaxa* 330: 97–100 (2017)**

Holotype: Centre Road, Otago Peninsula, Otago Land District, 180 m, weed in garden and nursery area and on paths, 8 January 2010, *P. B. Heenan s.n.*, CHR 616824!

**Etymology:** The specific epithet *heleniae* is after Helen F. Heenan (née Baldwin; 1968–) and acknowledges her continual support and encouragement of the botanical research of Peter B. Heenan.

Perennial herb, single rosette or with short lateral branches. Leaves up to 120 mm long, pinnatisect; lamina 4.0–55.0 × 2.5–25.0 mm, green to green-brown, membranous, glabrate to sparsely hairy on abaxial surface, sparsely to moderately hairy on adaxial surface, margin and petiole margin hairs usually conspicuous; hairs 0.4–0.6 mm long, spreading to patent; petiole up to 65 mm long, green-brown to red-brown. Terminal pinna 2.0–14.0 × 2.0–17.0 mm, simple, orbicular, broadly orbicular, orbicular-reniform to broadly orbicular-reniform; margin entire, often with 2 distinct shallow lobes, with 2 usually distinct hydathodes; apex obtuse, usually with a distinct hydathode; base usually truncate to weakly cordate, or occasionally obtuse; margin and main veins on abaxial surface green-brown to red-brown. Lateral pinnae 2–6, 1.0–10.0 × 1.0–10.0, simple, orbicular, broadly orbicular, to broadly elliptic-orbicular; margin entire, sometimes shallowly lobed, usually with 2 usually distinct hydathodes; apex obtuse; base usually truncate to weakly cordate, or occasionally obtuse; margin and main veins on abaxial surface green-brown to red-brown; petiolule usually distinct, 0.2–8.0 mm long, green-brown to red-brown. Cauline leaves similar to rosette leaves but smaller, narrower and more angular, with fewer lateral pinnae, pinnae bases attenuate to cuneate; terminal pinna up to 14.0 × 6.0 mm, lateral pinnae up to 8.0 × 4.5 mm. Inflorescence with solitary flowers or 1–3 corymbs, corymbs 2–8-flowered; peduncle up to 150 mm long, 0.5–1.0 mm diam. at base, spreading to ascending, glabrous to sparsely hairy. Pedicels 5.0–20.0 mm long, 0.2–0.5 mm diam., glabrous to sparsely hairy. Sepals 1.3–1.5 × 0.4–0.6 mm, elliptic-oblong, saccate, green-brown to red-brown; sparsely hairy, hairs spreading to patent, 0.2–0.4 mm long; margin white and membranous, apex obtuse, base truncate. Petals 1–4 or absent; 3.0–3.5 × 1.0–1.5 mm, white, limb obovate; apex obtuse; base cuneate, tapering to a 0.7–1.0 mm long claw. Stamens 4–6; median filaments 2–4, 1.8–1.9 mm long; lateral filaments 2, 1.5–1.7 mm long; anthers 0.3–0.4 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 1.9–2.0 mm long, 0.3–0.5 mm diam., ± terete, green-brown to red-brown, glabrous; ovules 26–34; style c. 0.2 mm long, ± terete; stigma 0.3–0.4 mm diam. Siliques 8.0–20.0 × 0.7–0.8 mm, glabrous, weakly torulose, style 0.7–1.2 mm long; valves usually red-brown or sometimes green at maturity and when dehiscent; replum 0.3–0.35 mm wide. Seeds 0.9–1.0 mm long, 0.5–0.7 mm wide, 0.3–0.4 mm thick, oblong, pale green to yellow-green; wing absent.



**Fig. 174:** *Cardamine heleniae* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** North Island: Auckland, Gisborne, Taranaki, Southern North Island.

South Island: Marlborough, Canterbury, Otago.

*Cardamine heleniae* is known from collections made throughout New Zealand, albeit with a sparse distribution, but it has probably been under-collected and it is likely it will be shown to be more common. The North Island collections from widely separated areas provide little additional distributional information, but it is likely to have been under-collected. The available distribution and habitat data indicate that *C. heleniae* may occur naturally in the eastern South Island. If the natural distribution of *C. heleniae* is the eastern South Island, its natural abundance may have reduced due to a significant loss and degradation of habitat, such as has occurred with, for example, the threatened Nationally Critical *Olearia adenocarpa* (Asteraceae) (Heenan & Molloy 2004; de Lange *et al.* 2018).

**Biostatus:** Indigenous (Endemic).

*Cardamine heleniae* is assessed as having a conservation status of Data Deficient (de Lange *et al.* 2018), because its natural distribution, habitats, and the number and size of the

populations are not known with certainty.

**Habitat:** There is considerable uncertainty about the habitats of *Cardamine heleniae* since it is known only from a few wild locations, but its occurrence on limestone and mudstone at a number of sites indicates that it likes base-rich substrates (Heenan 2017). *Cardamine heleniae* has strong, weedy tendencies and often occurs as a weed in amenity gardens, lawns, and nursery pots.

**Recognition:** *Cardamine heleniae* is distinguished from *C. corymbosa* by its conspicuous hydathodes on the leaflet margin, usually distinct petiolules, conspicuously hairy leaf margins, narrow and angular cauline leaflets, siliques that are green-brown to reddish-brown and narrow, and oblong seeds.

**Phenology:** Flowering July–December; Fruiting July–February.



**Fig. 175:** *Cardamine heleniae*. Plants with rosette leaves and flowers.



**Fig. 176:** *Cardamine heleniae*. Rosette leaves.





**Fig. 177:** *Cardamine heleniae*. Leaflets with hairs on margin.



**Fig. 178:** *Cardamine heleniae*. Side view of flower; sepals with patent hairs.



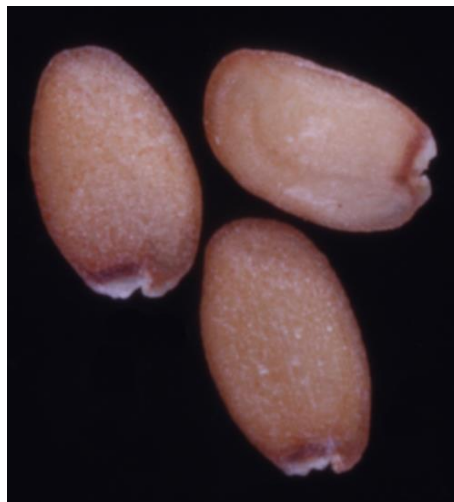
**Fig. 179:** *Cardamine heleniae*. Apetalous flower; sepals with patent hairs.



**Fig. 180:** *Cardamine heleniae*. Inflorescence with cauline leaves and siliques.



**Fig. 181:** *Cardamine heleniae*. Inflorescence with siliques.

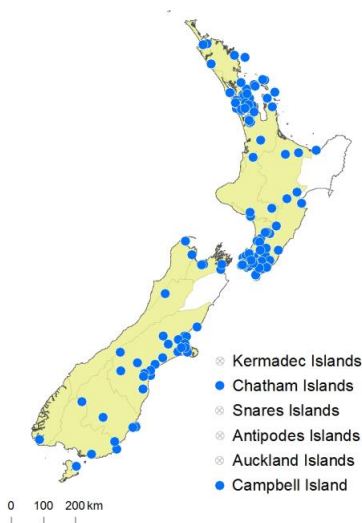


**Fig. 182:** *Cardamine heleniae*. Seeds.

## *Cardamine hirsuta* L., Sp. Pl. 655 (1753)

**Etymology:** The specific epithet *hirsuta* (Latin: hairy) probably alludes to the hairy leaves.

Annual herb, single rosette or sometimes several rosettes on short lateral branches; stems erect to ascending. Leaves up to 100 mm long, pinnatisect; lamina 10.0–22.0 × 8.0–18.0 mm, green, membranous, glabrous to sparsely hairy on abaxial surface, sparsely to moderately hairy on adaxial surface, margin, and petiole; hairs 0.4–0.6 mm long, spreading to patent; petiole up to 27 mm long. Terminal pinna 4.0–20.0 × 6.0–20.0 mm, simple, orbicular to reniform; margin entire to shallowly sinuate, with 2–3 ± distinct hydathodes; apex obtuse with a ± distinct hydathode; base cordate, truncate or occasionally obtuse. Lateral pinnae 2–8, 2.0–11.0 × 2.0–6.0 mm, orbicular to broadly elliptic-orbicular; apex obtuse; base often oblique; petiolule 0.4–1.0 mm long. Cauline leaves similar to rosette leaves but smaller, narrower, with fewer lateral pinnae, pinnae bases attenuate to cuneate; terminal pinna up to 7.0 × 2.5 mm, lateral pinnae up to 4.5 × 1.5 mm. Inflorescence racemose, sometimes with lateral racemes, each raceme 6–12-flowered; peduncle up to 130 mm long, 0.6–0.7 mm diam. at base, spreading to ascending, glabrous to sparsely hairy. Pedicels 6.0–8.0 mm long, 0.2–0.5 mm diam., erect or ascending at fruiting, glabrous to sparsely hairy. Sepals 1.5–2.5 × 0.3–0.7 mm, elliptic-oblong, saccate, green to red-brown, sparsely hairy, hairs spreading to patent, margin white and membranous, apex obtuse, base truncate. Petals 3.0–3.8 × 1.4–1.5 mm, white, limb obovate; apex obtuse; base attenuate, tapering to a c. 0.2 mm long claw. Stamens 4(–6); median filaments 1.2–2.2 mm long; anthers 0.3–0.4 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 1.5–1.7 mm long, 0.3–0.5 mm diam., ± terete, green, glabrous or sparsely to moderately hairy; hairs 0.4–0.6 mm long, patent to slightly antrorse; ovules 28–36; style c. 0.2 mm long, ± terete; stigma 0.3–0.4 mm diam. Siliques 10.0–25.0 × 1.0–1.3 mm, glabrous or sparsely hairy, hairs 0.35–0.6 mm long, style 0.2–0.4 mm long; valves green to yellow-green at maturity and when dehiscent; replum 0.2–0.3 mm wide. Seeds 1.0–1.3 mm long, 0.6–0.9 mm wide, 0.2–0.3 mm thick, oblong to broadly oblong, henna-green to henna; wing present at apex and lateral margin, <0.1 mm wide.



**Fig. 183:** *Cardamine hirsuta* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** North Island: Northland, Auckland, Volcanic Plateau, Taranaki, Southern North Island.

South Island: Western Nelson, Sounds Nelson, Canterbury, Otago, Fiordland, Southland.

Stewart Island.

Chatham Islands.

Campbell Island.

*Cardamine hirsuta* is naturalised in New Zealand, and is originally from Europe. The glabrous siliqua form of *C. hirsuta* occurs throughout New Zealand (including offshore islands). The hairy siliqua form of *C. hirsuta* occurs predominantly in eastern areas of the North, South and Stewart Islands.

**Region of origin:** Europe

**Biostatus:** Exotic; fully naturalised.

**Habitat:** The hairy and glabrous siliqua forms of *C. hirsuta* are both common weeds of parks and gardens in urban areas, of disturbed habitats such as roadsides, waterways and industrial areas, and sometimes of open areas of indigenous vegetation.

**First record:** In his treatment of *C. hirsuta* in New Zealand, Kirk (1899) included the autonym *C. hirsuta* var. *hirsuta* along with four other indigenous taxa accepted by him as varieties of *C. hirsuta*. Kirk (1899) is very clear in recognising *C. hirsuta* var. *hirsuta* in his treatment by referring to the indigenous taxa having six stamens and explicitly stating four stamens are characteristic of *C. hirsuta* var. *hirsuta*. A specimen in the Kirk Herbarium (WELT 62027) is possibly the voucher for this published record, but it lacks a collector, collection date, and locality.

This first record differs from that stated by Garnock-Jones (1979) as being Thomson (1901). Thomson (1901) refers to *C. hirsuta* in a list of garden weeds, but the location of the first record is not stated and a voucher supporting this record has not been located. Allan (1940) gives "Thomson. 1922" as the first record and states the species occurs in Wellington and Otago.

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**Phenology:** Flowering January–December; Fruiting January–December.

**Notes:** *Cardamine hirsuta* and *C. flexuosa* can sometimes be confused. The two species are easily separated by stamen number, with *C. hirsuta* having mostly four stamens and *C. flexuosa* predominantly six stamens. However, stamen number in *C. hirsuta* can be variable, as noted by Cheo et al. (2001), who report that about 80% of the plants in *C. hirsuta* they examined have flowers with four stamens and 18% have five stamens. For *C. flexuosa* they report that 97% of plants have six stamens. In New Zealand a hairy silique form of *C. hirsuta* is distinguished from the glabrous silique form of *C. hirsuta*, and this is supported by nrDNA ETS sequence data (Heenan 2017).



**Fig. 184:** *Cardamine hirsuta*. Plant with rosette leaves.



**Fig. 185:** *Cardamine hirsuta*. Rosette leaves.



**Fig. 186:** *Cardamine hirsuta*. Top view of flowers.



**Fig. 187:** *Cardamine hirsuta*. Plant with inflorescences.



**Fig. 188:** *Cardamine hirsuta*. Inflorescence with cauline leaves and siliques.



**Fig. 189:** *Cardamine hirsuta*. Siliques with valves dehiscent.



**Fig. 190:** *Cardamine hirsuta*. Ovary with patent hairs.



**Fig. 191:** *Cardamine hirsuta*. Seeds.

### ***Cardamine integra* Heenan, *Phytotaxa* 330: 104–106 (2017)**

Holotype: Canterbury Land District, South Canterbury, near Pleasant Point, Rockdale homestead limestone outcrop, Sterndale Valley Road, 190 m, ledges and crevices in limestone outcrop, 27 February 2014, *P. B. Heenan s.n.*, CHR 636068!

**Etymology:** The specific epithet *integra* (Latin: entire) refers to the cauline leaves usually not having any lobes or division (e.g., not being pinnatifid or pinnatisect).

Perennial herb, single rosette or with short lateral branches. Leaves up to 70 mm long, usually simple, seldom pinnatifid or pinnatisect; lamina 2.5–19.0 × 2.0–11.0 mm, green, membranous, glabrous on abaxial surface, glabrous or occasionally with hairs on adaxial surface, glabrous or sparsely hairy to glabrescent on margin and petiole; hairs 0.2–0.25 mm long, spreading to patent; petiole up to 50 mm long. Terminal pinna 2.5–19.0 × 2.0–11.0 mm, simple, oblong-elliptic, broadly oblong-elliptic, to oblong-orbicular; margin entire to shallowly crenate, with 2–4 indistinct hydathodes; apex obtuse with a usually indistinct hydathode; base cuneate to occasionally obtuse. Lateral pinnae absent or 1–2, 2.0–5.0 × 1.5–3.2 mm, broadly oblong-elliptic to oblong-orbicular; apex obtuse; base often oblique; sessile or petiolule < 0.5 mm long. Cauline leaves similar to rosette leaves but smaller, narrower, with no lateral pinnae; terminal pinna up to 18.0 × 10.0 mm, oblong-elliptic, narrowly oblong-orbicular. Inflorescence with 1–8 corymbs, each corymb 2–4-flowered or flowers sometimes solitary; peduncle up to 150 mm long, 0.5–1.0 mm diam. at base, spreading to weakly ascending, glabrous. Pedicels 6.0–42.0 mm long, 0.25–0.5 mm diam., glabrous. Sepals 1.8–2.5 × 0.4–1.0 mm, oblong, elliptic-

oblong, saccate, green, sparsely hairy, hairs spreading to patent, margin white and membranous, apex obtuse, base truncate. Petals 4.5–6.0 × 1.8–2.0 mm, white, limb obovate; apex obtuse; base attenuate, tapering to a 1.0–1.2 mm long claw. Stamens 6; median filaments 4, 1.6–2.2 mm long; lateral filaments 2, 1.5–1.8 mm long; anthers 0.5–0.6 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 2.5–3.5 mm long, 0.4–0.5 mm diam., ± terete, green, glabrous; ovules 20–34; style c. 0.4–0.5 mm long, ± terete; stigma 0.3–0.4 mm diam. Siliques 9.0–20.0 × 0.9–1.1 mm, glabrous, style 0.5–1.4 mm long; valves green to yellow-green at maturity and when dehiscent; replum 0.3–0.4 mm wide. Seeds 0.8–0.9 mm long, 0.5–0.6 mm wide, 0.25–0.35 mm thick, oblong to broadly oblong, henna-green to henna; wing absent.

**Distribution:** South Island: Canterbury.

Known only from limestone bluffs at Rockdale, South Canterbury.

**Biostatus:** Indigenous (Endemic).

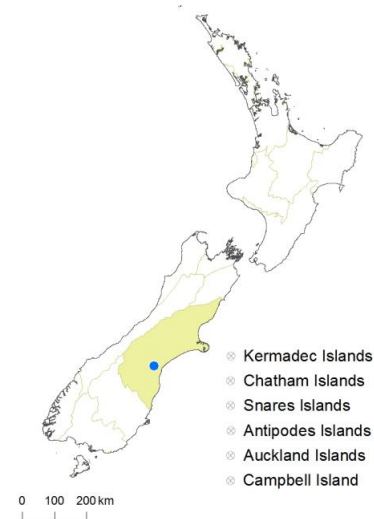
*Cardamine integra* is assessed as having a conservation status of Threatened, Nationally Critical (A2), with the qualifier Data Poor (de Lange *et al.* 2018). The qualifier Data Poor is applied since there is other limestone habitat that may be suitable for the species in South Canterbury and further field survey is required.

**Habitat:** *Cardamine integra* is restricted to limestone habitats, where it occurs on ledges and in crevices on bluffs and rock outcrops.

**Recognition:** *Cardamine integra* is distinguished from *C. corymbosa* by the rosette leaves being mostly simple and having a cuneate to occasionally obtuse base, and the cauline leaves being simple and oblong-elliptic to narrowly oblong-orbicular. *Cardamine grandiscapa* is also found on the limestone bluffs at Rockdale, but it occurs under shaded forest in south-facing gullies. These two species are most easily

distinguished by *C. integra* having rosette and cauline leaves, mostly simple, oblong-elliptic, broadly oblong-elliptic to oblong-orbicular, and with a cuneate to occasionally obtuse base; *C. grandiscapa* has rosette and cauline leaves, usually pinnatisect, orbicular, orbicular-reniform to orbicular-deltoid, and an obtuse, truncate or cordate base.

**Phenology:** Flowering September–February; Fruiting October–March.



**Fig. 192:** *Cardamine integra* distribution map based on databased records at AK, CHR, OTA & WELT.



**Fig. 193:** *Cardamine integra*. Plant with rosette leaves and inflorescences.



**Fig. 194:** *Cardamine integra*. Rosette leaves.



**Fig. 195:** *Cardamine integra*. Cauline leaves.



**Fig. 196:** *Cardamine integra*. Inflorescence with cauline leaves and siliques.



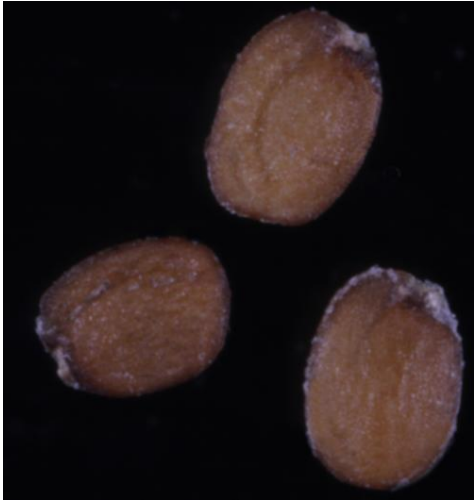
**Fig. 197:** *Cardamine integra*. Top view of flower.



**Fig. 198:** *Cardamine integra*. Flowers with 2 and 3 petals.



**Fig. 199:** *Cardamine integra*. Apetalous flowers.



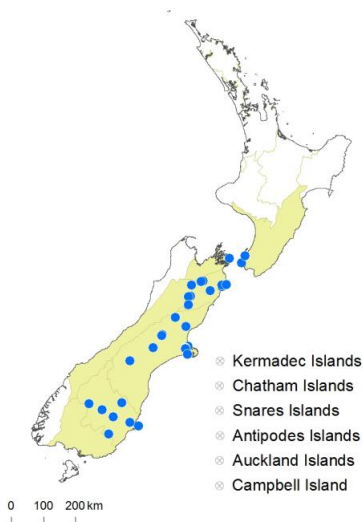
**Fig. 200:** *Cardamine integra*. Seeds.

## *Cardamine intonsa* Heenan, *Phytotaxa* 330: 106–109 (2017)

Holotype: Canterbury Land District, Port Hills, Mount Pleasant, crevice on cliff face, 30 September 1996, P. B. Heenan 33/96 & J. D. Heenan, CHR 510578!

**Etymology:** The specific epithet *intonsa* (Latin: unshaven) refers to the short hairs on the silique.

Perennial herb, single rosette or with short lateral branches, stem and branches 0.5–1.2 mm diam. Leaves up to 125 mm long, pinnatisect; lamina 30.0–65.0(–90) × 8.0–50.0 mm, light green to pale grey-green, membranous, glabrous or sparsely to moderately hairy on adaxial and abaxial surfaces, margin and petiole sparsely to moderately hairy, hairs up to 0.4 mm long. Terminal pinna 4.5–25.0 × 5.0–25.0(–30.0) mm, reniform, reniform-deltoid to reniform-rhomboid, margin usually with 1–5 shallow lobes and 1–5 small conspicuous hydathodes, apex obtuse with a small conspicuous hydathode, base cordate to truncate. Lateral pinnae 2–4(–6), 3.0–13.0 × 3.0–15.0, reniform, reniform-deltoid to orbicular-rhomboid, petiolule 2.0–16.0 mm long, glabrous; petiole up to 50 mm long. Cauline leaves similar to rosette leaves but usually smaller, lateral pinnae absent or 2(–4); pinnae reniform, orbicular-reniform to elliptic, lobes shallowly rounded to narrowly triangular, hydathodes conspicuous. Inflorescence racemose, often with lateral racemes, each raceme 5–8-flowered; peduncle up to 350 mm long, 0.5–1.2 mm diam. at base, spreading to ascending, sparsely to moderately hairy, glabrescent, hairs retrorse, sometimes glabrous in lower parts. Pedicels 4.0–25.0(–35.0) mm long, 0.3–0.5 mm diam., terete, sparsely to densely hairy, hairs retrorse. Sepals 1.7–1.9 × 0.6–0.9 mm, elliptic-oblong, saccate, green or red-brown; sparsely hairy distally, hairs up to 0.2 mm long, retrorse to spreading, margin white and membranous; apex obtuse, base truncate. Petals 4.0–4.5 × 1.1–1.3 mm, white, limb oblong to oblong-obovate; apex obtuse; base attenuate, tapering to a 0.7–1.0 mm-long claw. Stamens 6; median filaments 4, 2.6–2.7 mm long; lateral filaments 2, 2.2–2.3 mm long; anthers 0.3–0.4 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 2.0–2.1 mm long, 0.5–0.6 mm diam., ± terete, green to green-brown, valves with short retrorse hairs up to 0.1 mm long; ovules 26–30; style 0.6–0.7 mm long, ± terete; stigma 0.4–0.6 mm diam. Siliques 9.0–26.0 × 1.0–1.4 mm, valves green-brown to red-brown at maturity, straw-coloured when dehiscent, style 0.3–1.7 mm long, replum 0.4–0.5 mm wide; valves and usually replum sparsely to densely hairy, hairs 0.1–0.2 mm long, appressed to spreading, retrorse. Seeds 1.0–1.2 mm long, 0.7–0.9 mm wide, 0.2–0.3 mm thick, oblong, broadly oblong to oblong-orbicular, yellow-brown to henna; wing absent.



**Fig. 201:** *Cardamine intonsa* distribution map based on databased records at AK, CHR, OTA & WELT.

hairs usually evenly cover the length of the valve, but in several collections from Coopers Knob, Port Hills, Canterbury, the valves are either completely hairy (e.g., CHR 620183, CHR 497758) or only partially hairy at the distal and proximal ends (e.g., CHR630005, CHR 630006). The replum is usually sparsely to moderately hairy (e.g., CHR 607869, CHR 226068), but can sometimes be glabrous (e.g., CHR 363591, WELTU 7447).

**Distribution:** North Island: Southern North Island.

South Island: Sounds Nelson, Marlborough, Westland, Canterbury, Otago, Southland.

**Biostatus:** Indigenous (Endemic).

*Cardamine intonsa* is assessed as having a conservation status of Not Threatened (de Lange *et al.* 2018).

**Habitat:** *Cardamine intonsa* primarily occurs on rock bluffs and outcrops in open sites and forest, and also on scree, river terraces, at the margin of water courses, and among tussocks/herbfield.

**Recognition:** *Cardamine intonsa* is distinguished from *C. glara* by the leaves having conspicuous hydathodes, smaller sepals, petals and filaments, and the silique usually being moderately to densely covered in short, appressed to spreading and retrorse hairs.

**Phenology:** Flowering August–January; Fruiting November–February.

**Notes:** The hairs on the ovary and silique valves of this species can be variable in placement (Heenan 2017). The



**Fig. 202:** *Cardamine intonsa*. Rosette leaves.



**Fig. 203:** *Cardamine intonsa*. Cauline leaves.



**Fig. 204:** *Cardamine intonsa*. Inflorescence with cauline leaves, flower buds and open flower.



**Fig. 205:** *Cardamine intonsa*. Top view of flowers.



**Fig. 206:** *Cardamine intonsa*. Flowers.



**Fig. 207:** *Cardamine intonsa*. Silique with hairs.





Fig. 208: *Cardamine intonsa*. Seeds.

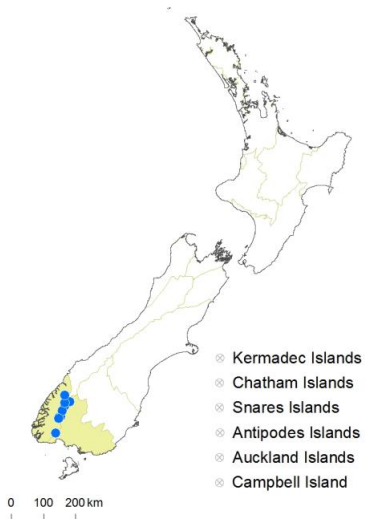
***Cardamine lacustris* (Garn.-Jones & P.N.Johnson) Heenan, *New Zealand J. Bot.* 40: 568 (2002)**

≡ *Iti lacustris* Garn.-Jones & P.N.Johnson, *New Zealand J. Bot.* 25: 603–604 (1987)

Holotype: Henry Creek, east side of Lake Te Anau, 21 May 1971, *P. N. Johnson s.n.*, CHR 286399!

**Etymology:** The specific epithet *lacustris* (Latin: inhabiting lakes) refers to the lake-shore habitat.

Annual rosette herb; stems on young plants very short, on older plants lateral, ascending at first, later prostrate, geniculate, rooting regularly, up to 50 mm long, reaching 0.8–2.0 mm diam., glabrous or sometimes with sparse, fine, slightly recurved hairs. Leaves glabrous, or with sparse, simple hairs on petiole, slightly glossy, dull green or tinged purplish grey, in rosettes and clustered on stems; early rosette leaves entire, linear-spathulate; later rosette and cauline leaves pinnatifid, 20–50 mm long; petiole 2.0–12.0 mm long, 0.5–1.0 mm wide; terminal lobe narrow-spathulate, 2.0–5.0 mm broad; lateral lobes narrowly oblong-spathulate, 4.0–10.0 mm long, sometimes single or in uneven numbers, but usually in 1–3 subopposite pairs. Inflorescence short-racemose, 1.0–2.0 mm long, reaching 2.0–5.0 mm long at fruiting; peduncle glabrous. Sepals suberect, oblong, glabrous, green with narrow, pale margins, 1.5–2.0 × 0.6–1.0 mm. Petals white, suberect, oblong- to obovate-spathulate, obtuse, 1.8–2.5 × 0.8–1.2 mm, weakly clawed; limb spreading. Stamens suberect; median stamens usually 2, rarely 4, 1.6–2.0 mm long; lateral stamens 1.0–1.5 mm long. Ovary ellipsoid, 1.0–1.6 mm long; stigma sessile, 0.4 mm diam.; locules each with 5–8 ovules. Silicle elliptic to oblong, 1.0–3.5 × 1.0–1.7 mm; valves pale straw-coloured, thin, convex, glabrous, not veined or with 1 weak vein. Seeds 0.6–0.9 mm long, 0.3–0.4 mm wide, 0.2–0.25 mm thick, oblong, yellow-brown to henna; wing absent.



**Fig. 209:** *Cardamine lacustris* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** South Island: Southland, Fiordland.

*Cardamine lacustris* is confined to Southland and Fiordland, where it occurs at the margins of Lake Manapōuri, Lake Te Anau, and an unnamed tarn in the Countess Range to the east of Lake Te Anau.

**Biostatus:** Indigenous (Endemic).

*Cardamine lacustris* is assessed as having a conservation status of At Risk–Naturally Uncommon, with the qualifiers Extreme Fluctuations and Sparse (de Lange *et al.* 2018).

**Habitat:** The plants typically grow on cobble beaches on lake shores and tarn margins, in silty sediments lodged between stones.

**Phenology:** Flowering January–February; Fruiting February–March.

**Cytology:** Chromosome number  $2n = 48$ .



**Fig. 210:** *Cardamine lacustris*. Plant with rosette leaves and basal inflorescences (CHR 625908).



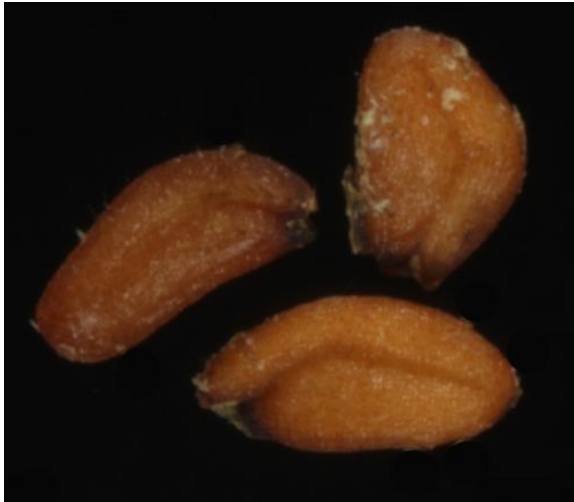
**Fig. 211:** *Cardamine lacustris*. Plant with rosette leaves (CHR 512383).



**Fig. 212:** *Cardamine lacustris*. Flowers (CHR 540574).



**Fig. 213:** *Cardamine lacustris*. Silicle (CHR 540576).



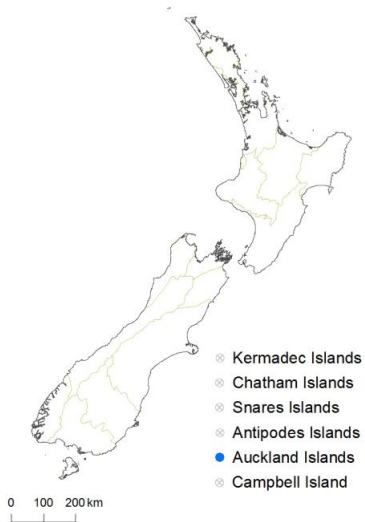
**Fig. 214:** *Cardamine lacustris*. Seeds.

***Cardamine latior* Heenan, *New Zealand J. Bot.* 46: 562–564 (2008)**

Holotype: Bivouac Saddle, Auckland Islands, fellfield, 1600 ft., January 1963,  
*E. J. Godley s.n.*, CHR 134244A!

**Etymology:** The specific epithet *latior* (Latin: broader) refers to siliques being wider than those of *C. subcarnosa*.

Perennial herb, caespitose, with many leaves forming a small, compact rosette. Leaves pinnatisect, up to 40(–50) mm long, glabrous, green, ± coriaceous; petiole 8–12 mm long, 1.7–1.8 mm wide, winged and sheathing at base. Terminal pinna 3.5–4.7 × 3.5–4.1 mm, with 2 conspicuous lateral lobes; lateral pinnae with 11–15 leaflets, in pairs and usually overlapping in distal part of leaf, alternate and distant in lower part of leaf, reniform, orbicular to broadly elliptic, hydathodes prominent on margin and in axil of petiolule, margin entire; base cordate, ± truncate to obtuse; apex obtuse to rounded. Lateral pinnae 1.5–2.5 × 0.7–2.2 mm; petiolules up to 0.5 mm long, often ± absent. Cauline leaves occasionally present subtending only the lower 1–2 flowers; similar to rosette leaves, but with fewer leaflets and smaller in all parts. Inflorescence usually up to 50 mm long, occ. 145 mm in sheltered sites, 1.2–1.6 mm diam. at base, glabrous, compact and not elongating after flowering, fastigiate, racemose, flowers usually crowded in upper half. Pedicels 5–10(–17) mm long, 0.8–1.2 mm diam., usually erect. Sepals 2.0–2.4 × 0.7–1.2 mm, oblong to elliptic, glabrous, margin white and membranous, apex obtuse to rounded, base truncate. Petals 3.2–4.0 × 1.2–1.5 mm, white, pale pink or purple, limb obovate; apex obtuse to rounded; base cuneate to attenuate, tapering to an indistinct claw. Stamens 6; median filaments 4, 1.6–2.0 mm long; lateral filaments 2, 1.1–1.4 mm long; anthers 0.4–0.5 mm long. Ovary 1.5–2.6 mm long, 0.5–0.6 mm diam., terete, glabrous; stigma 0.3–0.5 mm diam. Siliques 12–23 × 1.7–2.2 mm, glabrous, crowded, erect, style 0.7–1.4 mm long; replum 0.9–1.1 mm wide. Seeds 1.4–2.1 mm long, 1.1–1.5 mm wide, 0.4–0.5 mm thick, orbicular to broadly oblong, red-brown; wing absent.



**Fig. 215:** *Cardamine latior* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** Auckland Islands.

*Cardamine latior* is known from the subantarctic Auckland Island and Adams Island.

**Biostatus:** Indigenous (Endemic).

*Cardamine latior* is assessed as having a conservation status of At Risk–Naturally Uncommon, with the qualifiers Data Poor, Island Endemic and One Location (de Lange *et al.* 2018). The qualifier Data Poor is applied because data are required on the number and size of the populations.

**Habitat:** *Cardamine latior* grows among boulders and fellfield, particularly at higher altitudes on mountaintop screes (Johnson & Campbell 1975).

**Phenology:** Flowering October–December; Fruiting October–February.



**Fig. 216:** *Cardamine latior*. Plant rosette leaves and inflorescence with siliques (CHR 54206).



**Fig. 217:** *Cardamine latior*. Rosette leaves (CHR 54206).



**Fig. 218:** *Cardamine latior*. Plant with inflorescence and siliques (CHR 54206).



**Fig. 219:** *Cardamine latior*. Seeds.

## ***Cardamine megalantha* Heenan, *Phytotaxa* 330: 112–114 (2017)**

Holotype: Stewart Island, Mt Anglem summit, under rock c. 50 m west of Mt Anglem summit, 980 m, 11 April 2014, B. D Rance & A. Fergus s.n., CHR 688744!

**Etymology:** The specific epithet *megalantha* (Latin: *mega* – large; *antha* – flower) refers to the large flowers.

Perennial herb, single rosette or with short, lateral branches. Leaves up to 65 mm long, pinnatisect; lamina 9.0–27.0 × 6.0–16.0 mm, green to dark green, membranous, glabrous; hydathode in leaflet axil, up to 0.2 mm long; petiole up to 65 mm long. Terminal pinna 8.0–15.0 × 11.0–15.0 mm, simple, pandurate, broadly pandurate to rhomboid-pandurate; margin entire, with 2–4 distinct hydathodes; apex obtuse with a distinct hydathode; base cordate to truncate. Lateral pinnae 1–2, 1.5–6.0 × 1.1–6.2, orbicular, broadly orbicular to broadly elliptic-orbicular, weakly pandurate; apex obtuse; base attenuate to obtuse; petiolule 0.2–1.5 mm long. Cauline leaves similar to rosette leaves but usually smaller; terminal pinna up to 7.0 × 7.6 mm, lateral pinnae up to 3.7 × 2.4 mm. Inflorescence racemose, sometimes with lateral racemes, each raceme 3–5-flowered; peduncle up to 190 mm long, 0.5–1.2 mm diam. At base, ascending, glabrous. Pedicels 14.0–32.0 mm long, 0.5–0.8 mm diam., glabrous. Sepals 2.7–3.1 × 1.2–1.5 mm, elliptic-oblong, saccate, green to red-brown, glabrous, margin white and membranous, apex obtuse, base truncate. Petals 6.0–7.0 × 4.2–4.5 mm, white, limb broadly obovate; apex obtuse; base cuneate, tapering to a 1.0–1.5 mm long claw. Stamens 6; median filaments 4, 3.2–3.4 mm long; lateral filaments 2, 2.2–2.3 mm long; anthers 0.7–0.8 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 3.8–4.0 mm long, c. 0.8 mm diam., ± terete, green, glabrous; ovules 14–18; style c. 1.0 mm long, ± terete; stigma 0.5–0.6 mm diam. Siliques 23.0–28.0 × 2.1–2.4 mm, glabrous, style 2.8–3.0 mm long; valves green to yellow-green at maturity and when dehiscent; replum 0.4–0.7 mm wide. Seeds 1.4–1.8 mm long, 1.0–1.2 mm wide, 0.2–0.3 mm thick, oblong, broadly oblong to orbicular-oblong, henna-green to henna; wing absent.

**Distribution:** Stewart Island.

*Cardamine megalantha* is known only from the summit of Mt Anglem, Stewart Island.

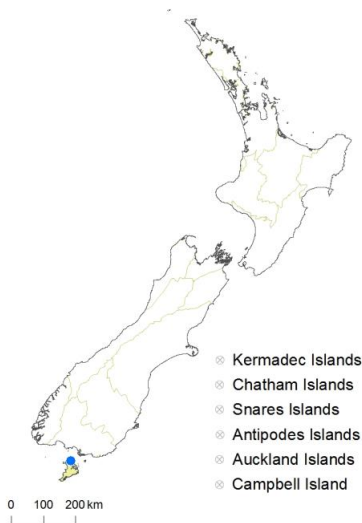
**Biostatus:** Indigenous (Endemic).

*Cardamine megalantha* is assessed as having a conservation status of Threatened—Nationally Endangered A(3), with the qualifiers One Location and Data Poor (de Lange *et al.* 2018). The qualifier Data Poor is applied because information is required on the number and size of the populations.

**Habitat:** *Cardamine megalantha* occurs in sheltered sites among rocks and underneath shrubs.

**Recognition:** *Cardamine megalantha* is distinguished from *C. reptans* by its coriaceous leaves with prominent marginal hydathodes, larger terminal leaflet and fewer lateral leaflets, leaflets with distinct petiolules and axillary hydathodes, and elongated inflorescences.

**Phenology:** Flowering January; Fruiting February.



**Fig. 220:** *Cardamine megalantha* distribution map based on databased records at AK, CHR, OTA & WELT.



**Fig. 221:** *Cardamine megalantha*. Plant with rosette leaves.



**Fig. 222:** *Cardamine megalantha*. Rosette leaves.



**Fig. 223:** *Cardamine megalantha*. Cauline leaf.



**Fig. 224:** *Cardamine megalantha*. Leaflet axillary hydathode.



**Fig. 225:** *Cardamine megalantha*. Side view of flower.



**Fig. 226:** *Cardamine megalantha*. Top view of flower.



**Fig. 227:** *Cardamine megalantha*. Top view of flower.



**Fig. 228:** *Cardamine megalantha*. Dehiscent siliques.



**Fig. 229:** *Cardamine megalantha*. Seeds.

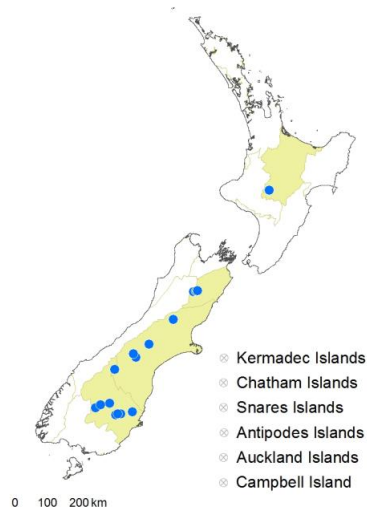
### ***Cardamine mutabilis* Heenan, *Phytotaxa* 330: 114–116 (2017)**

Holotype: Otago, Lake Onslow, Fortification Stream, 700 m, gently sloping turfy edge of old stream oxbow in red tussock grassland, 11 December 1985, *P. N. Johnson* 490, CHR 420058!

**Etymology:** The specific epithet *mutabilis* (Latin: variable) refers to the variable size and shape of the leaves.

Small perennial herb, single rosette or with short lateral branches, stem and branches 0.5–0.6 mm diam. Leaves up to 25(–45) mm long, seedling leaves simple, mature leaves pinnatifid or pinnatisect; lamina 5.0–12.0 × 2.0–3.0 mm, green to brown-green, usually slightly coriaceous, glabrous on abaxial and adaxial surfaces. Terminal pinna 2.0–8.0 × 0.5–5.0 mm, usually simple, sometimes with 1–2 irregular lobes, elliptic, broadly elliptic, obovate, ovate or spatulate, apex obtuse with a prominent hydathode, base attenuate to cuneate. Lateral pinnae 0–6, 1.0–2.2 × 0.2–0.7, elliptic, oblong, ovate or obovate, usually glabrous although margin of lower pinnae sometimes sparsely hairy, hairs septate and 0.3–0.4 mm long; petiole up to 20(–25) mm long, glabrous or sparsely hairy on margin, hairs septate and 0.3–0.5 mm long. Cauline leaves occasional, similar to rosette leaves but smaller and with fewer lateral pinnae. Inflorescence corymbose, 2–8-flowered, flowers sometimes solitary; peduncle up to 30 mm long, c. 0.3 mm diam. At base, spreading to ascending, glabrous to moderately hairy. Pedicels up to 37 mm long, 0.2–0.5 mm diam., terete, flexuose, glabrous to sparsely hairy. Sepals 0.9–2.0 × 0.5–1.1 mm, elliptic-oblong to broadly elliptic, saccate, green or red-brown, glabrous, margin white and membranous, apex obtuse, base truncate. Petals (1.0–)2.0–4.0(–5.2) × 1.2–2.0 mm, white,

limb obovate to broadly elliptic, occasionally apetalous; apex obtuse; base cuneate, tapering to a c. 1 mm-long claw. Stamens 6,  $\pm$  similar length; filaments 0.3–2.4 mm long; anthers 0.3–0.6 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 0.9–2.8 mm long, 0.3–0.4 mm diam.,  $\pm$  terete, green, glabrous; ovules 8–14; style c. 0.2 mm long,  $\pm$  terete; stigma 0.2–0.3 mm diam. Siliques 6.0–11.0  $\times$  0.6–0.9 mm, glabrous, style indistinct; valves green to red-brown at maturity; straw-coloured when dehiscent, replum 0.3–0.4 mm wide. Seeds 0.5–0.9 mm long, 0.3–0.5 mm wide, 0.2–0.3 mm thick, orbicular to orbicular-oblong, yellow-brown to henna; wing absent.



**Fig. 230:** *Cardamine mutabilis* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** North Island: Volcanic Plateau.

South Island: Marlborough, Canterbury, Otago.

*Cardamine mutabilis* is known in the South Island from south-eastern Nelson, Canterbury, and Otago, and in the North Island from a single collection from upper Mākatote River, Mt Ruapehu (northern Wellington).

**Biostatus:** Indigenous (Endemic).

*Cardamine mutabilis* is assessed as having a conservation status of Threatened—Nationally Critical (A3), with the qualifiers Conservation Dependent, Extreme Fluctuations, Data Poor, Range Restricted and Sparse (de Lange *et al.* 2018). The qualifier Conservation Dependent is applied because at some sites (e.g., Sedgemere Tarns, Marlborough) intensive management is required for weed control and to ensure the survival of indigenous plants (Heenan 2017). The qualifier Extreme Fluctuations is used because the lake and tarn margin habitat is dependent on fluctuations in water level for suitable habitat, and Data Poor because the population numbers and trends are not known with certainty.

**Habitat:** *Cardamine mutabilis* usually occurs on the periodically inundated turfy margins of montane and inland tarns and lakes, and also in wetlands associated with the banks and edges of streams. When associated with tarn and lake margins it occupies the marginal turf zone as water retreats and the margin dries out. It has also been collected from wet ground in tussock-grassland and herbfields.

**Recognition:** *Cardamine mutabilis* is distinguished from the larger and more robust *C. glara* by its diminutive growth habit, leaves up to 45 mm long, narrower terminal leaflet, smaller sepals, petals and filaments, and shorter siliques.

**Phenology:** Flowering December–March; Fruiting December–April.

**Cytology:** Chromosome number  $2n = 48$  (CHR 546262).

**Notes:** The sizes of the floral and vegetative parts of *C. mutabilis* are variable depending on growth conditions and age of the plant (Heenan 2017). Plants from moist sites, for example, are generally much larger in all parts than plants from drier sites. A number of floral characters are particularly variable in this regard, with some very small plants with leaves 10–20 mm long having petals 1.0–1.5 mm long (e.g., CHR 312947), whereas other larger plants (with leaves up to 30 mm long) have petals up to 5 mm long (e.g., CHR 420058). Typically, the petals are 2–4 mm long. Other floral characters show a similar range of variation in size. The leaves are also variable, with the leaves on mature plants being pinnatifid or pinnatisect and those of seedlings (e.g., CHR 546262) and some plants from moist habitats (e.g., CHR 21016) being unifoliate.

Previously known by the tagname *C. "tarn"* (e.g., de Lange *et al.* 2013, p. 65).





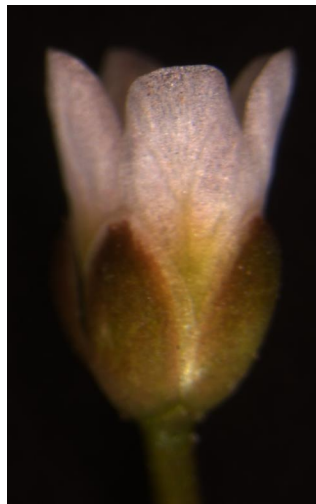
**Fig. 231:** *Cardamine mutabilis*. Rosette leaves.



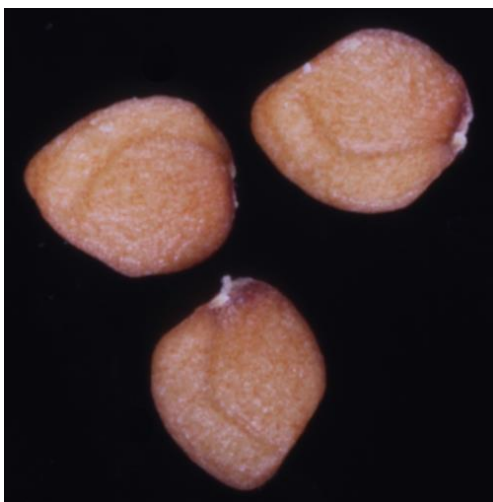
**Fig. 232:** *Cardamine mutabilis*. Inflorescence stem hairs.



**Fig. 233:** *Cardamine mutabilis*. Top view of flower.



**Fig. 234:** *Cardamine mutabilis*. Side view of flower.

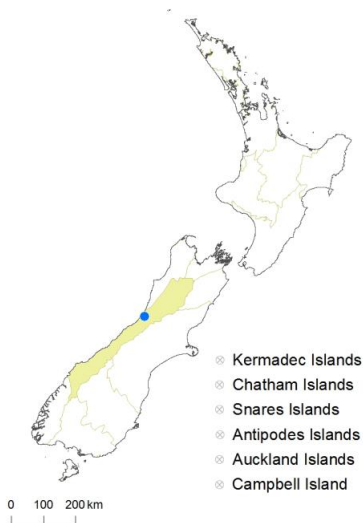


**Fig. 235:** *Cardamine mutabilis*. Seeds.

## ***Cardamine occulta* Hornem., *Suppl. Hort. Bot. Hafn.* 71 (1819)**

≡ *Cardamine flexuosa* var. *occulta* (Hornem.) O.E.Schulz, *Bot. Jahrb. Syst.* 32: 479 (1903)

Annual herb, few to many lateral branches or occasionally a single stem; stems usually sparsely to moderately hairy, especially on lower half; sometimes rooting at nodes. Leaves up to 77 mm long, pinnatisect, rosette and lower cauline leaves withering; lamina 25.0–70.0 × 8.0–43.0 mm, green, membranous, glabrous to sparsely hairy on abaxial and adaxial surfaces, margin and petiole; hairs 0.2–0.4 mm long, spreading to patent; petiole up to 15 mm long. Terminal pinna 4.0–32.0 × 4.0–19.0 mm, simple, elliptic, broadly elliptic, orbicular, often palmatifid, margins entire or shallowly 1–4-lobed, often asymmetric and irregular, lobes with distinct hydathodes, apex subacute to obtuse, usually with a distinct hydathode, base attenuate, cuneate or obtuse, often oblique. Lateral pinnae 4–8, 4.5–24.0 × 1.0–8.0 mm, elliptic to broadly elliptic, margin entire or occasionally shallowly 1–2-lobed, apex subacute, obtuse or truncate, base attenuate, cuneate or obtuse, often oblique, petiolule 1.0–3.0 mm long. Cauline leaves similar to rosette leaves but with narrower terminal and lateral pinnae, linear to narrowly elliptic, pinnae bases attenuate to cuneate; terminal pinna up to 30.0 × 6.0 mm; lateral pinnae up to 23.0 × 5.0 mm. Inflorescences numerous, racemose, racemes 3–21-flowered; peduncle up to 30 mm long, 0.3–0.8 mm diam. at base, erect to ascending, usually sparsely hairy. Pedicels 2.0–5.0 mm long, 0.2–0.3 mm diam., divaricate to ascending, glabrous. Sepals 1.3–1.7 × 0.4–0.5 mm, elliptic-oblong, slightly saccate, green or red-brown, glabrous, margin white and membranous, apex obtuse, base truncate. Petals 4, 1.8–2.3 × 0.4–0.9 mm, white, limb obovate; apex obtuse; base attenuate, tapering to a 0.4–0.5 mm long claw. Stamens 6; median filaments 4, 1.7–1.8 mm long; lateral filaments 2, 1.1–1.3 mm long; anthers c. 0.2 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 1.8–1.9 mm long, 0.3–0.4 mm diam., ± terete, green, glabrous; ovules 28–32; style c. 0.2 mm long, ± terete; stigma 0.3–0.4 mm diam., white. Siliques 14.0–27.0 × 0.7–1.0 mm, glabrous, style 0.3–0.5 mm long; valves green at maturity and when dehiscent; replum 0.3–0.4 mm wide. Seeds 0.7–0.9 mm long, 0.5–0.6 mm wide, 0.2–0.3 mm thick, broadly oblong, light brown to yellow-brown; wing absent.



**Fig. 236:** *Cardamine occulta* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** South Island: Westland.

Naturalised in New Zealand where it is known from Blue Bottle Creek near Lake Kaniere (Westland, South Island). Also in Australia (Thompson 2003; as *C. aff. flexuosa*), Europe (Lihova et al. 2006, as Asian *C. flexuosa*; Bleeker et al. 2008) and North America (Al-Shehbaz et al. 2010; Post et al. 2011); see Marhold et al. (2016) for a detailed account of the distribution of this species. DNA sequence data has shown that Asia (e.g., Japan, China) is the likely origin of naturalised populations in Europe (Lihova et al. 2006). In New Zealand it is possibly more widespread.

**Biostatus:** Exotic; fully naturalised.

**Habitat:** *Cardamine flexuosa* occurs on disturbed stony-gravels adjacent to Blue Bottle Creek. In Japan this species is a serious weed of cultivated areas, preferring wet habitats such as paddy fields, moist gardens, and orchards (Lihova et al. 2006).

**First record:** The first record is from Blue Bottle Creek, Westland, 16 September 2009, *P. B. Heenan s.n.*, CHR 617206 (Heenan 2017).

**Phenology:** Flowering September–February; Fruiting September–February.



**Fig. 237:** *Cardamine occulta*. Plant with leafy rosettes and inflorescences.



**Fig. 238:** *Cardamine occulta*. Rosette leaves.



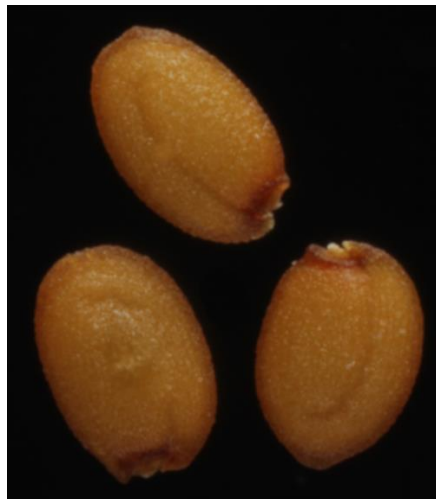
**Fig. 239:** *Cardamine occulta*. Stem hairs.



**Fig. 240:** *Cardamine occulta*. Cauline leaves.



**Fig. 241:** *Cardamine occulta*. Flowers.



**Fig. 242:** *Cardamine occulta*. Seeds.

## ***Cardamine pachyphylla* Heenan, *Phytotaxa* 330: 118–120 (2017)**

Holotype: Torlesse Range, Canterbury Land District, rock outcrop, 2 March 1997, P. B. Heenan s.n., CHR 511918!

**Etymology:** The specific epithet *pachyphylla* (Greek: thick-leaved) refers to the leaves.

Perennial herb, single rosette or with short lateral branches. Leaves up to 98 mm long, simple or occasionally pinnatifid; lamina 4.0–45.0 × 2.5–23.0 mm, grey-green, coriaceous, glabrous or occasionally with 1–3 marginal hairs; petiole up to 43 mm long. Terminal pinna 4.0–45.0 × 2.5–23.0 mm, simple, broadly elliptic to broadly elliptic-obovate, sometimes elliptic-rhomboid; margin entire to shallowly sinuate, sometimes with 2 prominent teeth, hydathodes ± indistinct; apex obtuse to subacute, with a distinct hydathode; base cuneate. Lateral pinnae 1–4, 2.0–5.0 × 1.5–3.5 mm, broadly elliptic; apex obtuse; base truncate; sessile. Cauline leaves similar to rosette leaves but smaller, narrower, base attenuate. Inflorescence racemose, with lateral racemes, terminal flowers in a cyme-like cluster, each raceme 3–22-flowered; peduncle up to 300 mm long, 0.4–1.9 mm diam. at base, ascending to erect, glabrous. Pedicels 20.0–60.0 mm long, 0.4–0.7 mm diam., glabrous. Sepals 2.9–3.0 × 1.2–1.6 mm, elliptic-oblong, saccate, green to red-brown, glabrous, margin white and membranous, apex obtuse, base truncate. Petals 4.5–5.2 × 1.9–2.5 mm, white, limb obovate; apex obtuse; base attenuate, tapering to a c. 1.0 mm long claw. Stamens 6; median filaments 4, 3.0–3.4 mm long; lateral filaments 2, 2.5–2.6 mm long; anthers 0.3–0.5 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 3.2–3.4 mm long, 0.4–0.6 mm diam., ± terete, green, glabrous; ovules 56–62; style c. 0.2 mm long, ± terete; stigma 0.5–0.6 mm diam. Siliques 13.0–30.0 × 1.2–1.5 mm, glabrous, style 0.6–1.0 mm long; valves green to yellow-green at maturity and when dehiscent; replum 0.4–0.5 mm wide. Seeds 1.0–1.5 mm long, 0.65–1.0 mm wide, 0.3–0.4 mm thick, oblong, orbicular-oblong to broadly oblong, henna; wing absent.

**Distribution:** South Island: Marlborough, Canterbury.

*Cardamine pachyphylla* is known from greywacke mountains in eastern South Island, where it occurs in Torlesse Range (Canterbury) and Inland Kaikōura Range (Marlborough).

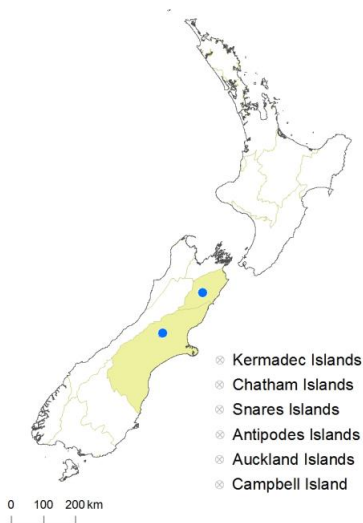
**Biostatus:** Indigenous (Endemic).

*Cardamine pachyphylla* is assessed as having a conservation status of Threatened, Nationally Critical A(1), with the qualifier Data Poor (de Lange *et al.* 2018). The qualifier Data Poor is applied because this species is known with certainty from few locations and additional information is required on the number and size of the populations.

**Habitat:** *Cardamine pachyphylla* occurs on shaded bluffs and rock outcrops, typically in lower-elevation alpine sites.

**Recognition:** *Cardamine pachyphylla* is distinguished from *C. bilobata* by its leaves having a longer and wider terminal leaflet, a smaller flower with petals 4.5–5.2 mm long, and a silique with a shorter style.

**Phenology:** Flowering November–March; Fruiting November–March.



**Fig. 243:** *Cardamine pachyphylla* distribution map based on databased records at AK, CHR, OTA & WELT.



**Fig. 244:** *Cardamine pachyphylla*. Plant with rosette leaves and inflorescence.



**Fig. 245:** *Cardamine pachyphylla*. Rosette leaves.



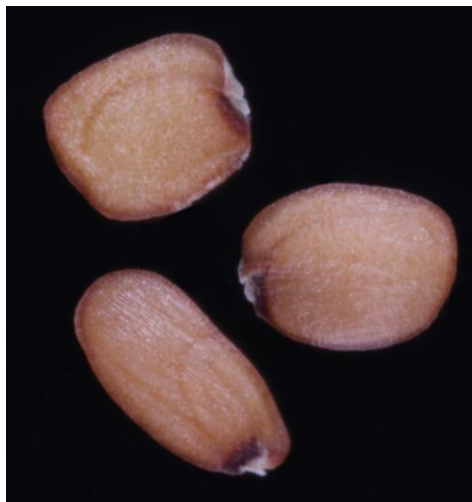
**Fig. 246:** *Cardamine pachyphylla*. Rosette leaves.



**Fig. 247:** *Cardamine pachyphylla*. Inflorescence with buds and open flowers.



**Fig. 248:** *Cardamine pachyphylla*. Top view of flower.



**Fig. 249:** *Cardamine pachyphylla*. Seeds.

***Cardamine panatohea* Heenan & de Lange, *Phytotaxa* 379: 256–260 (2018)**

Holotype: Wellington Land District, Mt Ruapehu, tributary of Mangaturuturu Stream, permanently wet seepage below waterfall, 1650 m, 12 March 2015, *P. B. Heenan s.n.*, CHR 640349!

**Etymology:** The specific epithet '*panatohea*' originates from the names 'panapana', a common name for this type of cress, and 'tītōhea' which is the description of the land above the bush line on Mt Ruapehu.

Perennial herb, single or several rosettes, with 1–10 short lateral branches, stems and branches 0.5–1.5 mm diam. Leaves up to 45 mm long, pinnatisect; lamina 3.3–15.0 × 3.5–13.0 mm, green, semi-coriaceous, sparsely to moderately hairy or glabrate on adaxial surface, margin and petiole, glabrous or sparsely hairy on abaxial surface; terminal pinna 3.3–12.0 × 3.5–13.0 mm, simple, orbicular-reniform to reniform, apex obtuse with an inconspicuous hydathode, base usually cordate, sometimes obtuse or truncate. Lateral pinnae 0–4, 2.0–4.0 × 1.5–2.5, orbicular to orbicular-rhomboid, petiolule absent or up to 1.2 mm long; petiole up to 30 mm long; hairs 0.1–0.2 mm long, spreading to patent. Cauline leaves similar to rosette leaves but distally smaller, narrower, with fewer lateral pinnae. Inflorescence with 1–4 racemes, each raceme 4–12-flowered, terminal flowers often in a cyme-like cluster; peduncle up to 140 mm long, 0.5–1.5 mm diam. at base, prostrate, decumbent to seldom upright, glabrous. Pedicels 1.5–8.0 mm long, 0.2–0.8 mm diam., glabrous or rarely hairy, spreading. Sepals 1.8–2.2 × 0.5–1.1 mm, elliptic-oblong to narrowly elliptic-oblong, ± saccate, green, glabrous; margin with a thin membranous white edge, apex obtuse; base truncate. Petals 4; 3.8–5.0 × 1.2–1.5 mm, white, limb obovate to broadly elliptic-obovate; apex obtuse; base cuneate, tapering to a c. 1 mm-long claw. Stamens 6; median filaments 4, 2.4–2.7 mm long; lateral filaments 2, 2.1–2.2 mm long; anthers 0.3–0.4 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 2.2–2.4 mm long, 0.3–0.4 mm diam., ± terete, green, glabrous; ovules 18–24; style 0.1–0.2 mm long, ± terete; stigma 0.3–0.4 mm diam. Siliques 12.0–23.0 × 1.3–1.8 mm, glabrous, style 1.0–1.5 mm long; valves green at maturity and when dehiscent, replum 0.3–0.4 mm wide. Seeds 1.1–1.4 mm long, 0.9–1.0 mm wide, 0.4–0.5 mm thick, orbicular-oblong to broadly oblong, light green to brown-green; wing absent.

**Distribution:** North Island: Volcanic Plateau.

*Cardamine panatohea* is known from two tributary streams in the upper Mangaturuturu Stream headwaters, Mt Ruapehu, Tongariro National Park, Central North Island, New Zealand.

**Biostatus:** Indigenous (Endemic).

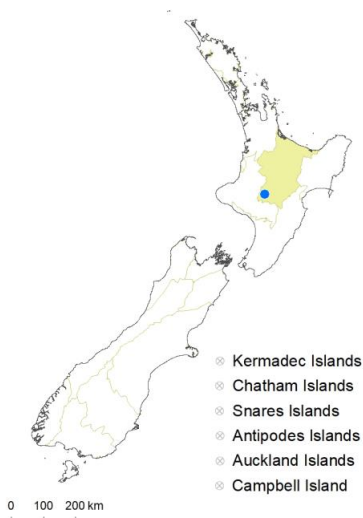
*Cardamine panatohea* is assessed as having a conservation status of Threatened, Nationally Critical, with the qualifier Data Poor (de Lange et al. 2018). The qualifier Data Poor indicates that additional information is on species population trends.

**Habitat:** *Cardamine panatohea* occurs in two closely located but separate seepages and associated alpine flush vegetation at 1600–1700 m elevation. The two habitats occupied are water-saturated, with plants growing threaded through thick, floating bryophyte-dominated mats composed of *Breutelia pendula* and *Riccardia furtiva* in sites partially sheltered by the grasses *Hierochloa redolens* and *Chionochoa pallens* subsp. *pallens*.

**Recognition:** *Cardamine panatohea* is distinguished from all other indigenous and naturalised species in New Zealand by its decumbent, sprawling racemose inflorescences that have

leafy rosettes in the axils of the lateral branches. It differs from *C. corymbosa* in its thicker leaves and moderate covering of scattered hairs on the adaxial surface.

**Phenology:** Flowering November–March; Fruiting December–April.



**Fig. 250:** *Cardamine panatohea* distribution map based on databased records at AK, CHR & WELT.



**Fig. 251:** *Cardamine panatohea*. Plant with rosette leaves.



**Fig. 252:** *Cardamine panatohea*. Rosette leaves.



**Fig. 253:** *Cardamine panatohea*. Rosette leaf.



**Fig. 254:** *Cardamine panatohea*. Flowers.



**Fig. 255:** *Cardamine panatohea*. Upper part of inflorescence with cauline leaves.



**Fig. 256:** *Cardamine panatohea*. Upper part of inflorescence with siliques.



**Fig. 257:** *Cardamine panatohea*. Inflorescence with axillary rosettes.

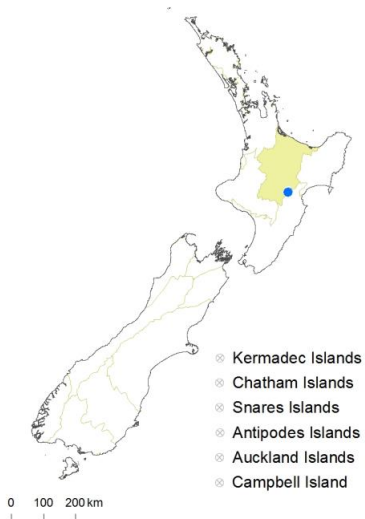
### ***Cardamine parvula* Heenan, *Phytotaxa* 330: 120–122 (2017)**

Holotype: Mt Kaweka, Kaweka Range, 5500 ft., fine rock detritus, gentle slope, April 1980, A. P. Druce s.n., CHR 358809!

**Etymology:** The specific epithet *parvula* (Latin: small) refers to the leaves being smaller than the two other specialist scree species *C. alalata* and *C. glara*.

Perennial herb, single rosette or with multiple rosettes on short lateral branches, stems sometime rhizomatous. Leaves up to 60 mm long, pinnatisect, glabrous; lamina 2.5–15.0 × 4.5–9.0 mm, green, coriaceous; petiole up to 24 mm long. Terminal pinna 1.5–2.5 × 1.0–2.5 mm, simple, broadly orbicular to orbicular-rhomboid; margin entire, hydathodes inconspicuous; apex obtuse, hydathode inconspicuous; base truncate to obtuse. Lateral pinnae 4–8, 1.0–3.0 × 1.0–3.5, broadly orbicular, orbicular-rhomboid to elliptic-orbicular; margin entire, hydathodes inconspicuous; apex obtuse, hydathodes inconspicuous; base truncate to obtuse; petiolule 0.3–7.0 mm long. Cauline leaves similar to rosette leaves but often smaller, narrower, with fewer lateral pinnae, pinnae bases attenuate to cuneate; terminal pinna up to 2.9 × 3.0 mm, lateral pinnae up to 2.8 × 2.7 mm. Inflorescence cymose, sometimes with lateral cymes, each cyme 1–7-flowered; peduncle up to 60 mm long, 0.8–1.4 mm diam. at base, spreading to ascending, glabrous. Pedicels 3.0–7.0 mm long, 0.3–0.5 mm diam., glabrous. Sepals 1.8–2.3 × 0.6–1.0 mm, elliptic-oblong, saccate, red-brown, glabrous, margin white and membranous, apex obtuse, base truncate. Petals 2.7–3.2 × 1.1–1.5 mm, white, limb broadly obovate; apex obtuse; base attenuate, tapering to a c. 1.0 mm long claw. Stamens 6; median filaments 4, 1.3–2.6 mm long; lateral filaments 2, 1.1–1.8 mm long; anthers 0.4–0.6 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 1.5–3.0 mm long, 0.4–0.5 mm diam., ± terete, green, glabrous; ovules 28–32; style 0.2–0.4 mm long, ± terete; stigma 0.2–0.3 mm diam. Siliques 13.0–25.0 × 1.0–1.5 mm, glabrous, style 0.9–1.5 mm long; valves pink-green at maturity and when dehiscent; replum 0.5–0.6 mm wide. Seeds 1.0–1.3 mm long, 0.9–1.0 mm wide, 0.3–0.4 mm thick, broadly oblong to orbicular-oblong, henna; wing absent.





**Fig. 258:** *Cardamine parvula* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** North Island: Volcanic Plateau.

*Cardamine parvula* is restricted to Kaweka Range where it is sympatric with *C. glara* (e.g., CHR 631716).

**Biostatus:** Indigenous (Endemic).

*Cardamine parvula* is assessed as having a conservation status of Threatened, Nationally Vulnerable B(1), with the qualifiers One Location and Data Poor (de Lange *et al.* 2018). The qualifier Data Poor indicates that additional information is required on the number and size of the populations.

**Habitat:** *Cardamine parvula* occurs on alpine scree and may be restricted to fine-grained argillite scree, but field work is required to confirm this.

**Recognition:** *Cardamine parvula* is distinguished from *C. glara* by its small and compact growth habit, smaller leaves with more leaflets, terminal leaflet a similar size to the largest lateral leaflets, smaller flowers, and shorter siliques.

**Phenology:** Flowering December–February; Fruiting December–April.



**Fig. 259:** *Cardamine parvula*. Plant with rosette leaves (CHR 358809).



**Fig. 260:** *Cardamine parvula*. Rosette leaves (CHR 358809).



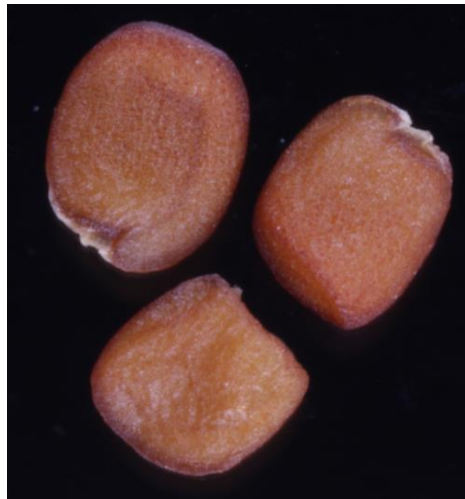
**Fig. 261:** *Cardamine parvula*. Inflorescence with buds and flowers (CHR 275329).



**Fig. 262:** *Cardamine parvula*. Flower bud and flower (CHR 275329).



**Fig. 263:** *Cardamine parvula*. Inflorescence with siliques (CHR116209).



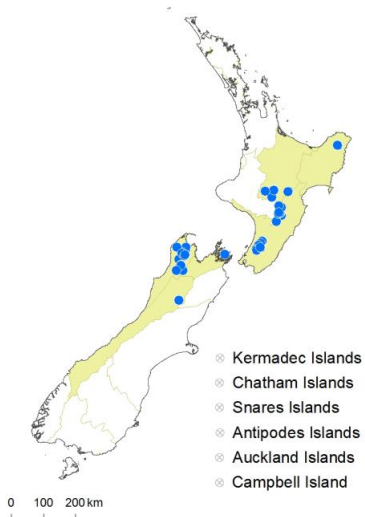
**Fig. 264:** *Cardamine parvula*. Seeds (CHR 358809).

### ***Cardamine polyodontes* Heenan, *Phytotaxa* 330: 122–125 (2017)**

Holotype: Lewis Pass, Nelson Land District, in rock crevices, 7 February 1997,  
*P. B. Heenan s.n.*, CHR 511891!

**Etymology:** The specific epithet *polyodontes* (Greek: many teeth) refers to the numerous marginal hydathodes on the terminal leaflet.

Perennial herb, single rosette or several rosettes on short lateral branches, stem and branches 1.0–2.8 mm diam. Leaves up to 140 mm long, pinnatisect or simple; lamina 6.0–25.0 × 4.3–28.0 mm, green, membranous, glabrous or sparsely to moderately hairy on abaxial and adaxial surfaces, margin and petiole. Terminal pinna 4.7–36.0 × 5.5–33.0 mm, usually simple, with 4–10 shallow lobes each with a conspicuous hydathode, orbicular, orbicular-angular, apex obtuse with a conspicuous hydathode, base cordate or truncate and sometimes oblique. Lateral pinnae 1–2(–4), 1.9–15.0 × 2.1–12.5 mm, orbicular, orbicular-rhomboid, to broadly elliptic, base truncate or weakly cordate and sometimes oblique, petiolule 0.1–8.5 mm long; petiole up to 195 mm long; hairs 0.3–0.6 mm long. Cauline leaves with 0–4 lateral pinnae, otherwise similar to rosette leaves but smaller, often narrower, and with fewer but more distinctive lobes and hydathodes. Inflorescence raceme, each 4–8-flowered and sometimes with a solitary flower or lateral raceme lower down the peduncle; peduncle up to 350 mm long, 0.5–1.6 mm diam. at base, ascending, glabrous or occasionally sparsely hairy. Pedicels 4.5–44.0 mm long, 0.4–1.0 mm diam., glabrous. Sepals 2.4–3.0 × 1.1–1.6 mm, elliptic-oblong to broadly elliptic, ± saccate, green or red-brown, glabrous, margin white and membranous, apex obtuse, base truncate. Petals 7.5–9.0 × 2.5–5.0 mm, white, limb obovate to broadly elliptic; apex obtuse; base cuneate, tapering to a c. 1.0 mm-long claw. Stamens 6; median filaments 4, 2.8–4.0 mm long; lateral filaments 2, 1.8–3.1 mm long; anthers 0.5–0.7 mm long, cream to pale yellow and occasionally flushed maroon, when dehiscent held at a similar height to or slightly below the stigma. Ovary 3.1–4.8 mm long, 0.5–0.6 mm diam., ± terete, green, glabrous; ovules 14–18; style 0.3–0.4 mm long, ± terete; stigma c. 0.4 mm diam. Siliques 35.0–47.0 × 1.8–2.5 mm, glabrous, style 1.0–4.8 mm long; valves green at maturity; straw-coloured when dehiscent, replum 0.7–0.8 mm wide. Seeds 1.8–2.2 mm long, 1.1–1.5 mm wide, 0.5–0.6 mm thick, oblong, henna to henna-green; wing absent.



**Fig. 265:** *Cardamine polyodontes* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** North Island: Gisborne, Volcanic Plateau, Southern North Island.  
South Island: Western Nelson, Sounds Nelson, Westland.

**Biostatus:** Indigenous (Endemic).

*Cardamine polyodontes* is assessed as having a conservation status of Not Threatened (de Lange *et al.* 2018).

**Habitat:** *Cardamine polyodontes* occurs on cliffs, shrub-tussockland, water courses, and scree.

**Recognition:** *Cardamine polyodontes* is distinguished from *C. glara* by its larger and more robust growth habit, longer inflorescence, leaves with a large, usually orbicular terminal leaflet with 5–11 prominent hydathodes, and longer and broader siliques.

**Phenology:** Flowering December–March; Fruiting December–April.

**Notes:** Previously known by the tagname *C.* “tussock race” (e.g., Pritchard 1957).



**Fig. 266:** *Cardamine polyodontes*. Plant with rosette leaves.



**Fig. 267:** *Cardamine polyodontes*. Terminal leaflet with marginal hydathodes.



**Fig. 268:** *Cardamine polyodontes*. Rosette leaves.



**Fig. 269:** *Cardamine polyodontes*. Rosette leaves.



**Fig. 270:** *Cardamine polyodontes*. Inflorescence with apetalous flowers and cauline leaves.



**Fig. 271:** *Cardamine polyodontes*. Flower with two petals.



**Fig. 272:** *Cardamine polyodontes*. Apetalous flower.



**Fig. 273:** *Cardamine polyodontes*. Top view of flower.



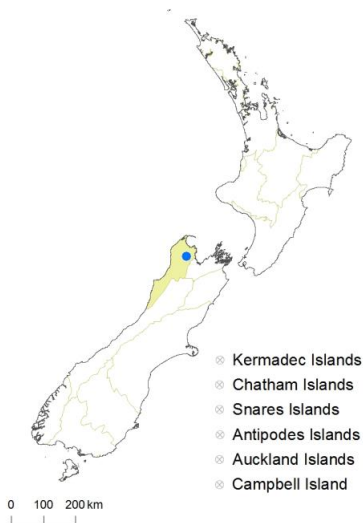
**Fig. 274:** *Cardamine polyodontes*. Seeds.

## *Cardamine porphyroneura* Heenan, *Phytotaxa* 330: 125–126 (2017)

Holotype: Nelson Land District, Cobb Dam, 950 m, shaded crevices and ledges on magnesite outcrops in forest, 23 October 2014, P. B. Heenan s.n., CHR 640343!

**Etymology:** The specific epithet *porphyroneura* (Greek: purple-nerved) refers to the violet-purple-veined cotyledons in the embryo.

Perennial herb, single rosette or with lateral branches. Leaves up to 65 mm long, simple or pinnatisect; lamina 5.0–27.0 × 9.0–20.0 mm, green, membranous, glabrous; petiole up to 65 mm long. Terminal pinna 5.0–19.0 × 4.0–20.0 mm, simple, weakly pandurate to pandurate-orbicular; margin entire, with 2–4 distinct hydathodes; apex obtuse with a distinct hydathode; base cordate. Lateral pinnae 1–2 or absent, 1.5–10.0 × 1.5–6.5 mm, orbicular to broadly elliptic-orbicular, weakly pandurate; apex obtuse; base obtuse; petiolule up to 2.0 mm long. Cauline leaves similar to rosette leaves but smaller, narrower, lateral lobes more prominent, base attenuate. Inflorescence racemose, often branched, each raceme 5–15-flowered; peduncle up to 300 mm long, 0.4–1.0 mm diam. at base, ascending, glabrous. Pedicels 8.0–16.0 mm long, 0.25–0.4 mm diam., glabrous. Sepals 2.0–2.4 × 1.0–1.3 mm, elliptic-oblong to broadly elliptic-obovate, saccate, green, glabrous, margin white and membranous, apex obtuse, base truncate. Petals 4.1–4.5 × 1.9–2.3 mm, white, limb obovate; apex obtuse; base attenuate to cuneate, tapering to a 1.0–1.2 mm-long claw. Stamens 6; median filaments 4, 3.0–3.5 mm long; lateral filaments 2, 2.7–2.8 mm long; anthers 0.4–0.6 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 3.0–3.4 mm long, 0.5–0.6 mm diam., ± terete, green, glabrous; ovules 15–22; style 0.3–0.4 mm long, ± terete; stigma c. 0.4 mm diam. Siliques 10.0–22.0 × 1.1–1.3 mm, glabrous, style 0.1–0.2 mm long; valves grey-brown to grey-green at maturity and when dehiscent; replum 0.3–0.4 mm wide. Seeds 1.1–1.6 mm long, 0.6–0.8 mm wide, 0.4–0.8 mm thick, oblong, broadly oblong, ovate-oblong to obovate-oblong, green, henna-green to henna; veins of embryo cotyledons usually strongly but sometimes weakly coloured violet-purple; wing absent.



**Fig. 275:** *Cardamine porphyroneura* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** South Island: Western Nelson.

*Cardamine porphyroneura* occurs in Western Nelson (South Island), where it is restricted to rocky outcrops near Cobb Reservoir.

**Biostatus:** Indigenous (Endemic).

*Cardamine porphyroneura* is assessed as having a conservation status of Threatened, Nationally Critical A(3), with the qualifier One Location (de Lange *et al.* 2018).

**Habitat:** *Cardamine porphyroneura* occurs on shaded ledges and crevices of base-rich talc magnesite outcrops cliffs, scarps, and tors.

**Recognition:** *Cardamine porphyroneura* is distinguished from *C. dactyloides* by its larger growth habit and leaves, cauline leaves with broad pinnae, petals narrower, anthers cream to pale yellow, seeds narrower and slightly smaller, and the cotyledons of the seed embryo with violet-purple veins.

**Phenology:** Flowering December–January; Fruiting January.

**Notes:** Previously known by the tagname *C.* “Cobb magnesite mine” (e.g., de Lange *et al.* 2013, p. 63).



**Fig. 276:** *Cardamine porphyroneura*. Plant with rosette leaves.



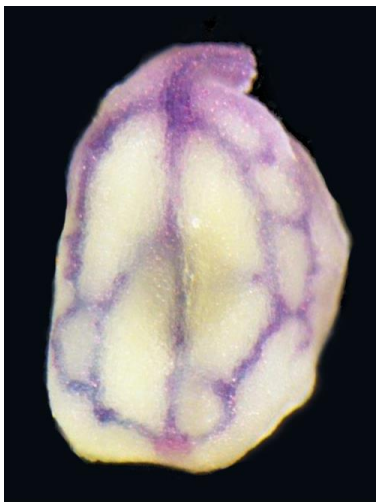
**Fig. 277:** *Cardamine porphyroneura*. Top view of flower.



**Fig. 278:** *Cardamine porphyroneura*. Side view of flower.



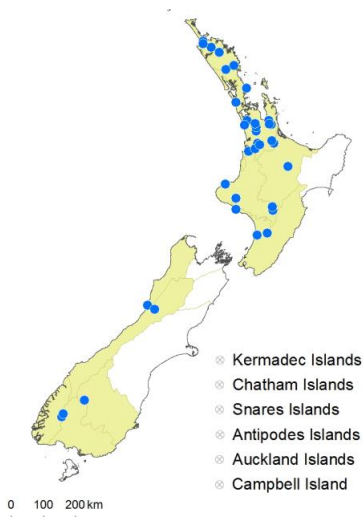
**Fig. 279:** *Cardamine porphyroneura*. Seed showing purple venation under testa.



**Fig. 280:** *Cardamine porphyroneura*. Seed with testa removed showing purple venation.

## *Cardamine pratensis* L., Sp. Pl. 656 (1753)

Perennial herb, single rosette or with short lateral branches, rhizomatous. Leaves up to 110 mm long, pinnatisect; lamina 30.0–82.0 × 15.0–23.0 mm, green, membranous, glabrous or sparsely hairy; hairs 0.1–0.4 mm long, appressed to spreading; petiole up to 30 mm long. Terminal pinna 5.5–25.0 × 5.8–25.0 mm, larger than lateral leaflets, simple, orbicular, broadly orbicular, orbicular-reniform to broadly orbicular-reniform; margin entire, sometimes shallowly lobed, with 2–6 usually indistinct hydathodes; apex obtuse to retuse, usually with an indistinct hydathode; base weakly cordate, truncate or obtuse. Lateral pinnae 6–14, 3.0–18.0 × 3.0–17.0 mm, orbicular to broadly orbicular, margin entire or sinuate, apex obtuse or subacute; base weakly cordate, truncate to obtuse; petiolule 0.3–1.5 mm long, occ. ± sessile. Cauline leaves narrower, smaller and with fewer pinnae than rosette leaves; pinnae narrow-elliptic to linear, margins entire, bases attenuate to obtuse, glabrous, rarely ciliate; terminal pinna up to 35.0 × 4.8 mm; lateral pinnae up to 24.0 × 4.6 mm. Inflorescence racemose, 2–13-flowered; peduncle up to 350 mm long, 0.8–1.2 mm diam. at base, erect to ascending, purple or green, glabrous. Pedicels 8.0–30.0 mm long, 0.25–0.5 mm diam., glabrous. Sepals 2.5–4.0 × 1.0–2.4 mm, elliptic-oblong, saccate, green or green-pink, glabrous; margin white and membranous, apex obtuse, base truncate. Petals 4; 7.0–11.0 × 2.1–6.0 mm, pink or white, limb obovate; apex obtuse; base attenuate to cuneate, tapering to a claw up to 2.3 mm long. Stamens 6; median filaments 4, 3.2–4.0 mm long; lateral filaments 2, 2.0–2.7 mm long; anthers 1.0–1.3 mm long, cream to pale yellow, when dehiscent held above the stigma. Ovary 2.8–2.9 mm long, 0.5–0.6 mm diam., ± terete, green, glabrous; ovules 12–20; style c. 0.2 mm long, ± terete; stigma 0.4–0.5 mm diam., white. Siliques 10.0–32.0 × 1.0–1.7 mm, pale yellow-green, valves often purple, glabrous, style 1.0–1.7 mm long; replum 0.4–0.6 mm wide. Seeds 1.5–1.7 mm long, 1.1–1.2 mm wide, 0.4–0.6 mm thick, broadly oblong to orbicular-oblong, red-brown; wing present or absent around margin.



**Fig. 281:** *Cardamine pratensis* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** North Island: Northland, Auckland, Volcanic Plateau, Taranaki, Southern North Island.

South Island: Westland, Southland.

Naturalised in New Zealand. In the North Island *C. pratensis* occurs in Northland, Auckland, Volcanic Plateau, Taranaki and Southern North Island, and in the South Island in Westland and Southland, predominantly in higher-rainfall western areas. *Cardamine pratensis* is originally from Europe, where it is widespread (Zozomova-Lihova & Marhold 2003).

**Region of origin:** Europe

**Biostatus:** Exotic; fully naturalised.

**Habitat:** *Cardamine pratensis* occurs in shaded and/or damp sites such as river banks, lake edges, swamps and boggy areas, track edges, and amongst open scrub and shrubs, low herbs and grasses.

**First record:** Allan (1940; see also Garnock-Jones 1979) gives the first record as being from Whāngarei (North Auckland). The specimen supporting this record has no collector and is undated, but it does have a supplementary label added by A. J. Healy on 20 August 1946. This

supplementary label implies the specimen may have been received at the herbarium for identification from an "Inspector of Stock", Whāngarei (North Auckland), on 16 October 1936. Two other early records are a specimen collected from New Plymouth (Taranaki) on 27 November 1936 by V. D. Zotov (CHR 17295), and another specimen collected from Palmerston North (Wellington) on 21 November 1937 by H. H. Allan (CHR 19086).

**Phenology:** Flowering September–June; Fruiting October–June.

**Notes:** *Cardamine pratensis* "toothed-leaved form": In New Zealand a tooth-leaved form of *C. pratensis* is only known from the Hauraki Plains, North Auckland, where it occurs in swamps and grassland. It is distinguished from the more typical sinuate margin / entire-leaved form of *C. pratensis* by more numerous leaflets that are prominently toothed, the silique is slightly more slender and with a longer style, and the seeds are oblong rather than being rounded.

Leaves with 16–24 lateral pinnae, broadly elliptic to elliptic-ovate and margin toothed, base cuneate to obtuse. Cauline leaves narrower, smaller and with fewer pinnae than rosette leaves, entire or with 1–2 teeth; terminal pinnae up to 17.0 × 1.8 mm; lateral pinnae up to 15.0 × 1.2 mm.



**Fig. 282:** *Cardamine pratensis*. Rosette leaves.



**Fig. 283:** *Cardamine pratensis*. Cauline leaflets with toothed margins.



**Fig. 284:** *Cardamine pratensis*. Cauline leaflets with entire margins.



**Fig. 285:** *Cardamine pratensis*. Seeds.

### ***Cardamine reptans* Heenan, *Phytotaxa* 330: 129–131 (2017)**

Holotype: Otago Land District, Dunstan Mts, Fairfax Spur, near Leaning Rock, 9 December 1997, *P. B. Heenan s.n.*, CHR 514169!

**Etymology:** The specific epithet *reptans* (Latin: creeping) refers to the growth habit.

Perennial herb, single rosette or with lateral, prostrate or decumbent, often with rhizomatous stems. Leaves up to 95 mm long, pinnatisect; lamina 5.0–35.0 × 3.5–34.0 mm, green, coriaceous, glabrous on abaxial surface, glabrous or sparsely to moderately hairy on adaxial surface and petiole; hairs up to 0.4 mm long, spreading to patent; petiole up to 75 mm long. Terminal pinna 2.5–13.0 × 2.0–14.8 mm, simple, orbicular-rhomboid, rhomboid, broadly elliptic-rhomboid to broadly elliptic; margin entire to shallowly sinuate, with 2–4 indistinct hydathodes; apex obtuse with a ± distinct hydathode; base attenuate to obtuse, occasionally truncate. Lateral pinnae 2–6, 1.0–13.0 × 0.6–8.3 mm, orbicular to broadly elliptic-orbicular; apex obtuse; base attenuate; petiolule sessile or up to 5.0 mm long. Cauline leaves absent. Inflorescence corymbose, each corymb 2–3-flowered or flowers solitary; peduncle up to 45 mm long, 0.3–0.4 mm diam. at base, spreading to ascending, glabrous. Pedicels 6.0–145.0 mm long, 0.3–0.4 mm diam., glabrous. Sepals 2.2–3.4 × 1.0–1.8 mm, elliptic-oblong to broadly elliptic-obovate, saccate, green or reddish brown, glabrous or occasionally sparsely hairy, margin white and



membranous, apex obtuse, base truncate. Petals 6.5–9.7 × 3.0–5.6 mm, white, limb obovate; apex obtuse; base attenuate to cuneate, tapering to a 2.0–2.5 mm long claw. Stamens 6; median filaments 4, 3.6–5.2 mm long; lateral filaments 2, 2.0–3.7 mm long; anthers 0.9–1.0(–2.2) mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 5.0–6.4 mm long, 0.5–0.9 mm diam., ± terete, green, glabrous; ovules 28–36; style (1.2–)2.5–3.0 mm long, ± terete; stigma 0.35–0.45 mm diam. Siliques 11.0–15.0 × 1.5–1.7 mm, glabrous, style 1.6–2.0 mm long; valves green at maturity and when dehiscent; replum 0.2–0.3 mm wide. Seeds 1.3–1.7 mm long, 0.8–1.1 mm wide, 0.2–0.4 mm thick, oblong to broadly oblong, henna to henna-green; wing absent.

**Distribution:** South Island: Westland, Canterbury, Otago, Southland.

*Cardamine reptans* is known from the schist mountains of Otago and Canterbury, including St Mary's Range, St Bathans Range, Dunstan Mountains, Old Man Range, Pisa Range, Remarkables and Crown Range, and Southland (Garvie Mountains).

**Biostatus:** Indigenous (Endemic).

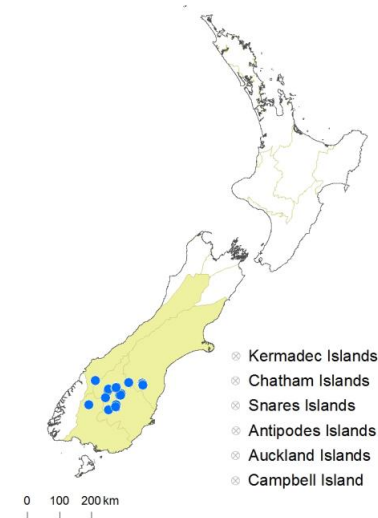
*Cardamine reptans* is assessed as having a conservation status of At Risk—Naturally Uncommon, with the qualifier Data Poor (de Lange *et al.* 2018). The qualifier Data Poor is applied because additional information on the number and size of the populations is required.

**Habitat:** *Cardamine reptans* occurs in a variety of subalpine and alpine habitats such as seepages, damp stream margins, moist hollows, bog margins, and wet hollows in alpine cushion vegetation.

**Recognition:** *Cardamine reptans* is distinguished from *C. megalantha* by its membranous leaves with indistinct marginal hydathodes and smaller terminal leaflet, and in

having several lateral leaflets, leaflets often with indistinct petiolules and lacking axillary hydathodes, and short inflorescences.

**Phenology:** Flowering December–February; Fruiting January–February.



**Fig. 286:** *Cardamine reptans* distribution map based on databased records at AK, CHR, OTA & WELT.



**Fig. 287:** *Cardamine reptans*. Plant with underground stems.



**Fig. 288:** *Cardamine reptans*. Plant with rosette leaves and inflorescences.



**Fig. 289:** *Cardamine reptans*. Plant with rosette leaves and inflorescences.



**Fig. 290:** *Cardamine reptans*. Rosette leaves.



**Fig. 291:** *Cardamine reptans*. Top view of flowers.



**Fig. 292:** *Cardamine reptans*. Back view of flower.



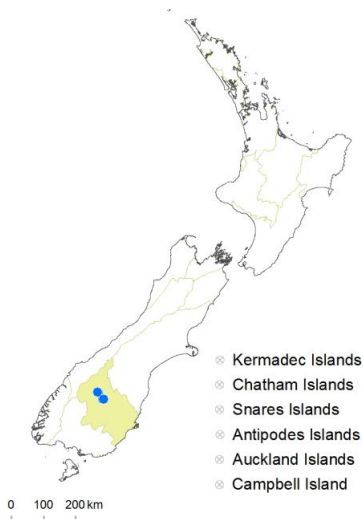
**Fig. 293:** *Cardamine reptans*. Siliques.

## *Cardamine sciaphila* Heenan, *Phytotaxa* 330: 131–133 (2017)

Holotype: Otago Land District, Dunstan Mts, among grasses around rock tors, 9 December 1997, P. B. Heenan s.n., CHR 514168!

**Etymology:** The specific epithet *sciaphila* (Latin: shade-loving) refers to the shaded habitat that is preferred by the species.

Perennial herb, single rosette or with short lateral branches, stem and branches c. 2 mm diam. Leaves up to 17(–45) mm long, simple, glabrous or hairy; lamina 5–20 × 2–5 mm, narrowly obovate to spatulate, glossy, coriaceous, green, brown-green to bronze, glabrous on abaxial surface, glabrous or sparsely to moderately hairy on margin and adaxial surface; apex obtuse, often with a distinct hydathode; base cuneate to attenuate, grading into petiole; hairs unicellular, straight or curved, transparent. Petiole up to 12(–25) mm long, plano-convex, usually glabrous although sometimes 1–3 hairs on margin. Cauline leaves occasional, similar to rosette leaves but smaller. Inflorescence corymbose with 2–8 flowers, flowers sometimes solitary, peduncle up to 30(–70) mm long, 0.7–0.8 mm diam. at base, upright, glossy, glabrous, green to brown-green. Pedicels up to 30 mm long, 0.5 mm diam., flexuose. Sepals 1.6–1.8 × 0.7–1.0 mm, oblong to oval, ± saccate, green, glabrous or with occasional simple hairs, margin white and membranous, apex obtuse, base truncate. Petals 2.1–3.2 × 1.2–1.3 mm, white, limb obovate to oblong; apex obtuse; base attenuate, tapering into the ± indistinct claw. Stamens 4–6; filaments 1.2–1.3 mm long; anthers 0.4–0.5 mm long, yellow, held at a similar height to or slightly overtopping the stigma. Ovary 1.8–2.0 mm long, c. 0.6 mm diam., ± terete, green, glabrous; ovules 13–14 in each locule; style 0.3–0.4 mm long, ± terete; stigma 0.4–0.5 mm diam. Siliques 7–14 × 1.4–1.5 mm, erect, glabrous, valves green at maturity, style 0.7–0.8 mm long. Seeds 1.0–1.1 mm long, 0.8–0.9 mm wide, 0.3–0.5 mm thick, oblong, orbicular-oblong to orbicular, pale yellow; wing absent.



**Fig. 294:** *Cardamine sciaphila* distribution map based on databased records at AK, CHR, OTA & WELT.

mm long.

**Phenology:** Flowering December–January; Fruiting January–March.

**Notes:** Plants from the Dunstan Mountains have a conspicuously hairy leaf lamina, whereas the lamina of plants from the Pisa Range are very sparsely hairy, glabrate or glabrous. Few flowers were available for study, but a plant from the Pisa Range (CHR 580889) had two flowers that had only four stamens, whereas plants from Dunstan Mountains had six stamens. Further taxonomic research on variation of the leaf and flower characters is required.

Previously known by the tagname *C.* “Pisa Range” (e.g., de Lange *et al.* 2013).

**Distribution:** South Island: Otago.

*Cardamine sciaphila* is known from the highest parts of the Dunstan Mountains (1600 m) and Pisa Range (1620–1850 m) in Central Otago.

**Biostatus:** Indigenous (Endemic).

*Cardamine sciaphila* is assessed as having a conservation status of Threatened, Nationally Critical A(1), with the qualifiers Range Restricted and Data Poor (de Lange *et al.* 2018). The qualifier Data Poor is applied because there is suitable alpine habitat for this species on the plateau mountains of Central Otago and field survey is likely to locate additional populations.

**Habitat:** *Cardamine sciaphila* occurs among low-growing herbs and grasses on ledges and crevices of rock tors, outcrops, and bluffs, showing a clear preference for shaded sites. Plants are often difficult to find unless in flower as they are often buried among other herbaceous vegetation.

**Recognition:** *Cardamine sciaphila* is distinguished from *C. alticola* by its glossy, narrow and coriaceous leaves, which are often hairy, shorter petioles, and its petals being 2.1–3.2



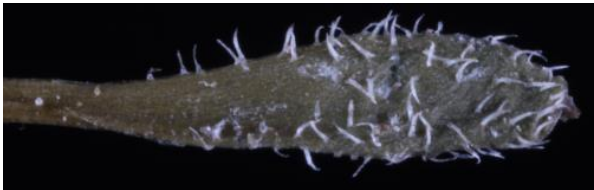
**Fig. 295:** *Cardamine sciaphila*. Plant with inflorescences and siliques.



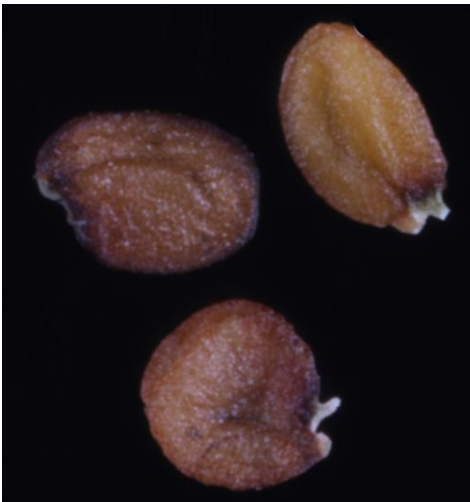
**Fig. 296:** *Cardamine sciaphila*. Plant with green rosette leaves.



**Fig. 297:** *Cardamine sciaphila*. Plant with brown rosette leaves and inflorescence with flower buds.



**Fig. 298:** *Cardamine sciaphila*. Rosette leaf with patent hairs.



**Fig. 299:** *Cardamine sciaphila*. Seeds.

## ***Cardamine serpentina* Heenan, *Phytotaxa* 330: 134–135 (2017)**

Holotype: Southland Land District, West Dome, ultramafic scree, 27 January 1999, P. B. Heenan s.n., CHR 546249!

**Etymology:** The specific epithet *serpentina* (Latin: serpentine rock) refers to the base rock and substrate the species occurs on.

Perennial rosette herb, stem and branches c. 2 mm diam. Leaves up to 40 mm long, simple or pinnatisect; lamina 3–13 × 3–8 mm, green-brown to purple-brown, coriaceous, glabrous; terminal pinna 2.0–6.0 × 1.8–8.0 mm, orbicular-reniform to deltoid-reniform, apex obtuse with a small but distinct hydathode; base truncate to cordate. Lateral pinnae 1–2 or absent, 0.8–3.2 × 0.8–2.3 mm, orbicular, petiolule up to 1.2 mm long; petiole up to 32 mm long, plano-convex, glabrous. Cauline leaves sometimes subtending lower pedicels, narrowly obovate, up to 13 mm long. Inflorescence corymbose to corymbose-racemose, with 1–3 lateral corymbs, each corymb 2–8-flowered, flowers sometimes solitary, peduncle up to 100 mm long, 0.6–0.9 mm diam. at base, upright, glabrous, green-brown to purple-brown. Pedicels up to 36 mm long, 0.3–0.5 mm diam., flexuose, ascending to divaricate. Sepals 1.8–2.4 × 1.0–1.8 mm, broadly oblong to ovate, weakly saccate, green, often flushed red-brown, glabrous, margin white and membranous, apex obtuse, base truncate. Petals 4.5–5.0 × 2.6–3.0 mm, white, limb obovate; apex obtuse; base attenuate, tapering into the ± indistinct claw. Stamens 6; median filaments 4, 2.7–3.1 mm long, lateral filaments 2, 2.9–3.5 mm long; anthers 0.6–0.7 mm long, yellow, overtopping the stigma. Ovary 2.7–3.2 mm long, 0.5–0.6 mm diam., ± terete, green, glabrous; ovules 13–14 in each locule; style 0.3–0.5 mm long, ± terete; stigma 0.3–0.4 mm diam. Siliques 12–20 × 0.9–1.2 mm, erect, glabrous, valves green-brown to purple-brown at maturity, style 0.8–1.8 mm long. Seeds 1.0–1.2 mm long, 0.8–0.9 mm wide, 0.3–0.4 mm thick, orbicular to orbicular-oblong, orange-brown; wing absent.

**Distribution:** South Island: Southland.

*Cardamine serpentina* is restricted to Southland, where it occurs at West Dome, Black Ridge Quarry, Bald Hill, and Livingstone Mountains.

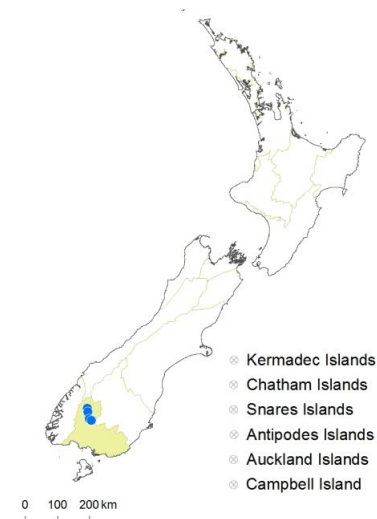
**Biostatus:** Indigenous (Endemic).

*Cardamine serpentina* is assessed as having a conservation status of Threatened, Nationally Vulnerable B(1) with the qualifier Sparse (de Lange *et al.* 2018). This assessment of *C. serpentina* is consistent with its small population sizes, geographical restriction, and specific habitat.

**Habitat:** *Cardamine serpentina* grows on scree and loose stones/rubble around outcrops derived from ultramafic rocks.

**Recognition:** *Cardamine serpentina* is distinguished from *C. glara* by its smaller and compact growth habit, smaller green-brown to purple-brown leaves, smaller terminal leaflet with a more distinct cordate base, fewer lateral pinnae, smaller sepals, and shorter siliques.

**Phenology:** Flowering December–February; Fruiting December–April.



**Fig. 300:** *Cardamine serpentina* distribution map based on databased records at AK, CHR, OTA & WELT.

**Notes:** Previously known by the tag name *C. "West Dome"* (e.g., de Lange *et al.* 2013, p. 68).



**Fig. 301:** *Cardamine serpentina*. Plant with rosette leaves, flowers and old inflorescences.



**Fig. 302:** *Cardamine serpentina*. Plant with rosette leaves and inflorescence with flowers.



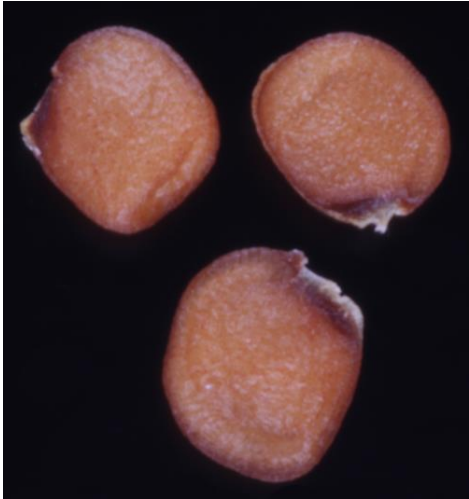
**Fig. 303:** *Cardamine serpentina*. Rosette leaves.



**Fig. 304:** *Cardamine serpentina*. Inflorescence with buds and side view of flowers.



**Fig. 305:** *Cardamine serpentina*. Top view of flowers.



**Fig. 306:** *Cardamine serpentina*. Seeds.

## *Cardamine sinuatifolia* Heenan, *Phytotaxa* 330: 136–137 (2017)

Holotype: Canterbury, Torlesse Range, Foggy Peak, damp banks of stream, 9 December 2009, P. B. Heenan s.n., CHR 616910!

**Etymology:** The specific epithet *sinuatifolia* (Latin: wavy leaves) refers to the leaves of this species usually being wavy on the margin.

Perennial herb, single rosette or with short lateral branches. Leaves up to 90 mm long, simple or pinnatisect, upright to spreading; lamina 4.0–30.0 × 2.5–15.0 mm, light green, membranous, usually glabrous on abaxial and adaxial surfaces, glabrous or sparsely hairy on margin and petiole; petiole up to 70 mm long, green and usually purple-red in lower half, glabrous to sparsely hairy, hairs 0.3–0.5 mm long, spreading to patent. Terminal pinna 5.0–18.0 × 5.0–15.0 mm, simple, oblong-ovate, broadly elliptic-ovate, elliptic-oblong to deltoid-oblong; margin usually shallowly sinuate to occasionally entire, hydathodes indistinct; apex obtuse, hydathode indistinct; base truncate, obtuse, to weakly cordate. Lateral pinnae 1–2(–4), 2.0–8.0 × 1.5–6.0, orbicular, broadly elliptic-ovate, deltoid-ovate to rhomboid-ovate; margin entire, occasionally weakly lobed, hydathodes inconspicuous; apex obtuse; base truncate to cuneate, often oblique; petiolule 0.2–1.0 mm long, often appearing ± sessile. Cauline leaves similar to rosette leaves but smaller, terminal pinna often pinnatifid, pinnae bases attenuate to truncate; terminal pinna up to 10.0 × 6.0 mm, lateral pinnae up to 8.0 × 4.5 mm. Inflorescence with solitary flowers or 1–3 corymbs, corymbs 2–6-flowered; peduncle up to 100 mm long, 0.5–1.0 mm diam. at base, spreading to ascending, glabrous. Pedicels 15.0–115.0 mm long, 0.3–0.7 mm diam., terete, glabrous. Sepals 1.8–2.2 × 0.7–1.2 mm, elliptic-oblong, saccate, green or red-brown; glabrous to sparsely hairy; margin white and membranous, apex obtuse, base truncate. Petals 1–4, or absent; 4.5–5.5 × 2.1–3.0 mm, white, limb obovate; apex obtuse; base cuneate, tapering to a 1.0–1.5 mm long claw. Stamens 4–6; median filaments 2–4, 2.0–2.6 mm long; lateral filaments 2, 1.6–2.2 mm long; anthers 0.5–0.6 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 2.6–2.9 mm long, 0.4–0.6 mm diam., ± terete, green, glabrous; ovules 20–20; style c. 0.2 mm long, ± terete; stigma 0.4–0.5 mm diam., white. Siliques 18.0–25.0 × 1.0–1.2 mm, glabrous, style 0.2–0.4 mm long; valves green at maturity and when dehiscent; replum 0.4–0.5 mm wide. Seeds 0.9–1.2 mm long, 0.5–0.7 mm wide, 0.3–0.4 mm thick, oblong to broadly oblong, henna; wing absent.

**Distribution:** South Island: Western Nelson, Canterbury, Otago.

*Cardamine sinuatifolia* is currently known from a few collections in Western Nelson, Canterbury and Otago, but the wide geographical range of *C. sinuatifolia* in the South Island suggests it is likely to be more common.

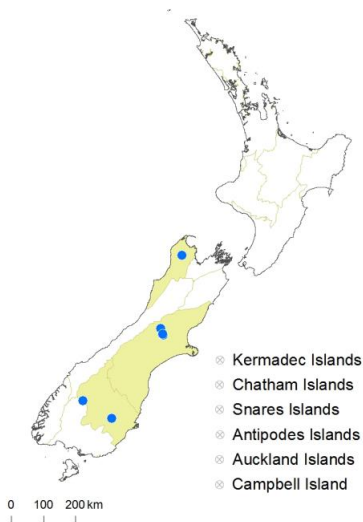
**Biostatus:** Indigenous (Endemic).

*Cardamine sinuatifolia* is assessed as having a conservation status of At Risk—Naturally Uncommon, with the qualifiers Range Restricted, Data Poor and Sparse (de Lange *et al.* 2018). The qualifier Data Poor is applied because there is a lack of information on the number and size of the populations. Sparse is applied to reflect the current distribution, but further populations will almost certainly be located since its habitats are common throughout its distributional range.

**Habitat:** *Cardamine sinuatifolia* prefers to grow in damp sites such as lake margins and stream banks.

**Recognition:** *Cardamine sinuatifolia* is distinguished by usually simple leaves, although occasionally they have 1–2 lateral pinnae, light green colour, margin with inconspicuous hydathodes, and purple-red petiole bases and stems. A notable feature of the terminal leaflets is their irregular shape, a tendency to be elliptic or oblong, and the weakly sinuate margin.

**Phenology:** Flowering January–December; Fruiting January–March.



**Fig. 307:** *Cardamine sinuatifolia* distribution map based on databased records at AK, CHR, OTA & WELT.



**Fig. 308:** *Cardamine sinuatifolia*. Plant with rosette leaves.



**Fig. 309:** *Cardamine sinuatifolia*. Plant with rosette leaves and inflorescences.



**Fig. 310:** *Cardamine sinuatifolia*. Rosette leaves.



**Fig. 311:** *Cardamine sinuatifolia*. Rosette leaves.



**Fig. 312:** *Cardamine sinuatifolia*. Terminal leaflet of rosette leaves.



**Fig. 313:** *Cardamine sinuatifolia*. Top view of flower.

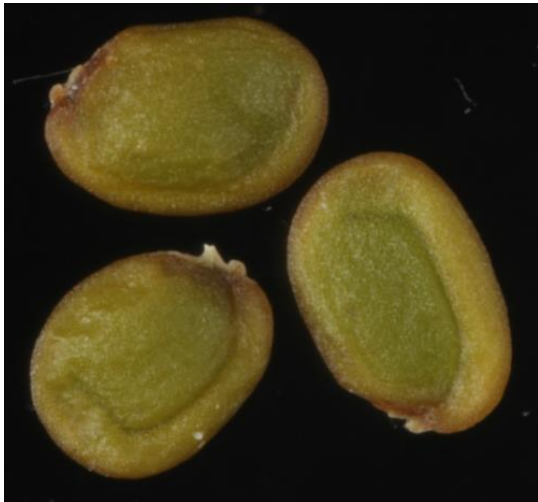




**Fig. 314:** *Cardamine sinuatifolia*. Flowers with two petals.



**Fig. 315:** *Cardamine sinuatifolia*. Apetalous flower.



**Fig. 316:** *Cardamine sinuatifolia*. Seeds.

### ***Cardamine subcarnosa* (Hook.f.) Allan, *Fl. New Zealand* 1, 184 (1961)**

≡ *Cardamine hirsuta* var. *subcarnosa* Hook.f., *Bot. Antarct. Voy. I. (Fl. Antarct.) Part I*, 5 (1844)

≡ *Cardamine glacialis* var. *subcarnosa* (Hook.f.) O.E.Schulz, *Bot. Jahrb. Syst.* 32: 542 (1903)

Lectotype (designated by Heenan 2008): Flora of Campbell Islands, Antarctic Expedition, 1839–1843, *J. D. Hooker*, BM!

**Etymology:** The specific epithet *subcarnosa* (Latin: sub a little; carnosus fleshy) probably refers to the leaves.

Perennial herb, caespitose, forming an open rosette. Leaves pinnatisect, up to 100(–140) mm long, green, glossy, subcoriaceous, lamina and petiole margins sparsely ciliate, glabrate, or occasionally glabrous; petiole 20–40(–60) mm long, 1.5–6.0 mm wide, winged and sheathing at base; hydathodes inconspicuous to prominent. Terminal pinna 5–25 × 5–20 mm, orbicular to broadly elliptic, with inconspicuous lateral lobes or shallowly toothed, apex obtuse to rounded, base cuneate, obtuse or ± truncate. Lateral pinnae 5–7, 3–22 × 2.5–12 mm, usually in pairs although proximal leaflets occasionally alternate, usually not overlapping except occasionally the uppermost pair and the terminal, broadly elliptic, elliptic to obovate, shallowly toothed or entire; petiolules up to 10 mm long, although sometimes ± absent, apex obtuse to rounded, base cuneate, obtuse or ± truncate. Cauline leaves subtending pedicels, although sometimes absent on upper pedicels; lower leaves similar to rosette leaves, but with fewer and narrower leaflets, becoming smaller in all parts; upper leaves 1.7–6.5 × 0.3–0.9 mm, increasingly linear, simple. Inflorescence 50–150(–300) mm long, 1.2–1.6 mm

diam. at base, glabrous, usually elongating after flowering, upright to ascending, racemose, flowers distant in upper half. Pedicels 2.0–12 mm long, 0.5–0.8 mm diam, erecto-patent to spreading. Sepals 1.3–2.4 × 0.7–1.2 mm, oblong to elliptic, glabrous, green or purple, margin white and membranous, apex obtuse to rounded, base truncate. Petals 2.2–4.5 × 0.6–1.3 mm, white, pink or purple, usually purple veined, limb obovate; apex obtuse to rounded; base cuneate to attenuate, tapering to a ± indistinct claw, claw up to 0.5 mm long. Stamens 6; median filaments 4, 1.9–2.2 mm long; lateral filaments 2, 1.6–1.9 mm long; anthers 0.3–0.4 mm long. Ovary 3.2–3.5 mm long, 0.5–0.7 mm diam., terete, glabrous; stigma 0.3–0.5 mm diam. Siliques 9–20 × 0.9–1.3 mm, glabrous, not crowded, erecto-patent to spreading, style 1.0–1.4 mm long; replum 0.3–0.4 mm wide. Seeds 0.8–1.4 mm long, 0.5–0.9 mm wide, 0.3–0.5 mm thick, orbicular-oblong or oblong, red-brown; wing absent.

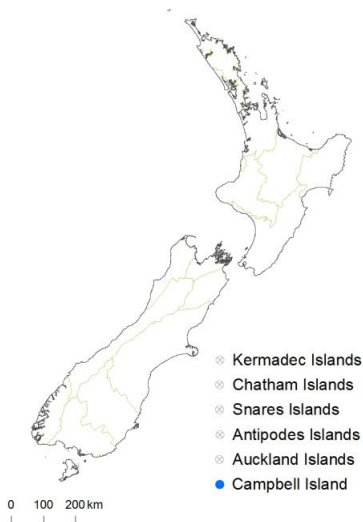
**Distribution:** Campbell Island.

**Biostatus:** Indigenous (Endemic).

*Cardamine subcarnosa* is assessed as having a conservation status of At Risk—Naturally Uncommon, with the qualifiers Island Endemic and One Location (de Lange *et al.* 2018).

**Habitat:** *Cardamine subcarnosa* grows in damp places on scree, peat, grassland, and rock crevices. Noted by Meurk *et al.* (1994) as being most common in herbfields, tall *Marsippospermum* rushlands, and fellfields of the summit tundra zone.

**Phenology:** Flowering November–February; Fruiting December–February.



**Fig. 317:** *Cardamine subcarnosa* distribution map based on databased records at AK, CHR, OTA & WELT.



**Fig. 318:** *Cardamine subcarnosa*. Plant with rosette leaves and inflorescence (CHR 49785).



**Fig. 319:** *Cardamine subcarnosa*. Inflorescence with mature flowers (CHR 605663).



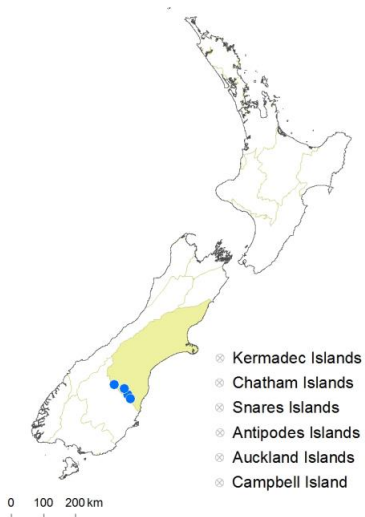
**Fig. 320:** *Cardamine subcarnosa*. Inflorescence with siliques (CHR 624024).

### ***Cardamine thalassica* Heenan, *Phytotaxa* 330: 139–142 (2017)**

Holotype: Otago Land District, Hawkdun Range, Rambling Stream, bouldery colluvium, 7 December 2011, *J. Barkla s.n.*, CHR 619275!

**Etymology:** The specific epithet *thalassica* (Latin: greyish) alludes to grey to grey-green leaves.

Perennial herb, single rosette or with lateral branches. Leaves up to 135 mm long, pinnatisect; lamina 17.0–65.0 × 16.0–42.0 mm, grey to grey-green, coriaceous, glabrous; petiole up to 92 mm long. Terminal pinna 5.7–14.0 × 4.5–9.5 mm, simple, broadly elliptic, elliptic-orbicular, ovate or broadly ovate; margin entire; lateral hydathodes absent; apex obtuse with a distinct hydathode; base obtuse. Lateral pinnae 2–6, 4.4–13.0 × 3.0–9.5, simple, broadly elliptic, elliptic-orbicular, ovate or broadly ovate; margin entire, lateral hydathodes absent; apex obtuse with a distinct hydathode; base obtuse; petiolule 1.8–10.5 mm long. Cauline leaves similar to rosette leaves but smaller, narrower, with fewer lateral pinnae, pinnae bases attenuate to cuneate; terminal pinna up to 20.0 × 5.0 mm, lateral pinnae up to 12.0 × 5.7 mm. Inflorescence racemose, sometimes with lateral racemes, each raceme 6–18-flowered; peduncle up to 250 mm long, 1.2–1.6 mm diam. at base, ascending, glabrous. Pedicels 10.0–22.0 mm long, 0.4–0.5 mm diam., glabrous. Sepals 2.1–2.4 × 0.8–1.4 mm, elliptic-oblong, saccate, green to red-brown, glabrous, margin white and membranous, apex obtuse, base truncate. Petals 3.6–4.5 × 1.2–1.4 mm, white, limb obovate; apex obtuse; base attenuate, tapering to a 1.0–1.5 mm-long claw. Stamens 6; median filaments 4, 2.4–3.1 mm long; lateral filaments 2, 2.1–2.9 mm long; anthers 0.3–0.4 mm long, cream, when dehiscent held slightly below the stigma. Ovary 2.5–3.2 mm long, 0.4–0.6 mm diam., ± terete, green-brown, glabrous; ovules 30–32; style c. 0.3 mm long, ± terete; stigma 0.4–0.5 mm diam. Siliques 21.0–34.0 × 1.1–1.3 mm, glabrous, style 0.7–1.0 mm long; valves green-brown at maturity and when dehiscent; replum 0.7–0.8 mm wide. Seeds 1.3–1.4 mm long, 0.8–0.9 mm wide, oblong to orbicular-oblong, yellow-brown; wing absent.



**Fig. 321:** *Cardamine thalassica* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** South Island: Canterbury.

*Cardamine thalassica* occurs on the Kakanui Mountains and St Bathans Range.

**Biostatus:** Indigenous (Endemic).

*Cardamine thalassica* is assessed as having a conservation status of Threatened, Nationally Endangered B(1), with the qualifier Data Poor (de Lange *et al.* 2018). The qualifier Data Poor is applied because additional information is required on the number and size of the populations and further field work is likely to discover new populations.

**Habitat:** *Cardamine thalassica* grows on dry, unstable, bouldery colluvium and rocky slopes.

**Recognition:** *Cardamine thalassica* is distinguished from *C. glara* by being entirely glabrous, with grey to grey-green leaves, leaflets with more distinct petiolules, inflorescence a raceme, shorter petals, and longer seeds.

**Phenology:** Flowering December–March; Fruiting December–March.



**Fig. 322:** *Cardamine thalassica*. Plants with rosette leaves and flowering inflorescences.



**Fig. 323:** *Cardamine thalassica*. Plant with rosette leaves and flowering inflorescences.



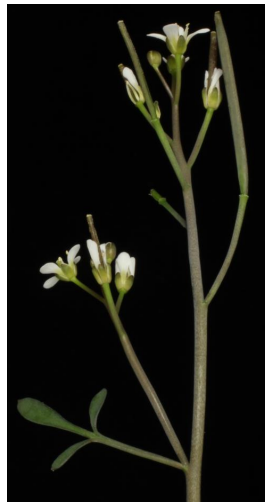
**Fig. 324:** *Cardamine thalassica*. Plant with rosette leaves and flowering inflorescences.



**Fig. 325:** *Cardamine thalassica*. Rosette leaves.



**Fig. 326:** *Cardamine thalassica*. Rosette leaves.



**Fig. 327:** *Cardamine thalassica*. Inflorescence with cauline leaves, siliques and flowers.



**Fig. 328:** *Cardamine thalassica*. Flower bud.



**Fig. 329:** *Cardamine thalassica*. Top view of flower.



**Fig. 330:** *Cardamine thalassica*. Side view of flower.



**Fig. 331:** *Cardamine thalassica*. Seeds.

## *Cardamine unguiculus* Heenan, *Phytotaxa* 330: 142–143 (2017)

Holotype: The Haystack, Matiri Range, NW Nelson, 5000 ft., damp hollow on limestone ridge, March 1981, A. P. Druce *s.n.*, CHR 366093!

**Etymology:** The specific epithet *unguiculus* (Latin: fingernail) alludes to the French manicure fingernail-like appearance of the apical wing on the seed.

Perennial herb, single rosette or with short lateral branches, stem and branches 1.0–3.0 mm diam. Leaves up to 115 mm long, pinnatisect; lamina 16.0–60.0 × 9.0–32.0 mm, green to green-brown, pinnae midrib and main veins green or red to red-brown on adaxial surface, membranous, glabrous, matt. Terminal pinna 5.5–30.0 × 8.0–29.0 mm, reniform, broadly reniform, to orbicular-reniform, margin with 1–7 shallow lobes and 1–7 conspicuous hydathodes, apex obtuse to truncate with a conspicuous hydathode, base weakly to strongly cordate. Lateral pinnae 2–4, 3.1–14.0 × 2.4–17.0 mm, reniform, orbicular-reniform, or broadly elliptic, margin with 1–5 shallow rounded lobes and 1–5 conspicuous hydathodes or entire, apex obtuse with a conspicuous hydathode, base cordate to obtuse, petiolule (0.6–)3.0–5.3 mm long; petiole up to 70 mm long. Cauline leaves similar to rosette leaves but smaller, lateral pinnae absent or 2(–4); pinnae reniform, orbicular-reniform to elliptic, lobes shallowly rounded to narrowly triangular, hydathodes conspicuous. Inflorescence with 1–8 racemes, each raceme up to 17-flowered; peduncle up to 400 mm long, 1.0–2.2 mm diam. at base, green or green-brown and mottled red-brown, spreading to ascending, glabrous. Pedicels 4.0–17.0 mm long, 0.4–1.0 mm diam., terete, glabrous. Sepals 2.0–3.2 × 0.7–1.3 mm, elliptic-oblong to broadly elliptic, ± saccate, green or green-brown, glabrous, margin white and membranous, apex obtuse, base truncate. Petals 3.0–6.0 × 1.5–2.7 mm, white, limb obovate to broadly elliptic; apex obtuse; base attenuate to cuneate, tapering to a 0.5–1.2 mm-long claw. Stamens 6; median filaments 4, 2.5–4.1 mm long; lateral filaments 2, 1.8–3.3 mm long; anthers 0.4–0.8 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 2.8–6.0 mm long, 0.5–1.0 mm diam., ± terete, green, glabrous; ovules 13–24; style 0.3–1.1 mm long, ± terete; stigma 0.3–0.5 mm diam. Siliques (8.5–)17.0–43.0 × 1.5–2.3 mm, glabrous, style 1.0–3.0 mm long; valves green to green-brown at maturity; replum 0.4–1.4 mm wide. Seeds 1.5–2.4 mm long, (0.6–)1.0–1.5 mm wide, 0.4–0.6 mm thick, oblong to oblong-elliptic, green to green-brown; apex broad, obtuse, with prominent wing c. 0.1 mm wide present at apex.

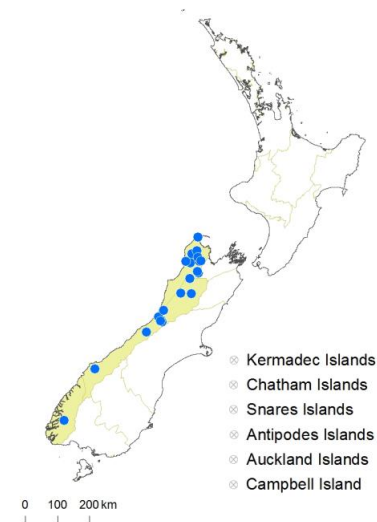
**Distribution:** South Island: Western Nelson, Westland, Fiordland.

**Biostatus:** Indigenous (Endemic).

*Cardamine unguiculus* is assessed as having a conservation status of At Risk—Naturally Uncommon, with the qualifiers Data Poor and Sparse (de Lange *et al.* 2018). The qualifier Sparse is applied because current knowledge indicates that *C. unguiculus* comprises mostly small and scattered populations. The qualifier Data Poor indicates additional information is required on the number and size of the populations.

**Habitat:** *Cardamine unguiculus* grows in a variety of habitats including a sphagnum swamp, on damp rock outcrops, and on limestone in damp hollows and tussockland.

**Recognition:** *Cardamine unguiculus* is distinguished from *C. polyodontes* in having entirely glabrous leaves with 1–2 pairs of lateral leaflets, terminal and lateral leaflets with prominent marginal hydathodes and 2–7 shallow angular or weakly rounded lobes, narrower sepals, shorter and narrower petals, and seeds with a prominent apical wing.



**Fig. 332:** *Cardamine unguiculus* distribution map based on databased records at AK, CHR, OTA & WELT.

**Phenology:** Flowering November–March; Fruiting November–August.

**Notes:** Leaf colour varies in *Cardamine unguiculus*, with this variation often occurring in the same geographical area, such as at Blue Bottle Creek, Lake Kaniere, Westland. At this site, some plants have leaves that are green with inconspicuous green veins, and others are green-brown with conspicuous red to red-brown veins.

Some of the Nelson collections of *Cardamine unguiculus* were previously identified as belonging to the tagname entities *C.* “Tussock Race” (e.g., CHR 366094) or *C.* “Glossy Leaf” (e.g., CHR 419070);

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collections referable to *C. "Tussock Race"* are herein named as *C. polyodontes* and those of *C. "glossy leaf"* as *C. chlorina*.



**Fig. 333:** *Cardamine unguiculus*. Rosette leaves lacking prominent veins.



**Fig. 334:** *Cardamine unguiculus*. Cauline leaves lacking prominent veins.



**Fig. 335:** *Cardamine unguiculus*. Rosette leaves with prominent veins.



**Fig. 336:** *Cardamine unguiculus*. Cauline leaves with prominent veins.



**Fig. 337:** *Cardamine unguiculus*. Inflorescence with buds and flowers.



**Fig. 338:** *Cardamine unguiculus*. Inflorescence with siliques and cauline leaf.



**Fig. 339:** *Cardamine unguiculata*. Seeds with prominent apical wing.

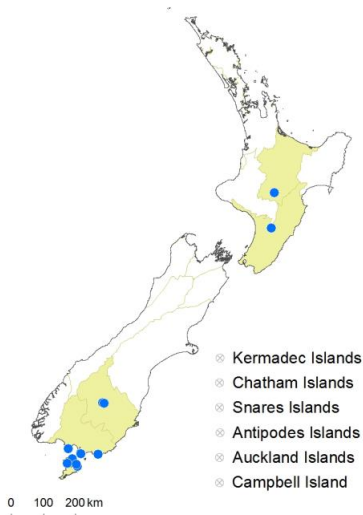
### ***Cardamine unicaulis* Heenan, *Phytotaxa* 330: 144–145 (2017)**

nom. nov. pro *Cardamine hirsuta* var. *uniflora* Hook.f. 1864  
 = *Cardamine hirsuta* var. *uniflora* Hook.f., *Handb. New Zealand Fl.* 12 (1864)  
 ≡ *Cardamine heterophylla* var. *uniflora* (Hook.f.) Cockayne, *Rep. Bot. Surv. Stewart Island* 54 (1909)  
 ≡ *Cardamine uniflora* (Hook.f.) Allan, *Fl. New Zealand* 1, 183 (1961) nom. illeg., non *Cardamine uniflora* Michx. 1803  
 Lectotype (designated by Allan 1961, p. 184): *Colenso 1813*, lectotype K!

**Etymology:** The specific epithet *unicaulis* (Latin: single stalk or stem) alludes to the mostly single flowering stems and retains the intent of the original species epithet *uniflora* (Latin: single flower).

Perennial herb, single rosette or with short lateral branches, stem and branches 0.9–2.5 mm diam. Leaves up to 85 mm long, simple or pinnatisect; lamina 1.8–25.0 × 1.3–14.0 mm, light green to green, membranous, glabrous to sparsely or moderately hairy on adaxial surface, margin and petiole, glabrous on abaxial surface. Terminal pinna 1.8–14.5 × 1.3–14.3 mm, simple, reniform, orbicular-rhomboid to broadly elliptic, apex obtuse with an inconspicuous hydathode, base truncate to cordate. Lateral pinnae absent or 1–4, 1.8–12.0 × 0.8–5.5 mm, orbicular, orbicular-rhomboid, to broadly elliptic, base often oblique, petiolule 0.2–1.7 mm long; petiole up to 60 mm long; hairs 0.2–0.4 mm long, spreading. Cauline leaves, usually simple, with fewer and narrower leaflets than rosette leaves, becoming smaller in all parts; upper leaves up to 10.0 × 1.6 mm, increasingly linear. Inflorescence with flowers solitary or corymbose, corymbs 2–6-flowered; peduncle up to 70 mm long, 0.4–0.6 mm diam. at base, spreading to ascending, glabrous. Pedicels 1.5–14.0 mm long, 0.2–0.4 mm diam., glabrous. Sepals 1.1–1.6 × 0.5–0.8 mm, elliptic-oblong to narrowly elliptic-oblong, saccate, green or red-brown, glabrous or sparsely hairy distally, margin white and membranous, apex obtuse, base truncate. Petals 3.5–4.7 × 1.7–2.5 mm, white, limb obovate; apex obtuse; base cuneate, tapering to claw up to c. 1.5 mm long. Stamens 6; median filaments 4, 1.0–2.0 mm long; lateral filaments 2, 0.8–1.7 mm long; anthers 0.4–0.5 mm long, cream to pale yellow, when dehiscent held at a similar height to or slightly below the stigma. Ovary 1.1–1.7 mm long, 0.15–0.25 mm diam., ± terete, green, glabrous; ovules 8–11; style 0.2–0.3 mm long, ± terete; stigma 0.15–0.25 mm diam. Siliques 8.0–13.5 × 0.9–1.2 mm, glabrous, style sessile or up to 1.0 mm long; valves green to green-brown at maturity; straw-coloured when dehiscent, replum 0.4–0.45 mm wide. Seeds 0.9–1.1 mm long, 0.6–0.8 mm wide, 0.25–0.45 mm thick, yellow-brown to henna; wing absent.





**Fig. 340:** *Cardamine unicaulis* distribution map based on databased records at AK, CHR, OTA & WELT.

**Distribution:** North Island: Volcanic Plateau, Southern North Island.

South Island: Otago, Southland.

Stewart Island.

*Cardamine unicaulis* is known from scattered localities throughout the lower North Island, South Island and Stewart Island.

**Biostatus:** Indigenous (Endemic).

*Cardamine unicaulis* is assessed as having a conservation status of Data Deficient (de Lange *et al.* 2018). Little is known about the number and size of the populations and what the threats are.

**Habitat:** *Cardamine unicaulis* occurs in low-elevation sites, with the majority of collections being from coastal areas, but it does occur inland. It grows in a variety of habitats, including lake and pond margins, river banks, the base of rock outcrops, among coastal turf, sand and rocks, and on limestone rocks. It seems to prefer partially shaded sites such as occur with an open forest canopy or among rock outcrops, and also moist areas such as muddy or damp ground.

**Phenology:** Flowering September–March; Fruiting November–April.

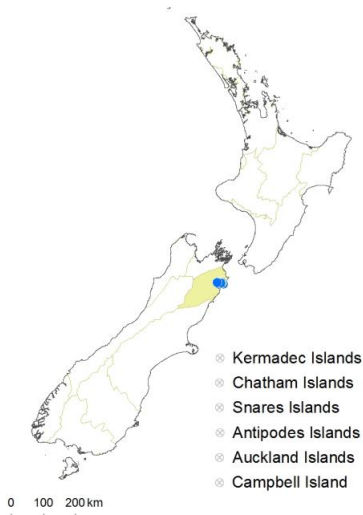
**Notes:** Specimens from the Southland coast, Foveaux Strait, and Stewart Island have broader siliques and cauline leaves than the other collections.

### ***Cardamine verna* Heenan, *Phytotaxa* 330: 146–147 (2017)**

Holotype: Isolation Creek, Waimā River, Marlborough Land District, 320 m, on gravels in river bed, 2 September 2009, *P. B. Heenan s.n.*, CHR 617208!

**Etymology:** The specific epithet *verna* (Latin: spring) refers to the early flowering of this species, beginning in August and September.

Perennial herb, single rosette or with short lateral branches, stem and branches 0.9–2.0 mm diam. Leaves up to 120 mm long, pinnatisect; lamina 30.0–75.0 × 8.0–46.0 mm, green to brown-green, usually semi-coriaceous, glabrous. Terminal pinna 6.0–25.0 × 5.5–22.0 mm, usually simple, orbicular-rhomboid, rhomboid, broadly elliptic-rhomboid to broadly elliptic, often irregularly shaped, apex obtuse with a conspicuous hydathode; margin entire, irregularly and shallowly lobed, with 2 distinct hydathodes; base obtuse to sometimes ± truncate. Lateral pinnae 2–8, 4.0–13.0 × 4.0–9.0, orbicular-rhomboid, rhomboid, broadly elliptic-rhomboid to broadly elliptic, petiolule 2.0–15.0 mm long; petiole up to 60 mm long, glabrous or sparsely hairy toward base. Cauline leaves similar to rosette leaves, but with fewer and narrower leaflets, becoming smaller in all parts; upper leaves 5.0–10.0 × 2.0–3.5 mm, increasingly linear, simple. Inflorescence racemose, usually with lateral racemes, each raceme 4–12-flowered; peduncle 100–350 mm long, 1.2–2.1 mm diam. at base, spreading to ascending, glabrous. Pedicels 4.0–22.0 mm long, 0.3–0.6 mm diam., glabrous. Sepals 2.4–2.6 × 1.2–1.4 mm, elliptic-oblong to broadly elliptic, saccate, green or red-brown, glabrous, margin white and membranous, apex obtuse, base truncate. Petals 5.0–11.5 × 2.5–5.5 mm, white, limb obovate to broadly elliptic-obovate; apex obtuse; base cuneate to obtuse, tapering to a 1.0–2.0 mm long claw. Stamens 6; median filaments 4, 2.5–4.2 mm long; lateral filaments 2, 2.4–3.5 mm long; anthers 0.7–0.8 mm long, cream to pale yellow, when dehiscent held slightly at a similar height to or slightly below the stigma. Ovary 4.2–4.5 mm long, 0.5–0.7 mm diam., ± terete, green, glabrous; ovules 19–22; style 0.5–1.3 mm long, ± terete; stigma 0.7–0.8 mm diam. Siliques 17.0–40.0 × 1.2–1.5 mm, glabrous, style 0.2–1.4 mm long; valves green at maturity, straw-coloured when dehiscent; replum 0.5–0.8 mm wide. Seeds 1.2–2.1 mm long, 0.8–1.1 mm wide, 0.3–0.4 mm thick, orbicular-oblong to broadly oblong, yellow-brown to henna; wing present at apex and base, especially well developed at apex, 0.1–0.2 mm wide.



**Fig. 341:** *Cardamine verna* distribution map based on databased records at AK, CHR, OTA & WELT.

November–April.

**Notes:** There are two flower size morphs in *C. verna*. The larger flower is up to 13 mm diameter and has petals 7.5–11.0 mm long, median filaments 3.2–4.2 mm long, stigma 0.8–1.0 mm diam., and the stigma protrudes above the dehiscent anthers. The smaller flower has 9–10 mm diameter flowers, petals 5.0–7.0 mm long, median filaments up to 2.7–2.9 mm long, stigma 0.6–0.7 mm diam., and the stigma is placed below the dehiscent anthers. The larger flower and exerted stigma indicate the large-flowered morph may be adapted to outcrossing, whereas the small-flowered morph with the stigma held below the anthers indicates it may be suited to self-pollinating.



**Fig. 342:** *Cardamine verna*. Plant with rosette leaves and inflorescences.



**Fig. 343:** *Cardamine verna*. Rosette leaves.

**Distribution:** South Island: Marlborough.

*Cardamine verna* is known from limestone in the vicinity of Ben More and Isolated Hill, in a restricted geographical area between the northern end of the Chalk Range and the lower parts of the Waimā River.

**Biostatus:** Indigenous (Endemic).

*Cardamine verna* is assessed as having a conservation status of Threatened, Nationally Vulnerable B(1), with the qualifier Data Poor (de Lange *et al.* 2018). The qualifier Data Poor is applied because additional information is required on the number and size of the populations.

**Habitat:** *Cardamine verna* mainly occurs in river and stream beds among rocks and stones, and on alluvium and rock outcrops.

**Recognition:** *Cardamine verna* is distinguished from *C. alalata* by its larger growth habit, matt leaves, terminal leaflet irregularly lobed, lateral leaflets with a longer petiolule, longer inflorescence, larger petals, and larger seeds.

**Phenology:** Flowering August–December; Fruiting



**Fig. 344:** *Cardamine verna*. Inflorescence with cauline leaves and flowers.



**Fig. 345:** *Cardamine verna*. Top view of flowers.



**Fig. 346:** *Cardamine verna*. Flowers from different plants with a short (left) and long (right) gynoeceium at anthesis.



**Fig. 347:** *Cardamine verna*. Seeds.

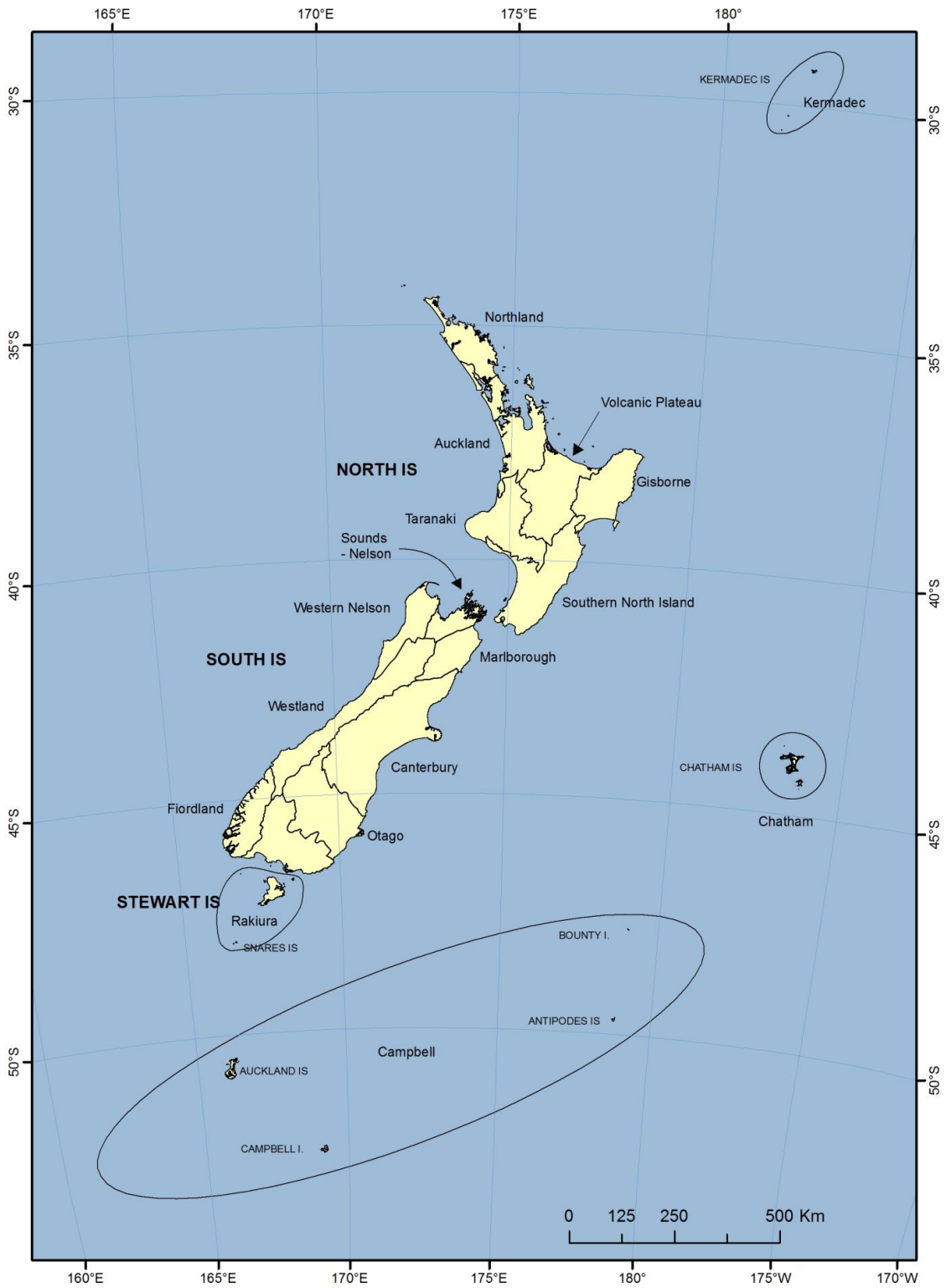
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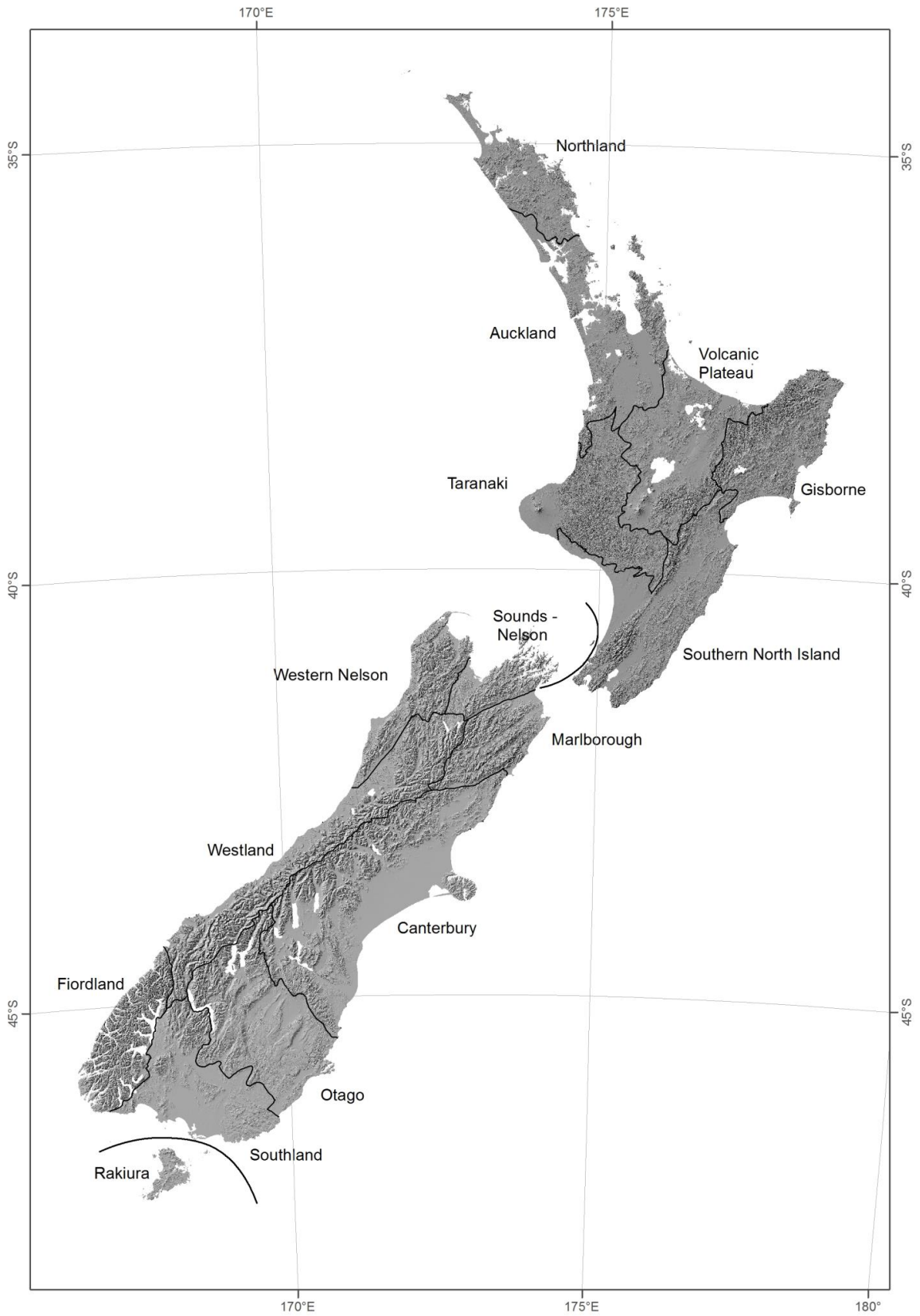
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**Map 1:** Map of New Zealand and offshore islands showing Ecological Provinces



**Map 2:** Map of New Zealand showing Ecological Provinces



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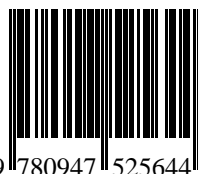
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