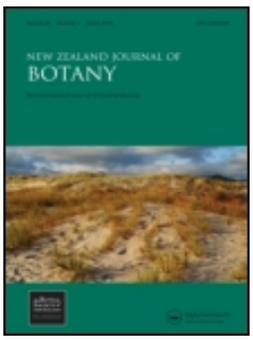

New Zealand Journal of Botany

ISSN: 0028-825X (Print) 1175-8643 (Online) Journal homepage: http://www.tandfonline.com/loi/tnzb20

Illustrated and annotated key to the erechtitoid Senecios in New Zealand (Senecioneae-Compositae) with a description of Senecio diaschides

D. G. Drury

Illustrated and annotated key to the erechtitoid Senecios in New Zealand (Senecioneae-Compositae) with a description of *Senecio diaschides*

D. G. DRURY

Botany Division, DSIR, Private Bag, Christchurch, New Zealand

(Received 13 February 1974)

ABSTRACT

A key based primarily on vegetative characteristics is given together with a summary of the distribution, and habitats for the 12 erechtitoid Senecios found in New Zealand. These are *Senecio quadridentatus* Labill., *S. dunedinensis* Belcher, *S. wairauensis* Belcher, *S. apargiaefolius* Walp., *S. kermadecensis* Belcher, *S. biserratus* Belcher, *S. minimus* Poiret, *S. bipinnatisectus* Belcher, *S. glomeratus* Desf. *ex* Poiret, *S. hispidulus* A. Rich., *S. scaberulus* (Hook.f.) Drury comb. nov., and *S. diaschides* Drury sp. nov. Except for the little known *Senecio apargiaefolius*, a plant portrait of each species is provided.

INTRODUCTION

It is usually possible for those familiar with erechtitoid Senecios to recognise and name a growing plant or dried specimen on sight; on the other hand to commit the diagnostic features of each species to paper is a more challenging exercise. Phytography is made difficult in the auriculate species with divided foliage by the enormous diversity in leaf outline in any one plant as well as between plants. The problem is alleviated for the most part by delimiting three leaf categories within which leaves tend to conform in size and overall shape.

1. *Basal stem leaves* are stalked and without a pair of ear-like stem-clasping foliar expansions at the base of the leaf (auricles). In the smaller-growing species these are either withered or lacking at flowering.

2. *Mid stem leaves* are short stalked or attenuate at the base with auricles.

3. *Upper stem leaves*, from which the inflorescence branches may arise, are sessile and auriculate.

In the key which follows, all leaf characteristics (hairiness, dimensions, margins, auricles, etc.) are taken from the mid stem leaves unless otherwise stated.

Fortunately in two of the three non-auriculate species the basal leaves, which contrast with the others in shape and width, are usually shrivelled or missing at anthesis. Furthermore the stem leaves, although gradually decreasing in size are uniform for the criteria used in the key in all three species. In non-auriculate plants then, the key characters are obtained easily from a leaf about the mid-point of the aerial stem.

In citing specimens the following abbreviations for herbaria are used:

AK —Auckland Institute and Museum, Auckland, New Zealand
AKU —Department of Botany, University of Auckland, Auckland, New Zealand
CANTY—Canterbury Museum, Christchurch, New Zealand
CANU —Department of Botany, University of Canterbury, Christchurch, New Zealand
CHR —Botany Division, DSIR, Christchurch, New Zealand
K —Royal Botanic Gardens, Kew, England
OTA —Department of Botany, University of Otago, Dunedin, New Zealand
W —Naturhistorisches Museum, Wien, Austria
WELT —National Museum, Wellington, New Zealand
WELTU—Department of Botany, Victoria University of Wellington, Wellington, New Zealand
US —National Museum, Smithsonian Institution, Washington, U.S.A.

Key to the Erechtitoid Senecios

Fresh or dried plant material may be used to attempt determinations. Leaves on lateral branches ought not to be used, as these sometimes differ in shape from leaves on the primary stem. Decisions at each couplet should be made after considering as many of the attributes mentioned as possible.

1 (16). *Mid stem leaves >4× as long as wide (width is determined by adding together the measures of the broadest part of the two leaf halves).*

2 (13). *Leaves entire or with shallow teeth up to 3 mm.*

3 (8). *Auricles absent from the leaf base; margins of upper stem leaves often markedly rolled back towards the lower surface (revolute); leaves sometimes conspicuously pilose or white cottony beneath; involucral bracts 11–13(–14); achenes (2–)2.5–3.5 mm, short necked below pappus.*

4 (7). *Leaves green and hairless, OR grey-green cottony, OR white felted above and below; rough hairs absent.*

5 (6). *Basal leaves >1.5 cm wide; upper surface glabrous or balding; involucral bracts 4–5.5 mm long; florets predominantly 4- and 5-toothed; hermaphrodite florets (13–)15–27(–31) surrounded by (8–) 14–18(–21) females, florets sex ratio ± 1:1.*

Senecio dunedinensis Belcher (Fig. 1)

TAXONOMY: In its floral numerics, pseudopetiolate lower leaves, inflorescence, and achene length *Senecio quadridentatus* var. *lanceola* Kirk agrees with *S. dunedinensis*, whereas in stem height and branching, leaf hairiness, achene pilosity and ribbing *S. quadridentatus* features are evident. All material of variety *lanceola* (WELT 32734, Lynton Downs, Kaikoura; WELT 32735, near Lincoln; CHR 10456, Ashburton) was gathered before 1925. The hypothesis that the variety is a hybrid between *Senecio dunedinensis* and *S. quadridentatus* has not been tested (it is intermediate between the two in width and tip of basal leaves and involucral bract length), but in the meantime it seems better placed under *Senecio dunedinensis.*

HABITATS: An upland species with a recorded altitudinal range of 1 100–2 800 ft (335–853 m), appearing in bare places in short-tussock and snow tussock grassland, on rock outcrops, and stony lake margins. Plants have also been gathered from manuka and bracken scrub, and along roadsides. It is infrequently seen in damp shady sites.

DISTRIBUTION: There are no specimens to support Kirk's record for Stewart Island (WELT 31626=*Senecio biserratus*), and Petrie's record from Kariori, near the base of Mt Ruapehu in the North Island (WELT 31622, WELT 31620=*Senecio glomeratus*).

South Island

Canterbury (Lake Lyndon, CHR 173441; Upper Godley River, OTA 004351; Liebig Range, CHR 176096; Lake Waitaki, CANU 4480). **Otago** (near Arrowtown, CHR 72506; Lake Hawea, OTA 003995). **Southland** (near Manapouri, CHR 133304).

6 (5). *Basal leaves <1.5 cm wide, upper surface grey-green or white cottony, or white felted; involucral bracts 6.5–8.5 mm long; florets predominantly 3- and 4-toothed; hermaphrodite florets (7–)9–11(–15) surrounded by (17–) 21–27(–32) females, floret sex ratio ± 1:2.*

Senecio quadridentatus Labill. (Fig. 2)

TAXONOMY: Allan (1961) partitions the species in New Zealand into varieties *quadridentata, lanceola* Kirk (above), and *traversii* Allan. The last is based on a very cottony erechtitoid *Senecio* (WELT 32736) from the Chatham Islands, with red involucres and conspicuous denticulate leaf auricles reminiscent of *Senecio glomeratus.* A comparison of the diagnosis given by Allan with his description of *Senecio glomeratus,* shows that the only major difference is in the width of the mid stem leaves. Furthermore, when WELT 32736 was included in a computer analysis of the *Senecio glomeratus–hispidulus* complex in New Zealand (Drury & Randal 1969, item 22) it was identified with *Senecio glomeratus* in floral details. For these reasons *Senecio quadridentatus* var. *traversii* ought to be included in the synonymy of *S. glomeratus* (p. 525).

HABITATS: *Senecio quadridentatus* is one of the first opportunist plants to appear on newly bared dry substrates on open sites, but disappears year by year as the ground cover increases. It ranges from sea level to 2 000 ft (610 m) colonising bare soil of road cuttings and roadside banks, the shingly and stony places in river beds, about shingle pits and the railways, and also appears in the crevices on rocky faces. Although the species sometimes occurs as a component of manuka, kanuka, and *Discaria* scrub, it is uncommon in grassland communities.

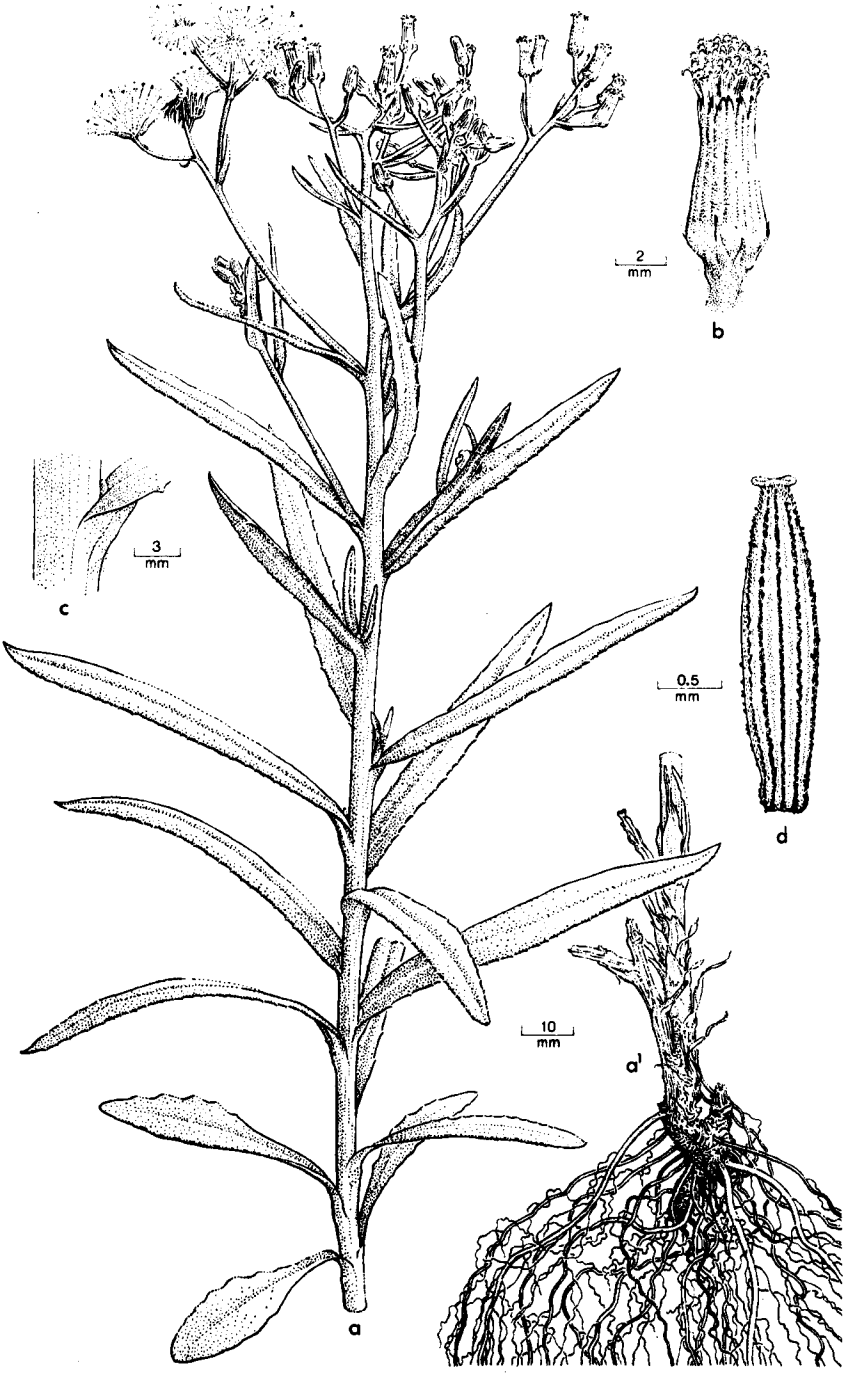

FIG. 1—*Senecio dunedinensis*. a, upper and mid stem; a¹, basal stem; b, capitulum; c, leaf base from mid stem; d, achene.

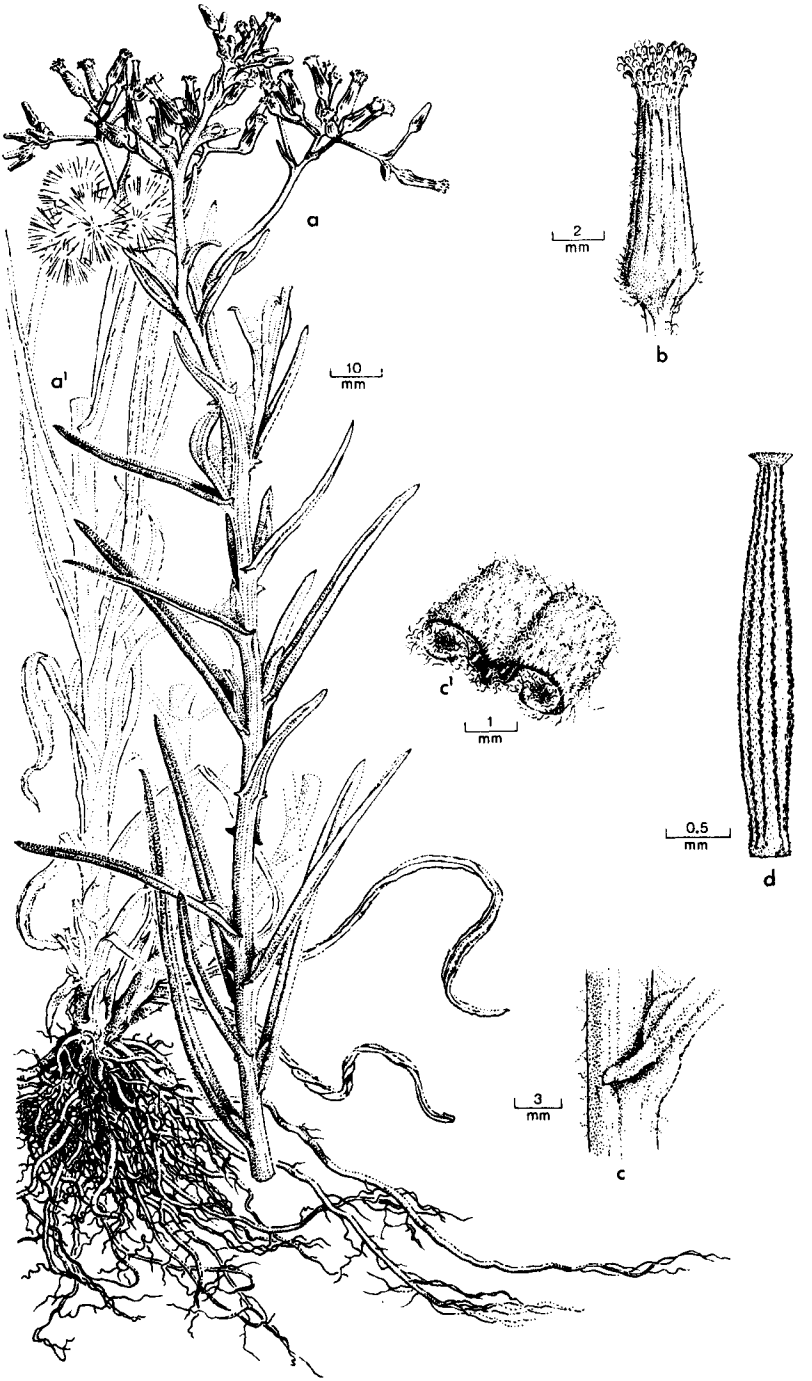

FIG. 2—*Senecio quadridentatus*, a, upper and mid stem; a¹, basal stem; b, capitulum; c, leaf base from mid stem; c¹, transverse section of mid stem leaf; d, achene.

White (1970) reports collecting achenes of *Senecio quadridentatus* in aerial samples taken using a light aircraft in the vicinity of Keith in the south-east of South Australia. Out of six samples taken during 4 days in November 1964 between one and two achenes were caught at altitudes ranging between 350 and 500 ft (105 and 150 m) during flights up to 36 minutes duration. Air speeds between 60 and 65 knots were maintained at fixed, predetermined altitudes.

DISTRIBUTION:

North Island

North Auckland (Mt Eden, WELT 32756; Wairua Falls, CANTY 1617/5). **South Auckland** (Horahora, WELT 32750). **Hawkes Bay** (Manawatu Gorge, CHR 18300). **Wellington** (Palmerston North, CHR 854; Thorndon, Wellington, CHR 10168).

South Island

Marlborough (French Pass, WELT 9590; Seddon, CHR 35516). **Nelson** (Boulder Bank, CHR 140787). **Canterbury** (Lyttelton Hills, CANU 4491; Ashburton, CHR 10461). **Otago** (Hope Hill, CANU 4492; Hector Mts, WELT 32757).

7 (4). *Leaves green and rough with hair bases above, pilose and cobwebby beneath; white cottony hairs absent.*

Senecio apargiaefolius Walp.

HABITAT AND DISTRIBUTION: The record is based on a single gathering of two plants (CANTY 1616/–) made by H. Carse in November 1915 near Flax Bridge between Kaiaka and Kaitaia, Mangonui County, North Auckland. He identified this probable adventive as a semi-glabrous form of *Erechtites scaberula* Hook.f.

8 (3). *Auricles present, sometimes small; margins of upper stem leaves usually plane; leaves apparently hairless beneath at maturity; involucral bracts 8–11(–12); achenes 1.7–2.4 (–2.6) mm, cigar-shaped.*

9 (10). *Leaves regularly toothed, teeth <3 mm apart; auricles conspicuous, semicircular, and much toothed.*

Senecio minimus Poiret (Fig. 3)

TAXONOMY: It is not clear why Colenso (1895) included his *Senecio heterophylla* in that genus when he was aware that the florets are ". . . very slender, capillary . . . tips 3-fid", and that the herb "differs considerably from all our endemic species of this genus". Apart from its height (5–6 ft, 0.9–1.8 m) Colenso's plant is indistinguishable from *Erechtites prenanthoides* (=*Senecio minimus*) in the Flora of his day (Hooker 1864).

In his diagnosis Allan (1961) distinguishes var. *angustata* from *heterophylla* by its shorter (8–12 cm) and narrower (0.5 cm) leaves and smaller (*c.* 1 mm) achenes. However, a re-examination of Allan's type (CHR 67287) reveals that he took his leaf width from the developing foliage on the axillary shoots, and not from those on the main stem which are 1 cm wide as in his description of var. *heterophylla*. The range of leaf lengths in var. *angustata* are spanned by those of *heterophylla*. Moreover, the achenes of CHR 67287 are 2 mm long, the same length as given by Belcher for the typical variety of *Senecio minimus*. Allan's wording mentions phyllary lengths of 5–9 mm for var. *heterophylla* and *c.* 6 mm for var. *angustata*. Nevertheless, phyllaries are no more than 6.7 mm long on New Zealand plants and the phyllaries in the type of *Senecio heterophylla* are 6 mm. Godley (1969) rightly refers all erechtitoid Senecios from the Auckland Islands to *Senecio biserratus* which would take in a portion of what Allan intended by var. *angustata* being distributed, as he says, "on Auckland Is". Belcher's treatment of *Senecio minimus* in New Zealand is preferred.

FIG. 3—*Senecio minimus*. a, upper stem; a¹, mid stem; a², basal stem; b, capitulum; c, leaf base from mid stem; d, achene.

HABITATS: A native, ranging from sea level to 762 m (2 500 ft) in the South Island and to 914 m (3 000 ft) in the North Island, characteristic of bush margins and clearings throughout, and a weed of coastal scrub, dune, rock, and cliff communities particularly in the south and west of the South Island and Stewart Island. On occasions plants have been gathered from swamps and bogs. Where the rainfall is more than 30 inches per annum, *S. minimus* colonises cleared and burnt-over sites, roadsides, railway environs, and waste and disturbed land generally. In dry Marlborough, Canterbury, and Otago, the species is found in places about running water particularly where there is shade. It is infrequently seen in tussock and pasture land, and in urban areas.

Petrie (1884–85) has tendered evidence of wind dispersal which may explain why *Senecio minimus* is recorded for Kawau Island (Buchanan 1877) when Kirk (loc. cit.) says "Not found on adjacent mainland or outlying islands." It is plentiful on Kawau Island now (A. E. Esler pers. comm.) and other islands in the Hauraki Gulf. The increase of *Senecio minimus* is further supported by Cheeseman (1882–83) who saw a few plants in the Kaueranga Valley, Thames, although previously not known by him north of Cambridge in the Waikato and Tauranga on the East Coast.

DISTRIBUTION:

North Island

North Auckland (Parerau, AK 10478; Pokenoe, WELT 31466). **South Auckland** (Karaka Creek, Thames, AK 10480; Huka Falls, WELT 31460). **Taranaki** (Stratford, AK 10485; Pouakai Range, CHR 86464). **Gisborne** (between Toatoa and Motu, CANU *J. M. Ward 67877*). **Hawkes Bay** (Woodville, WELT 24170A; Dannevirke, WELT 24169A). **Wellington** (Feilding, AK 32100; Wellington, WELT 31457).

South Island

Marlborough (D'Urville Id, WELT 9611; Hundalee, CANU 4481). **Nelson** (Nelson, AK 10487; near Westport, AK 10488). **Westland** (Waiho, CANU 4479; Okuru, CHR 152828). **Canterbury** (Christchurch, CHR 166422; Motunau Id, CHR 145634). **Otago** (Waitaki River, *J. M. Ward 64011*; Milton, CHR 184141). **Southland** (Caswell Sound, WELT 9609; Invercargill, CHR 184137).

Outlying Islands

Stewart Island (Stewart Island, CANU 4489; Long Id, CANU 7937).

10 (9). *Leaves irregularly toothed, teeth >3 mm apart; auricles sometimes small, 1-4-dentate.*

11 (10). *Principal teeth of leaf margins <5 mm apart if serrate or biserrate; margins usually pinnati-lobed or -fid at the widest point with segments toothed mostly on the proximal edge; auricles 2–3 (–4) toothed; uppermost leaves serrate with plane margins; stems hairy at base; female florets (3–) 8–10 (–13).*

Senecio biserratus Belcher (Fig. 4)

HABITATS: Essentially a weed of open coastal places, dunes, at the head of shingle beaches, and coastal scrub. In Otago and Southland plants may be found on the margins of podocarp forest by the sea. The only inland records come from Manawatu, Kairanga, and Woodville counties, Wellington where *Senecio biserratus* has appeared on roadsides, disused railway environs, and in Tiritea Reserve.

DISTRIBUTION:

North Island

North Auckland (Woodhill, CANTY 1619/4). **South Auckland** (Waihi Beach and Papamoa, CHR 159150). **Wellington** (Tiritea Reserve, A. E. Esler Herb.; Himatangi Beach, A. E. Esler Herb.).

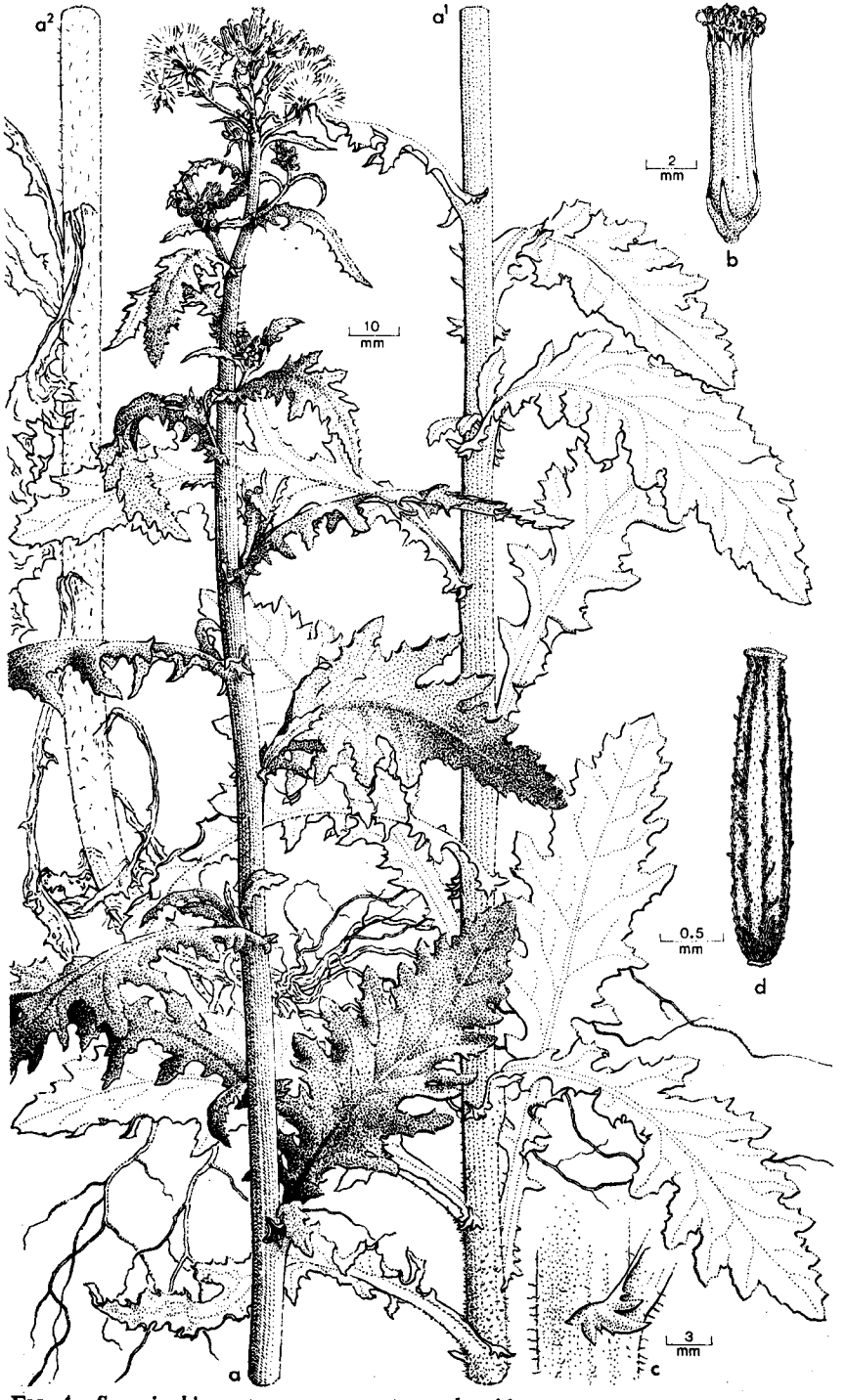

FIG. 4—*Senecio biserratus*. a, upper stem; a¹, mid stem; a², basal stem; b, capitulum; c, leaf base from mid stem; d, achene.

South Island

Otago (Otago Heads, CANU 4494; Akatore, CHR 90102). **Southland** (Bluff, CANU *J. M. Ward 64021A*; Chalky Inlet, CHR 72522).

Outlying Islands

Stewart Island (Stewart Island, WELT 31626; Codfish Island, CANU 7934). **Auckland Islands** (Enderby Island, AK 10490; Deep Bay, CHR 49679).

12 (11). *Principal teeth of leaf margin >5 mm apart if serrate; margins usually denticulate, dentate, or pinnatifid at the widest point with entire segments or singly toothed on the proximal edge; auricles unequally 2-pronged or with a single prong; uppermost leaves entire or denticulate with revolute margins; stems hairless; female florets 15–16.*

Senecio diaschides Drury, sp. nov. (Fig. 5)

Herba annua vel perennis brevi summa vitae. Caulis primarius ad 1.5 m, plerumque simplex, superne ramosus, erectus, teres, in longitudinem corrugatus, purpurascens, glaber, basin versus ligneus.

Folia alterna, crassiuscula, rigidula, glabra, pinnatinervia sessilia, forma variabilia; folia infima marcescentia vel absentia sub anthesi; longissima folia caulina 5.5–21.5 cm longa, 0.4–5.0 cm lata, linearia vel peranguste elliptica ambitu, apice acuta, inferne longe attenuata pseudopetiolata basi subamplexicaulia auriculis unidentatis vel inaequaliter bifurcatis, supra atroviridia, costa impressa ceteris nervis obsoletis, subtus pallidiora, subinde purpurascentia, costa prominente ceteris nervis inconspicuis; margines vix revoluti, dentati, vel serrati, vel pinnatifidi segmentis 1-dentatis in marginibus proximalibus; folia suprema linearia, integra vel denticulata, exauriculata.

Capitula pauca vel multa, heterogama, discoidea, in corymbos latos in apicibus ramorum disposita. Involucrum cylindraceum, calyculatum *c.* 5.5 mm altum, *c.* 2 mm crassum; bracteolis calyculi 4–6, brevissimis, bracteis involucralibus 8–12, 4.3–5.2 mm longis, viridibus, glabris. Flores 19–21, lutei; flores centrales 4–6 hermaphroditi, corollis tenuiter tubulosis, apice brevissime 4–5-dentatis; flores marginales 15–16, feminei, corollis filiformibus, apice minute 3–4-dentatis. Filamentum fundo antherae balusteriforme; endothecium antherae crassitudinibus radialibus. Achaenia 1.8–2.7 mm longa, fusiformia, brunnea, pubescentia in angustis sulcis inter costas latas; pili 1–2–(3)-seriati, latitudinem costae aequantes vel ea breviores. Pappus capillaris, tenuissimus, niveus.

Holotype: *K. A. Allison 95*. Waipoua River, Waipoua Forest, barren stony river margin with *Erechtites atkinsoniae*. February 1944 (CHR 90103, specimens examined).

Isotypes: CHR 44758–9, specimens examined.

Annual or short-lived perennial herb. *Primary stem* up to 1.5 m, usually simple, branched above, erect, terete, ridged, purplish, hairless, and woody towards the base. Leaves alternate thickish, stiffish, hairless, pinnati-nerved, sessile, and variable in outline; *lower leaves* shrivelled or lacking at flowering; longest stem leaf 5.5–21.5 cm long, 0.4–5.0 cm wide, linear or very narrowly elliptic in outline, apex acute, long attenuate and pseudo-petiolate in the proximal part, at the base somewhat stem-clasping with unequally two-pronged auricles, dark green, midrib impressed with the remaining veins obscure above, below paler, sometimes purplish, midrib prominent with the remaining veins inconspicuous; *margins* hardly revolute, dentate, serrate, or pinnatifid with segments singly toothed on the proximal edge; uppermost leaves entire or denticulate and without auricles. *Capitula* few or many, heterogamous, discoid, arranged in broad corymbs at the ends of branches. *Involucre* cylindrical, calyculate *c.* 5.5 mm long, *c.* 2 mm wide, calycle 4–6, very short; involucral bracts 8–12, 4.3–5.2 mm long, green, hairless. *Florets* 19–21, yellow; central florets 4–6, hermaphrodite with slender tubular

FIG. 5—*Senecio diaschides*. a, upper stem; a^1, mid stem; a^2, basal stem; b, capitulum; c, leaf base from mid stem; d, achene.

corollas shortly 4–5-toothed at the apex; marginal florets 15–16, female with filiform corollas minutely 3–4-toothed at the apex. *Filament* balusteriform at the base of the anther, endothecium with radial thickenings. *Achenes* 1.8–2.7 mm long, cigar-shaped, brown, hairy in narrow grooves between broad ribs; hairs 1–2 (–3) seriate as long as or shorter than the width of the ribs. *Pappus* capillary, very slender, white.

Plants of this kind are not catered for in the monograph of Belcher (1956). The fact that all the specimens originate from North Auckland land district in the North Island, and that the earliest gathering was as recent as 1944 suggests *Senecio diaschides* is adventive in New Zealand.

HABITATS: Mostly found on roadsides, but has also been collected from a burnt-over swamp, and from reclaimed land near the sea. On one occasion it has appeared as a weed of cultivated ground in Auckland City.

DISTRIBUTION:

North Auckland

Hokianga (Waipoua Forest, CHR 90103). **Bay of Islands** (Kerikeri swamp, CHR 69653). **Whangarei** (Parua Bay, CHR 220293; Whangaruru North Head, CHR 227519; Tutukaka, CHR 228745). **Hobson** (Taharoa Lake, CHR 214311). **Auckland** (Mt Eden, AK 100323–4).

EXPERIMENTAL HYBRIDS: ♀ *Senecio diaschides* × ♂ *hispidulus* (CHR 256905) was successful; the f_1 was grown to flowering stage.

13 (2). *Leaves coarsely toothed or divided into lobes or segments, the largest process >3 mm long.*

14 (15). *Principal teeth of leaf margin <5 mm apart if serrate or biserrate; margins usually pinnati-lobed or -fid at the widest point with segments toothed on the proximal edge; auricles 2–3 (–4) -toothed; uppermost leaves serrate with plane margins; stems hairly at base; female florets (3–) 8–10 (–13).*

Senecio biserratus Belcher (Fig. 4)

See lead **11 (10)** for annotations.

15 (14). *Principal teeth of leaf margin >5 mm apart if serrate; margins usually denticulate, dentate, or pinnatifid at the widest point with entire segments or segments singly toothed on the proximal edge; auricles unequally 2-pronged or with a single prong; uppermost leaves entire or denticulate with revolute margins; stems hairless; female florets 15–16.*

Senecio diaschides Drury (Fig. 5)

See lead **12 (11)** for annotations.

16 (1). *Mid stem leaves <4× as long as wide (width is determined by adding together the measures of the broadest part of the two leaf halves).*

17 (20). *Auricles conspicuous, undivided, much toothed with sinuate denticles, principal vascular traces of involucral bracts >15; leaves and stems sometimes cottony-hairy.*

18 (19). *Stems and leaves grey-green and cottony hairy; uppermost leaves usually less than half as long as the lower stem and basal leaves with revolute margins, the body of the uppermost leaves awl-shaped with several long slender basal teeth; capitula on short pedicles borne in compact clusters; involucral bracts 4.2–5.5 mm long, cottony basally, sometimes reddish; achenes 1.2–1.5 mm long, cigar-shaped.*

Senecio glomeratus Desf. *ex* Poiret (Fig. 6)

TAXONOMY: *Erechtites quadridentata* var. *traversii* Allan ought to be incorporated into the synonomy of this species (see p. 515).

HABITATS: The most widespread erechtitoid *Senecio*, ranging altitudinally from sea level to about 914 m (3 000 ft) in the North Island, characteristic of grassy roadside habitats; gorse hedges, ditches, banks, and cuttings. In urban centres it is seen on waste and reclaimed land, grassed-over rubbish tips, and on shingle ballast about railways. Shingle beaches, cliffs, and dunes colonised by lupin provide suitable sites on the coast for *Senecio glomeratus*, but the species is uncommon on river beds. In forested areas plants are usually confined to roadsides and grassy clearings. Scrubland, bogs, and swamps are occasionally colonised.

DISTRIBUTION:

North Island

North Auckland (Maungatapere, CANTY 1615/6; Auckland, WELT 32709). **South Auckland** (Karamu, WELT 31620; Tirau, WELT 32702). **Gisborne** (Waikaremoana, WELT 9600). **Hawkes Bay** (south of Dannevirke, CANU *J. M. Ward 67547*). **Taranaki** (Pouakai Range, CHR 129958; Ngaere, CHR 159653). **Wellington** (Kariori, WELT 31622; Otaki Forks, CHR 85841).

South Island

Marlborough (Rarangi, CHR 72520; Conway Flat, CHR 126138). **Nelson** (Mokihinui, AK 10495; between St Arnaud and Kawatiri, CHR 152008). **Canterbury** (between Spotswood and Phoebe, CHR 126521; Geraldine, CHR 96719). **Otago** (near Hampden, CHR 127364; Mt Cargill, CANU 4498). **Southland** (Riverton, CHR 184133; Puysegur Pt, CHR 148046).

Outlying Islands

Chatham Islands (Chatham Island, CHR 91949; Mangere Island, CHR 187033). **Stewart Island** (Stewart Island, CHR 151357; Codfish Island, CHR 174410).

19 (18). *Stems hairless, green or purplish; leaves pubescent on veins, often purplish beneath; uppermost leaves at least half as long as the lower stem and basal leaves with margins plane, the body of the uppermost leaves oblong with lobed or sinuate margins; capitula on long pedicels (up to 2 cm) borne in loose corymbs at the end of paniculately arranged branches; involucral bracts 5.5–7.0 mm long, green, and hairless; achenes 3–4 mm long, cigar-shaped, long, tapering to the pappus, sometimes curved.*

Senecio wairauensis Belcher (Fig. 7)

TAXONOMY: All the floral details of *Erechtites wairauensis* var. *robusta* described in volume I of the "Flora of New Zealand" fall into the range of variation given there for the typical variety. This includes involucral bract number which Allan (loc. cit. p. 736) considers diagnostic for his variety. A comparison of the diagnosis of var. *robusta* with the corresponding features of var. *wairauensis* shows that they differ in (i) plant height, (ii) leaf outline, (iii) tip and margins of the terminal lobe of lower leaf, and shape of the upper leaves. However, although

FIG. 6—*Senecio glomeratus*. a, upper stem; a¹, mid stem; a², basal stem; b, capitulum; c, leaf base from mid stem; d, achene.

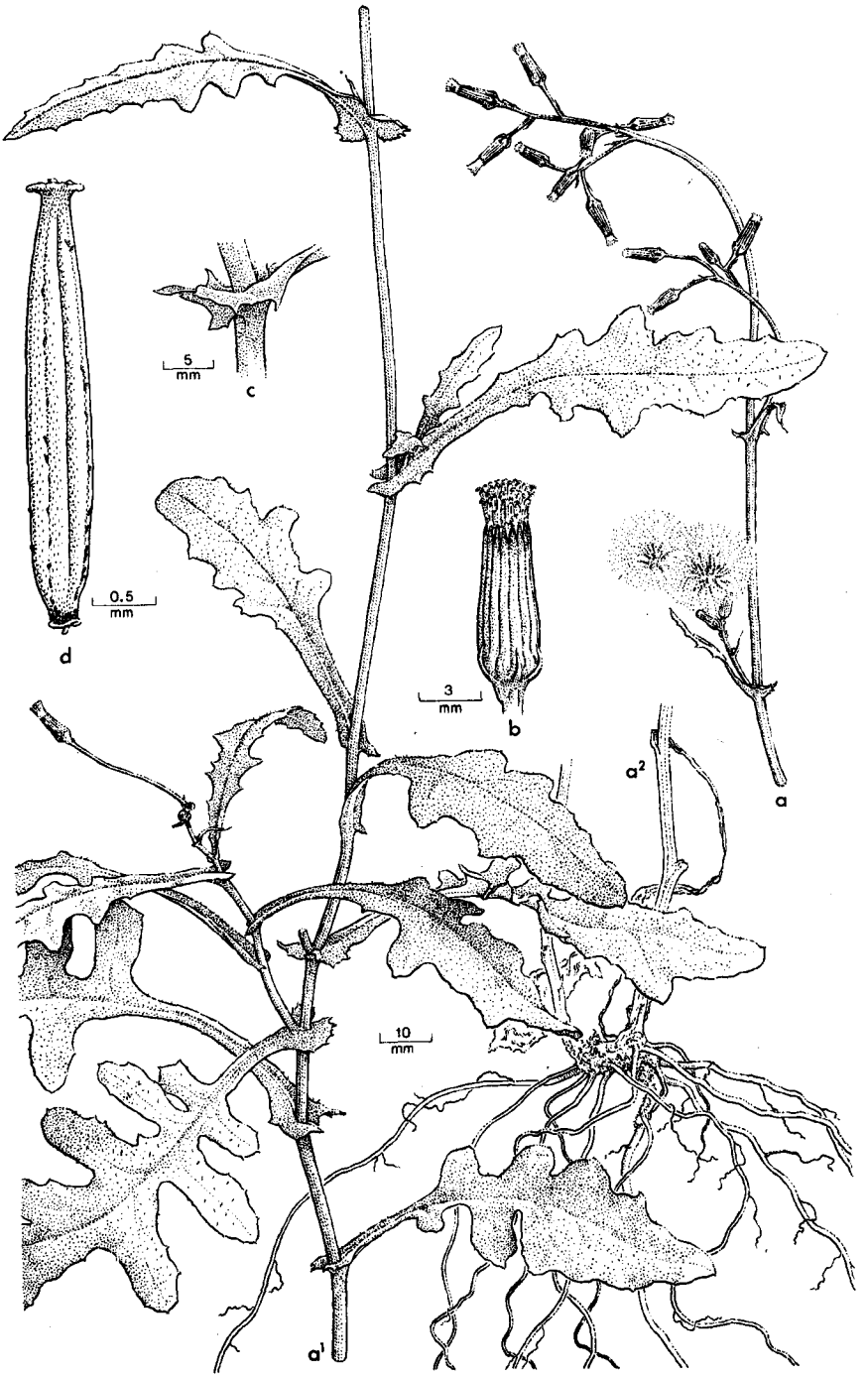

FIG. 7—*Senecio wairauensis*. a, upper stem; a¹, mid stem; a², basal stem; b, capitulum; c, leaf base from mid stem; d, achene.

the outline of the lower leaves of var. *robusta* is given as "ovate" in the diagnosis, Allan describes it as broadly ovate in his description so cancelling this point of contrast. Furthermore, the tip of the terminal lobe of the lower leaves in the type material of *Erechtites glabrescens* Kirk (WELT 32753≡*Senecio wairauensis*) is subacute rather than obtuse and therefore comes into the forms recorded for var. *robusta*. The difference between "*grosse dentato-apiculato*" and "shallowly lobulate . . . apiculate" is very slight indeed. For practical purposes then, flowering plants over 50 cm high with linear inflorescence leaves ought to be determined as var. *robusta*. Of the two syntypes on Kirk's herbarium sheet of *Erechtites glabrescens*, the flowering specimen is over 60 cm long, but unfortunately it lacks inflorescence leaves. As would be expected in the situation described here, I have found it impossible to distinguish the two entities. Remarking on *Senecio wairauensis* in an unpublished, provisional annotated list of vascular plants of Mt Cook National Park, H. D. Wilson writes "Many of our plants probably key out to var. *robusta*, but the species is variable here, and I have been unable to draw any lines". The synonymy of *Senecio wairauensis* ought to include var. *robusta*.

HABITATS: Typically an upland native favouring damp places mainly between 610 m (2 000 ft) and 1 371 m (4 500 ft); commonly appearing in clearings, along tracks and about the margins of beech (*Nothofagus*) forests in both Islands. Plants have been collected below 610 m at Lake Grasmere and Otira in the South Island and at 1 524 m on Mt Hikurangi in the North Island. *Senecio wairauensis* is sometimes found on stream banks and in seepage areas in woodland, scrub (*Discaria, Dracophyllum*), and snow and fescue tussock grassland, and is occasionally collected from bogs. Open sites such as landslides, screes, talus slopes, moraines, rock outcrops, and lake margins provide suitable habitats in the higher rainfall areas.

DISTRIBUTION:

North Island

South Auckland (Hauhangaroa Range, CHR 70629). **Gisborne** (Mt Hikurangi, CHR 116219). **Hawkes Bay** (Maungaharuru Range, CHR 209697). **Taranaki** (between Egmont and Pouakai Range, CHR 86930). **Wellington** (Ruapehu, WELT 32755; near Potae, Ruahine Mts, CHR 6311).

South Island

Marlborough (Team River,, CANU *J. M. Ward 66538*). **Nelson** (Mt Mueller, CANU 8798; NE of Lake Peel, CHR 75597). **Westland** (Otira River, WELT 32747; Fox Glacier, WELT 32701). **Canterbury** (Mt Oxford, CHR 168225; Mt Cook, AKU 5257). **Otago** (near Nugget Pt, CANU 4493). **Southland** (Henry Saddle, CHR 65495; Takitimu Mts, CANU 4504; Cleddau River, CANU *J. M. Ward 67302*).

Outlying Islands

Stewart Island (Cooper Island, CANU 4497).

20 (17). *Auricles sometimes inconspicuous, divided, 1–3 (–4) toothed or lobed; principal vascular traces of the involucral bract up to 13; leaves and stems never cottony-hairy.*

21 (22). *Leaves pinnatipartite with the longest segments again pinnatipartite into linear segments, or occasionally pinnatifid; auricles deeply divided unequally into 3 toothed straps.*

Senecio bipinnatisectus Belcher (Fig. 8)

REMARKS: Its presence in New Zealand was first reported by Carse (1916) from Mangonui County, North Auckland with the comment "Spreading: a troublesome weed". His specimens (CHR) were taken from Kaiaka and Otukai. Allan (1940) remarks that the species "Has spread rapidly in the "gumlands" of North Auckland, and is extending its area southwards". To date all specimens have come from North Island localities, the most southerly station being Waikanae (CHR 174349). Gourlay (1955) however, records that he reared larvae and

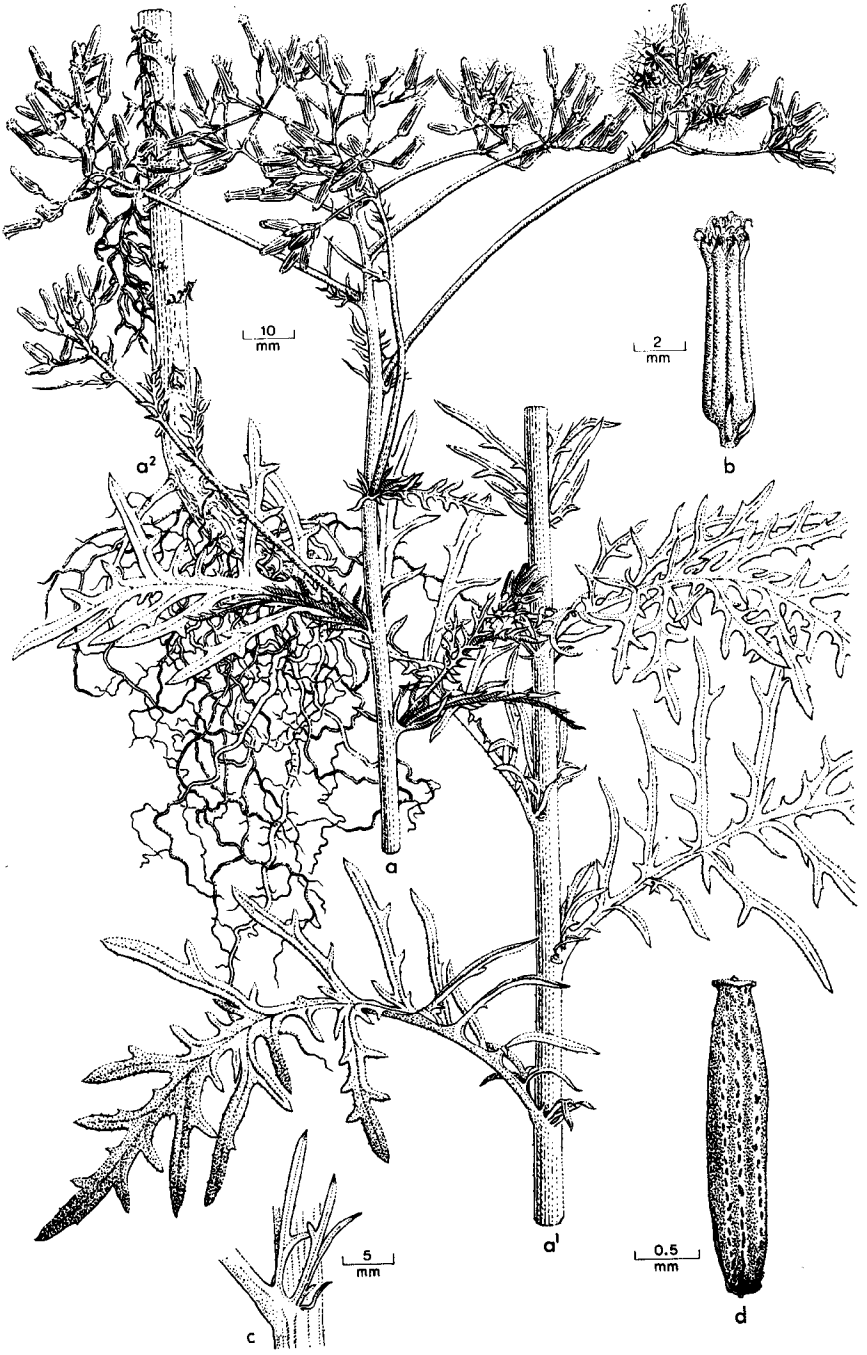

FIG. 8—*Senecio bipinnatisectus*. a, upper stem; a^1, mid stem; a^2, basal stem; b, capitulum; c, leaf base from mid stem; d, achene.

pupae of the gall-forming trypetid fly *Tephritis fascigera* taken from *Erechtites atkinsoniae* on a visit to Bulwer at the entrance of Pelorus Sound, Nelson. No specimen of the host was made and the report remains to be confirmed.

White (1969) has shown that the level of liver-damaging alkaloid in this species is potentially as toxic to farm animals as is ragwort (*Senecio jacobaea*).

HABITATS: A rank weed of disturbed open ground from sea level to 488 m (1 600 ft), frequent on roadsides and wasteland, also occurring in burnt or cut-over areas. On the coast it is collected on consolidated sand dunes associated with lupin. Occasionally the species colonises pasture where, according to Taylor (1964), it is able to persist in some districts.

DISTRIBUTION:

North Island

North Auckland (Otukai, CHR 5695; Manurewa, CHR 58748). **South Auckland** (Puriri, CHR 1245; Rotorua, CHR 152380). **Taranaki** (Tarurutangi, CHR 58747; Manutahi, CHR 91018). **Gisborne** (Tolaga Bay, CHR 127229; Opoutama, CHR 98130). **Hawkes Bay** (Tutira, CHR 143605). **Wellington** (Wanganui, CHR 118128; Castle Point, CHR 172502).

22 (21). *Leaves toothed, pinnatifid or -lobed with segments merely toothed; auricles dentate.*

23 (26). *Leaves smooth, sometimes short hairs seen with a hand-lens; involucral bracts 5–8 (–9); florets (5–) 7–11 (–19) per capitulum.*

24 (25). *Leaves pinnatifid or -lobed at the widest point, or occasionally with biserrate or serrate margins; involucral bracts 5.5–7.0 mm long; florets (10–) 15–17 (–19) per capitulum.*

Senecio biserratus Belcher (Fig. 4)

See lead **11 (10)** for annotations.

25 (24). *Leaves dentate, sinuately dentate, or distantly sinuate denticulate, rarely with deltoid lobes singly toothed on the distal edge; involucral bracts 4.0–5.2 mm long; florets (5–) 7–9 (–13) per capitulum.*

Senecio kermadecensis Belcher (Fig. 9)

TAXONOMY: *Senecio kermadecensis* has been found only once outside the Kermadec Islands. The specimen (AK 32099), which was originally identified as *Erechtites prenanthoides* (syn. *Senecio minimus*), came from the south island of the Poor Knights group. The label annotation describes the plant as "rare". There are some notable differences between AK 32099 and plants from the Kermadecs as the following table shows:

Kermadecs	*Poor Knights*
1. Leaves 3–4 × as long as wide.	1. Leaves 5 × as long as wide.
2. Marginal teeth never distantly denticulate.	2. Marginal teeth distantly denticulate (4–5 mm apart, 1–2 mm deep).
3. Leaves rough-hairy when dried.	3. Leaves smooth and almost hairless.
4. Involucral bracts up to 5.5 mm long.	4. Involucral bracts 6.5 mm long.
5. 5-lobed hermaphrodite florets absent.	5. 5-lobed hermaphrodite florets present.

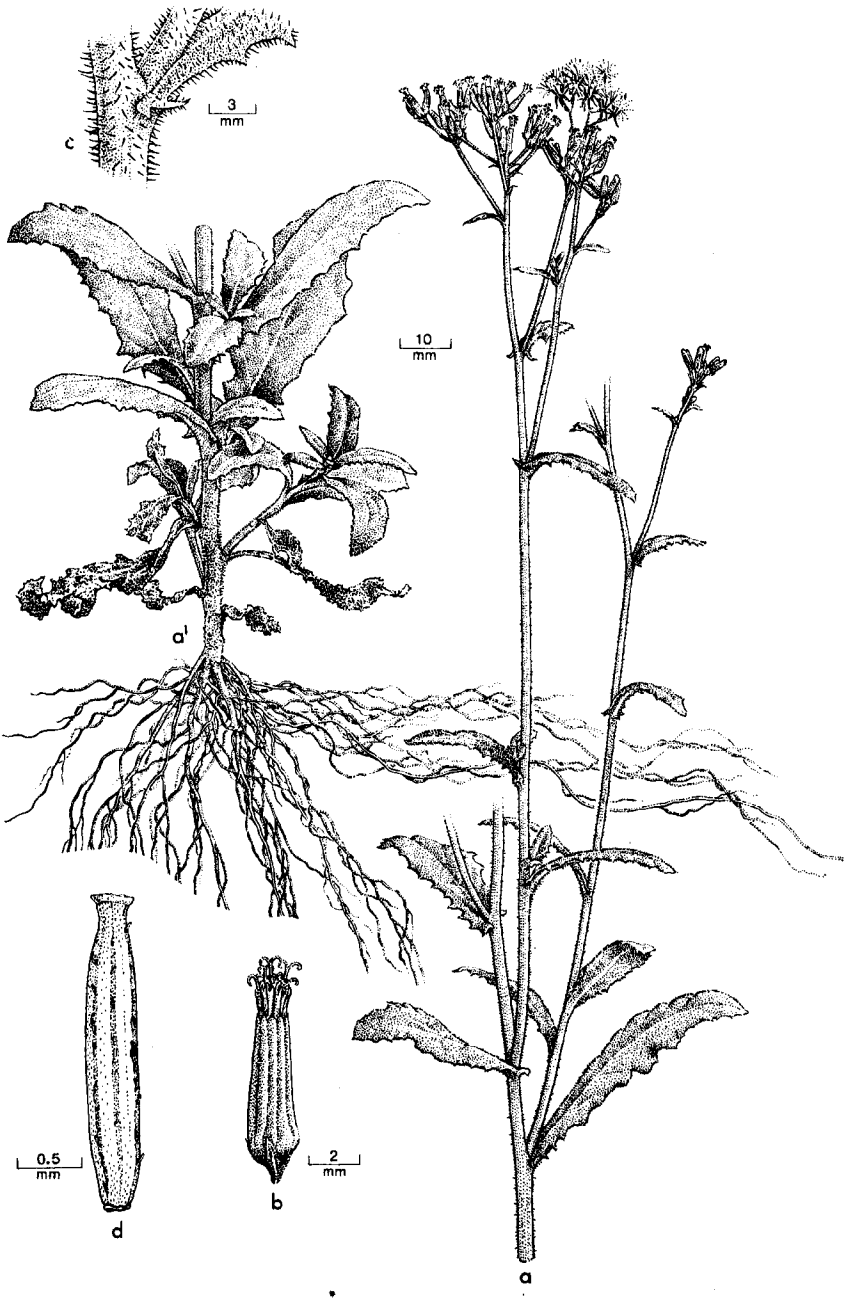

FIG. 9—*Senecio kermadecensis.* a, upper and mid stem; a¹ basal stem; b, capitulum; c, leaf base from mid stem; d, achene.

The distinguishing marks of the Poor Knights plant are characteristics of *Senecio minimus*. However, AK 32099 has only 8 florets per capitulum, and 6 involucral bracts with 8 vascular traces, a difference of 2 and not 5 as is the case with *Senecio minimus*. For these reasons the collection from Poor Knights would be anomalous in *Senecio minimus*.

HABITATS: On Raoul Island plants grow on the coast above the beach and are also common and abundant on roadsides. The species has been gathered in an area of bird burrows near the summit of South Chanter Islet. The Poor Knights specimen was taken from manuka scrub.

DISTRIBUTION:

Outlying Islands

Raoul Island (Kermadec Group) 1944, J. H. Sorensen, CHR 55303. **South Chanter** (Kermadec Group) Jan. 1967, W. R. Sykes, CHR 173133. **North and South Meyer and Dayrell Islands** (Kermadec Group) (W. R. Sykes, pers. comm.).

Offshore Islands

South Poor Knight Island Feb. 1937, L. M. Cranwell, AK 32099.

26 (23). *Leaves rough with hispid or scabrid hairs often evident to the unaided eye; involucral bracts (9–) 11–13; florets (17–) 19–29 (–31) per capitulum.*

27 (28). *Primary stem often branched basally, hairless, or with scattered inconspicuous rough hair bases; mid stem leaves lanceolate, occasionally narrowly elliptic or narrowly ovate in outline; margins often strongly revolute when dry, sinuately pinnatilobed, -fid, or -partite, the longest segments entire or denticulate on the proximal edge and occasionally with a 3-toothed lobe in the distal sinus angle, segments diminishing distally to become sinuately serr(ul)ate or dent(icul)ate in the distal quarter leaf; leaves narrowing towards the inflorescence and becoming sessile and acuminate; involucral bracts 4.7–5.7 (–6) mm long; hermaphrodite florets (4–) 5–12 (–16) surrounded by (8–) 13–19 (–21) females; achenes (1.6–) 1.7–1.8 mm long.*

Senecio hispidulus A. Rich. (Fig. 10)

TAXONOMY: Computer analysis of the floral variation in a sample of 26 specimens showed that *Senecio hispidulus* (excluding *S. scaberulus*) is represented in New Zealand by two components (Drury & Randal 1969). Geographically one grows in the area north of latitude 39°S whereas the other grows to the south. The major differences between the two sorts are given in the following table.

feature	*northern component*	*southern component*
capitula counted	14	48
total florets per capitulum	(17–) 26–31	17–24 (–27)
florets carrying polliniferous stamens	(6–) 9–11 (–12)	(4–) 5–8 (–9)
female florets per capitulum	(11–) 17–19 (–21)	(12–) 13–18
involucral bract number	(9–) 13 (–14)	(8–) 9–13
involucral bract trace number	(12–) 13–15 (–16)	13 (–14)
achenial hairs in grooves	2–4 rows	1–2 rows
mid stem leaf size (cm)	up to 12 (–15) × 3.5 (–6.0)	up to 9 (–14) × 2 (–4.0)
division of leaves	pinnatipartite, rarely pinnatifid	pinnatifid, sinuately serrate or dentate, less commonly pinnatipartite

No one of the features is diagnostic, and there is little value in giving names to the sorts. Largely because of the density of achenial hairs, leaf shape, hermaphrodite floret number, and the somewhat intermediate distribution, it was suggested that the northern component might well be of hybrid origin involving *S. scaberulus* and the southern component (Drury & Randal 1969). In the intervening years it has become apparent that there is a break in the range of *S. hispidulus sensu stricto* between latitude 38° and 40°S separating the two components. From the geographical standpoint the hybridisation hypothesis lacks support.

Petrie sent specimens of *S. hispidulus* collected from Coromandel to the Royal Botanic Gardens, Kew, England with a covering letter dated 19 May 1914 which reads: "I am forwarding a form of *Erechtites* of which I do not know what to make. It does not appear to be conspecific with any known species of that genus indigenous in New Zealand, with all of which I am intimately acquainted. It may perhaps be a casual introduction. It may perhaps be a new species, you had better have it described." The determination given by J. H. at Kew was "*E. scaberula* Hk.f. with slightly different achenes". In his monograph Belcher (1956) infers from Petrie's letter that *S. hispidulus* is adventive in New Zealand to some extent.

There are other evidences which appear to support Belcher's inference about the northern component. When Hooker (1853) described New Zealand material of *S. hispidulus* as "*tota pilis brevibus albidis hispidula, caule simplici*", he had before him specimens of most of the major collections made in the islands. He goes on to reaffirm the character of New Zealand *S. hispidulus* in the "Handbook" (1864) by stating ". . . hispid all over, except the pedicels and involucre" and distinguishes it from Tasmanian plants under a new name *Erechtites scaberula* Hk.f. It would appear then that glabrous stem plants of the *S. hispidulus* type from New Zealand were unknown to Hooker at the time of writing the "Handbook". Furthermore, a manuscript headed *Erechtites* drafted by H. Carse and attached to a specimen (WELT) of *S. hispidulus* collected by him from Lower Glen Eden, Auckland on 10 January 1923 is also of special interest. In it Carse distinguishes three entities: α *Erechtites prenanthoides*, β *E. scaberula* and γ *E.* "from Coromandel and New Lynn–Henderson districts". His description of β *E. scaberula* reads:

> "Stems grooved, rough with short hispid hairs, branched above. Leaves subcoriaceous, coarsely and irregularly toothed or lobed, more or less densely covered with hispid hairs on both surfaces. Corymbs lax. involucral bracts 10–14",

whereas he characterises γ as

> "Very close to β differing chiefly in the almost glabrous stems (a variable character in β) and is branched from the woody base frequently",

together with the comment "I am inclined to think this form γ should be placed under *E. scaberula*".

Cleafly Carse was aware that another plant similar to *E. scaberula* Hook.f. was present in the Coromandel–Auckland districts. His herbarium (CANTY) contains specimens of the northern component of *S. hispidulus* determined as *E. scaberula* which would explain why he considered stem hairiness variable in the latter species and gave the involucral bract number as 10–14. Taken together the writings of Hooker, Petrie, and Carse suggest that between 1864 and 1914 another erechtitoid *Senecio* appeared in Auckland Province from an unknown source.

The situation regarding the southern component is less complex because *S. scaberulus* is not present in the area (see p. 535). Nevertheless, there is little documented evidence on which to decide whether the component is indigenous or adventive. Buchanan (1873) does not record *E. scaberula* for Miramar Peninsula, Wellington, although the species is now very common about Wellington; but he does in his comprehensive catalogue of the Flora of Wellington Province, with the

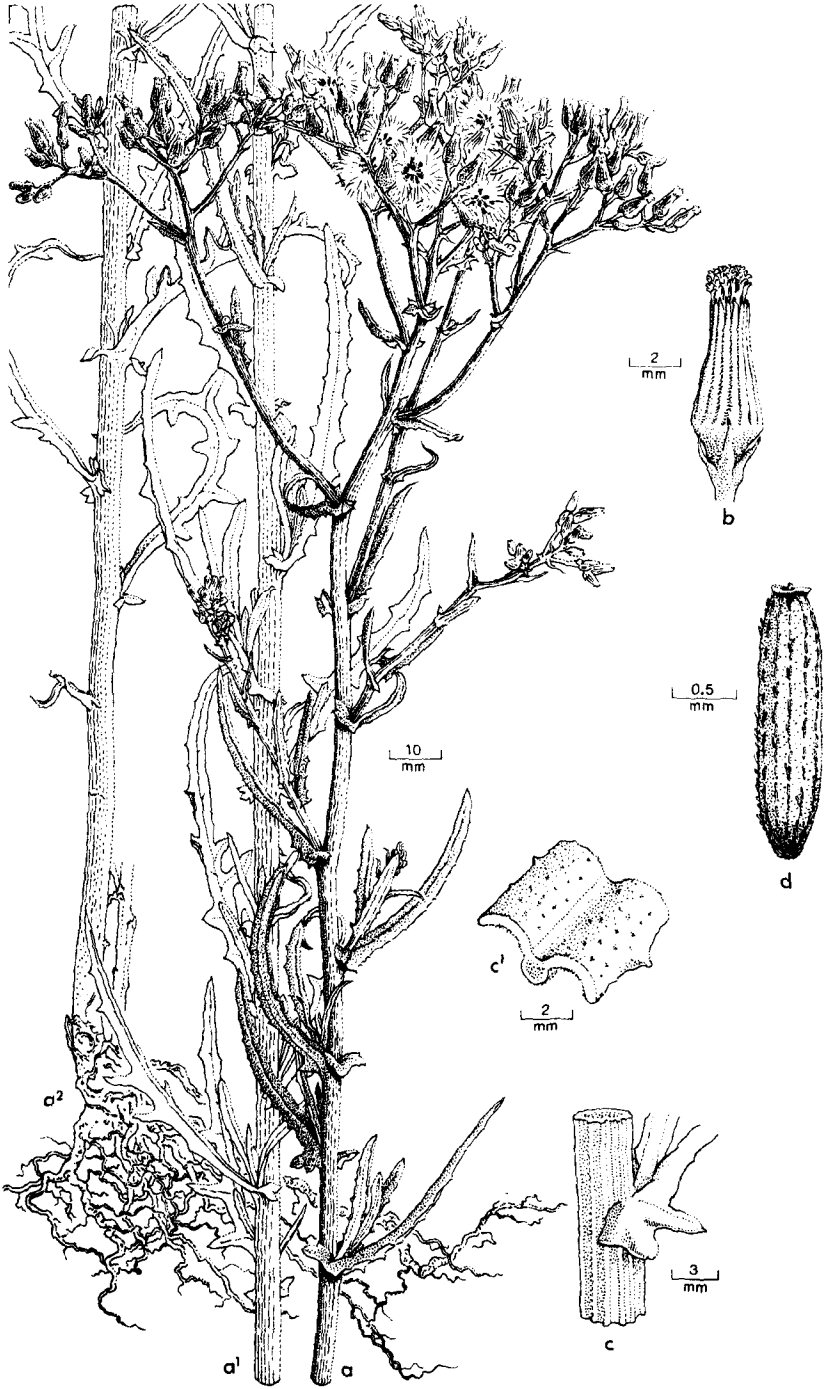

FIG. 10—*Senecio hispidulus*. a, upper stem; a¹, mid stem; a², basal stem; b, capitulum; c, leaf base from mid stem; c¹, transverse section of mid stem leaf; d, achene.

qualification "Upper Rangitikei." Aston who also gives an inventory of the flowering plants of Wellington Province (1911) says "*E. scaberula* Hook.f. ascends to 1 500 ft." I have seen no specimens confirming these records. There is, however. a specimen of Kirk's collected in 1894 from Wellington (WELT 3287) and another (W, acq. 1916, nr 7052) from "Wellington: open places, 1 500 ft" gathered by H. H. Travers in 1909. In the South Island the earliest published record for this kind of plant is that of Cheeseman (1882) who records *S. scaberula* from "Near Nelson". I have been unable to discover Cheeseman's specimen. Although Martin (1932, 1938) does not name any erechtitoid *Senecio* from Marlborough, a specimen of *S. hispidulus* A. Rich. was collected at Kainui, in 1929 (CHR 920).

HABITATS: A pioneer of dry bare or disturbed soil, or surfaces denuded by fire, ascending from sea level to 457 m (1 500 ft). Plants are most commonly seen on wasteland, hedgelines and roadsides, banks and slopes where they may persist when the substrate becomes grassed over. On the coast, bluffs, cliffs, and fixed dune scrubland are frequented. In North Auckland specimens are more commonly collected from scrubland, clearings, and forest margins than in Wellington land district and the South Island. Forest gatherings from the southern end of the range sometimes show the effects of shade by their thin, almost entire or distantly denticulate, softly pubescent leaves.

DISTRIBUTION:

North Island

Wellington (Pahiatua Track, CHR 184017; Wellington, CHR 23182).

South Island

Marlborough (French Pass, WELT *Oliver s.n.*; near Hapuka River, CHR 157503). **Nelson** (Pohara Beach, CHR 73669; Maitai, CHR 3760). **Canterbury** (Hawkswood, CHR 170110).

28 (27). *Primary stem usually simple, densely covered with conspicuous, soft bristly hairs; mid stem leaves plane when dried, narrowly elliptic in outline; margins sinuately pinnati-lobed or -fid, the largest segment 3 (–5)- toothed with the terminal tooth longer than the laterals and ending in a distinctive hydathodal callous point, occasionally with a minor tooth in the sinus; segments diminishing distally to become dentate or sinuately denticulate in the distal quarter leaf; leaves narrowing towards the inflorescence to become sessile and almost oblong, acute. Involucral bracts (5.5) 6–7 mm long; hermaphrodite florets (11–) 16–24 (–25) surrounded by 0–9 females; achenes 2–2.2 (–2.5) mm long.*

Senecio scaberulus (Hook.f.) Drury, comb. nov. (Fig. 11)

≡*Erechtites scaberula* Hook.f.
Hooker 1864, Handb. Fl. New Zeal. 157.
Lectotype: Akaroa (K– Herb. Hook. ex Herb. Mus. Paris, examined)

≡*Senecio hispidulus* var. *scaberulus* (Hook.f.) Belcher
Belcher 1956, *Ann. Missouri Bot. Gard. 43:* 69.

=*Erechtites scaberula* var. *chathamica* Allan.
Allan 1961, Fl. New Zeal. I: 733 and 971.
Lectotype: *H. H. Travers s.n.* Chatham Islands (WELT 33957, examined)
?Isotype: WELT 32699, examined.

TAXONOMY: Var. *chathamica* Allan of *Erechtites scaberula* is known only from two herbarium sheets collected from the Chatham Islands in the 19th century. On their labels the collectors are given as W. Travers (WELT 32699) and H. H. Travers (WELT 33957). However, W. T. L. Travers never visited the island. but his son, H. H. Travers. made collections on the Chathams in 1863 and again in 1871. The materials from his first visit were worked up by Mueller (1864) who

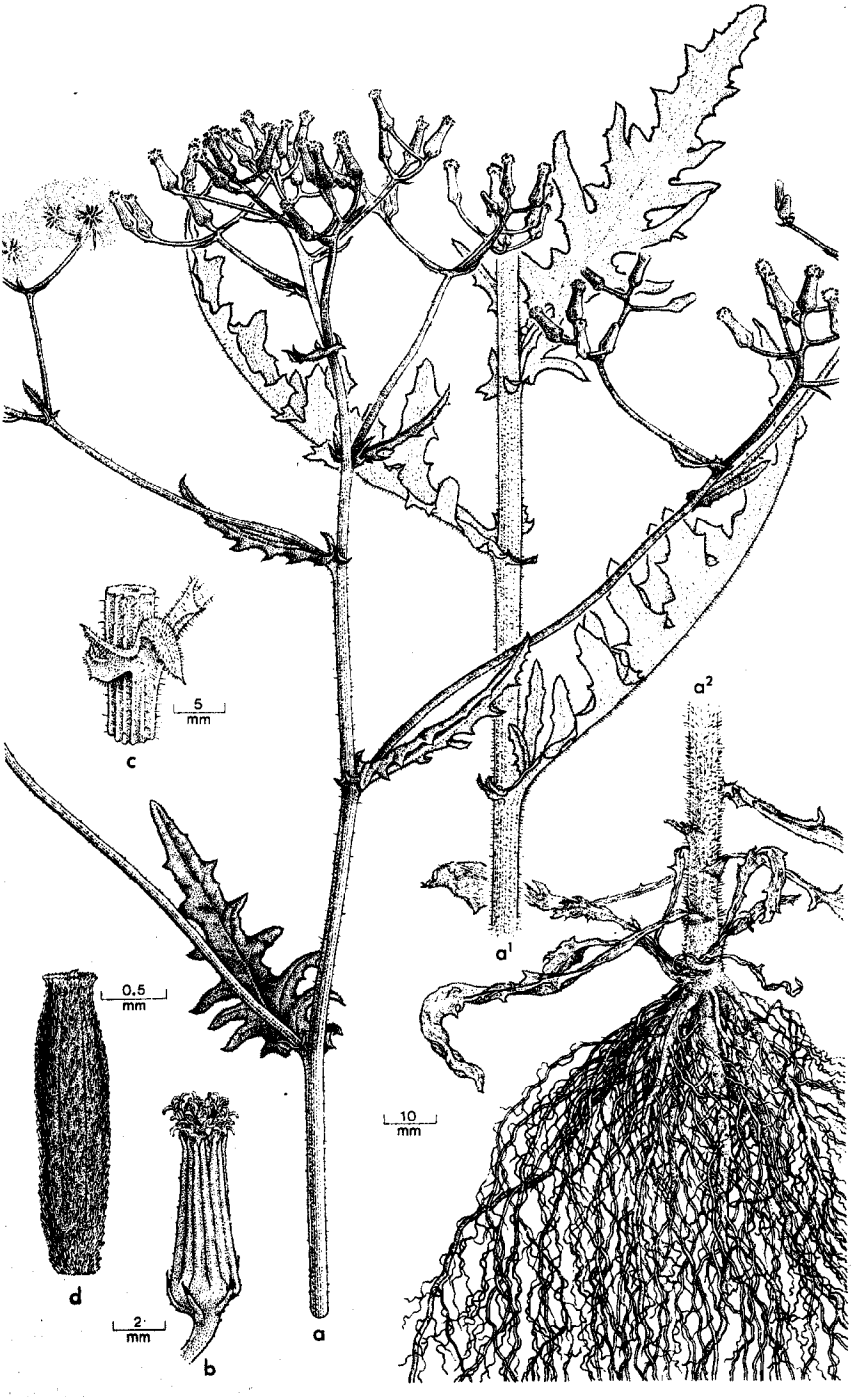

FIG. 11—*Senecio scaberulus.* a, upper stem; a¹, mid stem; a², basal stem; b, capitulum; c, leaf base from mid stem; d, achene.

does not record any erechtitoid Senecios from the Islands, but Buchanan (1875) lists *Erechtites scaberula* among three erechtitoid Senecios gathered on H. H. Travers' second visit. Incidentally, Cockayne (1902) states that an *Erechtites* species came up after burning on the Dry Ridge near Lake Rangatapu, but I have not discovered a specimen corresponding to this report.

Apart from the shape of the lower leaves, all the floral and foliar features in Allan's diagnosis of var. *chathamica* fall into the range of the typical variety from the North Island. The slight difference in leaf shape is perhaps more evident when the upper stem leaves of the two sorts are compared, rather than the lower leaves. In the typical variety, upper leaves are acuminately tapering to the tip whereas in var. *chathamica* the leaves are more rounded to the tip. There are also some minor differences in the floral quantities between the two sorts. Variety *chathamica* has fewer ♀ florets, particularly those with 3 lobes, and more 5-lobed florets, particularly the ♀ ones than most available specimens of variety *scaberulus,* for these reasons the samples of the two sorts did not group together in a computer analysis (Drury & Randal 1969) but var. *chathamica* immediately joined with one stray sample of var. *scaberula* with similar floral quantities. This would indicate that the Chatham Island plants occupy one extreme in the range of *S. scaberulus* in numbers of floret types and character of the involucre. Because the two varieties are also similar in stem hairiness, achene size and hairiness and in the presence of corolla hairs only on the female florets and because var. *chathamica* is based on one gathering only, it would appear consistent and more practical to include the Chatham Island material as an integral part of *S. scaberulus.*

Belcher follows Kirk (1899) by questioningly listing *Erechtites pumila* J. B. Armst. as a synonym of *S. hispidulus* var. *scaberulus.* It was Kirk's view that *E. pumila* was ". . . merely a starved state in which the inflorescence is reduced to a single head". There is no specimen extant in the Armstrong herbarium (CANTY), but several of the features mentioned in the vague diagnosis suggest that his specimen was not an example of *S. scaberulus* from the South Island. Armstrong's plant is very small (5.1–10.2 cm), scapose with radicle leaves. No mention is made of stem leaves, only that there are 4–6 sessile linear bracts. The basal leaves are also remarkably small (4.2–8.5 mm) and described as "puberulous or glabrous", but not hispid or scabrid as in *S. scaberulus.* The flowering heads are too large (8.5 × 6.3 mm) and the number of involucral bracts (8–10) too small for that species. The fact that *E. pumila* was cultivated at the Christchurch Botanic Garden (Armstrong 1880) and that the plant was scapigerous suggests that the plant may have been perennial and not annual, as stated in the protologue. Nevertheless, disregarding the duration of the plant, the remaining character combination makes it difficult to equate with any erechtitoid *Senecio.*

HABITATS: Judging from available specimens, *S. scaberulus* was more commonly collected before the turn of the century than during the last 50 years, and now appears to be a very local species in North and South Auckland land districts. Although plants were plentiful on the lava fields of Auckland, and present in other areas in Auckland Province where a basic volcanic geology occurs, recent specimens have come from bush-clearings on islands in the Hauraki Gulf and coastal scrub north of latitude 38°S away from urban centres.

DISTRIBUTION: Hooker (1864) cites no specimens for his new species *E. scaberula,* but refers to his account in the "Flora Novae Zelandiae" where he gives the habitat as "Northern and Middle Islands. Bay of Islands to Akaroa, D'Urville, Cunningham, etc.". Hooker's South Island record is based on a specimen bearing the locality "Akaroa" without a collector's name on the "HERB. MUS. PARIS" label (K *ex* Hb Hook.). The sheet was chosen by Belcher (1956) as the lectotype of *S. hispidulus* var. *scaberulus,* who presumed it was supplied by D'Urville since Hooker mentions D'Urville in his treatment in 1853.

D'Urville paid three visits to New Zealand, and it was only on his third and last voyage (1837–40) that he came to Akaroa. The flowering plants collected

on that voyage do not include any erechtitoid *Senecio* (Decaisne 1853). The only Senecios in the D'Urville herbarium at Caen are *S. neglectus* and *S. argutus*. It is tempting to surmise that the Akaroa specimens may have been made by Raoul because the Paris label and overstamp are identical with those found on the type of *Erechtites argutus* var. α Hook.f. which is annotated "Akaroa, Raoul". Nevertheless, Raoul (1846) makes it clear that the only collection of *S. hispidulus* from New Zealand known to him was made by R. Cunningham at the Bay of Islands in 1833. It seems curious then that Hooker should imply that D'Urville gathered *Senecio scaberulus* from Akaroa. No subsequent specimens have been sighted at Akaroa to substantiate the record. The same holds for plants originating during the last century from Dunedin (*Kirk 333*, US) and Picton (*Kirk 433*, CANTY), other major ports in the South Island. If the localities on all the herbarium sheets are taken at face value then a possible explanation is that the annual was a casual introduction from the North Island. I have been unable to discover Stewart Island material of *Senecio scaberulus* to substantiate Cheeseman's claims (1925), and Travers' specimen from Wellington cited by Belcher (1956) is correctly an example of *Senecio hispidulus*.

Armstrong (1880) gives *E. scaberula* as a Canterbury species, but his specimen collected on Banks Peninsula is the adventive *Senecio sylvaticus*. Allan in a pencilled annotation to this specimen dated 1934 writes "I am doubtful about this *Erechtites*", and in ink he says "This comes into Cheeseman's concept of the compound species of *E. scaberula*. Probably this and other species of *Erechtites* will be split up when studied intensely." Allan (1961) records the distribution of *E. scaberula* as ". . . mainly east of the divide in S[outh Island]". Incidentally, Wall also makes the same mistake with other specimens which Armstrong had simply named *Erechtites*. This perhaps explains Wall's (1953) record in his "Botany of Christchurch".

North Island

North Auckland (Whangaroa, WELT 32721; Wairua Falls, AK 32107). **Auckland** (Ellerslie, WELT 32713, CANTU 4503; Onehunga, AK 11788). **South Auckland** (Puru River, AK 10497; Raglan, WELT 32715).

South Island

Marlborough (Picton, CANTY *Kirk 433*). **Canterbury** (Akaroa, K. Herb. Hook. ex Herb. Mus. Paris). **Otago** (Dunedin, US *Kirk 333*).

Off-shore Islands

Hen and Chickens (Taranga Island, AK 32106; Whatapuke Island, CHR 186728. **Great Barrier** (WELT, *Kirk s.n.*).

Outlying Islands

Chatham Islands (WELT 32699; WELT 33957).

Acknowledgments

I greatly appreciate the help of Mr K. R. West, botanical artist with Botany Division, DSIR, who has skilfully prepared the illustrations of these difficult plant subjects. Thanks are extended to the keepers of the herbaria mentioned through the text for the loan of specimens and for providing information vital to the study, and also to my colleagues for their specimens and helpful comments. The Latin diagnosis was checked by Dr E. Edgar, Botany Division, DSIR.

References

ALLAN, H. H. 1940: A handbook of the naturalized flora of New Zealand. *Department of Scientific and Industrial Research, New Zealand, Bulletin 83.*

——— 1961: "Flora of New Zealand". Vol. I. Government Printer, Wellington. 1 085 pp.

ARMSTRONG, J. B. 1880: A short sketch of the flora of the province of Canterbury, with catalogue of species. *Transactions and Proceedings of the New Zealand Institute 12:* 325–53.

ASTON, B. C. 1911: List of phanerogamic plants indigenous in the Wellington Province. *Transactions of the New Zealand Institute 43:* 225–47.

BELCHER, ROBERT O. 1956: A revision of the genus *Erechtites* (Compositae) with inquiries into *Senecio* and *Arrhenechthites. Annals of the Missouri Botanical Garden 43:* 1–85.

BUCHANAN, JOHN 1873: List of plants found on Miramar Peninsula, Wellington Harbour. *Transactions and Proceedings of the New Zealand Institute 5:* 349–52.

——— 1875: On the flowering plants and ferns of the Chatham Islands. *Transactions and Proceedings of the New Zealand Institute 7:* 333–41.

——— 1877: On the botany of Kawau Island: physical features and causes influencing distribution of species. *Transactions and Proceedings of the New Zealand Institute 9:* 503–25.

CARSE, H. 1916: Some further additions to the flora of the Mongonui County. *Transactions and Proceedings of the New Zealand Institute 48:* 237–43.

CHEESEMAN, T. F. 1882: Contributions to a flora of the Nelson provincial district. *Transactions and Proceedings of the New Zealand Institute 14:* 301–29.

——— 1882–83: On some hitherto unrecorded plant-stations. *New Zealand Journal of Science Series 1. 1:* 202–5.

——— 1925: "Manual of the New Zealand Flora". 2nd ed. Government Printer, Wellington. 1 163 pp.

COCKAYNE, L. 1902: A short account of the plant-covering of Chatham Island. *Transactions and Proceedings of the New Zealand Institute 34:* 243–325.

COLENSO, W. 1895: A description of a few more newly-discovered indigenous plants; being a further contribution towards making known the botany of New Zealand. *Transactions and Proceedings of the New Zealand Institute 27:* 383–99.

DECAISNE, J. 1853: Description des plants vasculaires. *In* "Voyage au Pôle Sud et dans l'Océanie sur les corvettes L'Astrolabe et la Zélée, exécuté . . . pendant . . . 1837–1840, sous le commandement de M. J. Dumont d'Urville . . . publié . . . sous la direction supérieure de M. Jacquinot". Botanique II. 96 pp.

DRURY, D. G.; RANDAL, J. M. 1969: A numerical study of the variation in the New Zealand *Erechtites arguta-scaberula* complex (Senecioneae–Compositae). *N.Z. Journal of Botany 7:* 56–75.

GODLEY, E. J. 1969: Additions and corrections to the flora of the Auckland and Campbell Islands. *N.Z. Journal of Botany 7:* 336–48.

GOURLAY, E. S. 1955: Notes on exotic and New Zealand insects. *The New Zealand Entomologist 1:* 3–5.

HOOKER, J. D. 1853: "The Botany of the Antarctic Voyage of H.M. Discovery ships Erebus and Terror in the years 1839–1843". II. Flora Novae-Zelandiae. Part I. Flowering Plants. Reeve, London. 312 pp.

——— 1864–67: "Handbook of the New Zealand Flora". Reeve, London. 798 pp.

KIRK, T. 1877: Critical notes on certain species of plants doubtfully indigenous to Kawau. *Transactions and Proceedings of the New Zealand Institute 9:* 525–7.

——— 1899: "The Students' Flora of New Zealand and the Outlying Islands". Government Printer, Wellington. 408 pp.

MARTIN, WM. 1932: "The Vegetation of Marlborough". Reprinted from the Marlborough Express. 46 pp.

——— 1938: Notes on the indigenous flora of Marlborough (New Zealand) with special reference to plant distribution. *Transactions of the New Zealand Institute 67:* 414–25.

MUELLER, FERDINAND 1864: "The vegetation of the Chatham Islands". Government Printer, Melbourne. 86 pp.

PETRIE, D. 1884–85: The rapid increase of *Erechtites prenanthoides,* D.C. *New Zealand Journal of Science Series 1. 2:* 454–5.

RAOUL, M. E. 1846: "Choix de Plantes de la Nouvelle-Zélande". Fortin, Masson et Cie, Paris. 122 pp.

TAYLOR, R. L. 1964: Common fireweeds. *Proceedings of the Seventeenth New Zealand Weed and Pest Control Conference:* 79–84.

WALL, ARNOLD 1953: "The Botany of Christchurch". 2nd ed. A. H. and A. W. Reed, Wellington. 62 pp.

WHITE, E. P. 1969: Alkaloids of some herbaceous *Senecio* species in New Zealand. *N.Z. Journal of Science 12:* 165–70.

WHITE, T. C. R. 1970: Dispersal of exotic weed plants. *Australian Journal of Science 32:* 370.