Biodiversity in the New Zealand divaricating tree daisies: *Olearia* sect. nov. (Compositae)

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Received September 1997; accepted for publication March 1998

The trees and shrubs in *Olearia* sect. *Divaricaster*, sect. nov., are found in North, South, and Stewart Islands of New Zealand. They are distinguished by their small, opposite leaves borne on brachyblasts (short shoots), long shoots which abort apically, solitary or fascicled capitula, flowers with purple style arms, and a very distinctive insect fauna. The ten species and three subspecies, including the new *O. fimbriata*, *O. gardneri* and *O. virgata* subsp. *centralis* are revised and a key and distribution maps provided. The section includes four threatened species: *O. hectorii*, *O. polita* and the two new species. Species density is mapped in grid cells 1° latitude by 1° longitude. Areas west of the geological Median Tectonic Zone (Nelson, Westland and Fiordland) show relatively low diversity. The highest diversity, six species in one grid cell, is recorded in north-west Otago, around Mt Aspiring and the Humboldt Mountains. This region is also geologically significant as several allochthonous terranes are juxtaposed there. In the central South Island *O. laxiflora*, *O. fimbriata* and *O. odorata* have concentric distributions around what were Tertiary basins and inland seas. Members of the section favour fertile, lowland sites on alluvium and have suffered reduction in population size over the last century due to agricultural development. Several species, such as *O. hectorii*, the ‘swamp gum’, occur in sites which are periodically flooded. *Olearia solandri* is a coastal species, often growing as a mangrove associate, but occasionally found inland. The anomalous inland populations are discussed and their location attributed to geological uplift.

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INTRODUCTION

Tree daisies in the genera *Olearia* Moench and *Brachyglottis* J.R. & G. Forst. are a distinctive feature in the New Zealand landscape (Simpson, 1975). Although they do not form such large trees as some tropical Compositae (*Vernonia* Schreb.), their diverse growth forms are of considerable interest. The new section of *Olearia* described in this paper includes plants which may reach tree dimensions and have divaricating shoots with deciduous foliage. This combination of features is common enough in other Gondwanic floras, such as that of southern and eastern Africa, but is unusual in New Zealand and in the family Compositae.

**BIOGEOGRAPHY OF OLEARIA AND RELATED GENERA**

*Olearia*, as currently circumscribed, has about 130 species all restricted to Australasia. It is found in Australia, Tasmania, Lord Howe Island, New Zealand and New Guinea, but does not occur in New Caledonia or Norfolk Island. Other Australasian groups surprisingly absent from New Caledonia include *Coprosma* J.R. & G. Forst. (Rubiaceae) and the *Hebe* Juss. complex (Scrophulariaceae).

The biogeographic connections of *Olearia* can be treated under three headings: affinities with northern hemisphere plants, affinities with other Australasian plants, and affinities with African and South American plants.

When it was first described, the southern genus *Olearia* Moench 1802 was compared with the northern, herbaceous *Aster* L. and subsequently it has always been placed in the tribe Astereae; in their global accounts Bentham (1866) and Baillon (1888) regarded *Olearia* as very close to *Aster* and not separated from that genus by any one definite character. In fact, Bentham (1866, 1873) argued that “no one positive character” distinguishes many genera in the “great mass” of Astereae. Mueller (1865–6) had lumped *Olearia* and *Celmisia* Cass. into *Aster*, and Kirk (1890) pointed out that the Australasian genera *Olearia*, *Pleurophyllum* Hook. f. and *Celmisia* all differ from *Aster* mainly in habit and are maintained “chiefly on grounds of expediency”, to prevent a large, unwieldy *Aster*. Nevertheless, Bentham noted that *Olearia* differs from *Aster* in its shrubby habit and southern distribution, and other characters for *Olearia* have also been cited: its terete achenes (flattened dorsiventrally in *O. sect.*
Divaricaster), tailed anthers and phyllaries not herbaceous-appendiculate (Hooker, 1864; Bentham, 1873). Bentham concluded that the “semi-geographical” genera Olearia and Felicia Cass. (Africa) should be maintained, as they are at least more distinct from Aster than is Erigeron L.

Olearia also has affinities with relatives in its own region. For example, in his generic key, Allan (1961) distinguished Olearia from Celmisia only by vegetative characters: Olearia has an erect or spreading habit, non-imbricate leaves and hard wood; Celmisia has a prostrate or low growing habit, imbricate leaves and soft wood. Given & Gray (1986) treated Olearia in a “Celmisia-Olearia complex” with the New Zealand genera Celmisia, Pleurophyllum, Pachystegia Cheeseman and Dannamenia Given, as well as Erigeron rapensis F.Br. of Rapa Island, and proposed that several characters unite this group: caudate or tailed anthers, densely tomentose abaxial leaf surfaces, inflorescences frequently macrocephalous and plants woody. There seem to be exceptions to all of these. In addition to these genera, Wagner & Herbst (1987) and Nesom (1994b) regarded Reny'a Hillebr. ex Benth., a genus of Hawaiian lianes, as “closely allied” to New Zealand species of Olearia. Within this Olearia complex, if it is a group at all, generic limits are also poorly defined. Nesom (1994a,b) observed that the “highly diverse” Olearia “may prove to be polyphyletic” and suggested that two groups of Olearia would be better positioned outside Olearia and closer to Celmisia (cf. Kirk, 1890; Drury, 1968; Given, 1973).

Olearia has a third set of affinities involving other southern taxa in Africa and South America. These possibly ‘Gondwanic’ affinities are of great interest and provide a context for the present revision. Other New Zealand plants in ‘derived’ families which nevertheless show Gondwanic connections include the Hebe complex (Scrophulariaceae) and Coprosma (Rubiaceae) (Heads, 1993, 1994a,b, 1996). The austral relationships of Olearia were already well documented by the time Bentham & Hooker (1873) provided their overview of the tribe Astereae, a group of about 3000 species. They treated Olearia in an unnamed group of genera with five subgroups, as follows:

1. Five herbaceous genera including Aster, distributed largely in the northern hemisphere but with a few members in South Africa and South America.

2. Olearia and eight other genera of southern hemisphere shrubs. These are found in St Helena (Commidendron DC., Melanodendron DC.), Africa north to Ethiopia (Felicia Cass.), Madagascar (Henricia Cass.), Australasia (Olearia) and South America (Sommerfeldia Less., Hinterhubera Sch. Bip., Diplostephium Kunth, Chliotrichum Cass.). Bentham & Hooker also noted that while Rochonia DC. of Madagascar has yellow ray florets and so is placed in another subtribe, it has the habit of Olearia. These distributions illustrate the standard Australasia–South America connection seen in many taxa and discussed by many authors, as well as the less widely acknowledged but equally important affinities between Australasia and Africa.

3. The silvery-sericeous, herbaceous Celmisia and Pleurophyllum of Australia, New Zealand and the New Zealand subantarctic islands. Celmisia is very close to Aster and to Orinophium (Kunth) Cuatrec., the latter ranging from the Bolivian Andes north to Mexico. This affinity repeats the Australasia–South America connection.

4. A group of five herbaceous genera including Vittadinia A. Rich. (Australia and New Zealand) and Erigeron (widespread, but not in New Zealand).

5. Tetramolopium Nees, a central Pacific endemic found in New Guinea and Queensland (25 species), Hawaii (12 species), and the Cook Islands. This striking
distribution is similar to that of *Keysseria* Lauterb. (tribe Astereae) from Borneo, Sulawesi, New Guinea, Fiji and Hawaii. Other central Pacific endemics in the Astereae include two new monotypic genera from Rapa Island: *Pacifigernon* (Nesom, 1994a) based on *Erigeron rapensis* and closest to members of the *Olearia* group, and *Apostates* (Lander, 1989) based on *Olearia rapa* F.Br. Nesom (1994a) suggested that this latter plant may not even belong in the tribe Astereae but rather in the Inuleae, which suggests a phylogenetically intermediate, nodal form like the Pacific genus *Abrotanella* Cass. (?Senecioneae). *Remya*, in the *Olearia* complex, is endemic to Hawaii. The central Pacific is an important but strangely neglected region of endemism for these and many other plants, such as Rubiaceae and *Corokia* A.Cunn. (?Aleuritesmiaceae) (Heads, 1993; Gustafsson & Bremer, 1997).

In sum, according to Bentham & Hooker the group of genera immediately allied with *Olearia* is a global complex with most genera in the southern hemisphere, in particular around the southern Indian Ocean and the south and central Pacific Ocean. The northern hemisphere representatives are species rich but do not show as great a diversity of structure as the southern plants. This is a pattern seen in many other groups, such as *Euphrasia* L. (Scrophulariaceae), the family Fagaceae and the related Balanopaceae (Heads, 1989), and the family Thymelaeaceae. Despite changing generic concepts, subsequent work has largely supported Bentham & Hooker’s main conclusions.

In a typically perceptive variation, Baillon (1888) united *Olearia* with the South American *Chiliotrichum* in a broad, Pacific *Olearia* related by Baillon to *Aster* and four genera of South Africa–Ethiopia. Modern authors have also emphasized the Gondwanic ties of *Olearia* with South America and southern Africa. Grau (1977) confirmed that “most of the genera in Astereae are distributed in and about land areas peripheral to the Pacific and Indian Oceans” and that “The endemic Madagascan genera are, in some respects, more closely related to the Pacific than to other African genera”. This is compatible with the suggestion made above that the trans-Indian Ocean connection is Gondwanic (Mesozoic) in origin.

In recent studies, Zhang & Bremer (1994) proposed the *Olearia* complex as the sister group of the *Chiliotrichum* and *Hinterhubera* generic complexes of South America, with the three groups sharing cordate or sagittate (caudate) anther bases. In another detailed study of the Astereae Nesom (1994b) placed *Olearia* in the subtribe *Hinterhuberinae* Cuatrec., “remarkable in its pan-temperate distribution in the Southern Hemisphere”. It is found mainly in southern Africa, Madagascar, Australasia and South America. A few genera occur in central America and western USA, and *Remya* is in Hawaii.

In sum, *Olearia* is probably closest to Pacific, South American and northern hemisphere taxa, but ultimately connects with an aggregate of African genera in what is thus a global complex. Other New Zealand Compositae, such as *Helichrysum* L. and *Kirkianella* Allan, differ in having immediate phylogenetic connections with Africa and Asia rather than with America.

**THE GONDWANIC CONTEXT AND ITS INTERPRETATION**

Although the Compositae are usually seen as too young to have evolved in Gondwana, several authors have interpreted apparently Gondwanic distributions in
the family as evidence of Mesozoic vicariance. Bentham (1873) found that the main centres of endemism of Compositae are in Africa and the Mediterranean, Australia, and Chile and Mexico and “point to a very wide dispersion of the original stock of the family at a very early period, when the physical configuration of the surface of the globe must have been very different from what it is now . . .”. In particular, this early dispersion was “previous to the disruption or stoppage of communication between what are now the tropical regions . . .”. Absence of fossil Compositae from some early strata may not mean very much and Bentham observed that “the absence of their remains is no proof of their non-existence at various geological periods”. Bremer (1994) also accepted that “groups may be much older than their fossil record” and Turner (1977) suggested that: “the family [Compositae] is a very old one among angiosperms generally, [its] origin stems back to at least the Cretaceous”. For Turner, macrofossils “suggest that the family existed in about the same morphological form (tribally speaking) in about the same regions during the Oligocene as it does today”, and the distribution of the family “seems more logically bound up with continental drift than it is to explosive evolution and adaptive radiation up and down the world’s mountain chains since Miocene time”. Likewise, DeVore & Stuessy (1995) have argued that the distribution of Compositae and related families “strongly suggests that the separation of Antarctica from Australia and South America may explain present distributional patterns.”

It is seldom appreciated that disruption of, for example, Australasia (Olearia) and South America (Chiliotrichum) explains only the disjunction: Australasia–South America. It does not explain why Olearia and Chiliotrichum were confined to Australasia plus South America to begin with. In the vicariance model this is an earlier pattern which must have been in existence before the break-up of Gondwana, implying spatial heterogeneity in the Gondwana flora.

In his recent, detailed revision of the subtribes of Astereae, Nesom (1994b) concluded firmly in favour of vicariance. He agreed that America–Africa disjunctions “suggest that these taxa were evolving at least by the middle to late Cretaceous”. He also observed that “Notwithstanding the lack of fossil evidence for a pre-Tertiary origin of the family, the geographic distribution of some Astereae . . . is similar to that of many other families and generic groups known to have a Cretaceous history and hypothesized to be vicariantly divided in the Cretaceous between Africa and South America. . . . The repeating pattern of disjunction between South America and Australasia in [four subtribes] suggests that these groups were in existence at least by early Tertiary”. In the Hinterhuberineae, “remarkably similar apparently unspecialised genera occur in Madagascar, South America and the Australasian region (e.g. Madagaster, Diplostephiwm, Olearia).”

Following other studies on the Astereae by Zhang & Bremer (1994), Bremer (1994) wrote that: “It is possible that the origin of the Astereaceae was linked to the history of the Pacific area. . . . Plate tectonics of the Pacific are complicated, and involve a number of rafts traversing the Pacific, and ancient slowly moving island areas, such as the Hawaiian islands . . .”. The currently-exposed rocks of groups such as the Hawaiian Islands and Galapagos Islands are, of course, geologically young, and the crucial question is: could there have been any land in the region prior to these islands? The Compositae have presumably been in the area for a long time; Bremer (1994) pointed out that members of the tribes Astereae (such as the Lagenophora Cass. group), Senecioneae (subtribe Blennospermatinae Nordenstam)
and Anthemideae (the \textit{Cotula} \textit{L.} group) all have circum-Pacific distributions, and “mirror those found at a higher systematic level, including the whole family.”

In conclusion, Bentham and Turner’s vicariance interpretation is easily applied to \textit{Olearia} and is supported here, as it accounts for both the Indian Ocean and Pacific Ocean patterns of distribution noted by Grau (1977), Bremer (1994) and Nesom (1994b). The new section of \textit{Olearia} described below also shows vicariance, both with outgroups to the north, south, east and west of New Zealand, as well as among species within New Zealand.

\textbf{OLEARIA SECT. \textit{DIVARICASTER}: TAXONOMIC DISCUSSION}

\textit{Taxonomic history}

Despite the fact that Hooker (1864), Kirk (1899) and Cheeseman (1914) all referred to this new section as distinctive, it has seldom been discussed. Nevertheless, Nesom (1994b) indicated that the infra-generic organization of \textit{Olearia} is one of the most significant and interesting problems remaining in the classification of \textit{Astereae}.

Taxonomic knowledge of \textit{O. sect. Divaricaster} began with Hooker’s (1853) description of \textit{Eurybia solandri} and \textit{E. virgata}. Hooker commented on the similarity of \textit{E. solandri} with the Australian \textit{E. ramulosa} Labill., but noted the differently shaped involucres. Later, Hooker (1864) synonymized \textit{Eurybia} Cass. under \textit{Olearia} and named a third species in the group, \textit{O. hectorii}.


\textit{Delimitation}

Archer (1861) and Bentham (1866) arranged the species of \textit{Olearia} in five sections, with leaf tomentum hairs T-form (\textit{Dicerotriche}), stellate (\textit{Asterotriche}), glandular (\textit{Adenotriche}), densely intricate-dendritic (\textit{Eriotriche}) or septate (\textit{Merismotriche}). \textit{O. virgata} and \textit{O. solandri} were included in \textit{O. sect. Dicerotriche} and the remaining New Zealand species of \textit{O. sect. Divaricaster} also have T-form hairs (Drury, 1968; pers. obs.). Archer’s and Bentham’s systems did not recognize \textit{O. sect. Divaricaster} as a group, but van Royen (1983) and Lander (1991) have both indicated that this earlier infrageneric classification very likely needs to be modified.

In contrast with Bentham, who worked largely on Australian \textit{Olearia}, Hooker (1864) had \textit{O. sect. Divaricaster} as one of just two unnamed sections of New Zealand \textit{Olearia}, emphasizing its distinct nature. Hooker characterized it as having “leaves in opposite pairs or opposite fascicles, 1/6–1″ long”, rather than “leaves alternate not fascicled [and larger]” as in the other species. Hooker wrote that this “small N. Zealand section ... might (on account of its habit) be separated generically, were it not for intermediate Australian forms” (probably referring to \textit{O. ramulosa} (Labill.) Benth., discussed below).
Kirk (1899) treated the New Zealand species of *Olearia* in three groups: one for *O. sect. Divaricaster*, one for *O. fragrantissima* Petrie, and a third group for all the others. Cheeseman (1914, 1925) also treated *O. sect. Divaricaster* as a “peculiar” section, one of five in New Zealand *Olearia*.

Drury (1968) cited a paper (Drury et al. ‘in press, *Bot. J. Linn. Soc.*)), in which a numerical analysis of *Olearia* showed six groups. Group 2 included *O. solandri* and other species not in *O. sect. Divaricaster*. This conclusion is hard to assess as it seems that the paper was never actually published.

Concluding with Hooker, *O. sect. Divaricaster* is easily distinguished if it is taken to include shrubs and small trees bearing small, opposite leaves, brachyblasts, flowers with purple style arms, solitary or fascicled capitula and a distinctive fauna of host-specific Lepidoptera.

**Affinities**

Within the Compositae opposite leaves characterize large groups and many genera. They are unusual within *Olearia* and the tribe Astereae, but are constant in *O. sect. Divaricaster*. They are also present in *O. buchanae* Kirk (North Island, known only from the type) and *O. traversii* (F. Muell.) Hook. f. (Chatham Islands). Allan (1961) linked these two species with *O. sect. Divaricaster* in his synopsis, but they appear to have little in common with the section apart from the opposite leaves.

*Olearia sect. Divaricaster* appears to be more closely related to *O. fragrantissima*. This species has a divaricate, deciduous habit with short shoots, and leaves which are alternate and acuminate but otherwise like those of *O. hectorii*. It is distributed in the south-east of South Island (north to Banks Peninsula), like several species in *O. sect. Divaricaster*. However, the inflorescence differs in being almost racemose.

*Olearia sect. Divaricaster* also resembles some Australian forms. Hooker (1864) noted similarities with *O. ramulosa*, a much-branched shrub of Victoria, New South Wales, Tasmania and South Australia. It has revolute leaf margins and leaves “clustered in the axils”, but the leaves are alternate and the capitula are terminal on long shoots. *O. revoluta* F. Muell. of Western Australia has a similar habit, with revolute, alternate leaves. *O. algida* Wakefield, illustrated by Costin et al. (1979), also shows similarities. It grows in heaths near treeline in the Australian Alps and in Tasmania. Leaves are very small (1.5–2.5 mm) with revolute margins, and are clustered on minute, spirally arranged short shoots. The capitula are solitary and sessile. Other Australian species such as *O. rosmarinifolia* White and *O. alpicola* White have opposite leaves with revolute margins, but the heads are in panicles.

All but one of the 16 New Guinea *Olearia* species are alpine and are illustrated by van Royen (1983). None resembles *O. sect. Divaricaster*.

The “macrocephalous” olearias of New Zealand (Kirk, 1890) form a distinct group and show “striking resemblances” with *Pleurophyllum* (Archer, 1861; Drury, 1968). Although *O. sect. Divaricaster* is very different in habit from these large-leaved shrubs and ‘megaherbs’, it may be related to them through its brachyblasts with reduced internodes (as in the rosettes of *Pleurophyllum*), purple style arms (the whole flower is purple in *Pleurophyllum*) and unbranched inflorescences (like several macrocephalous *Olearia* species). In any case, the groups replace each other geographically and altitudinally on the New Zealand plateau, with *Pleurophyllum* and the macrocephalous olearias on the subantarctic islands and in the subalpine vegetation.
zone on the main islands, while *O. sect. Divaricaster* is restricted to the lowlands of the main islands. *O. ballii* (F. Muell.) Hemsl., from Lord Howe Island, north-west of New Zealand, also appears to have purple style arms and purplish florets (photograph in Green, 1994).

In conclusion, although *Olearia sect. Divaricaster* has not had a name at any rank, it is very distinctive and is probably not present in Australia or New Guinea. Hooker (1864) implied that the group may be a genus, and the “intermediate” Australian species he cited is probably not truly intermediate. Perhaps the group could be regarded as a genus, but this course is not followed here. As Drury (1968) pointed out, “It is well-known that Compositae are already plagued with numerous petty genera” and monotypic or oligotypic genera often simply obscure what are usually evident relationships.

Species delimitation

In general the species of *Olearia sect. Divaricaster* are clear-cut and easily identified, at least with flowering material, but the subspecies of *O. virgata* are less distinct and would repay further study. Modern authors working on the section have concentrated on what was originally a very broad *O. virgata*, splitting off from this seven of the taxa accepted here.

Mueller (1865–6) included both *Olearia* and *Celmisia* in *Aster*, and moreover placed the three species of *O. sect. Divaricaster* which he knew (*O. solandri*, *O. virgata* and *O. hectorii*) under *O. solandri*. This extreme lumping is not followed here.

As for the mutual affinities of the species, *O. solandri*, *O. bullata* and *O. lineata*, they are linked by their revolute leaves. The distributions of the last two overlap significantly with each other and are more or less vicariant with *O. solandri*, *O. hectorii*, *O. polita* and *O. gardneri* have stems more or less 2-flanged rather than terete or tetragonal and also appear to be related, especially the last two which also share similar phyllaries and juvenile foliage. The remaining species, *O. odorata*, *O. finbriata*, *O. laxiflora* and *O. virgata*, generally have obovate leaves and may be related. They form a series of vicariant taxa which may also include *O. solandri*.

MORPHOLOGY

Plant architecture

Members of *O. sect. Divaricaster* form erect, multi-leadered shrubs or small trees with a single trunk, and grow 2–10 m tall. Bark of the larger members, such as *O. lineata* and *O. hectorii*, is thick, corky and deeply furrowed. Shoot axes are initially orthotropic and later become plagiotropic, all by primary growth. The apex of the module eventually aborts and a replacement shoot continues the sympodial shoot axis. Growth conforms to Mangenot’s architectural model of Hallé, Oldeman & Tomlinson (1978).

Cockayne (1958, 1967) referred to *O. virgata* and its allies as “heath-like” or “divaricating” “tree daisies” and included *Olearia* in a list of only nine New Zealand genera of deciduous woody plants. A deciduous habit is often correlated with the
differentiation of short shoots and this is true in Olearia. The most clearly differentiated brachyblasts in New Zealand members occur in O. odorata and to a lesser extent in O. hectorii, where they form distinct spurs. Both species are strongly deciduous. A deciduous habit and distinct brachyblasts are also found in O. fragrantissima, but no other New Zealand Olearia has either brachyblasts or a deciduous habit.

Bulmer (1958) included all members of O. sect. Divaricaster in a valuable illustrated key to the divaricating shrubs of New Zealand and observed that O. solandri and O. lineata are “not strictly divaricating”. Similarly, Wardle (1991) described some members of the group (O. odorata and O. virgata) as “strongly divaricating”, others (O. hectorii, O. lineata) as “filiramulate” only.

The plants referred to by New Zealand botanists as “divaricating” have a distinct syndrome of characters in addition to divaricating or widely spreading branches. The plants have leaves and flowers borne on brachyblasts (short shoots) which form either sessile fascicles or conspicuous spur shoots. They also have long shoots which are modular by regular apical abortion. All members of O. sect. Divaricaster have both features, apart from the two species noted by Bulmer in which apical abortion of the leaders is reduced (O. lineata) or absent (O. solandri). O. lineata has well-differentiated brachyblasts, O. solandri usually less so.

As a third feature of their architecture, most divaricating plants have at least a portion of their branches growing plagiotropically (that is, obliquely or horizontally) or even geotropically (towards the ground). Bulmer (1958) referred to the slender, weeping branches of Olearia lineata and geotropic branches are well-known in Rapanea divaricata (A.Cunn.) Oliver (Myrsinaceae). Some divaricating shrubs, such as Coprosma acaena A.Cunn. (Rubiaceae) are completely plagiotropic, while others, such as Plagianthus divaricatus J.R. & G. Forst. (Malvaceae) and members of Pittosporum ser. Bivalsae (Gowda) R.Cooper, are almost totally orthotropic in their primary growth, although they show some secondary plagiotropy. However, the most common arrangement in divaricating shrubs is for branches to show ‘mixed’ growth (Halle et al., 1978), with some portions plagiotropic and others orthotropic. Most of the small-leaved Coprosma species show this pattern (Heads, 1996), as do species of O. sect. Divaricaster, which confirms Cheeseman’s (1914) observation that these small-leaved Olearias have “much of the habit, foliage, and divaricating branches of some Coprosmas”. Shoot modules in both groups are initially orthotropic and become plagiotropic by primary growth (sometimes reverting to orthotropic growth). As indicated, this growth pattern conforms to Mangenot’s model of tree architecture, but the shoot systems of these plants and the other divaricates are distinguished by the differentiation of short shoots and the apical abortion of the long shoots. This distinctive architecture is particularly frequent in the floras of those countries surrounding the southern Indian Ocean: southern and eastern Africa, Madagascar, southern Australia and New Zealand, but is hardly seen in the Chatham Islands or Melanesia which lie east and north of the main divaricating shrub flora.

Other species in New Zealand Olearia and Pleunophyllum have monopodial trunks and orthotropic laterals with foliage in rosettes, which resemble brachyblasts in their reduced internodes. The main architectural distinction between Olearia and the closely related Celmisia is the orientation of the trunks. These are orthotropic in Olearia, but in Celmisia the shoot systems comprise woody runners which grow plagiotropically on the ground, often over rocks, bearing rosettes of leaves in 2/5 phyllotaxis. ‘Trunk’ leaders are monopodial and do not flower (personal observations on C. hectorii Hook. f.).
Foliage

One of the few variations in the foliage of Compositae of systematic importance for the higher taxa is the arrangement of the leaves on the stem, which may be either opposite or alternate. As noted, the opposite leaves of *O. sect. Divaricaster* are very unusual in the tribe Astereae.

Another unusual feature of several species in the section is the production of distinctive juvenile foliage and similar ‘reversion’ foliage. In *O. bullata* and *O. solandri* juvenile and ‘reversion’ leaves are much larger and more spreading than the adult leaves (Fig. 2A,B) and do not have revolute margins, rather like the normal foliage of *O. virgata*. The ‘juvenile’ foliage is sometimes present in flowering specimens, and especially in *O. bullata* has confused collectors. Possible juvenile foliage in *O. polita, O. gardneri* and *O. hectorii* is toothed (cf. *Leonohebe* Heads and *Hebe*, Heads, 1994c).

Flower and fruit

The style branches of the disc florets provide some of the most useful taxonomic variation in family Compositae, and it is not surprising that such an apparently natural group as *O. sect. Divaricaster* should have distinctive styles, with large purple papillae (‘collecting hairs’) up to 80 μm long on the backs of the style arm appendages.

The stamens have the connective extended into a short, triangular tip. Members of the *Olearia, Chiliotrichum* and *Hinterhubera* generic complexes have caudate anther bases (Hooker, 1864; Given & Gray, 1986; Zhang & Bremer, 1993). Kirk (1899) and Cheeseman (1925) realized that there is variation in the anthers of *Olearia*, describing them as “often acute at the base or with minute tails, rarely obtuse”, but did not cite particular species. Cheeseman (1914) showed obtuse anther bases in *O. bullata*, but at least *O. solandri, O. polita, O. laxiflora* and *O. paniculata* (J.R. & G. Forst) Druce appear to have minute tails (pers. obs.). Cheeseman (1914), Drury (1968) and Given (1973) showed that in four species of macrocephalous *Olearia* the anther tails are longer than the filament collar but are shorter in the other species of *Olearia* and *Celmisia*. Given (1969) described the anther bases of *Celmisia* as “sagittate”, but also noted that the length of the tails can vary considerably among the species of the *Olearia–Celmisia* complex (Given, 1973). Cheeseman (1914) and Moore & Irwin (1978) have illustrated anther bases of *Pachystegia insignis* (Hook. f.) Cheeseman with conspicuous tails, and those of *Celmisia* spp. as obtuse and rounded. In the Australian species of *Olearia* described by Lander (1989b, 1990) anther bases are acute (sometimes sagittate or acuminate) or obtuse, but always shorter than the filament collar.

Achenes are described as terete and not flattened in *Olearia* by Bentham (1866), although they are strongly flattened dorsiventrally in all species of *O. sect. Divaricaster*.

Chromosome number

Chromosome number in *Olearia* is given as *n* = 9, 27, 54 (*Celmisia* is 9 or 27) by Grau (1977) although the New Zealand species have *2n* = 108, 216 and 324 and *O. angulata* Kirk has the very high number *2n* = 432 (Beuzenberg & Hair, 1984; Dawson,
The members of *O.* sect. *Divaricaster* which have been counted (*O.* *lineata*, *O.* *vigata* subsp. *imprista*, *O.* *vigata* subsp. *vigata*, *O.* *bullata*, *O.* *polita*, *O.* *fimbriata*) all have $2n = 108$ like most other New Zealand members of the genus.

**ASSOCIATED LEPIDOPTERA**

The following information (Table 1) on host-specific Lepidoptera was kindly supplied by Mr B. Patrick, Otago Museum, Dunedin.

Summarizing the information in the table, eight species of Lepidoptera from seven families feed exclusively on two or more species of *Olearia* sect. *Divaricaster*. Other Lepidoptera are restricted to a single species of *Olearia* sect. *Divaricaster*, notably *O.* *odorata*. The geometrid *Pseudoconemia rudisata* is on *O.* *odorata* as well as other *Olearia* species not in *O.* sect. *Divaricaster*, but is also on members of *Cassinia* R.Br. and *Helichrysum*—no species link *O.* sect. *Divaricaster* and other *Olearia* species exclusively.

The moth fauna restricted to *O.* sect. *Divaricaster* is of theoretical as well as conservation interest. This sort of relationship is often interpreted as an ‘adaptive radiation’ of one group ‘onto’ another. However, it is possible, even likely, that ancestors of *O.* sect. *Divaricaster* were already being grazed by the precursors of the modern Lepidoptera.

**ECOLOGY**

The species of *Olearia* sect. *Divaricaster* are found in open communities such as shrubland, tussock grassland and forest margins, ranging from the coast through to upper montane sites. Plants are often characteristic of wetter sites on alluvium which may be inundated periodically or even continuously. *O.* *odorata*, *O.* *lineata* and *O.* *bullata* are currently ‘stranded’ in the semi-arid central South Island where they typically occur along minor water courses. Several taxa show a weedy tendency, being recorded as pioneers in burnt forest, in rough pasture and on gold tailings. *O.* *virgata* and *O.* *lineata* can be dominant in certain shrublands (Cockayne, 1958; pers. obs.) and *O.* *fimbriata* and *O.* *hectorii* form monospecific and apparently evenly-aged woodlands in parts of Otago.

Wardle (1991) cited *O.* *odorata*, *O.* *lineata* and *O.* *virgata* as members of “grey scrub”. (On the western side of the Indian Ocean, Duthie (1929) has described a “grey bush” community near Cape Town dominated by another composite, *Relhania* L’Hér. ). Wardle noted that *O.* *odorata* may be increasing in some areas of secondary grey scrub, and may also occur in short tussock grassland. *O.* *virgata* and *O.* *laxiflora* are recorded from “shrub heath and mires and frost flats”.

Dawson (1988) characterized the New Zealand divaricating shrubs as flood tolerant, and this is certainly true for *O.* *virgata* and *O.* *laxiflora*. In addition, Petrie (1891) reported *O.* *hectorii* as common in the Catlins where it grew on the banks of streams and in swamps and was known as the ‘swamp gum’. This name is accounted for by the thick bark which peels off in strips, the grey-green leaves and the often multi-leadered, giant shrub habit. This ‘swamp mallee’ recalls mallee species of *Eucalyptus* L’Hér (Myrtaceae) growing around salt lakes in central Australia in a relictual ecology first established during marine transgressions in the Mesozoic,
managing to survive in situ following the retreat of the seas in the Tertiary (Heads, 1990). *O. gardneri*, which grows in pools of water on alluvium around ox-bows in the south-east North Island and has plagiotropic, layering shoot axes, recalls mangroves in both its architecture and ecology.

The process of long term ecological lag seems to account for the ecology of several *Olearia* species, but it is seldom discussed, although it has been mentioned briefly by several authors. Kirk (1871) discussed the inland occurrence of maritime plants in the Waikato district of New Zealand. He wrote: “It is readily admitted that littoral plants may occasionally be found in inland situations from accidental causes, but in the present case the number of species... affords forcible proof that the cause of their growth must be found in the district having been formerly a shallow estuary...”. Likewise, Cockayne (1900) found a number of plants in the lower Waimakariri Gorge which “rarely occur at any distance from the sea, and this seems to strongly favour Captain Hutton’s theory, the crucial point of which is that the sea at one time came up to this spot.” Cockayne (1902) also discussed inland cliffs on the Chatham Islands which were originally maritime: “Many of their plant inhabitants are doubtless part of the original flora... it seems well-established that sea-coast plants can continue to occupy an inland ancient maritime station.” In his account of the coastal vegetation of the South Island, Cockayne (1907) devoted his chapter 11 to the “occurrence of coastal plants inland” and gave several interesting examples. He wrote: “How far all the above cases denote a former shrinkage of the land and extension of the coast-line inland is not for a botanist to settle but certainly... they are suggestive, to say the least.” If such distributions are correlated with marine incursions “then it is evident that species can exist under special conditions for enormous periods of time”. Cockayne undoubtedly sensed the significance of these observations, and wrote that “the subject is of too much importance for a brief treatment”. Subsequently, other New Zealand authors have discussed this problem and used tectonic uplift as an explanation for the occurrence of coastal taxa at

Table 1. Lepidoptera species (left) and their sole food plants

<table>
<thead>
<tr>
<th>Nepticulidae:</th>
<th>Olearia species</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Stigmella ilsea</em></td>
<td>bullata</td>
</tr>
<tr>
<td>Plutellidae:</td>
<td>Protosynaema n. sp.</td>
</tr>
<tr>
<td>Gelechiidae:</td>
<td><em>Thanirothica olearia</em></td>
</tr>
<tr>
<td>Geometridae:</td>
<td><em>Pasiphaea catania</em></td>
</tr>
<tr>
<td>Oecophoridae:</td>
<td><em>Stathmopoda n. sp.</em></td>
</tr>
<tr>
<td>Tortricidae:</td>
<td><em>Harmologa oblongana</em></td>
</tr>
<tr>
<td>Noctuidae:</td>
<td><em>Meterana exquisita</em></td>
</tr>
<tr>
<td>M. grandiosa</td>
<td>√</td>
</tr>
</tbody>
</table>
unusually high altitude (Beddie, 1935; Heads, 1989). Morris & Hayden (1995) recently suggested that “It is generally understood that grasshoppers, buttercups, parrots and many of the other plants and animals found [at high altitude in the New Zealand mountains] have risen with the Southern Alps”.

In other countries the direct effect of tectonic change on altitude and evolution of biological communities has been explored by authors discussing spectacular cases such as inland mangroves on rapidly rising land (van Steenis, 1963, 1984) and also writers who accept it as a normal and universal phenomenon. Tolmachev (1970), for example, described the process of formation of highland floras: “the height rises with its vegetation cover ... which will ultimately become orophytic”. The nature of the orophytic floras “will largely depend on the floral and vegetational character of an area before its rise to the ultimate altitude, although this is currently not fully appreciated”.

*Olearia solandri* is the most obviously coastal member of *O. sect. Divaricaster* and is also the northernmost. It is usually found around the edge of the mangrove, in salt-marsh, on fixed dunes and around coastal gullies and cliffs, but there are several ‘anomalous’ inland populations, notably in the Taranaki Range and even at Mataroa, near Taihape. This part of the North Island was uplifted during the late Cenozoic Kaikoura Orogeny, which explains the altitude of these inland populations. It is less clear why Mataroa should already have been an important locality before the uplift of the axial mountain ranges. It is also significant as one of the few localities of *O. gardneri*. It is possible that earlier in the Tertiary these taxa had migrated and evolved around the shores of a sea which reached Mataroa. The history of *O. odorata* and its allies in the central South Island probably also involved evolution in a landscape of shallow, rapidly changing seas.

Ogle & Barkla (1995) analysed the biogeographic significance of Mataroa and emphasized the presence there of several taxa which have other disjunct records in the east, like *O. gardneri*. They wrote: “Although the Taihape area is west of the North Island’s axial ranges, in many respects the structure and species composition of its riverine forests are more like those of the eastern North and South Islands. The major uplift of the Ruahine ranges occurred in the Quaternary, i.e. less than 1.0 million years b.p. . . . Well into this mountain building period, forests of the present northern Manawatu-Rangitikei districts were probably continuous with Hawke’s Bay forests. We propose that as the mountains rose above the climatic limits for forest species, certain species became ‘stranded’ in the west . . .”. This view is fully supported here and the same process of stranding could apply to the South Island species discussed above, and to the section as a whole.

Several species of *O. sect. Divaricaster* have coastal records only in the east of New Zealand. *O. laxiflora* is coastal only in the Catlins region. *O. bullata* is coastal in the Catlins and at Shag Point, north of Dunedin. *O. hectorii* has coastal records in the Catlins and at Invercargill. *O. fimbrata* is near the coast only at Banks Peninsula and Otago Peninsula. *O. lineata* has coastal records from Dunedin to Ruapuke, but is probably coastal in the west as well. It seems that the group somehow ‘entered’ New Zealand from a base in the east before the uplift of the present mountains, like the forms of *Hebe parviflora* (Vahl) Cockayne & Allan sens. lat. mapped and analysed elsewhere (Heads, 1993).

The current flora of New Zealand may have been derived from an earlier flora of coastal swamps and associated drier hinterlands which survived considerable
tectonic disturbance and uplift. Although New Zealand currently has only one fully-fledged mangrove (*Avicennia marina* (Forsk.) Vierh. - Verbenaceae), local species of *Syzygium* Gaertn. (Myrtaceae), *Laurelia* Juss. (Monimiaceae) and *Freycinetia* Gaudich. (Pandaneae) can all have pneumatophores, and *Leptospermum* J.R. & G. Forst. (Myrtaceae), *Plagianthus* J.R. & G. Forst. (Malvaceae), *Coprosma* (Rubiaceae) and *Olearia* include species which are at least 'mangrove associates' and tolerant or periodic flooding.

**BIOGEOGRAPHY**

The distribution maps (Figs 4–9, 11, 12, 14–16) are based largely on the collections seen (AK, AKU, CANU, CHR, OTA, WAIK, WELT, WELTU), with a few additional records from Wilson (1991) and received as personal communications from colleagues listed below in the acknowledgements. Copies of a complete list of specimens seen have been lodged with these New Zealand herbaria. *Olearia* sect. *Divaricaster* is widespread through North, South and Stewart Islands of New Zealand, but is absent from islands to the south (the Subantarctic Islands), the east (Chatham Is.) and the north (Three Kings, Poor Knights, Hen and Chickens). As suggested above, *O. sect. Divaricaster* is an inland, lowland vicariant of *Pleurophyllum* and the macrocephalous olearias. These occur on the subantarctic islands (Macquarie, Auckland, Campbell, Antipodes Islands), as well as Stewart Island, Chatham Islands and the southwestern extremity of the South Island, with one species (*O. colensoi* Hook. f.) in subalpine Stewart, South and North Islands. Whether or not *O. sect. Divaricaster* is phylogenetically closest to these species, it lies within their generally outer, southern arc of distribution.

Within the South Island *O. laxiflora*, *O. fimbriata* and *O. odorata* themselves comprise a series of concentrically arranged distributions, with *O. odorata* in the centre. In the North Island, a more or less concentric series of distributions is seen in *O. solandri*, *O. virgata* subsp. *virgata* and *O. v. subsp. centralis*. Similar concentric patterns are also seen in *Lepeohebe* sect. *Flagriformes* Heads (Scrophulariaceae), and these have been attributed to evolution around shrinking inland seas during the Tertiary (Heads, 1994b).

Early South Island landscapes included periodically flooded alluvial habitats which would have been occupied by the ancestors of *O. sect. Divaricaster* and other divaricate shrubs. *O. odorata* defines three inland areas—central Otago, McKenzie country/Torlesse, and Marlborough—which comprised a series of alluvial flats and basins during the upper Cretaceous–Tertiary, but which are now crossed by block-faulted mountain ranges. In Otago, Cretaceous terrestrial breccias reach 4000 m thickness and consist of material of talus slopes, alluvial fans and lacustrine accumulations from the Haast schist (Lillie, 1980). Discussing the origin of Cretaceous coals in New Zealand, Lillie wrote: "The peats seem to have accumulated on the margins of lakes situated in wide depressions, through which rivers meandered changing their courses from time to time—laying gravels succeeded by sands and silts, to be eventually covered by peats accumulating in swamps...". Lillie pointed out that most New Zealand coals lens considerably as they have been laid in restricted alluvial basins. These small, rapidly changing alluvial basins would have facilitated speciation in the direct ancestors of *O. sect. Divaricaster*. From the Cretaceous through
the lower Tertiary, epeirogenetic subsidence brought about westward transgression by shallow seas across large parts of New Zealand. These seas reached their greatest extent in Oligocene (Landon) time, but the amount of land inferred to have been present varies considerably. Later, in the Miocene, regression of the sea from Central Otago was initiated and followed by differential movement that produced the Maniototo, Ida Valley and Manuherikia Depressions (Mutch, 1978). Crosdale (1993) discussed regression-related coal-bearing sequences in the Neogene. In Central Otago the Dunstan Formation “contains the main coal-bearing intervals and represents a broad colluvial plain prograding into a large freshwater lake… Deposition commences with braided river deposits… infilling valleys in weathered greywacke and schist. Overlying these is a series of alluvial plain…, anastomosal fluvial…, delta plain… and marginal lacustrine sediments.” In the Waiau basin, south-west South Island, a narrow geosyncline with small rocky islands developed (Wood, 1978). These beds show remarkably abrupt thinnings of sequence characteristics of several other Tertiary basins in New Zealand (Lillie, 1980).

Most species of *O. sect. Divaricaster* are found east of the Median Tectonic Zone (Bradshaw, 1993), a fundamental break in the geological structure of New Zealand. The highest number of species in a 1° latitude by 1° longitude grid cell is recorded in NW Otago (Fig. 1), in the region around Mount Aspiring and the Humboldt
Mountains. This region is the site of maximum biodiversity in several other groups (Heads, 1997) and is also of special tectonic significance as several allochthonous terranes are juxtaposed there. The nearby Oligocene beds at Bob’s Cove, north of Queenstown, are famous as they indicate that parts of the now mountainous region were once very shallow water marine embayments.

On the east coast of the South Island, the Port Hills region of Banks Peninsula is an important biogeographic boundary for several species: *O. fimbriata* (northern limit), *O. solandri* (southern limit) and *O. virgata* subsp. *virgata* (southern limit, disjunct). It is also the northern limit of *O. fragrantissima*.

**CONSERVATION**

Members of *Olearia* sect. *Divaricaster* often occur on moist, fertile, lowland alluvium. Because of this ecology the group has felt the effects of agricultural development and the evident rarity of the species has in many cases been induced. In this situation collections from the turn of the century or earlier are of special interest as they often indicate ranges of now extinct populations. The distribution maps given below show all specimens, but in several cases a species is no longer present at an early locality, for example, *O. hectorii* at the Catlins R. (cf. Petrie, AK, WELT), *O. lineata* at Green Island, Dunedin (Fulton 1880, WELT) and *O. gardneri* in Hawkes Bay (Elder, CHR).

Four of the species are threatened. *O. polita* is a very local endemic in north-west Nelson and is endangered. *O. fimbriata* is local, and threatened at several sites, *O. hectorii* was regarded as “endangered” by Rogers (1996) and with the recognition in this paper of two component species each of these is now seen to be even more threatened: *O. hectorii* s.s. has at least 2000 individuals and remains endangered, while *O. gardneri*, with fewer than 80, is critically endangered.

**ECONOMIC BOTANY**

*Olearia solandri* and *O. lineata* cultivar. *dartonii* are cultivated throughout New Zealand in shrub borders. The closely related *O. fragrantissima* deserves to be better known for the beautiful peach perfume of its flowers.

**SYSTEMATIC TREATMENT**

*Olearia* Moench 1802 (conserved against *Shawia* J.R. & G. Forst. 1776)

*Eurybia* Cass. sensu Hook. f. 1864 pro parte

*Olearia* sect. *Divaricaster* Heads, **sect. nov.**

Frutices erecti vel arbores parvae, ramificatione divaricata, foliis oppositis brachyblastis et surculis longis productis, foliis minus quam 60 mm longis, capitulis parvis solitariis vel in fasciculis nunquam in pedunculo ramoso, ramis styli flosculorum disci atropurpureis, pollinis granis echinulatis.

Erect shrubs or small trees, divaricately branched, leaves opposite, borne on
Figure 2. Olearia sect. Divaricaster: 1. leaves (juvenile (1a) and adult (1b) leaves are shown in A and B), 2. outer phyllaries, 3. inner phyllaries, 4. ray floret, 5. disc floret. A, O. solandri (R. Gardner 830, Pollen Island, AK); B, O. bullata (P. Wardle, upper Polnoon, OTA); C, O. lineata (B. Rance & K. Dickinson, Miller’s Flat, OTA); D, O. hectorii (D. petrie ex Wanaka, AK); E, O. gardneri (N. Elder, Puketitiri, CHR); F, O. polita (A.P. Druce, Glenhope, CHR); G, O. odorata (D. Scott, mid Godley V., OTA); H, O. fimbriata (type); I, O. laxiflora (B. Rance, K. Dickinson & B. Patrick, Slopedown, OTA).
brachyblasts (short shoots) sometimes forming spurs, and on long shoots which usually abort apically, leaves <60 mm long, elliptic, linear, obovate or spatulate. Capitula small, lateral on short shoots, solitary or in fascicles of 2–6, never several on a branched peduncle. Ray florets female, limb rarely divided into 2–3 teeth. Disc florets hermaphrodite, corolla lobes narrow-oblong, anther cylinder c. 1.5 × 0.3 mm, style branches dark reddish purple, especially the large papillae covering the abaxial surface of the style appendage, pollen grains echinulate rather than echinate. Achenes dorsiventrally flattened; pappus setose.

Type: Olearia virgata Hook. f.

Key to the species

1. Young stems, lower leaf midribs and phyllaries of adult plant covered with yellow or golden glandular hairs or at least a yellow varnish ........ 1. O. solandri
1. Young stems and leaf midribs without yellow hairs or varnish .................. 2
2. Leaf margins of adult leaves revolute, tomentum hairs waved or curled, loose, not appressed and not aligned ........................................................................ 3
2. Leaf margins of adult leaves plane, not revolute, tomentum hairs more or less straight, appressed and aligned .................................................................. 4
3. Leaves 5–12 mm long, rugose or bullate above, juvenile and reversion foliage spreading, leaf tomentum hairs dense, curled, phyllaries >2 mm long ..............
   ........................................................................................................... 2. O. bullata
3. Leaves (8–10) 12–30 mm long, smooth or obscurely rugose above, tomentum less dense than *O. bullata*, hairs waved but not curled, phyllaries <2 mm long
   ............................................................................................................ 3. *O. lineata*

4. Leaves broader than 10 mm, petiole 5 mm long ............................... 5
4. Leaves not usually >7 mm broad, no distinct petiole ............................ 6
5. Leaf tomentum more or less persistent, primary veins only visible, leaves usually >30 mm long, phyllaries oblong, pubescent ........................................ 4. *O. hectorii*
5. Leaves soon glabrous below, or with a few scattered hairs only, tertiary veins clearly visible, leaves usually <30 mm, phyllaries obovate, glabrous
   ............................................................................................................ 4. *O. gardneri*

6. Leaves obovate or elliptic, not broadly spatulate, stems round or 4-angled .... 7
7. Leaves linear-obovate and cuneately narrowed to base, phyllaries viscid with sessile glandular hairs only ................................................. 7. *O. odorata*
7. Leaves not linear-obovate cuneate, phyllaries either glabrous or with most hairs non-glandular .............................. 8
8. Leaves elliptic, leaf tomentum more loosely arranged, inner phyllaries up to 1.2 mm long, dark, margin entirely covered with dense hairs, surface glabrous
   ............................................................................................................ 8. *O. fimbriata*
8. Leaves narrow elliptic to obovate, leaf tomentum hairs more strictly appressed and aligned parallel, inner phyllaries at least 2 mm long, pale, marginal hairs restricted to near the apex .......................................................... 9
9. Branches silvery grey, spur shoots conspicuous, zones of short internodes present on long shoots where short shoots have become long shoots, leaf tomentum usually brownish, phyllaries >3 mm ................................. 9. *O. laxiflora*
9. Branches brown, spur shoots less conspicuous, not developing into long shoots, leaf tomentum usually white, sometimes brownish, phyllaries <3 mm .... 10
10. Ray florets (ovary base to tip of limb) <5.5 mm, shoot axes regularly aborting. South Island ................................................................. 11
10. Ray florets (ovary base to tip of limb) >6 mm, shoot axes aborting less often. North Island ................................................................. 12
11. Branches flexible, leaves rounded, many leaves borne on distal segments of branches, branches mainly erect, brownish grey, not densely leafy, capitulo 2–3 per fascicle ................................................. 10a. *O. virgata* subsp. *implicita*
11. Branches stiff, leaves elliptic, acute, leaves borne on short shoots on older branches in the middle of the plant, branches recurved and plant strongly divaricating, leaves dense, capitulo 2–6 per fascicle ................................................................. 10b. *O. virgata* subsp. *serpentina*
12. At least some leaves >9 mm, leaves pale green above, peduncles usually >3 mm long, inflorescences only sometimes covering whole branch
   ............................................................................................................ 10c. *O. virgata* subsp. *virgata*
12. Leaves <9 mm long, leaves dark green above, peduncles usually <5 mm, inflorescences covering the whole branch .... 10d. *O. virgata* subsp. *centralis*

Species treatments


*Erect shrub* or small tree 3–4 m tall, stems and lower midribs of leaves of adult plants covered with golden yellow glandular hairs and varnish, branchlets strongly tetragonous. Leaves of young plants and reversion shoots linear-spathulate up to 15 × 5 mm, leaves of adult plants (4–) 5–10 × 12 mm, linear-obovate, sweet-scented when crushed, tomentum hairs straight, aligned, appressed. **Capitula** usually solitary, peduncles 0.5 mm long. Capitula turbinate, 8–10 × 4–7 mm, strongly scented of vanilla or heliotrope; phyllaries c. 25, outer ovate, inner linear, margins hyaline bearing very short, yellow, glandular hairs; receptacle small, pitted. **Ray florets** 5–14, 5–6 mm long, limb 1 mm long. **Disc florets** 6–8, 7 mm long, corolla tube glabrous. **Achene** glabrous or very lightly pubescent, 2 mm long; pappus hairs 5–6 mm long, often with pink or brownish tinge.

**Distribution.** Figures 4, 5. North Island, northern South Island. Especially common around Auckland and Cook Strait. Cheeseman (1925) recorded the species from “North Cape”, but the northernmost collections I have seen are from Awanui (Matthews, AK) and nearby Kaingaroa (Bartlett, CHR). Salmon (1980) wrote that it occurs south to “about Westport”, but I have not seen specimens from there. Two specimens from near Christchurch deserve mention: I.H. Elder 27. xi. 1988 Banks Peninsula, Sugarloaf Reserve, 350 m “One only”, later annotated “Could be naturalised from planting on Port Hills” (CHR), and A.J. Healy 6. iv. 1966 New...
Brighton, Lower Avon River “edge of swampy land; single tree; does not appear to have been planted” (CHR). The second at least is probably natural.


The tube of the discs florets is as long as in the species of *Olearia* with large capitula. The habit is very similar to that of *Ozothamnus leptophyllus* (Inuleae) and differs mainly in the opposite leaves. Plants in exposed sites can be dwarfed and prostrate (e.g. at Red Rocks, Wellington). Juvenile and adult leaves are quite distinct (Cheeseman, 1925; Allan, 1961), although adult plants may occasionally bear leaves of ‘juvenile’ form as ‘reversion’ foliage (e.g. collections by Cheeseman and Carse at AK). The differentiation between adult leaves (narrow, with recurved margins) and juvenile and reversion foliage (much larger, spreading, margins not recurved) closely resembles that seen in *O. bullata*. Juvenile foliage of *O. solandri* also resembles seedling and adult foliage of *O. virgata*. Inland records include Druce Mataroa, forest margin, 2000’ (CHR) and several upland collections from the Tararua Range. These have greyish foliage, stems with faint yellow varnish, and leaves hardly recurved but very narrow as usual. *Healy* Sandon (CHR) has conspicuous brachyblasts, but is otherwise normal with narrow leaves with recurved margins and yellow varnish.


Selected specimens seen. NORTHERN NORTH ISLAND: J. Banks & D. Solander 23. x.–15. xi. 1769 Tolaga Bay or Mercury Bay (AK); T. Kirk Hobson’s Bay (AK); T. Kirk 17. ii. 1865 Hobson’s Glen (WELT); T. Kirk Bishop’s Creek, Ourakei (WELT); T. Kirk Remuera (WELT); T.E. Cheeseman iii. 1878 Waimate Harbour (AK); Herb. H.B. Matthews Awanui (AK); M. Ball ii. 1886 Rewiti, NW of Auckland (AKU); D. Petrie Whangarei, near sea (WELT); SOUTHERN NORTH ISLAND EXCEPT WELLINGTON: Olsen Norsewood (WELT); B.C. Aston iii. 1907 Crofton (WELT); H.H. Allan 5. i. 1925 Feilding (CHR); Zote 6. iii. 1929 swamps near Foxton (CHR); W. Oliver 29. xii. 1936 Opunaki beach (WELT); A. Healy 24. viii. 1937 Sandon block nr. Ohingaiti (WELT, CHR); WELLINGTON: S. Bengston v. 1874 Wellington (WELT); Petrie Wellington harbour (WELT); T. Kirk Newtown (WELT); T. Kirk Wellington (OTA); T. Kirk ii. 1896 Miramar (WELT); J. Hector Wellington (WELT); A. Thomas 2. iii. 1902 Hillop nr. Wellington (AKU); B. Aston Muritai (WELT); W. Oliver 26. ii. 1922 Seatoun (WELT); MARLBOROUGH SOUNDS: J. McMahon 21. x. 1891 Mt Peter (WELT); J. McMahon Motuara I., Queen Charlotte Sound, Marlborough (WELT, AK); W. Bryant i. 1896 D’Urville I. (WELT); D. Petrie 29. i. 1910 Picton Harbour (WELT, CHR); SOUTH OF WAIRAU: McMahon 21. x. 1891 Mt Peter [Seaward Kaikouras] (WELT); G. Simpson


shrub 1 (~3) m high, with many stems from base. Long shoots pale grey-brown, slender, whip-like, 5–20 cm long, internodes 2–3.5 cm long, often branching at right angles, obscurely four-ribbed, often more or less terete, brachyblasts forming spurs 2–6 mm long. leaves linear-oblong and 5–12 × 0.5–2 mm, obtuse, strongly revolute, rugose above, pubescent above only when young, glabrescent, tomentum hairs long, curled; juvenile or reversion foliage spreading, up to 17 × 4 mm. capitula solitary or in fascicles of 2–4, peduncles 1–4 mm long, pubescent. Capitula 6 × 5 mm, sweetly scented; phyllaries c. 13; receptacle small, flat. ray florets 5–7, 3–4 mm long, limb 1 mm long, disc florets 3–4, 5 mm long, corolla tube with sparse antorse and retrorse hairs, lobes villous. Achenes usually nearly glabrous, sometimes pubescent at apex, 1.5 mm long; pappus 3 mm long, colourless.

Distribution. Figure 6. South Island, New Zealand. G. Simpson Mt Duppa (CHR) clearly belongs here, but the locality is out of range for the species. Because it was
originally labelled *O. serpentina* Simpson, which has its type locality at Mt Duppa, it is assumed here that labels have been mixed. *O. bullata* appears to be absent from a region centred on Lindis Pass and at least 100 km across. This same gap is seen in the range of the otherwise widespread shrub *Leonohebe odora* (Hook. f.) Heads (Heads, 1994b), but no explanation has been given.

**Ecology.** 10 m (Shag Point)–1260 m. Lowland to montane shrubland, tussock grassland, forest margin. On river terraces, valley floors, scrub filled creek beds, moist soil in gullies, at edges of streams, seepages, lakes, tarns, swamps and bogs, and on steep shrubby banks and hillsides. *Ogle* 26. x. 1979 Upper Taieri Gorge (CHR) is annotated ‘common in every stream course, but never in dry interfluve scrub with *Discaria* and *Coprosma propinqua*’. Also on ultramafic outcrops, in grassland in burnt forest and in rough pasture on old talus. Associated with *Discaria toumatou* Raoul, *Chionochloa rubra* Zotov, *Festuca L.*, *Olearia odorata*, *Aristotelia fruticosa* Hook. f., *Dracocthyllum Labill.* and *Coprosma.*

**Flowers.** November–January.

Shoots bearing reversion foliage occasionally flower (*Simpson*, Swampy Hill, AK). In the short shoots the decussate phyllotaxis can be markedly skewed resulting in a more or less distichous, dorsiventral arrangement.

**Illustrations.** Figure 2B, Cheeseman (1914, as *O. virgata*), Wilson (1978), Eagle (1982), Wilson & Galloway (1993).

**Selected specimens seen.** CANTERBURY: *T. Kirk* Broken R. (OTA); *T.F. Cheeseman* Tasman V. (AK); *H.H. Allan* xi. 1919 Mt Peel (CHR, AK); *R.M. Laing* Mt Potts (CHR); *V. Žotov* 5. i. 37 Mt Edwards (CHR); *W. Oliver* 14. xii. 1951 Kirkliston Ra. (WELT); *D. Scott* 26. i. 1958 upper Godley V. (OTA); *H.E. Connor* 18. i. 62 Rockwood Ra. (CHR); *C. Burrows* xii. 64 Ashburton Gorge (CANU); OTAGO and SOUTHLAND: *D. Petrie* xi. 1888. Dunrobin, Heriot. (WELT); *D. Petrie* upper Waipori (WELT); *L. Cockayne* 10. xii. 1891 Catlins R. (WELT); *D. Petrie* 1. xii. 1893 Pisa Ra. (WELT); *D. Petrie* Catlins R. (WELT); *D. Petrie* Purakaunui, Waitati (WELT); *B.C. Aston* xii. 1908 Rock and Pillar (WELT); *E.M. Heine* 10. i. 1937 Garvie Mts. (WELT); *J.E. Holloway* Molke Lake (OTA); *L. Moore* 29. xii. 1939 Freestone Hill, [Mossburn-Manapouri road] (CHR), FIORDLAND: *J. Sorensen* Takahe V. (CHR); *G. Simpson* iii. 1942 Upper Freeman R. nr. Fowler pass (CHR); *E.G. Turbott* 26. viii. 1949 Takahe V. (AK); *Williams* ii. 1950 Takahe V. (WELT); *W. Oliver* 16. ii. 1952 Takahe V. (WELT); *G.T.S. Baylis* ii. 1956 Takahe V. (OTA); *J. Ward & M. Kalin* 11. i. 1967 Green Lake, Fiordland (CANU); *B. Macmillan* 14. xi. 1990 Garnock Burn and Stinking Creek, Manapouri (CHR).


**Shrub or small tree to 6 (–7) m tall, trunk 28–42 cm diameter.** Long shoots light to dark brown, slender, often pendulous, 4-ribbed sometimes obscurely, 14–40 cm long, internodes 20–30 mm long, brachyblasts forming spurs 2 mm long. **Leaves** very variable in size, narrow-linear (7–)20–40 × 0.75 (–2) mm, smooth or obscurely rugose above, pubescent above at first,omentum hairs short, hardly curled. **Capitula** in fascicles of 1–6, on densely pubescent peduncles 2–3 (–12) mm long. **Capitula**
5 × 5 mm; phyllaries c. 13, 1.5–2 mm long, upper half with very dense tomentum; receptacle hardly pitted. Ray florets 8–14, 3 mm long, limb 1 mm long. Disc florets 6–12, 4 mm long, corolla tube pubescent. Achenes almost glabrous or with few apical hairs; pappus 2–3 mm long, colourless.

Distribution. Figure 7. South Island, New Zealand. Several difficult east Fiordland populations previously identified as *O. lineata* are treated here as *O. bullata*. Apart from a puzzling *H.H. Allan* collection referred to below, the only record of *O. lineata* from Fiordland is from the Cascade Valley (Wilson, 1991) (mapped in Fig. 10), but I have not seen specimens. Similarly, no specimens are known to support Cheeseman’s (1925) record of the species in south Westland. On Stewart Island the species is known only from Rakeahua and Freshwater Valleys (Wilson, 1982).

*H.H. Allan* xii. 1936 ex W. Thomson’s garden from ‘Fiord’ (CHR) is problematic. One piece is good *O. lineata*, but two pieces have the leaf margins inrolled as in *O. lineata*, but leaves to 3 mm wide and alternately arranged. These might be hybrids with *O. fragrantissima*.

Ecology. 20 m (Stewart I., Catlins) to 750 m. Lowland to montane shrubland, tussock grassland, forest margin. Forming woodland at Murdering Beach and to a lesser extent at Roxburgh. Wet valley floor alluvium on river banks, alluvial river terraces, fans and flats, in low forest with clearings, on steep terrace scarp s and rock bluffs. In successional shrubland, on gold tailings and in denuded tussock pasture. Associated with *Hymenanthera alpina* (Kirk) W.R.B. Oliver, *Discaria tomentosa*, *Festuca*, *Chionochloa rubra*, *Poa laevis* Hook. f.

Wilson & Garnock-Jones (1992) distinguished *O. bullata*, with “leaves 8–12 mm long”, from *O. lineata*, “leaves 20–40 mm long” (cf. Allan, 1961). This will separate most specimens, but some forms of *O. lineata*, including the type, have short leaves only 8–9 mm long (cf. Kirk, 1899). The hair types and flowers of the two species appear to be quite different.


Selected specimens seen. STEWART ISLAND: H. Wilson xii. 1978 Rakeahua V. (CHR); H. Wilson 25. ii. 1978 Rakeahua V. (CHR). SOUTH ISLAND: J. Buchanan L. Ohou [=L. Ohau] (WELT); J. Buchanan Oamarama to Wanaka (WELT); I.L. Fulton 1880 Green Island (WELT); T. Kirk 18. xii. 1883 Winton (WELT); T.F. Cheeseman Burkes Pass (WELT); D. Petrie xi. 1885 Roxburgh (WELT); D. Petrie Taiker’s [spelling?] Diggings Otago (WELT); D. Petrie xi. 1888 Heriot (WELT); D. Petrie xi. 1888 Kelso (WELT); D. Petrie Speargrass Flat, nr. Alexandra south (AK). Anon. Bluff (WELT); D. Petrie xi. 1891 Heriot (CHR); H.J. Matthews interior of Otago (AK); C. Traill Ruapake (WELT); E.P. Turner Catlins R. (AK); B.C. Astorn Otago (AK); T.F. Cheeseman L. Tekapo (AK); L. Cockayne 1. xii. 1905 Rock and Pillar (WELT); L. Cockayne 3. xii. 1919 Lowburn ferry (AK); W. Mackay 6. i. 24 Between L, Brunner and L. Haupiri (CHR); A. Wall xi. 1925 Cromwell (CHR); G. Simpson mouth of Milton [= Tokomairiro?] (CHR); J. Holloway Cromwell (OTA); G. Simpson Makarora (CHR).

3a. *Olearia lineata* cultivar. *dartonii* Hort. Metcalf (1972) suggested that because of the name this “was presumably cultivated in the garden of Messrs. Darton and Hart at Weatherstones, Otago . . . It is a very rapid growing plant, sometimes making 3 feet or so of growth per year in its younger state. It is excellent in windy places . . .”. Metcalf cited the name *O. dartonii* Hort. ex Duncan & Davies Nursery Catalogue c. 1935: 21.

Specimens seen. W. Oliver 5. ix. 1948 McKay’s garden, Greymouth (WELT); P. Johnson 31. x. 1989 Portobello Rd. (CHR).


Deciduous shrub or tree 5 (~9.5) m tall, sometimes flowering while still without leaves, multi-leadered or single stemmed, trunks often consisting of loosely coalesced stems, bark thick, grey, cory, with deep, longitudinal furrows. Long shoots 10 (~50) cm–2 m long, flattened and almost 2-winged when young rather than tetragonal, becoming terete, with numerous grooves, pale grey–dark red-brown, more or less orthotropic, semi-lianoid (orthotropic–plagiotropic–orthotropic) in forest understoreys, brachyblasts forming well-developed spurs to 15 × 3 mm, sometimes reverting to long shoots. LEAVES (20–) 30 (~60) × 9 (~30) mm, pale green, elliptic (~slightly obovate), sometimes almost rhomloid, membranous, tomentose above when young, tomentum below pale silver-grey, sometimes glabrescent, petiole 5–7 mm long; juvenile leaves toothed. CAPITULA in fascicles of 2–6 on short shoots below leaves, peduncle 5–15 mm, shortly pubescent with a pair of bracts. Capitula 6 × 5 mm; phyllaries c. 17, outer phyllaries lightly tomentose all over, 1.6 × 1 mm,
inner phyllaries fewer, narrower linear-oblong 1 × 0.6 mm, hairs present at least at tip and on midrib, spheroidal glands 2 μm also present; receptacle deeply pitted. Ray florets dirty yellow, 2–17, 4 mm long, limb 1 mm long. Disc florets 8, 4.5 mm long, broader than ray florets. Achenes 1–2 mm long, glabrous or with silky hairs; pappus 2–3 mm long, colourless.

**Distribution.** Figure 8. South Island: Nelson, Marlborough, Otago, Southland.


**Flowers.** November–January. Flowers may appear in spring before the new leaves appear.

Stearn (1992: 288) discussed the endings of species epithets and wrote: “If a personal name is already Latin or Greek, the appropriate Latin genitive should be used, e.g. . . . *hectoris* from Hector”. Mueller (1865–6) and Huxley (1992) used *Olearia*
hectoris, Celmisia hectoris etc.; at least nine combinations with the epithet ‘hectori’ have been made for New Zealand flowering plants alone. In the interests of stability it seems best to keep the original spelling (corrected, in accordance with the current Code, to end in –ii).

Rogers (1996) gave detailed information on the ecology and conservation status of this endangered species. Shoots are notably more orthotropic than in O. odorata. In the Matukituki Valley and Southland it forms a small tree, elsewhere a stout shrub. A large tree can be seen in the Christchurch Botanical Gardens.


Specimens seen. NELSON and MARLBOROUGH: T. Kirk 22. xi. 1886 Pelorus Sound (WELT); J. Butland Pelorus Sd. (WELT); L. Cockayne Canvastown, Pelorus (WELT); J. McMahon Pelorus V. (AK); A. Wall 1922 Pelorus R. (CHR); G. Sainsbury xii. 1922 Mangles River Nelson (CHR); A.W. Wastney i. 1937 Marlborough (CANU, AKU); R. Coker 10. i. 1967 Conway R. (OTA); A.P. Druce xii. 1981 Wharf Strm., Chalk Ra. (CHR); D. Obendorf & B. Molloy 12. ix. 1981 Chalk Ra. (CHR); H. Cochrane 23. xi. 1993 Isolated Hill Scenic Reserve (CANU); OTAGO and SOUTHLAND: J. Buchanan Wyndham, Otago (WELT); Herb. T. Kirk Wyndham (AK); D. Petrie xii. 1880 Matukituki V., about S Mt Aspiring (AK, WELT); D. Petrie Matukituki flats (WELT); D. Petrie Catlins R. (AK, WELT); L. Cockayne Invercargill (WELT); H.H. Allan xi. 1936 Rahanui [=Ratanui] Clutha Co. (CHR); P. Wardle i. 1953 Lake Dispute, W Queenstown (OTA); O. Sansom xi. 1953 Matukituki R. (CHR); V. Životov 8. iii. 1962 Niger Ck., Matukituki V. (CHR); Halder 25. x. 1963 Myross Bush (CHR); B. Molloy 14. x. 1975 Matukituki (CHR); P. Johnson 13. xii. 1984 Roaring Meg (CHR); B. Rance 9. xi. 1986 Eyre Ck (OTA); K. Dickinson 21. iii. 1986 McKay Ck., Pomahaka V. (OTA); B. Nash 29. ii. 1989 Hokonui Scenic Reserve (CHR); A.P. Druce iii. 1991 foot of Mt Alta (CHR); A.P. Druce iii. 1991 Lake Dispute (CHR); G. Rogers 29. xi. 1992 Swales Bush Scenic Reserve, Hokonui Hills (CHR); A.P. Druce x. 1992 Piano Flat (CHR); G. Rogers 18. viii. 1993 Hokonui Hills (CHR); G. Rogers 19. i. 1994 S. Hokonui Hills 46°8′ 168°34′ (CHR); G. Rogers 14. iii. 1994 Matukituki west (CHR).

6. Olearia gardneri Heads sp. nov.

Ab O. hectore phylariis glabris latis obovatis et foliis minoribus glabris, ab O. polita foliis deciduis membranaceis glabris differt.

Holotype. R.O. Gardner 2597, 5. xii. 1979 Mataroa (AK 152293).

Deciduous shrub or small tree to 3 m tall, trunk 15 cm diameter, long shoots whip-like, initially orthotropic, 20–50 cm long, internodes 20–40 mm long, stems dark reddish brown, flattened with 2 flanges, older axes becoming plagiotropic, often arching and rooting, brachylasts usually small and inconspicuous to 2 (–5) mm long, sometimes reverting to long shoots. Leaves light green, spatulate, petiole 5–10 mm long, lamina broadly ovate–elliptic, 10 (–35) × 7 (–17) mm, lamina more or less glabrous below with a few scattered long and silky hairs but no tomentum, apex obtuse, apiculate; juvenile/reversion or shade foliage leaves smaller, rounder,
blade 12 × 12 mm, glabrous, spatulate, often truncate basally, apiculate and with one small marginal tooth like the apiculus but smaller. **Capitula** in fascicles of 1–6 laterally on brachyblasts, peduncles 6 (–10) mm long, flattened, bearing very sparse, antrorse hairs. Capitula 5 × 4 mm; phyllaries c. 16, glabrous, membranous, purple-tinged, obovate, acute; receptacle deeply pitted. **Ray florets** white, c. 9, 5 mm long, limb 1 mm long. **Disc florets** c. 10, 6 mm long, lower half of corolla tube with very short, rather glandular hairs. **Achene** 1.5 mm long, with pubescence of short, patent or slightly antrorse hairs; pappus 2 mm long, colourless.

**Etymology.** Named in honour of Dr R.O. Gardner, for his contributions to New Zealand and Pacific botany.

**Distribution.** Figure 9. North Island, New Zealand. Recorded from three regions only: Taihape, eastern Wairarapa and Hawkes Bay at Puketitiri (Ball’s Clearing and Hutchinson’s Bush), below the Kaweka Range. The Puketitiri population has been destroyed by fire (P. de Lange, pers. comm. Sept. 1996).

**Ecology.** 100–600 m. Lowland to montane forest, open forest and forest margins. High fertility alluvial river flats and terraces, limestone, swampy gullies, steep hillside, often in pools of water around old ox bows in heavy shade in forest. Associated with *Punoniopsis taxifolia*, *Dacrycarpus dacrydioides*, *Coprosma rotundifolia* A. Cunn., *C. propinqua*, *C. parviflora* Hook. f., *Fuchsia persicifolia* Cockayne & Allan and *Juncus gregiorus* L. Johnson.

**Flowers.** November–December. Flowers appear either coincident with or after the new leaves.
This species was first collected by Zotov and Druce in 1947 and was soon recognized as distinct by Elder (1950). He wrote that Hutchinson's Bush “contains a vigorous colony of an undescribed species of Olearia, which was at first reported to have been wiped out by the fire. Seed and some cuttings have been sent to Mr Brockie to establish it at Otari”, and a large plant can be seen at Otari Gardens today. Salmon (1980) and Rogers (1996) did not recognize O. gardneri as distinct from O. hectorii, while Eagle (1982) and Druce & Williams (1989) treated it informally as a variety of that species. O. hectorii differs through its tomentose, linear phyllaries and leaves which are larger, grey-green and tomentose below. O. hectorii also differs through its yellowish ray florets, larger overall size, paler branchlets, less plagiotropy in older shoots, and absence of both reversion shoots and layering. O. gardneri is closer to O. polita through its glabrous, broad obovate phyllaries, 2-angled stems and juvenile leaves with apiculate teeth but differs through its deciduous habit. Its growth rate appears to be less than that of O. hectorii and it grows on seasonally more waterlogged sites (Rogers, 1996). The layering growth habit is unknown elsewhere in O. sect. Divaricaster.

**Illustration.** Figures 2E, 10.

**Specimens seen.** EASTERN WAIRARAPA: V. Zotov 26. ii. 1947 Kourarau V. (CHR); A.P. Druce ii. 1947 Kouraurau V. (CHR); A.P. Druce 26. v. 1958 Gladstone (CHR); L. Moore 29. xi. 1958 Koromiko Station, Kourarau (CHR); A.P. Druce i. 1966 Kourarau V. (CHR); A.P. Druce vi. 1966 Wainuioru V., Gladstone (CHR); A.P. Druce 3. xi. 1966 Kourarau V. (CHR); W.D. Burke 3. xi. 66 Kourarau V. (WELTU); A.P. Druce vii. 1976 Kourarau V. Maungaraki Ra. (CHR); P. de Lange 6. v. 1993 Admiral’s Rd. (CHR); P. de Lange 2071, 6. v. 1993 Maungaraki Ra. (WELT); P. de Lange 2. viii. 1994 Admiral Rd., Wainuioru V. (AK); P.J. de Lange 3127 & A. Townsend 18. x. 96 Tinui, Springhill Station (AK). TAIHAPE: A.P. Druce x. 1972 Taihape Domain (CHR); A.P. Druce i. 1973 Taihape Domain (CHR); A.P. Druce i. 1977 Hautapu R., Taihape (CHR); A.P. Druce xii. 1977 Hautapu R. (CHR); A.P. Druce x. 1978 Oraukura Strm. (CHR); A.P. Druce ii. 1979 Mataroa (CHR); B.V. Sneddon 3. xi. 1979 1 m NW Taihape (WELTU); A.P. Druce xi. 1988 Mataroa (CHR); C. Ogle 6. iii. 1991 Mataroa (CHR); C. Ogle 16. i. 1992 Ngaurukehu Sci. Res., Hautapu R. (CHR); P. de Lange 22. i. 1992 Mataroa (AK, CHR); P. de Lange 9. x. 1992 Paengaroa Scenic Reserve, Mataroa (AK, CHR); HAWKES BAY: N. Elder i. 1958, Hutchinson Domain, Puketitiri (CHR); N. Elder Ball’s Clearing (CHR).


Evergreen shrub 4 (–6) m tall, either multi-leadered or with a single trunk, stems up to 10 (–20) cm diameter, bark pale brown, branches divaricating, decussately 2-angled or 2-winged, internodes 1 (–3) cm long. Leaves 4–12 × 3–6 mm, petiole 0.5–4 mm long, lamina elliptic to suborbiculate or broadly obovate to broadly spatulate, upper surface bright glossy green, slightly convex, margins red, obtuse, narrowed abruptly at the base to petiole; juvenile leaves with 1–2 small marginal teeth like the apiculus. Capitula solitary or in fascicles of 2–5, peduncle 1–2 mm long. Capitula 6–7 mm long; phyllaries 7–8, 2 mm long, glabrous except for a few marginal hairs; receptacle not pitted. Ray florets 2–3, 4 mm long, limb 0.5 mm long. Disc florets 1–2, 5 mm long. Achenes 1.5–2 mm long, bearing a few apical hairs; pappus 2.5–3 mm long, colourless.
Figure 10. Type specimen of *Olearia gardneri* Heads sp. nov.
Distribution. Figure 8. South Island: Nelson. Currently known with about 400 plants in the Hope Valley. The Cheeseman collection from 'Wangapeka', the only one not from the Hope Valley, probably came from the lower Wangapeka valley which by now has been largely cleared for farming (S. Courtney pers. comm. 1997).

Ecology. 400–500 m. On poorly drained alluvial and toe-slope sites under open Nothofagus menziesii forest remnants subject to periodic slumping and flooding, a few plants in open pasture.


Illustrations. Figure 2F. Eagle (1982 as Olearia sp. ‘a’), Wilson & Garnock-Jones (1992), Wilson & Galloway (1993).

Specimens seen. T.F. Cheeseman i. 1882 Wangapeka (AK, WELT); A.P. Druce xi. 1975 Glenhope (CHR); G. Park 5. vii. 1976 Glenhope (CHR); A.P. Druce xi. 1976 Glenhope (CHR).

7. Olearia odorata Petrie 1891 [‘1890’]: 399. Holotype: D. Petrie Maniototo plain (WELT). Deciduous shrub 2–4 m tall, branches strongly divaricating, often curving from vertical to plaitotrop to distally geotropic by primary growth. Long shoots stout, terete with numerous grooves, (5–) 20 (~30) cm long, internodes 15–30 mm, brachyblasts conspicuous, up to 8 mm long. Leaves up to 22 × 6 mm, subsessile, narrow to linear-obovate, cuneate to base, apex obtuse, tomentum of long, soft, undulating, white, cottony hairs not strictly appressed. Capitula in fascicles of 2–5, peduncles 1–2 mm long, pubescent. Capitula 5 × 2–3 mm, sweetly scented; phyllaries c. 16, 2 mm long, often dark brown, stiff, viscid, with multicellular, uniseriate, capitake glandular hairs only, without non-glandular hairs; receptacle slightly pitted. Ray florets 6–18, 4 mm long, limb 1 mm long, more or less streaked with purple. Disc florets 14–22, 4 mm long, corolla of disc florets glandular viscid-puberulous. Achenes 2 mm long, with silky, antrorse hairs, some glandular; pappus 2–3 mm long, colourless.

Distribution. Figure 11. South Island. Recorded in the Clutha Valley north of Moa Flat (near Miller’s Flat) by Petrie (1891).


Flowers. Late January–March (later than O. bullata and O. lineata; Petrie, 1891).

Axes are notably more plagiotropic than those of O. hectorii and O. virgata. Leaves are thinner with more veins visible than in O. virgata, and the tomentum hairs are longer, wavier and less strictly appressed than in that species. Leaf width is similar to that of O. virgata but leaves are 2.5 times as long. Populations of O. odorata, if not its overall range, may be expanding in some secondary communities. However,
entomologists know the plant well as it is rich in insects (Patrick, 1994) and Mr B. Patrick (pers. comm. June 1996) has described its overall decline.

Illustrations. Figure 2G. Salmon (1991). Eagle (1982) illustrated plants from Harewood, Christchurch, but the only Harewood specimens I have seen (B. Molloy, CHR) are O. virgata (probably subsp. virgata).

Selected specimens seen. OTAGO: D. Petrie ii. 1892 Sow Burn (WELT); D. Petrie ii. 1893, nr. Alexandra (WELT); D. Petrie xi. 1893 Speargrass Flat, nr. Alexandra (WELT); D. Petrie xii. 1893 Lowburn (WELT); D. Petrie N. Roxburgh (WELT); D. Petrie Cromwell (WELT); D. Petrie nr. St Bathans (WELT); D. Petrie 9. ii. 1911 L. Tekapo (WELT); B. Aston Gimmerburn (WELT); L. Cockayne 28. ii. 1919 Lindis V. (WELT); CANTERBURY: W. Martin i. 1920 Old riverbed of R. Waimakariri (WELT); A. Wall iv. 1920 Macauley R. (CHR); R.M. Laing i. 1923 Stony Ck., E side head L. Pukaki (CHR); H.H. Allan 6. i. 1928 Ohau R. bridge (CHR); H.H. Allan 26. i. 1935 Mistake Hill, L. Tekapo (CHR); Barker 2. i. 1938 Mt Cook Station (CHR); L. Moore 23. xii. 1939 Burkes Pass (CHR); H.H. Allan 19. iv. 1943 L. Alexandrina (CHR); H. Talbot xii. 1945 Tasman V. (CHR); MARLBOROUGH: J. McMahon Pine V., Wairau (WELT); B. Aston xii. 1915 Dee V., Clarence basin (WELT); B. Aston ii. 1916 Awatere nr. Upcot (WELT); D. Petrie ii. 1922 Molesworth, Upcot (WELT); H.H. Allan Elephant’s Head, Molesworth (CHR); W. Oliver 31. i. 1951 Branch R. (WELT); M.J.A. Simpson 24. xi. 1952 Saxton R. [Molesworth] (CHR); M.J.A. Simpson iii. 1955 Willow Strm. [Molesworth] (CHR).
8. *Olearia fimbriata* Heads **sp. nov.**

Ab *O. odorata* foliis ellipticis, foliorum pilis minus appressis, phyllariis parvioribus glabis praeter margines dense ciliatos, involucris et acheniis parvioribus differt.

*Holotype.* K. Dickinson & B.D. Rance 29. i. 86 Devil’s Gorge, Pomahaka River (OTA 43292). OTA 43293, 43295, 43296 are possibly isotypes.

Semi-deciduous shrub or small tree 5 (–8) m tall, multistemmed or with a single trunk up to 50 cm diameter, long shoots pale grey or brown, 5–30 cm, 4-angled, sometimes obscurely, brachyblasts 7 mm long, 2 mm broad. **Leaves** (10–) 13 (–17) × 4–6 mm, elliptic, sometimes slightly obovate, obtuse (–acute), tomentum hairs loose, cottony, dull, not shining. **Capitula** in fascicles of 1–5, sessile or peduncle 1 mm long, lateral on short shoots. **Capitula** 4 × 4 mm; phyllaries congested around inflorescence until late in fruit, c. 16, in 3 series, obtuse–acute, all similar, 1–1.5 mm long, dark, margins covered with dense white tinsel-like hairs, surface more or less glabrous; receptacle hardly pitted. **Ray florets** 3 mm long, limb 0.5 mm long. **Disc florets** 3 mm long, corolla lobes 0.5–0.75 mm long, tube 2 mm long, pubescent only in a ring just below throat with stiff antrorse hairs and a few hairs on corolla lobes, style branches purple. **Achenes** 1–1.5 mm long, clad in very short, sparse, stiff antrorse hairs 12 μm long; pappus hairs 2 mm long, colourless.

*Etymology.* Named for the distinct ciliate fringe on the phyllary margins.

*Distribution.* South Island: Southland, Otago, Canterbury. Figure 12.

*Ecology.* 180 m (Banks Peninsula) –600 m. Lowland to montane shrubland, alluvial flats, broken rock outcrops. Sometimes gregarious in dense monospecific woodland.
stands of apparently even-aged trees e.g. in Jordan Creek and Taieri Gorge, but populations often local and relictual; Wilson, Banks Peninsula (CHR) is annotated “the only plant of this species I know of on the whole of Banks Peninsula”, and the plant on Otago Peninsula, if it still survives, is probably the only one there. Associated species not known.

**Flowers.** January–February.

The species was first collected as *P. Wardle* 13. ii. 1951 Bush Gully, Lake Hawea (CHR, OTA) but was usually identified as *O. odorata* until 1986 when it was first recognized as distinct by Mr B. Patrick in the Pomahaka Valley. It was cited as *Olearia ‘poma’* by Dawson (1989). The leaf tomentum hairs of *O. fimbriata* are not aligned as they are in *O. odorata*. The pappus is shorter than the corolla, and the corolla is hairy below the throat, while in *O. odorata* the pappus is as long as the corolla and the corolla has only short, sparse glandular hairs. The phyllaries of the two species are quite distinct, *O. fimbriata* lacking the conspicuous glandular hairs of *O. odorata*. *O. fimbriata* also has smaller involucres, shorter achenes and shorter limbs on the ray florets.


**Specimens seen.** *P. Wardle* 13. ii. 1951 Bush Gully, Lake Hawea (CHR, OTA); C.J. Burrows i. 1954 Tasman Glacier (CANU); G. Simpson 6. i. 1957 Matukituki R. bridge (CHR); C.J. Burrows i. 1959 lower Broken R. (CANU); B. Macmillan 9. i. 1960 Mt Cook Station (CHR); H. Wilson 5. xi. 1969 foot of Mt Cook Ra., Blue Lakes Flat (CHR); H. Wilson 27. ii. 1970 Silver Stream, Tasman V. (CHR); H. Wilson 18. iii. 1971 Mt Wakefield (CHR); Y. Elder 16. ii. 76 1 km S of Pomahaka Bridge (CHR); P. Johnson 12. ii. 1982 Harbour Cone (CHR); B. Patrick 5. xi. 1984 Harbour Cone (OTA); H.D. Wilson 14. ii. 1985 Scrubly Bay Valley nr. Menzies’ Bay, Banks Peninsula (CHR); K. Dickinson 2. ii. 1986 Devil’s Gorge, Pomahaka (CHR, OTA); K. Dickinson 9. iii. 1986 Jordan Creek, Umbrella Mts. (CHR); B. Rance 9. iii. 1986 Jordan Creek (OTA); K. Dickinson 14. iii. 1986 Dusky Hill (CHR); K. Dickinson 16. xi. 1986 Nokomai Valley (CHR, OTA); T. Galloway 6. xii. 1986 Clyde V. nr. Jumped Up Downs (CHR); A.P. Druce ii. 1991 Havelock V. Two Thumb Ra. (CHR); B. Patrick 13. v. 1992 Barewood Creek, upper Taiieri Gorge (CHR); A.P. Druce x. 1992 Waikaia V. (CHR); B. Rance 21. i. 1994 Pomahaka V. (CHR).


Much branched, evergreen shrub 1–5 m tall, occasionally prostrate, branches slender or stout, stiff, divaricating, sometimes curving geotropically, dark pale grey, sometimes brownish, smooth, young branchlets pubescent, terete or obscurely tetragonous, internodes up to 5 cm; brachyblasts conspicuous, up to 10 mm long, leaves 9 (–14) × 2 (–3) mm, slightly obovate, often more or less acute, coriaceous, dull dark olive green above, with cream or usually rustly tomentum below, long and narrow. Capitula solitary or in fascicles of 2–3, peduncles 7–15 mm long, pubescent, sometimes bearing 2 opposite bracts. Capitula strongly and sweetly scented, 6 × 4 mm;
Figure 13. Type specimen of *Olearia fimbriata* Heads sp. nov.
Figure 14. Distribution of *Olearia laxiflora*.

phyllaries c. 14, with a few long rusty, crisped hairs distally, small glandular hairs basally, scattered hairs on margin, outer phyllaries short, broad, inner ones linear-oblong, 3 (4) mm long; receptacle pitted. **RAY FLORETS** 3–6, 4–5 mm long. **DISC FLORETS** 3–6, 5–6 mm long, corolla tube with silky antrorse hairs in lower half, a few hairs on corolla lobes. **ACHENES** 2.5 mm long, glabrous except at apex, few, silky, antrorse hairs 20–30 µm long; pappus hairs 3–5 mm long, colourless.

**Distribution.** Figure 14. South Island. The northern limits of this species are unclear. A.P. Druce xi. 1978 SSW Springs Junction (CHR) (leaves 12 × 2 mm) seems to be this species but is sterile. (B. Molloy 8. i. 1976 Springs Junction (CHR) from nearby is typical *O. virgata subsp. implicita*). D. Norton Cypress Strm., Ngakawau (CANU) is probably *O. laxiflora* but is also sterile.

**Ecology.** 5 m (Catlins) – 680 m (Ajax Swamp). Lowland to subalpine shrubland, rushland, forest margins, low forest with grassy clearings, tussock grassland. Estuaries, wet flushes, swamps, bogs, sometimes dominant in scrub on swampy ground, wet alluvium on valley floor, river terraces, poorly drained fan surfaces, swampy places between open fertile bog and beech forest, moist flats, edge of bog against forest edge in old dune depression. Associated with *Leptospermum*, *Coprosma parviflora*, *C. propinqua*, *C. tenuicaulis* Hook. f., *Phormium* J.R. & G. Forst., *Sphagnum* L.

**Flowers.** November–February.

This species was related to *O. odorata* by Kirk (1899), but is distinguished by fewer florets and non-viscid phyllaries. It is probably closer to *O. virgata*, as indicated by
Allan’s (1961) treatment, and is distinguished from that species through its more robust, strongly divaricating habit, pale bark, rusty tomentum, and larger phyllaries. The type and all other flowering collections have phyllaries up to 4 mm long, in contrast with the subspecies of *O. virgata* in which phyllaries are less than 3 mm long. *O. laxiflora*, *O. odorata* and *O. virgata* are all more or less vicariant biogeographically.

*H. Wilson* Big Hellfire (CHR), has very narrow leaves, 15×1.5 mm and slightly revolute, suggesting *O. laxiflora* × *O. lineata*. G.A.M. Scott 12. ii. 1969 Cascade Cove, Dusky Sound (OTA) has spathulate leaves 12×5 mm, including a winged petiole 4 mm. This is rather similar to *H. Wilson* Heron R. (CHR) which has spathulate leaves with a petiole 7 mm, blade 10×6, 8×7 and more or less orbicular. These may represent juvenile or reversion leaves.

**Illustrations.** Figure 2L Wilson (1982), Eagle (1982, could be *O. virgata* subsp. implicita), Wilson & Galloway (1993, as *O. virgata* var. implicita).

Selected specimens seen. STEWART ISLAND: T. Kirk 29. ii. 1887 Rakiahua (WELT); T. Kirk south arm, Patterson’s Inlet (WELT); L. Cockayne i. 1907 Table Hill (WELT); L. Cockayne i. 1907 Table Hill (WELT); L. Cockayne 1907 Golden Bay (WELT); G. Simpson iii. 1941 Table Hill (CHR); D. Leask xi. 1960 Mason Plain (WELT); R. Melville 14. ii. 1962 Table Hill (CHR); OTAGO–SOUTHLAND: D. Petrie Catlins R. (WELT); D. Petrie xii. 1891 Catlins (WELT); D. Petrie Matukituki V. (WELT); L. Cockayne nr. Wilmot Saddle (WELT); W.A. Thomson 1925 Doubtful Sound track (CHR); W.A. Thomson L. Hauroko (CHR); W. Morrison Doubtful Sound (WELT); W. Oliver 5. iii. 1927 Wilmot Pass (WELT); E.P. Turner McLennan R. (AK); L.M. Cranwell & L.B. Moore 30. xii. 1939 Wilmot Pass (CHR); WESTLAND–NELSON: R.M. Laing i. 1921 L. Mahinapua (CHR); W. Mackay xii. 1926 NoTown road (CHR); Dr Mackay xi. 1926 Greymouth (CHR); H.H. Allan 16. i. 1927 Notown (CHR); W. Oliver 28. i. 1950 Parina R. (WELT); W. Oliver 27. i. 1951 Waiho V. (WELT); P. Wandle 14. x. 1965 Meyer Swamp nr. Fox. (CHR); P. Wandle 2. ii. 1973 west of L. Mapourika (CHR).


Evergreen shrubs or small trees, stems tetragonous. Leaves ovate, tomentum of short, aligned hairs. capitula usually with fewer than 10 florets; phyllaries lightly pubescent. disc florets 4–5 mm long; pappus 2.5–3 mm long, colourless.

**Distribution.** Figures 15, 16. Northern South Islands, southern North Island. Buchanan & Kirk’s (1869) records of *O. virgata* and *O. solandri* from North Cape and of *O. virgata* from Whangarei, Wangaroa, Mt Camel and Kaitaia, all in Northland, are difficult to understand. They are not accepted here largely because in Kirk’s (1899) flora *O. virgata* is recorded only from East Cape and Hawkes Bay southwards. This East Cape record is also a mystery (*O. virgata* does not appear in Kirk’s (1896) account of East Cape plants).

The species is interpreted here with four geographic subspecies. Leaf tomentum and capitula are similar, and most differences among the subspecies lie in vegetative architecture and leaf morphology.

Figure 15. Distribution of *Olearia virgata* subsp. implicita (○) and *O. virgata* subsp. *serpentina* (●). Harewood population of *Olearia virgata* subsp. *virgata* *.*

*implicita* G. Simpson 1945: 199. Lectotype, selected here: G. Simpson xii. 1943 Maruia R. (CHR 64331A); isotypes at AK.

Shrub to 2 (−6) m tall, branches slender, pale brown, laxly diverging, more or less 4-angled. Leaves 5–8 × 2 (−3) mm elliptic to slightly obovate. Capitula solitary or in fascicles of 2–3, peduncles <1 mm long. Capitula glabrate, ‘fragrant with a slight heliotrope note’; phyllaries c. 12, 2–2.5 mm long; receptacle slightly pitted. Ray florets 4, limb 1 mm long. Disc florets 2. Achenes glabrous or with a few antrorse hairs; pappus hairs 2.5 mm long.

**Distribution.** Figure 15. Northern South Island. Recorded and illustrated from the Port Hills by Salmon (1991), but I have not seen specimens from there.

**Ecology.** 420–1260 m. Tussock grassland, open shrubland and forest margin, seepages, boggy ground, open river flats.

**Flowers.** December–February.

The type has large leaves and phyllaries lightly pubescent. The distribution of this subspecies overlaps slightly with that of *O. laxiflora* but it is distinct through its thinner branches which are brown rather than silvery grey, shorter internodes, smaller leaves, leaf tomentum not ferruginous, and smaller phyllaries. Phyllaries are usually virtually glabrous apart from a small apical tuft of cilia. This subspecies seems morphologically intermediate between subsp. *centralis* and subsp. *serpentina.*
Illustrations. Figure 3A.

Selected specimens seen. Herb. T. Kirk Nelson (AK, WELT); T.F. Cheeseman i. 1881 L. Rotoiti (AK); W. Mackay 6. i. 1924 betw. L. Brunner and L. Haupiri (CHR); R.M. Laing V. (CHR); W. Brockie i. 1946 Doubtful R., W Amuri flats (CHR); H. Talbot Jan. 1946 Doubtful R., Amuri Pass (CHR); H. Talbot i. 1946 Lewis R. (CHR); R. Mason 26. ii. 1946 Cobb V. (CHR); W. Oliver 13. xii. 1950 Tophouse (WELT); T. Mellor 2. ii. 1953 L. Rotoiti (WELT); A.E. Esler i. 1957 Cobb V. (AK); L.B. Moore 3. i. 1958 Lewis Pass road (CHR); R. Melville 14. i. 1962 Cobb R., foot Mt Peel (CHR); C.J. Burrows Apr. 1962 Hurunui R., above L. Sumner (CANU); H. Talbot xii. 1962 Gouland Downs (CHR); H. Talbot 17. xii. 1965 and i. 1962 Cobb V. (CHR); P. Wardle 12. i. 1969 Oxnams’s Plain, S Tutaki, nr. Murchison (CHR); P. Hynes 30. i. 1965 Maruia R., W of Lewis Pass (AK); M.A. & I.M. Ritchie iv. 1967 Cobb V. (CHR); P. Johnson 25. xi. 1967 Maruia V. above Springs Junction (OTA); M.J.A. Simpson 1. iii. 1969 Canaan (CHR); P. Wardle 2. xii. 1969 Rotomanu nr. Crooked R. (CHR); M.J.A. Simpson 22. i. 1973 Big R., Gouland Downs (CHR); B Macmillan 29. i. 1973 2 m W L. Sumner (CHR).

10b. Olearia virgata. subsp. serpentina (G. Simpson) Heads, stat. nov.


shrub to 3 (±4) m tall, long shoots 5–20 cm long, internodes 10 mm long, tetragonous, grey-brown. leaves usually very small, 2 (±10) × 1 (±3) mm, regularly spaced, with conspicuous red margin, obscurely mucronate, somewhat coriaceous, dark green above, tomentum with a silver sheen. capitula in fascicles of 1–3 (6), peduncle 1 mm long. Capitula 5 × 4 mm; phyllaries c. 13, 2 mm long. ray florets 2–5. disc florets 2–3. achenes minutely pilose at tip; pappus 2.5 mm long.

Distribution. Figure 15. Nelson, South Island.

Ecology. 250–900 m. Lowland to subalpine shrubland. Forest openings and margins, low myrtaceous forest, streambanks in forest, river terraces, regrowth after burning. This subspecies distinguishes the “magnesian soil shrubland” community of Cockayne (1958) and is “absolutely confined to serpentine” according to Cockayne (1967). Eagle (1982) described it as usually in the Mineral Belt but also on alluvial flats, where it follows the ultramafic outwash. Associated with Phyllocladus L.C. & A. Rich., Leptospermum scoparium, Metrosideros Gaertn., Nothofagus solandri var. cliffortioides (Hook. f.) Poole.


In its extreme, small-leaved form on serpentine this is stunted and procumbent and very distinct, but forms with larger leaves up to 10 × 3 mm, such as collections from the Maitai Valley, as well as the type, appear to grade into subsp. implicita and possibly subsp. centralis. Leaves are more coriaceous and darker green than in subsp. virgata, while the leaf tomentum is similar to that of subsp. virgata but has a more distinctly silver sheen.

Illustrations. Figure 3B. Davies (1961), Eagle (1982), Wilson & Galloway (1993).
Olearia virgata subsp. virgata

O. ramuliflora Colenso 1890: 467. Type collection: W. Colenso sides of streamlets, open ground, south of Dannevirke 1890. Lectotype, selected here: Colenso 1890 Dannevirke (Herb. Petrie) (WELT 440!). Isotypes: Colenso 1890 (AK) (three sheets).

O. aggregata Colenso 1896: 597. Type collection: H. Hill, Weber district, county of Patangata between Dannevirke and the east Coast. Lectotype, selected here: Rev. W. Colenso, presented 1897 (K!).


Twiggy shrub or small tree 1–6 m tall, trunk 30 cm basal diameter, bark pale to dark red-brown, deeply grooved, rough, long shoots c. 20 cm long, internodes 20 mm, leaves in distinct fascicles but spur shoots not developed. Leaves (10–) 13 (–17) × (2–) 3 (–7) mm, narrow and acute, pale green above, lower surface without brownish cast, reversion leaves from cut stump 21 × 8 mm, leaves in deep shade 16 × 5 mm. Capitula in fascicles of 1–5. Phyllaries c. 11. Ray florets 2–5, limb 2 mm long, pubescent abaxially. Disc florets 6–8. Achenes 2 mm long; pappus 2.5 mm long.

Distribution. Figure 16. North Island, north to Waikino (Ohinemuri V.) (Cheeseman 1914). B. Molloy 2. xii. 1970 and 13. ii. 1977 Harewood, Christchurch (Fig. 15), 120', Danthonia grassland, dunes (CHR) also seems to belong here, and if the identification is correct it would be a notable eastern disjunction, resembling that of O. solandri. The locality is in a disturbed area by a golf course, and I did not find any olearia there in a quick search in Jan. 1997.

Ecology. 12 m (Bulls) – 690 m. Lowland to montane forest, forest margin and shrubland. Often forming dense thickets, sometimes the most common tree in swamp scrub. Valley floors, fixed sand dunes, dune swamp, swamp forest, river flats and terraces, peaty gullies, boggy places by watercourses, shrubland in pasture. Associated with Dacrycarpus dacrydioides, Coprosma propinqua, C. rigida Cheeseman, Gahnia xanthocarpa (Hook. f.) Hook. f., Carex secta Boott, Phormium.
Flowers. November–February.


Selected specimens seen. NORTHERN NORTH ISLAND: W. Colenso iii. 1896 Owharoa, Ohinemuri (WELT); D. Petrie iii. 1896 Owharoa, Ohinemuri (AK, WELT, CHR); H. McMahon xi. 1897 Paeroa (WELT); SOUTHERN NORTH ISLAND: W. Colenso 1890 Dannevirke (WELT); W. Colenso Ruataniwha (WELT); J. Buchanan Wairarapa (WELT); B. Aston Puketoi Hills, Horoeke (WELT); B. Aston xii. 1908 Makino Feilding Pahiatua (AK, WELT); L. Cockayne 25. xi. 1908 betw. Rangitūkei and Manawatu (WELT); W. Townsend Marton, Wellington Prov. (AK); H.H. Allan 5. i. 1926 Merryhill farm, Feilding (CHR); H.H. Allan Cemetry Rd., Feilding (CHR); W. Oliver 6. xii. 1927 Hunterville (WELT); Anon. 19. ii. 1930 Pahiatua (WELT); A. Healy 20. viii. 1937 nr. Feilding (CHR); A. Poole 7. iv. 1940 Foxton (CHR); A.P. Druce i. 1944 S. Ruahine (CHR); V. Žotov 26. iii. 1945 U. Whareama V. [east coast Wellington] (CHR); R. Mason 12. iii. 1948 L. Koputara, Manawatu (CHR); R. Mason 24. x. 1948 Okau Strm, E coast Wellington (CHR); J. Burrell xii. 1949 Cheltenham (CHR); R. Mason 10. i. 1956 Pauri Lake, Wanganui (CHR); A.P. Druce iii. 1956 Mt Kaiparoro, N. Tararua (CHR); W. Oliver 28. xii. 1956 Rangiwahia (WELT); SOUTH ISLAND: B. Molloy 2. xii. 1970 and 13. ii. 1977 Harewood (CHR).

10d. Olearia virgata subsp. centralis Heads, subsp. nov.

Subspecies haec ab O. virgata subsp. virgata differt foliis brevioribus et pro ratione latioribus.

shrub or tree 4 (–6) m tall, 2–5 (–20) main branches from near base, or with a single trunk up to 20 cm diameter near the ground and unbranched for up to 50 cm, bark light brown, deeply fissured and weakly flaking, axes becoming plagiotropic distally, with orthotropic relay shoots, modules <10 cm, internodes 10 mm, branches often change direction at the nodes giving a distinct zig-zag effect, young branches more or less densely tomentose, bark pale brown, smooth or flaking. LEAVES 6 (–10) × (2)–3 (–4) mm, bunched, dark green, hardly shining, tomentum often with brownish tinge. CAPITULA in fascicles of 1–4, peduncles 0–5 (–7) mm long, elongate in fruit. Capitula 6 × 4 mm; phyllaries c. 12, 2–3 mm long, spreading in fruit; receptacle pitted. RAY FLORETS c. 9, limb 4.5 mm, 1 mm longer than style. DISC FLORETS c. 3, corolla lobes with retrorse hairs. ACHENES with short erect hairs; pappus 3 mm long.

Distribution. Figure 16. North Island.

Ecology. 540–1125 m (Reporoa Bog). Lowland to subalpine shrubland, forest margin, clearing in forest, tussock grassland. Wet ground on river terraces, swamps, bogs, streambanks, seepages. Associates include Halocarpus Quinn, Phyllocladus alpinus Hook. f., Syzygium maire (A. Cunn.) Sykes & Garn-Jones, Pittosporum turneri Petrie, Baumea Gaud., Cordyline indivisa (Forst. f.) Steud.

Flowers. December–January. The leaves are shorter and relatively broader than in subsp. virgata and the branch modules are generally shorter. A.P. Druce xi. 1988 Hautapu V., NW Taihape (CHR) has leaves 9–10 × 5 mm and is more or less intermediate with subsp. virgata, but the leaves are relatively broad so is placed here where leaves are usually 6–8 mm long. Other specimens have leaves 7 × 2 mm, 10 × 4, 9 × 4, 6 × 3. Larger sized leaves are always rounded and spathulate. Subsp. virgata usually has leaves around 10 × 3 mm, narrower and more acute. B.C. Aston Kaimanawa (WELT) has most leaves with 4–5 small teeth like O. polita and O. gardneri.

Plants at Pureora had shoots more or less orthotropic except where overtopped by planted conifers. In shaded sites like this the axes become plagiotropic and orthotropic relay axes develop.

Illustrations. Figures 3D, 17; Elder (1950: plants at Balls Clearing); Smith-Dodsworth (1991: plant from Ball’s Clearing).

Selected specimens seen. T. Kirk Rangitikei (OTA); T. Kirk Manawatu (CHR); B.C. Aston xii. 1904 Te Kuiti (WELT); D. Petrie xii. 1904 Te Kuiti (AK, CHR); D. Petrie xi. 1906 Komata track, near Paeroa, Thames V. (WELT); D. Petrie 2. ii. 1909 Tarawera Hawkes Bay, Taupo-Napier Rd. (WELT); B. Aston Hauraki Plains (WELT); Carse i. 1918 Waimarino (CHR, WELT); Carse & Matthews i. 1919 Mt Hauhungatahi (CHR); Carse & Matthews 22. xii. 1920 Waimarino Rwy Station (CHR); B. Aston xii. 1920 Tongariro (WELT); B. Aston Kaimanawa (WELT); Carse 4. i. 1924 Ohaupaoapo, Waimarino (CHR); E. Atkinson 29. xii. 1929 Puketiiri (WELT); J. Attwood x. 1935 Ohakune (CHR); J. Attwood 17. ix. 1937 Waimarino R., Erua (AK); J. Attwood 6. xi. 1939 Erua (CHR); A.P. Druce i. 1946 Mangaohane Strm, NW Ruahine (CHR); T. Rawson 17. i. 1947 Maraeora–Mangapehi Rd., King Country (CHR); A.P. Druce 1. 1947 Mangaio Strm., Kaimanawa Mts. (CHR); P. Hynes 3. i. 1953 E Hauhungatahi
Figure 17. Type specimen of *Olearia virgata* subsp. *centralis* Heads subsp. nov.
Hybrids

Allan (1961) commented that hybridism will “probably be found” in the group, but little evidence of current hybridism was found in this study. Apart from \( O. \) lineata cv. dartonii which is not known in the wild, there are only two likely hybrid collections, referred to above as \( O. \) laxiflora \( \times \) \( O. \) lineata (H. Wilson, Big Hellfire) and \( O. \) lineata \( \times \) ? \( O. \) fragrantissima (H.H. Allan ex hort. ex `Fiord').

ACKNOWLEDGEMENTS

I thank Professor P. Bannister and Associate Professor J.B. Wilson of the University of Otago Botany Department for their support, B. Patrick for stimulating discussion and company on many field trips, J. Barkla, S. Courtney, C. Jones, L. Forester, P. de Lange, C. Ogle, B. Rance, G. Rogers and A. Townsend, all of the New Zealand Department of Conservation, for readily sharing data and ideas and suggesting many improvements to the text, C. Beard, E. Cameron, M. Dawson, R.O. Gardner, N. Hind and F. Pitt for very helpful information on specimens, J. Braggins, R. Craw, E. Edgar, P. Garnock-Jones and D. Nicolson for advice on nomenclature, and the directors of AK, CANU, CHR, K, WAiK, WELT and WELTU for allowing me to study their collections of \( Olearia \) and borrow material.

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