

AK 281842, *Waller*, 28 June 2001, Te Uenga crossroads near Russell, Northland, in water-table (drain) where litter and soil collects, plant well-rooted, 50 cm tall.

AK 282850, *Forester & Cashmore*, 4 September 2002, Whale Island, Bay of Plenty, one seedling established on stable sand at back of beach.

References

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Some tall weedy willowherbs (*Epilobium* spp., Onagraceae)

Rhys Gardner

Introduction

We probably all know that New Zealand has numerous native species of willowherb (*Epilobium*) and just a handful of introduced, weedy ones. The natives are mainly lower-stature plants of swamps, stream edges and mountain habitats, and are of rather local occurrence around Auckland now. The introduced species, though, are less fussy, requiring only a site that is unshaded and neither too dry nor too wet.

The *Flora of New Zealand* account of *Epilobium* (Webb et al. 1988) was based on a well-regarded monograph of the genus in Australasia (Raven & Raven 1976). There are places in these works, however, that are less than clear, and over the years misidentified specimens have built up in AK (Auckland Museum herbarium), particularly of the introduced species, which resemble one another closely in their tall habit and in the general aspect of their foliage and flowers.

So I want to try to improve the situation, at least for the Auckland region, with an account of five taxa. Three are introduced species (*E. ciliatum* from North America; *E. obscurum* and *E. tetragonum* from Eurasia); two are natives (*E. pallidiflorum*, a wetland plant, and *E. hirtigerum*, an uncommon coloniser of damp ground). It seems likely that all these plants are, generally, self-pollinating, but there appear to be few barriers to crossing between the species (achieved by insect pollination), even between native and introduced species. It may be easier to name a specimen then if this possibility is assessed during the collection process rather than in the herbarium.

The characters

The observations below come from the above-cited works, my own examination of AK material, and the account of the genus in the second edition of Stace's invaluable *British Flora* (1997). The five species are annuals or short-lived perennials, and in their first

season of spring growth develop a single erect main stem, slightly woody at the base and sometimes 50 cm, or more, tall.

Hairs The predominant type of hair is a slender unicellular one, rather short and curved over to make a sub-appressed indument; these hairs give the stems and inflorescence their usual greyish colour. Two other types are more diagnostic. The first is also unicellular and slender but much longer and relatively straight. It is found, in the species here, only in *E. hirtigerum*, and gives a "hirsute" (irregularly shaggy) appearance to that plant. The second is the stalked glandular hair, the spherical gland at its apex standing just above the rest of the indument and visible even in dried material as a minute glistening ball. The presence or absence of gland-hairs on the lower part of the calyx ("hypanthium" of some books), on the fruit-capsule, and on the stem, may be of critical significance.

Leaves In all five species the leaves are oppositely arranged below, then alternately as the inflorescence is approached. They are rather similar in their ovate to lanceolate shape, distant tooting, thin texture, and near-absence of a petiole.

Flowers Among the five species only *E. pallidiflorum* stands out as different: its flowers are relatively large, and, as the name suggests, are almost always white to cream-coloured (rarely, pink). The small flowers of the other species are mainly pink to magenta-coloured, though *E. hirtigerum*, at least in the Auckland region, has (always ?) white flowers.

Fruit-capsule The greyish slender willowherb capsule, its four valves recurving to expose lines of small plumed seeds stacked one above the other, will be familiar to most. As far as I can tell the only useful distinction here seems to be one of size: the capsule of *E. tetragonum* is a relatively stout one,



Fig. 1. Five *Epilobium* spp., seed characters. Seed-body showing abaxial (curved) face, x 80, with enlargement (artist's impression) of surface pattern. Small seed with coma attached, x 10. Also shown in A & B: t.s. of seed-body at midway, showing relative prominence of papillae; close-up (x 200) of base of coma, showing the relatively 'bunched' character of *E. tetragonum*. Inset sketch of *Epilobium ciliatum* (Ross-Craig, Drawings Br. Plants 11, pl. 25 D. 1958), x 1.
A. *E. ciliatum* (AK 271345). Apical beak of seed-body arrowed. **B.** *E. tetragonum* (AK 219371). **C.** *E. hirtigerum* (AK 255738). **D.** *E. obscurum* (AK 42574). **E.** *E. pallidiflorum* (AK 143589).



Fig. 2. *Epilobium ciliatum* seed, adaxial surface; arrow indicates the "pellucid beak" on which the coma is seated. Seed-body is 1 mm long. AK 271345. Photo: ROG.

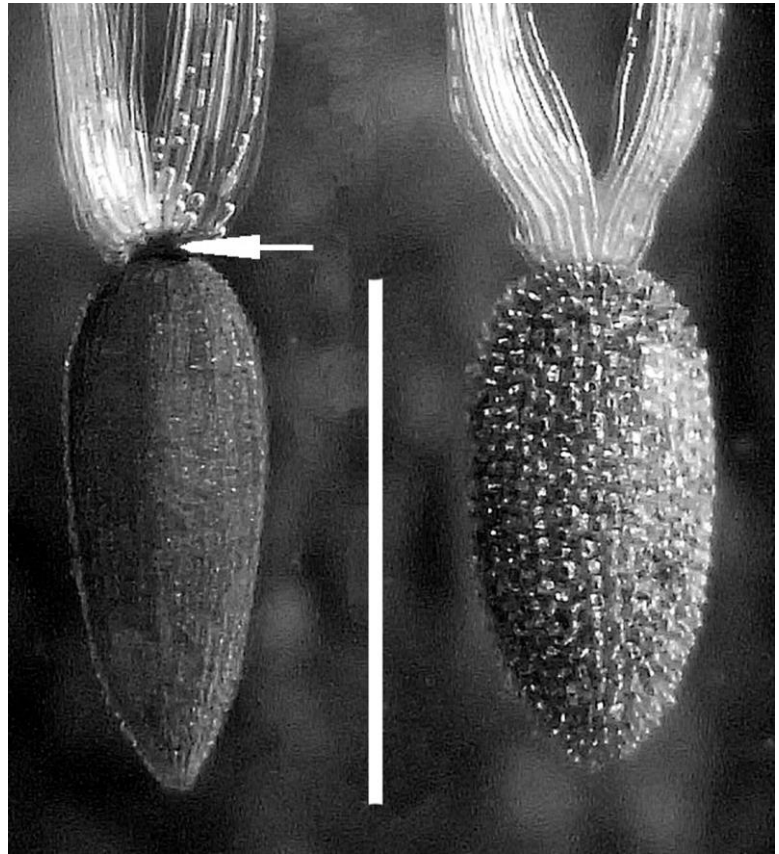


Fig. 3. *Epilobium* seeds, abaxial surface. Left, *E. ciliatum* (AK 271345), with coma hairs ascending outwards from their attachment on a "pellucid beak" (arrowed). Right, *E. tetragonum* (AK 219371), with coma hairs appressed to one another near their attachment. Note also this species' relatively large papillae. Scale bar 1 mm. Photo: ROG.

usually 5–7 cm long and c. 1.3 mm in diameter. The capsules of the other species are of similar length (sometimes smaller, or larger) but are generally 1–1.2mm diameter.

Seeds The seeds are brownish and about a millimetre long, and are plumed at their broader end by a tuft of white hairs (the "coma") that is five to ten times as long. The abaxial (dorsal) face of the seed is curved, and its surface is raised into papillae. This pattern cannot be made out by the naked eye, except in *E. tetragonum*, whose papillae are relatively large (0.03 mm long!).

The seed's adaxial (ventral) surface is more or less flat overall but bears a central longitudinal ridge, flanked each side by a shallow to quite abrupt channel. In all species except *E. tetragonum* the papillae are more or less undeveloped on the adaxial surface.

The scanning electron micrographs (SEM) of Webb and Simpson (2001) show the low-papillate pattern of the seeds of *E. hirtigerum* and *E. pallidiflorum*. The seed-coat's hexagonal cells are each raised centrally into a thimble-like projection about as

wide as long. An SEM of the *E. ciliatum* seed (Raven and Raven 1976: 19) shows, in contrast, slender finger-like papillae that occupy a relatively small part of their cells. This means that when the *E. ciliatum* seed is viewed at x 10 or so its surface appears to be one of exceedingly fine, pale, longitudinal lines (the reflecting papillae), separated by darker interspaces. (The keys of above-cited works are remiss in implying that the papillae of species other than *E. ciliatum* are not arranged in longitudinal lines: the SEM photographs clearly contradict this).

The seed of *E. ciliatum* offers an additional character: its coma springs from a minute non-papillate callus, or "pellucid beak" (Figs. 1A, 2). Again, this structure (c. 0.03 mm tall and about twice as wide) is invisible even to the experienced user of a hand-lens.

The coma has not been thought to have much taxonomic value, although its length does vary from species to species, and it seems to me that the most robust of the seeds here, that of *E. tetragonum*, also has the longest coma. But another feature of this species' coma can be

pointed out: near their attachment to the seed-body the individual hairs are rather closely appressed to one another, that is, the base of the coma is nearly cylindrical. By contrast, the coma hairs of *E. ciliatum* and the other three species curve away from the seed-body relatively abruptly. This distinction is illustrated in Figs. 1A, 1B and 3.

Synopsis

1A. Seeds appearing (x 10 or more) to be finely lined; seed's coma curved outwards from its attachment area, which is a non-papillose, cushion-like prolongation c. 0.03 mm tall; flowers pink to magenta; gland-hairs usually conspicuous on lower part of calyx, on capsule and (to a lesser extent) on upper part of stem; mid-stem leaves nearly glabrous, often more than 1 cm wide *E. ciliatum*

1B. Seeds (x 10 or more) with relatively large, close-spaced papillae; seed's coma contracted at base for a short way before spreading, not seated on an apical prolongation; flowers pink to magenta; gland-hairs absent from calyx, capsule and stem; mid-stem leaves nearly glabrous, seldom more than 1 cm wide *E. tetragonum*

1C. Seeds (x 10 or more) obscurely papillose; hairs of seed's coma spreading widely from base, not seated on an apical prolongation **2**

2A. Flowers white (rarely pink), relatively large, the petals in life 1 cm or more long; gland-hairs lacking (or few, sessile and concealed) on calyx, capsules and stem; mid-stem leaves nearly glabrous, seldom more than 1 cm wide *E. pallidiflorum*

2B. Flowers white (rarely pink), the petals less than 1 cm long; gland-hairs present on calyx, capsules and stem but mostly concealed by the rest of indument; mid-stem leaves less than 1 cm wide, hirsute (like rest of plant), the indument including some long, slender, loosely ascending hairs to c. 1 mm long *E. hirtigerum*

2C. Flowers pink, the petals less than 1 cm long; gland-hairs conspicuous on lower part of calyx (and sometimes on capsule); mid-stem leaves nearly glabrous, less than 1 cm wide *E. obscurum*

The species

Epilobium ciliatum American willowherb
Widespread, on recently disturbed open ground, especially in man-made habitats. First collected in New Zealand at Pongakawa, Bay of Plenty, in 1896 (Raven & Raven 1976).

Readers should be aware that for non-native taxa Webb et al. (1988) cite the earliest published record rather than the first collection, leading one to suppose here that *E. ciliatum* might have been in the country only since "1976". In admirable contrast, the previous *Flora of New Zealand* volume, on introduced monocots (Healy and Edgar 1980) gives both pieces of information.

Epilobium hirtigerum hirsute willowherb
Locally uncommon; recent records from Hobsonville (abundant in land being developed for housing), and in the former Winstone's Quarry at Mt Wellington (on land now developed for housing). Perhaps mainly found in places like ditches or areas of cleared clay ground, that are very wet only in winter. The distinction from *E. cinereum* (a smaller, densely basally-branched, short-haired, pink-flowered plant) is not always clear. It has been suggested to me by Peter de Lange that this might not simply be due to hybridism but to a recent infusion of *E. hirtigerum* from Australia.

Epilobium obscurum short-fruited willowherb
This European species has been in our country for more than a hundred years, but is perhaps now most likely to be met with in the South Island. Although there are three Auckland region collections attributed to this species in AK, I am not convinced that it currently occurs in the Auckland region or further northwards, but a specimen (AK 117728) from Coal Creek, Ninety Mile Beach, collected by Bob Cooper in 1966, is correctly identified.

Stace (1997) uses the above common name and indicates that the fruit-capsule is typically only 4–6 cm long. I have not seen enough New Zealand specimens to be able to evaluate this character.

Epilobium pallidiflorum pale-flowered willowherb
Still abundant in most of our larger wetlands, occurring mainly with raupo (*Typha orientalis*) but sometimes with other dominants, such as *Machaerina rubiginosa*; apparently never known to perch on *Carex secta* or *C. virgata*. Occasionally found on stream edges and in ditches. Hybrids with *E. ciliatum* are known.

Epilobium tetragonum square-stalked willowherb
North Auckland (Dargaville to Whangarei Heads and beyond) appears to be the stronghold of this weed, but it has recently been found (AK 329833, T. de Lange s.n., coll. 2012) on the harbour's edge at one of the Ferry Building steps; voyagers to Tiritiri Matangi take note. Where this species grows with *E. ciliatum* the two can immediately be distinguished by habit: *E. tetragonum* is the more robust of the two

(often nearly a metre tall) and its branching is strict rather than spreading (P.J. de Lange, pers. comm.).

Acknowledgements

Peter de Lange shared his knowledge of the species (and the problems therein), and Josh Salter advised on microtechnique.

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The scent of *Viola odorata* (Violaceae)*

Rhys Gardner

For a long time I used to go to bed early, and, unperturbed by the sounds downstairs of yet another dinner party, already aware that we do not receive wisdom but must discover it for ourselves, after a journey that no-one can take for us or spare us, would read myself to sleep with one or other of the volumes of Marcel Proust's great semi-autobiographical novel "Remembrance of Things Past". Such an unhurried, oblique and unworldly mode of botanical progress could not be expected to last long into the twenty-first century, accreted wisdom or not; from such habits that save us, however, the nourishing, kindly, marzipan-like odour of success has at last arisen.

That is: recently I had begun to sketch my garden's several kinds of violets: *Viola odorata*, *V. tricolor*, *V. reichenbachiana* and *V. hederacea*. Only the first has a scent, so it was natural to ask, which of the flower's parts might be responsible?

Early in his story Proust (1964: 229) describes childhood memories of the countryside in spring: "And every year, when we arrived at Combray, on Easter morning, after the sermon, if the weather was fine, I would run to see ... the river flowing past, sky-blue already between banks still black and bare, its only companions a clump of daffodils, come out before their time, a few primroses, the first in flower, while here and there burned the blue flame of a

violet, its stem bent beneath the weight of the drop of perfume stored in its tiny horn."

Clearly, little Marcel had taken close notice of these plants, observing the posture of the flower and the storage of nectar in the corolla spur, thrust up into the crook of the peduncle. But it is not true that the nectar is perfumed, and a less than inordinately prolonged search of the literature failed to give the answer required.

The simple experiment of cutting the flower into its various parts, and placing them separately in glass jars, did, however: the scent is supplied by the corolla's spreading petals and not (or hardly at all) by the corolla's spur, the nectar, or the staminal projections.

The flowering plants have not been widely surveyed for the way in which they produce scent, but it seems likely that most make it in specialised 'osmophore' areas on the adaxial surface of the petals; these areas are not visible to the naked eye (Vogel 1990).

Some features of the *V. odorata* flower are illustrated in Fig. 1, p. 106.

* In memory of Eric Godley (1919–2010), floral biologist and Proustian.

References

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