

VISUAL KEY TO NORFOLK WILLOWHERBS

Bob Leaney Aug. 2015

Field identification in flower/fruit: (i) First check stigma type (core as below) (ii) then strip off a mid-stem leaf: to check overall shape, edge dissection, basal shape, length of any petiole, mode of insertion if sessile (iii) then check upper stem indumentum, & pick the longest pod to check indumentum of pod and floral collar (& length?). Vegetative identification is often possible with experience, but take care early in the year (first 2-3 internodes at least usually glabrous & leaves may be atypical), and not for *obscurum*. Hybrids will be suspected first due either to "clenched fist" stigma, or mismatch between leaf shape and stem indumentum.

1 Stigma 4-lobed

E. hirs. *E. mont.* *E. parv.* "clenched fist"

2 Stems & leaves not conspicuously hairy → 4

2 Stems and leaves conspicuously hairy or hoary. → 3

3 Decurrent leaf bases, not hoary, long close serrations. *E. hirsutum*

3 Entire-denticulate, dense felted hairs (hoary), sessile-subsessile, not decurrent. *E. parviflorum*

4 Leaf upper surface minutely short-petiolate hairy only, 1-3(6) mm, ovate, base rounded-subcordate, regularly & strongly dentate. Straight patent & arched hairs. *E. montanum*

1 Stigma clubbed.

NB: not → Broadly clubbed / lobed "clenched fist" hybrid stigma

5 Stems rounded ± glandular hairs as well as semiappressed or arched hairs → 7

5 Stems 4 angled with raised lines at least at some level and all strictly appressed hairs → 6

6 Subsessile ± decurrent base, strongly & regularly dentate, 6-10 mm, 6-5-8-5 mm, pods over 7.0 cm, ± decurrent, hairs on stems & pods strictly appressed, 4 raised lines at some level. *E. tetragonum* (i) ssp *tetragonum* (up to 2 mm)

7 Leaves more grey green & lanceolate, teeth more obscure & remote. At least some leaves petiolate (< 2 mm). *E. tetragonum* (ii) ssp *lamyi* (especially upper stem)

7 Leaves broadly lanceolate or lanceolate-elliptic, with denticulate edges → 8

7 Leaves narrowly lanceolate with obscurely denticulate or entire edges → 9

8 1-3(6) mm, flowers quite often white, usually closely denticulate, leaf base rounded-subcordate, petioles rarely > 4 mm, short, patent glandular tipped hairs on upper stem & pods, plus semiappressed hairs. *E. ciliatum*

8 5-10(20) mm, flowers nearly always white, leaf base broadly concave (rounded), indumentum of stem & pods identical to *ciliatum* (up to 20 mm on early lower stem). *E. roseum*

9 Short pods (4-6 mm), stem ridging like betula, often basal flowering shoots, usually very short stalks, indumentum of stems and virtually all of pods strictly appressed. *E. palustre*

6 Subsessile ± decurrent base, obscurely dentate, leaves elliptic-lanceolate (to elliptic-ovate), strictly patent (not spreading) glandular hairs on floral collar & lowest 1/3 of sepals. *E. tetragonum*

9 Tall, slender delicate habit, only narrowly branched near top, fine stems with arched hairs, leaves very narrowly lanceolate, subsessile, serrate. *E. palustre*

Non-Norfolk species (*E. lanc.* 3 x since 1971, all v.c. 28)

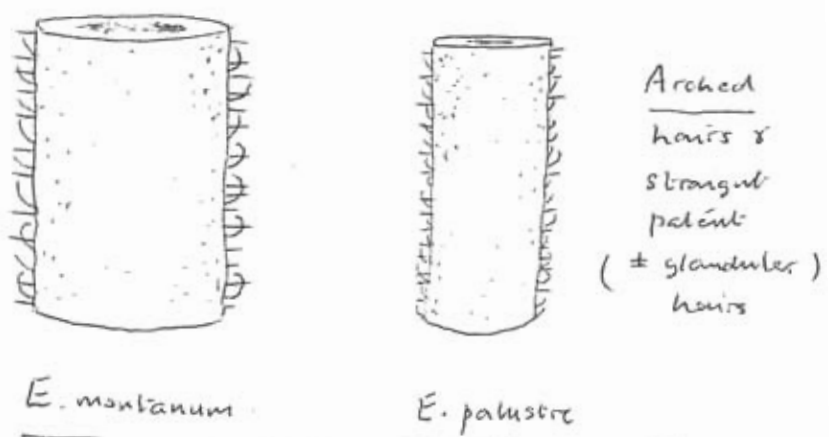
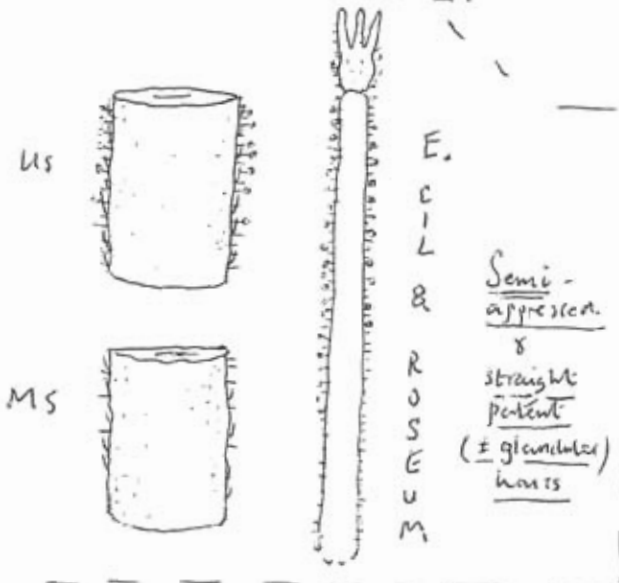
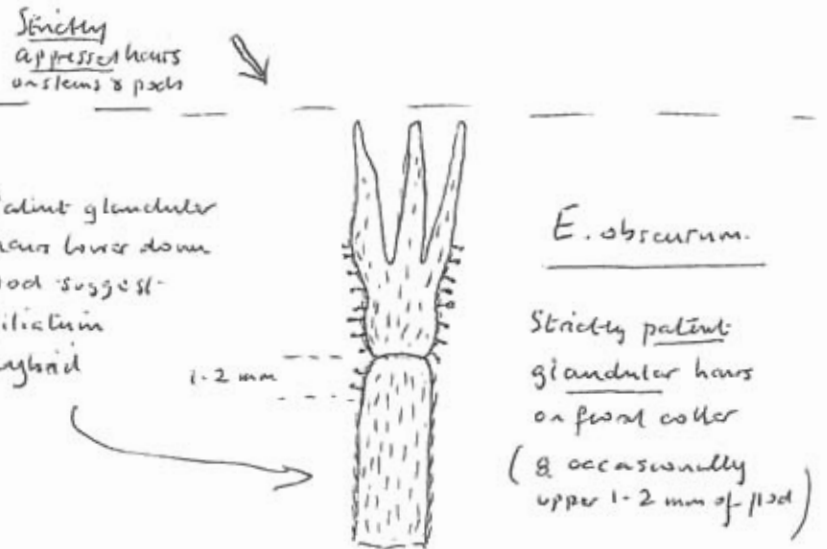
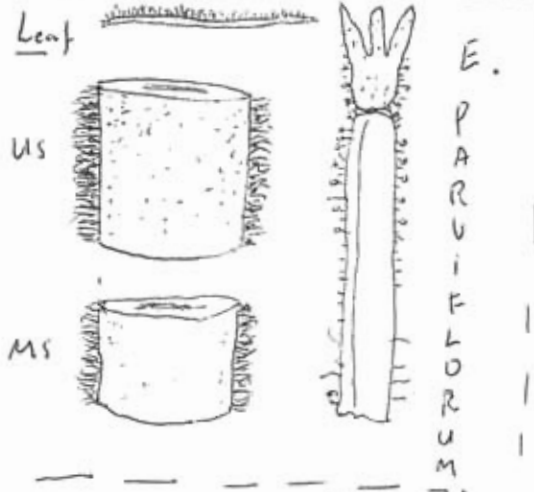
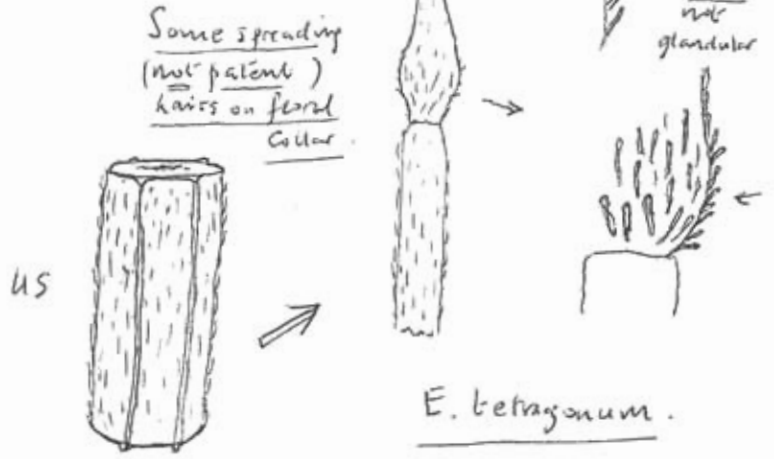
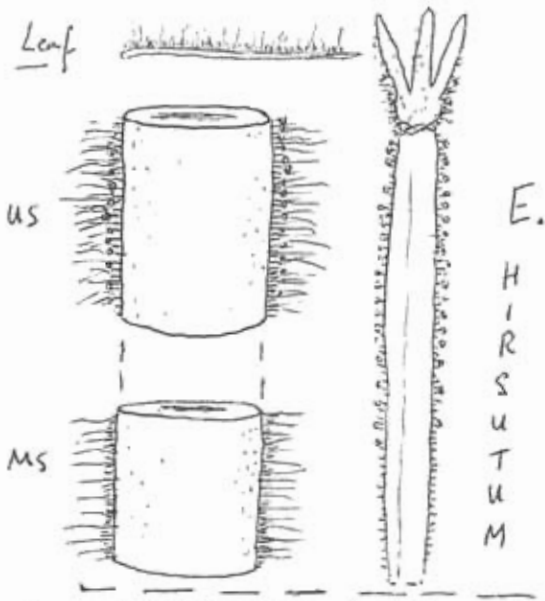
- E. lanceolatum*: 4-lobed stigma, & long petiolate (4-10 mm) white flowers
- New Zealand willowherbs: *E. brunneum*, *E. parviflorum*, *E. longiflorum* - all creeping, leaves ± orbicular, < 15 mm long (3 spp) flowers white
- Alpine spp - mountainous: *E. alsinifolium*, *E. anagallidifolium*: leaves ± ovate, > 15 mm long

1. Deep purple or purple blotched flowers
2. Candelabra or inverted candelabra
3. Short or abortive fruit inferiorance
4. Most seeds very small & pale

95% 5%

Indumentum of stems, fruits and floral collar in *Norpuce* willowherbs.

US = upper stem MS = mid stem.



Always examine upper stems and fruits for indumentum. Do not mistake spreading clustered hairs on floral collar of *E. tetragonum* for patent glandular hairs of *E. obscurum*. The extracellular glandular secretion on stems of *E. roseum* & *cilirosum* dry off on old hairs lower down the stem, & may not be present at all on older plants.

gla-dular hairs on stem - ciliatum, peritoma rostrata

Long leaf stalk - rostrata 26cm
 ciliatum 1-3m
 peritoma 20-40m

Square stem tetragonia distans

Furry hirsutum pinnatifidum

cordate leaf - ciliatum, distans

Clasped siliqua tetragonia distans
 ciliatum, rostrata
 (+ hybrids)

L. ped. siliqua hirsutum, pinnatifidum
 multicaule

Stem h. - obscurum

imbricate/ leaf - tetragonia -
 pinnatifidum

Some notes on the identification of the Norfolk Willowherbs (*Epilobium*)

Bob Leaney July 31st, 2015

Problems with identification in *Epilobium* mainly arise from two factors – the enormous variability in leaf shape, and difficulties with interpreting the quality of the indumentum, especially of the stem. There are no good illustrations of the different hair types, and standard descriptions of hair types are often confusing.

These and other common problems relating to identification of the willow herbs are discussed in these notes, which is designed to accompany the visual field key attached.

Indumentum of stem and fruit

When looking for diagnostic hairs, always look near the top of the main stems or inflorescence branches, and on the fruits when present. The lower/mid stem is usually glabrous or subglabrous, and hairs may not be typical. New growth in spring, even in the hairiest taxa such as *hirsutum* and *parviflorum*, will usually have completely glabrous stems.

- Non-glandular stem hairs in *montanum* and *palustre* are said to be +/- appressed (Stace), curved (Sell), or crisped (CTM). In fact, both these taxa have a mixture of straight, patent, +/- glandular hairs and what would be better termed *arched hairs* – i.e. hairs beginning at right angles to the stem surface and gradually arching over to point horizontally or downwards at the tip (see visual key). The group used to under record what we now know was *palustre* because we were not sure what hair types we should be looking for from the standard descriptions.
- Non glandular hairs in *ciliatum* and *roseum*. Similar hairs, though more appressed, are found in *ciliatum* and *roseum*, along with straight patent +/- glandular hairs once more. These should best be termed semi-appressed.
- Glandular hairs in *ciliatum* and *roseum*. These taxa do have glandular hairs, along with the semi-appressed hairs, but the glandular secretion is extracellular – there is no separate gland cell at the tip of the hair as found on the phyllaries of *Crepis*, on the sepals of *Cerastium*, or the petioles of *Geranium rotundifolium*. The glandular secretion dries out, and will only therefore be found on newly developed hairs near the top of the stem, or on the fruits, later on often not at all. The essential thing is to look for short patent blunt-tipped hairs, whether or not they are glandular tipped.

Leaf indumentum is seldom of use, except in *hirsutum* and *parviflorum*. *E. hirsutum* has a mixture of long appressed hairs and denser very short hairs on the leaf upper surface; *parviflorum* has denser felted hairs of one type, giving a furry appearance. However, it should be noted that, on closer examination, other species can have short and inconspicuous hairs on the leaf upper surface, as well as on the edge and below. *E. tetragonum* ssp. *lamyi* is said to have conspicuously hairy undersurface midribs.

4-lobed stigma

(*hirsutum*) *parviflorum* + *montanum* (only)

(see also here 'epilobium')

* Leaf edge dissection is most important in *hirsutum* (closely spaced long and forwardly hooked serrations), *montanum* (strongly and fairly closely dentate), and *tetragonum* (strongly but more distantly dentate). All the other species have leaf edges that are minutely and distantly dentate (*obscurum*, *ciliatum* and *roseum*) or are virtually entire (*parviflorum* and *palustre*).
entire leaves = palustre + parviflorum only

* Petiole length. Long petiolate leaves are characteristic of *roseum* and *lanceolatum* (not a Norfolk species), shortly petiolate leaves of *ciliatum* and *montanum*, very short petiolate leaves of *obscurum* and *tetragonum* ssp. *lamyi* (at least on the upper stem). It should be noted that the lower main stem petioles of *roseum* early on, lost by flowering, can be extremely long (5 – 10 – 20 mm), whereas those found later on the branches and upper stem will only be (4) 5 – 10 mm (the usual range given). White flowered plants of *ciliatum* can suggest *roseum*, and *ciliatum* can have fairly long petioles (1 – 3 (6) mm) – if in doubt check the base of the leaves which are subcordate in *ciliatum*, cuneate to rounded in *roseum*. Petiole length in *montanum* is much as in *ciliatum* (1 – 3 (6) mm), but here the leaf base is rounded to subcordate.
*herutium is, roseum.
>6mm petiole = roseum.*

Leaf insertion. In the taxa with sessile leaves, leaf insertion is a useful character; in *hirsutum* leaves are clasping and strongly decurrent; in *parviflorum* sessile but not clasping or decurrent; in *tetragonum* and *obscurum* clasping and sometimes very slightly decurrent onto the stem lines.

White flowered willowherbs. White flowers can occur in *montanum* and *hirsutum*, but are regular only in *lanceolatum* and *roseum*. In our region they are a spotting feature for *roseum*, a scarce casual, mainly of urban habitats. However, white flowers are also frequent in the very similar *ciliatum* – separation is by petiole length and basal leaf shape.
lanceolatum, roseum, ciliatum (rarely)

Capsule length is of importance in separating *obscurum*, *tetragonum* ssp. *tetragonum* and *tetragonum* ssp. *lamyi*. The short pods of *obscurum*, (3) 4 – 6 (6.5) cm long are a good spotting feature as are the very long pods of *tetragonum*, (5.5) 6.5 – 8.0 (10) cm – any plant in this group with a good number of pods over 7.0 cm can be taken as *tetragonum*. “*Lamyi*” was widely regarded as a distinct species in the middle of the last century, but is now only recognised usually as *tetragonum* ssp. *lamyi*. It is intermediate in pod length (5 – 5.5 (7.5)) according to Kitchener.
Short pod = best spotting char for obscurum

Seed characters. Seed testa patterning and seed shape is probably not reliable in separating *obscurum*, *tetragonum* and “*lamyi*” (Kitchener). Presence/absence of an appendage may be helpful occasionally. *E. palustre*, where diagnostic characters are few, has much the largest seeds (see Stace photos). Very small, narrow, pale seeds are the only truly diagnostic character for a hybrid.
(sprouts with have egg-shaped seeds)

Perennating structures are used as key characters by Stace, but are hard to interpret and often not present! Virtually all taxa are stoloniferous perennials, but it is only *hirsutum* that is regularly stand forming from long stolons. *E. ciliatum* is said to be non

stoloniferous and to perenate by sessile leaf rosettes (CTM and Stace). The stolons in *palustre* are said to be underground (!) and to terminate in a bulbil.

All willowherbs are automatically self pollinated and although capable of perenation they are usually found as individual plants, behaving as annual weeds – a single plant rarely persists from one year to the next.

There is not necessarily a distinction between stolons that give rise to leaf rosettes that root to produce new plants, and basal branches. *E. tetragonum* can be found as a ring of first year plants all attached by short radiating stolons to a single central plant that has died. Alternatively, a single plant, probably in its 2nd year, can be found with branches at ground level, spreading horizontally and then curving upwards as a flowering shoot. This also occurs in *obscurum*.

no use

Identification of *obscurum*. Mode of perenation is mainly of diagnostic importance in distinguishing *obscurum* from *tetragonum*. The only truly diagnostic characters for *obscurum* are the short pods and the very clearly demarcated zone of strictly patent – glandular hairs on the floral collar and lower ¼ or so of the sepals, but one needs a spotting character to indicate which plants to check for these characters. The third key character used by CTM and Stace for *obscurum* is the presence of long stolons. This should be a good spotting character but unfortunately is said to occur late in summer, and seldom seems to occur at all in Norfolk conditions.

E. obscurum is a plant of mainly moist conditions, occurring in wetlands, on river and ditch banks, shady woodland rides and moist wasteland or gardens. In West Cork it is by far the commonest willowherb and forms dense patches of a score or so plants, usually still attached by long stolons early in the summer. I suspect that *obscurum* behaves similarly in the west of England and Wales. In Norfolk, probably because of much drier conditions, long stolons are seldom found even late in the summer and the taxon usually occurs as single plants with only a few very short stalked buds arising from the stem base on close examination.

(A)

The strategy to spot *obscurum* in our region, therefore, has to be to look for short fruited willowherbs with a more elliptic leaf shape and obscure dentation than *tetragonum*, then looking for the characteristic indumentum and glandular hairs on the floral collar. *E. obscurum* cannot be reliably identified before flowering and fruiting.

Identification of *E. tetragonum* ssp. *lamyi*. "*lamyi*" is separated by Stace from ssp. *tetragonum* by its more lanceolate and short petioled leaves at least on the upper stem (CTM). Other defining characters, according to Kitchener, are the leaves tending to a grey green colour, and the upper stem having hairs on the leaf margins and underside veins, with an especially densely hairy midrib. The leaf edge is more distantly and obscurely dentate than in ssp. *tetragonum*. The flowers of *lamyi* are said to be much larger than any other willowherb apart from *hirsutum* – 10 – 12 mm diameter as opposed to 6 – 9 in ssp. *tetragonum*, *obscurum* and *ciliatum* (CTM; Kitchener). Although this is

not mentioned by Stace, and for some reason not stressed by Kitchener as a diagnostic character, this would seem a useful spotting character for the taxon.

Identification of *palustre*. In Norfolk, *palustre* has an uniquely slender, little branched and delicate habit, which together with the characteristic narrowly lanceolate, entire edged leaves, and stem indumentum, is diagnostic. This slender form seems remarkably constant and more or less confined to fen habitats in the county. Elsewhere a more robust, broadly branched habit may be encountered (Kitchener). + few-flowered

Identification of hybrids are said to be frequent between all the common species and are frequently suspected, but definite hybrids can only really be identified where large populations of several species build up in abundance on disturbed ground for a few years – i.e. on set aside or ground cleared for development. In Norfolk, *tetragonum*, *ciliatum* and *parviflorum* are the most likely species to be involved in this situation. *E. montanum* is said to produce the most hybrids nationally.

Hybrids cannot usually be identified before flowering and fruiting and a reliable determination is most likely if putative parents are present. They are usually suspected because of a mismatch between leaf shape and stem indumentum, sometimes with a characteristic "clenched fist" stigma type. However, there also should be specific hybrid characters present.

- "Clubbed fist" stigma

- Deep purple or purple blotched flowers.
- A long flowering period producing large candelabra or inverted candelabra shaped inflorescences.
- Short or abortive fruits.
- The majority of seeds very small and pale, highlighted by a few much darker and larger fertile seeds.

The last is the only truly diagnostic character for a hybrid.

Hybrids between taxa with clubbed and 4-lobed stigmas will produce a "clenched fist" stigma shape – i.e. slightly lobed and broadly clubbed. Care should be taken not to confuse the 4-lobed stigma of *parviflorum*, where the lobes are upright and often stuck together with pollen, for a true "clenched fist" hybrid stigma.

It should be noted that the hybrid between *ciliatum* and *tetragonum* may have appressed hairs only on the stem, but with patent straight +/- glandular hairs on the fruit and floral collar. This form of the hybrid could easily be mistaken for *obscurum*, but this species usually has no glandular hairs at all on the fruits, except occasionally one or two on the upper mm or so of the pod (despite illustration in Stella Ross-Craig and the Stace description).

References Stace (2010) is not so good as usual with *Epilobium*, and rather confusing; better are: Clapham, Tutin & Moore (1987) or CTW (1962); the BSBI Crib (1998); and Kitchener (BSBI Recorders' Conference April 2015, *Epilobium* workshops: online).