# A GUIDE TO PIGWEEDS, GOOSEFOOTS, ORACHES AND THEIR RELATIVES IN HAMPSHIRE

## Issue 2: September 2016

### The family Amaranthaceae (formerly Amaranthaceae and Chenopodiaceae)

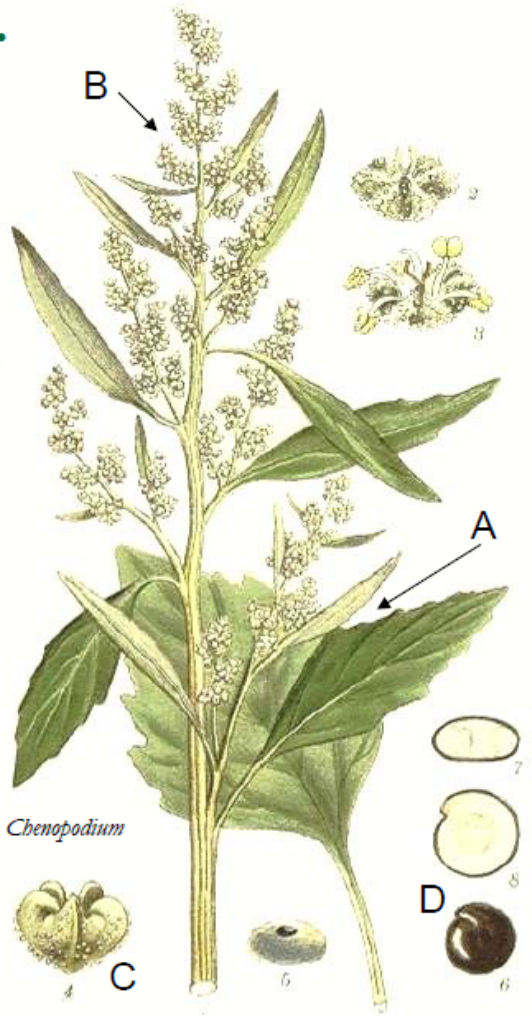
This group of plants, now all included within the one family in the 3rd edition of Stace's *New Flora of the British Isles* on the basis of molecular genetics, is one that many people shy away from. With their mostly dull-coloured, small flowers, weedy and sometimes lumpish overall appearance, from a distance they offer few of the visual charms of other families; but close up they can be as attractive, fascinating or even downright weird as orchids or other popular groups. Several genera (particularly the Pigweeds, Goosefoots and Glassworts) offer serious challenges for identification.

Characteristics of the family are an absence of stipules; a flower that has no distinction between sepals and petals (and so they are often referred to as *tepals*); a perianth of 0-5 tepals in a flower; 1-5 stamens; 2-3 styles; and a 1-celled ovary placed above (*superior*) or embedded at the level of (*semi-inferior*) the perianth. Inflorescences are densely clustered in many genera. Some genera, such as *Amaranthus* (Pigweeds) and *Atriplex* (Oraches), have distinctive bracts subtending the individual flowers, hence often referred to as *bracteoles*.

*An extract from Lena Strouwer, 2009, "Field identification of the 50 most common plant families in temperate regions", available online at* www.sci.sdsu.edu/plants/plantsystematics/Identifying_50_major_plant_families.pdf

## Amaranthaceae s. lat. AMARANTH FAMILY

- Herbs or shrubs (rarely trees or vines), often reddish, many salt-loving plants (halophytes)
- Stems often succulent, and/or jointed
- Leaves alternate, simple (**A**)
- No stipules
- Flowers small, actinomorphic (**B**)
- Sepals usually 3-5, free or fused basally, surrounding the fruit (**C**)
- Petals absent
- Stamens as many as sepals, positioned on the inside of each sepal
- Ovary superior or half-inferior, 1-3 fused carpels, one locule and one ovule, basal placentation
- Fruit a berry, capsule, or nutlet
- Seeds strongly curved (**D**)



# A key to the genera

**1** Succulent plants of the coast, with leaves either not apparent, or else narrow (<5mm), thick and succulent, untoothed.....2
**1'** Not as above.....5

**2** Leaves in opposite pairs but reduced to a succulent sheath largely fused with the stem, with no free margin or a very narrow free margin (usually <=0.3mm).....3
**2'** Leaves not as above; with a free blade and usually alternate.....4

**3** Perennial with rhizomes at or near the soil surface bearing aerial stems; the 3 flowers in each cyme making a broad arc above .....***Sarcocornia*** **(Perennial Glasswort)**
**3'** Easily uprooted annual; flowers either less than 3 in a cyme, or if 3 then making a more or less triangular peak.....***Salicornia*** **(Glassworts)**

**4** Leaves ending in a spine.....***Salsola*** **(Saltwort)**
**4'** Leaves without a spine.....***Suaeda*** **(Sea-blite)**

**5** Tepals 2-5, papery or membranous, soon losing any green colour as they mature, with 3-5 bracteoles just below tepals, sometimes closely resembling them and often stiff and bristly.....***Amaranthus*** **(Pigweeds)**
**5'** Tepals 0-5, generally not papery or membranous; if bracteoles present then flowers unisexual and bracteoles 2, found only on female flowers lacking tepals.....6

**6** Flowers unisexual; fruits surrounded by 2 enlarged bracteoles.....7
**6'** Flowers bisexual, or a mixture of bisexual and female; fruits without bracteoles, usually surrounded by tepals.....8

**7** Stigmas 2; bracteoles almost free to base to almost completely fused, but if fused more than half way then leaves white and mealy .....***Atriplex*** **(Oraches)**
**7'** Stigmas 4-5; bracteoles almost completely fused; leaves green.....***Spinacia*** **(Annual Spinach)**

**8** Tepals at fruiting time with a short transverse wing or tubercle on underside; leaves not mealy, but lower hairy. (Bushy annual mostly of motorway verges).....***Bassia*** **(Summer-cypress)**
**8'** Tepals at fruiting time without transverse tubercle or wing, often with longitudinal keel on underside.....9

**9** Ovary semi-inferior; receptacle swollen at fruiting time
.....***Beta*** **(Beets and 'Perpetual Spinach')**
**9'** Ovary superior; receptacle not becoming swollen at fruiting time.....10

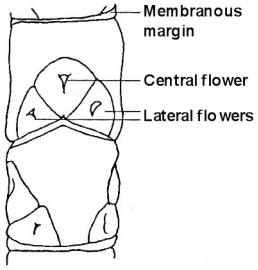
**10** Stems glandular-hairy above; plants with a not unpleasant odour.....***Dysphania*** **(Scented Goosefoots)**
**10'** Stems glabrous or mealy; plant scentless or stinking.....***Chenopodium*** **(Goosefoots)**

# Glassworts (*Salicornia* and *Sarcocornia*)

These extraordinary succulent plants are often neglected by botanists for a number of reasons. First, there is only a short window of time in the season when they can be accurately identified – roughly, from the middle of August to the beginning of October. Second, they grow in muddy and sometimes difficult places. Finally, they have a reputation for being difficult to identify which is in part well-deserved.

In fact, some species are very easy to recognise, and the remainder fall into two distinct groups which can also be easily distinguished. The difficulties start when trying to assign plants to species within those groups, and some writers have proposed that the groups themselves should be the recognised species. This view has been reinforced by recent molecular studies, which have found that there is often more genetic variation between plants considered to be of the same species in different parts of their range than between allegedly different species in the same area. As in many other difficult groups, subtle variations arise from the plants being capable of interbreeding, but frequently inbreeding, giving rise to local populations yet with subtle intergradations between them. Added to this, the form of the plants is often heavily influenced by their environment. For this reason, it is often best not to attempt to name individual plants outside what you suspect to be their normal habitat, and the population as a whole should always be examined.

First, some basic facts about structure. At first glance these plants appear to have no leaves at all. In fact, the rudiments of leaves occur in opposite pairs and are completely fused together to make a collar around the stem, marking it off into segments. These segments are reasonably obvious because the leaf margin is membranous and free from, although tightly pressed to, the stem.




Above this membrane arises a cyme of 1-3 flowers. The fact that it is a cyme is not very obvious, as the flowers are flattened against, and embedded in, the stem. Indeed the fact that they are even flowers may not be obvious, unless the 1 or 2 anthers are actually showing at flowering time.

## A key and guide to glassworts (avoiding the tricky bits)

The most recent proposed classification and names are shown in square brackets.

**1** Perennial with rhizomes at or near the soil surface bearing aerial stems; the 3 flowers in each cyme making a broad arc above .....***Sarcocornia perennis*** **(Perennial Glasswort)**

**1'** Easily uprooted annual; flowers either less than 3 in a cyme, or if 3 then making a rounded but more or less triangular peak.....**2**

**2** All cymes 1-flowered.....***Salicornia pusilla*** **(One-flowered Glasswort) [*S. europaea* subsp. *disarticulata*]**

**2'** Many or most cymes 1-flowered, with some 2- or 3-flowered..... .....***Salicornia europaea*** x ***marshallii*** **(Hybrid One-flowered / Purple Glasswort) [*S. europaea* nothosubsp.** x ***marshallii*]**

**2''** All cymes 3-flowered.....**3**

**3** Fertile segments in the middle of the terminal spike convex (with a single bulge in the middle); anthers up to 0.5mm; central flower usually noticeably larger than the laterals.....***Salicornia europaea*** **group [*Salicornia europaea* subsp. *europaea*]**

**3'** Fertile segments in the middle of the terminal spike more or less cylindrical or like a slightly saggy cone, with any bulge at the top or bottom of the segment; anthers >0.5mm; all flowers much the same size.....***Salicornia procumbens*** **group [*S. procumbens*]**

***Sarcocornia perennis*** will give little problem in the field, once known. It is true that some annual Glassworts can be hard to uproot, when growing in firm gravel, but they never tend to form mats with procumbent woody stems in the same way as this. The whole plant has a chunky look and the rather flattened arrangement of more or less equal-size flowers will confirm it. The other notable feature is the mixture of fertile and slenderer, more tapering sterile branches. It can extend over quite a wide range of the saltmarsh, but always where there is some well-stabilised gravel or sand in the substrate. This is a scarce plant nationally but Hampshire holds some very large populations.

***Salicornia pusilla*** will give no problems once the 1-flowered cymes are seen, except that plants should be examined for a mixture of 1-, 2- and 3-flowered cymes that will betray its hybrid with Purple Glasswort, *S.* x *marshallii*. From a distance it is often given away by the rather stubby appearance of its branches, especially as

the season progresses; this is because, as the fertile segments ripen fruit, they drop off individually. Earlier in the season it could be mistaken from a distance for Purple Glasswort *S. ramosissima* with which it often grows, but it has a less shiny and less 'beaded' appearance. It also goes pinkish rather than purplish red. It is usually to be found in the uppermost levels of the saltmarsh on a firm substrate, often where marsh runs up to shingle or into Sea Couch grassland. Like Purple Glasswort, it can grow in saline depressions behind the sea wall. It is widespread in Hampshire and there are big populations in places (for example, Needs Ore at Beaulieu and Gutner on Hayling), but in many of the smaller marshes it is rather rare. It is hard to say how abundant the hybrid is; a solid estimate would entail a lot of lying down in wet ground and examining many plants laboriously, and as far as I know, no-one has done this. Suffice it to say that where the parents occur together it usually does not take long to find a specimen of the hybrid.

On the whole, the ***Salicornia europaea*** group members are fairly easy to distinguish with the naked eye, and are the prettiest of the genus, as they have a beaded appearance from their convex fertile segments and a tendency to turn to bright colours, at least in part, as the autumn progresses. Mostly they are rather daintier looking plants than the *Salicornia procumbens* group and their branches tend to be wider spreading. For confirmation of ID, see the key characters above. They have a wide range over the saltmarsh, extending in the case of the Purple Glasswort *Salicornia ramosissima* to depressions and lagoons behind the sea wall, but are not usually found at the lowest levels of mudflats. They are all diploid species (as is *Salicornia pusilla*), and two of the species are widespread in Hampshire, while the other is very rare but recorded here.

The ***Salicornia procumbens*** group can usually be distinguished from the preceding group on the basis of 'taller, greener, uglier'. In general, the terminal spike tends to be more prominent on account either of its absolute length or of its length relative to its width. Branches tend to come off at right angles from the main stem and then curve upwards, rather than coming off at about 45 degrees in a straight line. For the more technical differences see the key. They are all tetraploids. As with the diploids, two of the species are widespread in Hampshire, while the other is very rare but recorded here. They are often characterised as plants more of the lower marsh, but this is only part of the truth; what appears to be the case is that they cannot tolerate much competition from plants other than Glassworts. This is mentioned in Ball & Brown (1970) in their study of species in the Dee estuary. So as well as the lower mud-flats, they can be found along creek sides and even right up against the sea wall where tidal scouring prevents, or has removed, closed saltmarsh vegetation. One species even specialises in salt pans either on the upper marsh or within the sea defences, in conditions that few other plants can tolerate.

## The tricky bits

A few general rules when trying to segregate species within each group:

- Don't look at a single plant in isolation; look at the population and see what features, if any, stand out. Be prepared to make a judgement only after observing and measuring a number of individuals, and be prepared quite often not to make a judgement at all.
- Avoid juvenile or damaged specimens. In particular, characters of the inflorescence should be observed on the middle section of the terminal spike.
- Make allowances for the season, especially when trying to evaluate colour characters. (On colouring, usually the latter part of August is the very earliest one can start to make these judgements, and sometimes one must wait until the end of September.)
- Take note of the preferred habitat of the species, but don't be too slavish in applying it as a criterion.
- Stace's illustrations are not very helpful, and I'm not sure how reliable his distinction between species with 1 stamen and 2 stamens is.

### *Salicornia europaea* group

**1** Plant deep shining green, usually turning entirely purplish-red as the season progresses; branches more or less straight, branched again on larger specimens; flowering and especially fruiting segments strongly beaded; membranous margin to leaf 0.1-0.2mm, making an angle at apex of c. 110-120 degrees.....***S. ramosissima*** **(Purple Glasswort)**

**1'** Plant clear green, glossy, reddening less intensely and less completely; branches straight, branched again on larger specimens; fruiting segments convex but not strongly beaded; membranous margin to leaf up to 0.1mm, angle at apex c. 90 degrees.....
.....***S. europaea*** **(Common Glasswort)**

**1''** Plant bluish green, matt, not reddening, or only slightly around flowers; branches mostly simple, curving upwards towards the end; fruiting segments convex but not strongly beaded; terminal flower only slightly larger than laterals; membranous margin very narrow (c. 0.05mm) and either making a smooth shallow curve at apex or an angle not less than 140 degrees.....
.....***S. obscura*** **(Glaucous Glasswort)**

The membranous margin width is key in determining species and, while getting familiar with these plants, should be measured with a measuring loupe. With a little experience, however, you will be able to make a judgement by eye. In practice you will come across many plants with a membranous margin of about 0.1mm and an apex angle somewhere between *S. ramosissima* and *S. europaea*. These may be partially red, especially earlier in the season. Records of these should be assigned to the group only.

There is an additional difficulty with distinguishing *S. ramosissima* from *S. europaea*: in the past the latter has been equated with the species *S. brachystachya* in Continental treatments, but this is usually described as having a much shorter terminal spike, whereas British authors say that *S. europaea* may have a longer spike. In practice spike length is not of much use in separating the species, as long as we retain a single species to circumscribe our much-branched plants with narrow leaf margins.

*S. ramosissima* is very variable in overall habit; plants can be tiny and virtually unbranched or robust and highly branched. It ranges from behind the sea-wall to the middle marsh or even sometimes lower in protected, well-vegetated situations. *S. europaea* is more 'middle of the road' in both its variation and its habitat preferences, being characteristic of the middle marsh and only coming to the upper levels where there is a reasonable amount of tidal overflow. Despite its vernacular name, it appears less widespread and much less abundant in Hampshire than *S. ramosissima*. Any *Salicornia* seen behind the sea-wall is likely to be *S. pusilla*, *S. ramosissima* or (just possibly) *S. obscura*.

*S. obscura* is the maverick in this set. Side branches tend to be shorter than the terminal branch, giving the plant a triangular or rhomboidal outline. In general appearance and in relative flower sizes it approaches much closer to the tetraploid *S. procumbens* group. It is best distinguished from them by the convexity of the fertile segments, which is most marked from the middle to the top of the terminal spike; and (if available) by the anther length. There are further disparities with some Continental authors, who allow more complex branching and a membranous margin up to 0.15mm. Given all this, it is hardly surprising that it has only been recorded five times in Hampshire. It is said chiefly to be a plant of salt pans in the upper marsh and perhaps behind the sea wall, where conditions are fierce and competition isn't.

### *Salicornia procumbens* group

**1** Lower fertile segments <3mm long, <3.5mm wide at narrowest point; plant becoming orangey-brown or warm brown..... .....***S. emerici*** **(Shiny Glasswort)**

**1'** Lower fertile segments 3-6mm long, 3-6mm wide at narrowest point; terminal spike tapering, with 12-30 fertile segments; plant dull green becoming dull yellow or yellowish-brown.....***S. dolichostachya*** **(Long-spiked Glasswort)**

**1"** Lower fertile segments 3-6mm long, 3-6mm wide at narrowest point; terminal spike cylindrical, usually with 6-15 fertile segments; plant mid-green becoming yellowish-green to bright yellow.....***S. fragilis*** **(Yellow Glasswort)**

Well-marked plants of *S. dolichostachya* are the easiest of this group to pick out from a distance, when they live up to both their vernacular and their scientific name by producing a long terminal spike with many segments. Any plant with more than 20 fertile segments in its terminal spike and a distinct taper along its length can hardly fail to be anything else. It also has a distinctive habit of falling over sideways and producing a very bushy plant with just the terminal spike emerging from the 'bush'. Sometimes the growth proceeds so far laterally as to resemble a short stretch of hedge rather than a bush. This species grows lower down in the saltmarsh than any other species, but can also appear right up against the sea-wall; the common factor is open, usually muddy ground where the only competition is from other Glassworts.

*S. fragilis* can often be picked out on its more yellowish colour, especially later in the season, but this is not wholly reliable. Better to observe the shorter, non-tapering spike with fewer segments. Plants with fewer than a dozen fertile segments are likely to be this or *S. emerici,* and the dimensions (especially the width) of the fertile segments will distinguish these. It tends to stay upright better than *S. dolichostachya*. Although some books attempt it, it is actually very hard to generalise about the overall shape of plants in these species, which are very protean not to say lumpish. *S. fragilis* does not usually go out onto the lower mudflats like *S. dolichostachya*, but higher up the shore in open situations they will often occur in mixed populations.

Both *S. dolichostachya* and *S. fragilis* are widespread and often abundant in Hampshire. In places where sea level rise or the construction of hard sea defences have abolished the more developed saltmarsh vegetation, they may be the only species left. Intermediate plants that are hard to name will certainly be encountered.

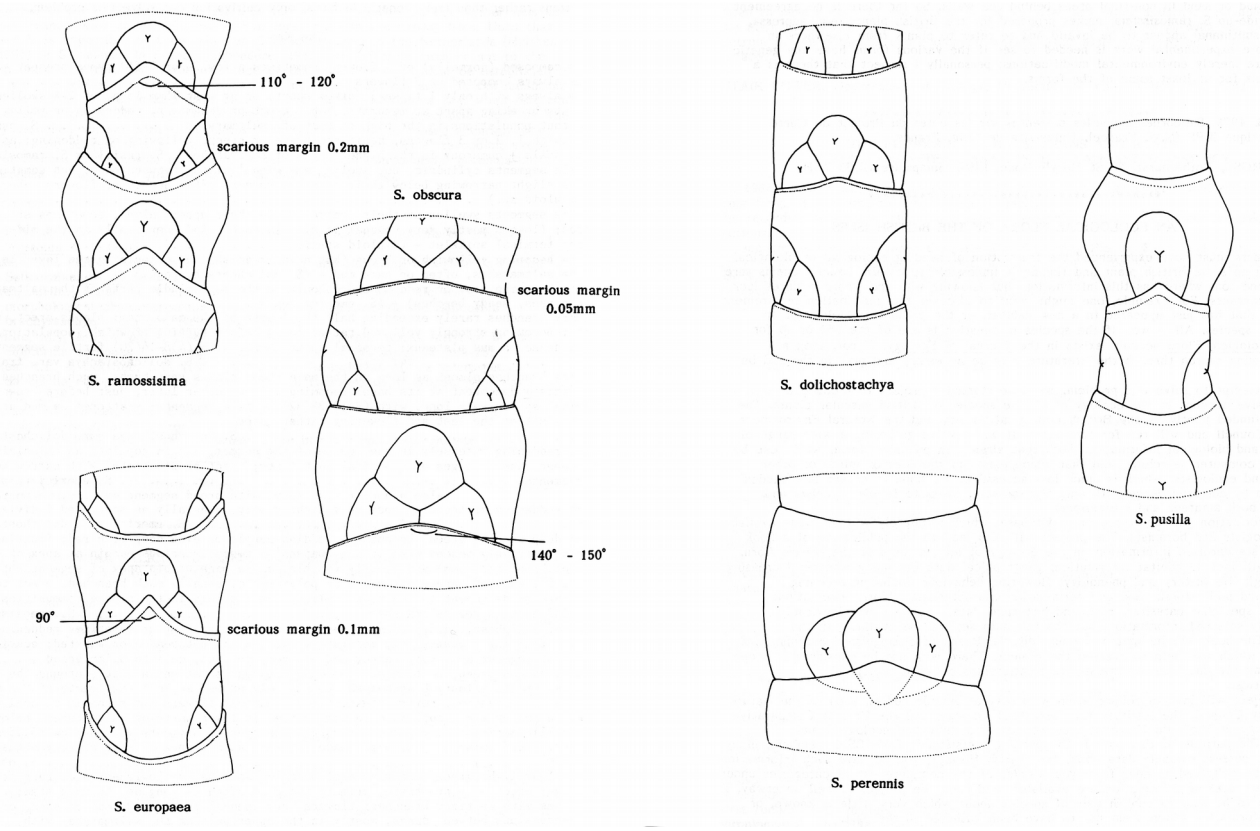
*S. emerici* is the plant formerly known as *S. nitens* in British Floras, but Stace has now adopted this usage which is in line with Continental botanists. The narrowness of the spikes and the dimensions of the fertile segments are the most diagnostic characters, but one must be careful to observe these on mature plants which have at least reached anthesis. Another feature that I have noticed is that, whereas the sterile segment between the highest branch node and the base of the fertile terminal spike is often reduced to a woody stalk by the time of flowering in the other two members of the group, in *S. emerici* it often persists as an even narrower, rather long succulent cylinder. Again, this must be looked for at the right time, which is when the flowers are open. This seems to be borne out by photographs of Continental material.

One feature of this species which we can't observe in this country, only becoming apparent south of Brittany, is its tendency to turn pink in autumn like some of the diploid species. Instead, here and elsewhere on the Channel coasts, it tends to turn a rather weird shade of orangey-purplish-brown – something that *S. fragilis* can also do at times.

*S. emerici* tends to appear in the middle and upper parts of saltmarshes, but usually where the vegetation is open. Unlike the other two species in the group, it seems not to be gregarious, and often one has to range quite widely over the marsh to convince oneself that one has a population of this species. It is either rare or under-recorded in Hampshire: there are only 10 records, mostly from the south-east of the county, and it was only in 2009 that plants were found west of Southampton Water, in two sites.

## Further study

Glasswort lovers are lucky; there is quite a good accessible literature to do with these plants. See the **References** section at the end of the document.




*From BSBI News 53*

## Pigweeds (*Amaranthus*)

Until recently, many British botanists felt they could ignore Pigweeds, and did. The 1962 edition of Clapham, Tutin and Warburg's *Flora* gave just two species, both of which were noted as rare and impermanent casuals.

Today the case is rather different. The great increase in Maize growing and the sowing up of game strips with exotic cereals has led to constant reintroductions of several species as arable weeds. Although they may be impermanent in this situation, they often persist in waste ground or disturbed waysides for several years. Many species are cited as introductions with soya bean waste, but it is doubtful that this makes much of a contribution in the countryside at large, although it may account for sightings round docks and industrial sites: much of the processing is done abroad; only a proportion of the waste goes into the open environment as animal feed, and only after processing. Bird seed certainly is a source of introduction to gardens, and of course a few species are actually garden ornamentals. The weedy species thrive in nitrogen-rich conditions.

Pigweeds are distinguished from other genera of the family by their stiff, membranous bracteoles (bracts subtending an individual flower) and tepals, which give their inflorescences a bristly look and often a prickly feel in the hand. They are another of those difficult groups that are in a state of rapid evolution, so there are little clusters of similar species and a lot of discussion on what should be regarded as a species.

### Identification

To tackle these plants you need the Stace *New Flora* which has a key to all the species recorded in Britain, backed up by terse descriptions and photographs of the fruiting perianths. The Stace *Field Flora* has just the keys and no illustrations, and I defy anyone to work from this alone. However, whichever you try, do make use of an excellent resource available for free on the Internet: the *Flora of North America* at www.efloras.org. This has detailed descriptions of all bar two of the species described or listed in Stace, and as one of those two has only been recorded twice in Britain in the last 20 years, and the other just once, they are unlikely to trouble you often. There are also fairly good line illustrations and helpful notes on the taxonomic standing of many of the trickier species. Some of the illustrations are included below, with acknowledgements to the *Flora of North America* project. Note that *A. hybridus* is shown with an indehiscent fruiting capsule, which is certainly not typical and may not even be accurate for this species.

*Amaranthus* are best studied by collecting fruiting specimens and making a detailed examination at home, preferably with the aid of a dissecting microscope. With this genus, you can be sure that you are not doing any ecological damage by collecting. Almost all species found in Britain are annuals, an exception being *A. deflexus* which is persistent in the Channel Islands. Sadly we don't yet have the most spectacular annual of all, *A. australis* of the southern States and central America, which can grow 9 metres tall in a single season. We would probably need a lot of global warming to acquire that!

The leaves of *Amaranthus* have "Kranz venation", which manifests itself as a dense closed network of thick veins with small more translucent "chambers" between. This helps to distinguish them from all but a couple of the Goosefoots and Oraches. It is related to the method of photosynthesis of the plant.

Most species are monoecious; that is, their flowers are either male or female but both are found on the same plant. A few are dioecious, having separate male and female flowers borne on different plants. Of these, *A. palmeri* is that most likely to be found in Britain. But of the rest, it is important that you observe the flowering features on female flowers.

Each flower is surrounded by a normal perianth all of similar segments (and therefore called tepals, as in Docks), and around this by a number of bracts (strictly, bracteoles, because they belong to the individual flower). The bracteoles and tepals sometimes look different, but in many species they are similar, and you should then look closely enough to make sure you know which is which. The number of each and their shapes is often diagnostic.

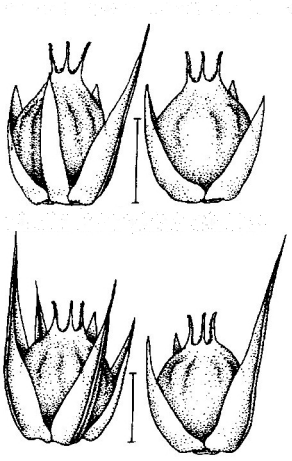
The fruiting capsules of *Amaranthus* are delightful, best described as "Space Hoppers for aliens with three arms". There is a single fruit within the capsule which is usually handsomely shiny. An important diagnostic character for a number of species is whether the capsule is dehiscent – splitting round the equator so that a little cap with handles detaches from the rest. You should only try to observe this on capsules with ripe fruit.

## Species in Hampshire

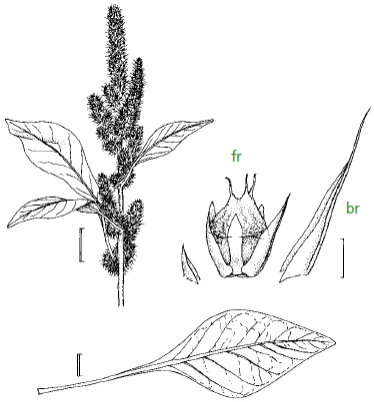
'Very Rare' = 3 sites or less recorded; 'Rare' = 10 sites or less; 'Scarce' = 25 sites or less.

**The most likely species you will encounter in Hampshire:**

***A. bouchonii*, Indehiscent Pigweed**: still rare but possibly increasing and very probably overlooked. Very similar to *A. hybridus*, except for the indehiscent fruits, and perhaps not a good species.



***A. hybridus*, Green Amaranth**: widespread and quite frequent, almost certainly under-recorded as a farmland casual.




*A. hybridus*

***A. retroflexus*, Common Amaranth**: widespread and frequent.


*A. retroflexus*

### Key to the "big three"

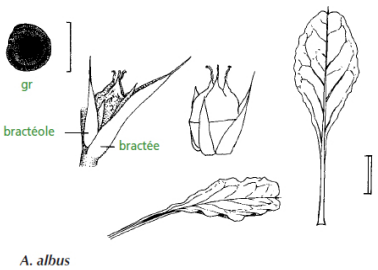
All have flowering stems leafless towards the apex, with the flowers borne in dense terminal spike-like panicles, often with clusters in axils of leaves lower down; female and male flowers; 3-5 tepals, slightly shorter than fruit to longer than fruit.

1 Seed covering of ripe fruit not splitting, or splitting irregularly; tepals tapered to acute apex ..... ***A. bouchonii***
1' Seed covering of ripe fruit splitting neatly along an equatorial line; tepals acutely tapered, obtuse or truncate ..... **2**

2 Tepals (3-)5, lanceolate, all tapered to an acute apex, midrib reaching or extending beyond apex ..... ***A. hybridus***
2' Tepals 5, narrowly oblong to spathulate, obtuse to truncate, sometimes with mucro but midrib usually ending short of apex ..... ***A. retroflexus***

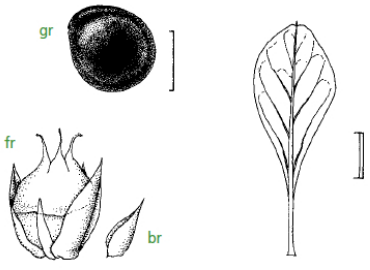
**Other species recorded:**

***A. albus*, White Pigweed**: rare




*A. albus*

***A. blitoides*, Prostrate Pigweed** : very rare




*A. blitoides*

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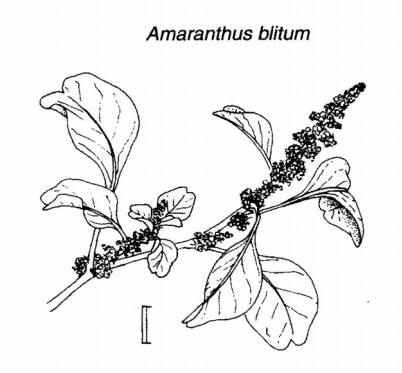
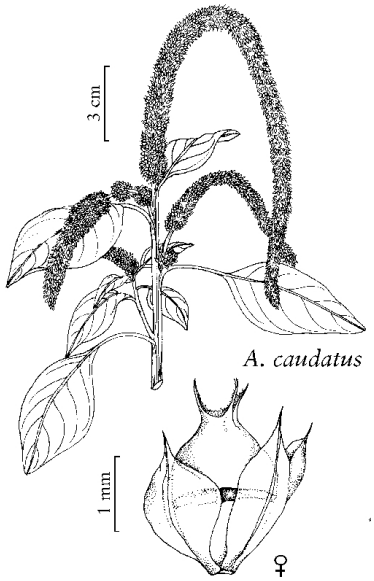
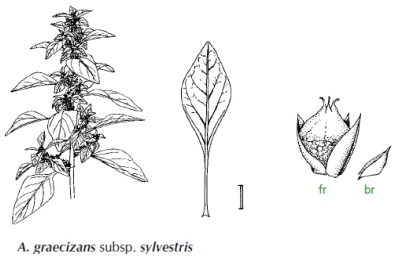
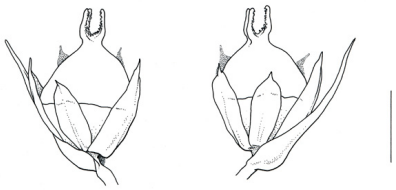
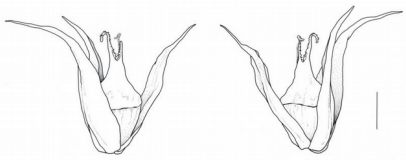
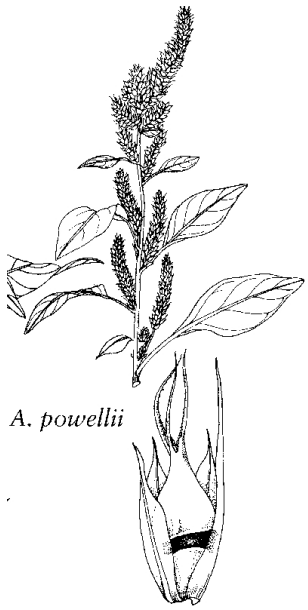
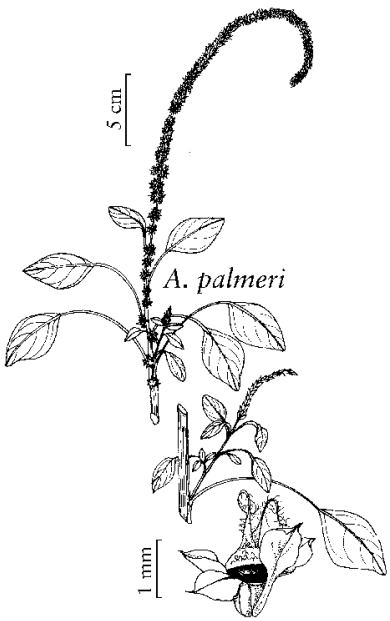
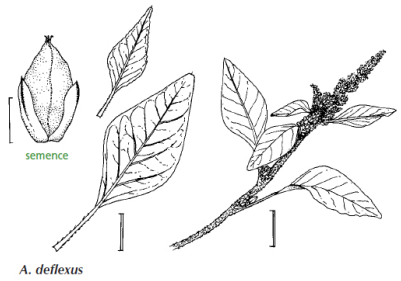
| ***A. blitum*, Guernsey Pigweed**: rare   | ***A. caudatus*, Love-lies-bleeding**: very rare   |
| ***A. graecizans*, Short-tepalled Pigweed**: very rare   | ***A. capensis*, Cape Pigweed**: very rare and probably extinct  |
| ***A. cruentus*, Purple Amaranth**: very rare  | ***A. thunbergii*, Thunberg's Pigweed**: very rare and probably extinct  |

**Not recorded, but may turn up:**

| | |
|---|---|
| ***A. powellii,*** **Powell's Pigweed**   | ***A. palmeri*****, Dioecious Pigweed**   |
| ***A. deflexus*****, Perennial Pigweed**   | ***A. standleyanus*****, Indehiscent Pigweed**  |

# Goosefoots (*Chenopodium* and *Dysphania*)

The key difference between these two genera, which were formerly all placed in *Chenopodium*, is in the glands. In *Dysphania* these are glandular hairs. In *Chenopodium* they are circular globe-like or disc-like structures, easily seen under the lens, with a waxy or "plasticy" look that give the plant its mealy appearance. (In the Oraches, *Atriplex*, they are elliptical or jelly-bean shaped.) Worse may be on the way; continental botanists are splitting even the remainder of the genus into *Blitum, Chenopodium, Chenopodiastrum, Lipandra* and *Oxybasis*.

## Identification

Members of *Dysphania* are all rare casuals, and only a couple, *D. cristata* (Crested Goosefoot) and *D. pumilio* (Clammy Goosefoot) have ever been recorded in Hampshire. At least one other, *D. ambrosioides* (Mexican Tea) might well turn up. If you want to learn more about this genus, consult Stace's *New Flora*.

For the genus *Chenopodium*, there is a comprehensive key in Stace's *New Flora*. There are several areas that present difficulties of identification, and some of these are covered in the BSBI *Plant Crib* section on *Chenopodium*, downloadable from the BSBI's web site www.bsbi.org.uk. Note that the account of *C. ficifolium*, *C. album* and *Atriplex patula* says that "It is also easy to mistake *Atriplex patula* L. for *C.ficifolium* when young leaves only are present (the latter tends to have acute lobes and ovate leaves)". This should read "the former" (i.e. *Atriplex patula*). And of course the gland differences will also help.

The big area of difficulty that the *Plant Crib* does not cover is that of *Chenopodium album* (Fat-hen) and its near-relatives *C. strictum, C. probstii* and *C. suecicum.* This group is especially difficult not least because of the remarkable variability of *C. album*. *C. probstii* has occurred a number of times in Hampshire in soil introduced for new roadside verges. *C. strictum* has occurred once. *C. suecicum* has not yet been recorded, but is likely to occur. Any specimens suspected of being any of these rare species should be submitted either to the BSBI *Chenopodium* referee or the BSBI Aliens referee, Eric Clement, preferably via the vice-county recorders or at least with a note to them.

In considering leaf outlines in any of the *Chenopodiums*, it is the lower leaves that are most important, and if these are missing from mature plants then less mature plants from the same population should be collected.

## Key to the main species of *Chenopodium* in Hampshire

The treatment of Sections below differs from Stace (2010), but derives from recent molecular work. This key will not work very well with a number of critical species close to *C. album* not yet recorded in the county, and should be used in conjunction with Stace if those are suspected. There is also another species (*C. hircinum*) that stinks of rotten fish which will not key out, but with only one British record in the last 40 years it is not likely to trouble you often.

**1** Rhizomatous perennial; stigmas 0.8-1.5mm; perianth segments usually fleshy and persistent at fruiting..... ***C. bonus-henricus*** **(Good-King-Henry) [Section *Blitum*]**

**1'** Annual plant; stigmas < 0.8mm; perianth segments, if persistent at fruiting, fleshy along midrib at most..... **2**

**2** Fruiting perianths somewhat longer than broad to subglobose, with at least some seeds longer than broad; inflorescence always glabrous..... **3 [Section *Oxybasis*]**

**2'** Fruiting perianths distinctly broader than long, with seeds broader than long; inflorescence mealy or glabrous..... **4**

**3** Leaves green on upperside, mealy-grey on underside, oblong in outline, shallowly toothed or scalloped, with secondary veining inconspicuous..... ***C. glaucum*** **(Oak-leaved Goosefoot)**

**3'** Leaves green or reddish on both surfaces, variable but approaching hastate in outline, strongly toothed, secondary veining conspicuous..... ***C. rubrum*** **(Red Goosefoot)**

**4** Leaves ovate-lanceolate, untoothed and unlobed, or with at most one pair of shallow basal lobes, lacking meal from outset; sepals lacking mealy glands from outset; stamens 1; plant not strongly fetid..... ***C. polyspermum*** **[Section *Lipandra*]**

**4'** Leaves mealy or not, various in outline, but usually some lower leaves showing lobing or toothing, or if not then plant strongly fetid; sepals with some mealy glands at least in early stages; stamens 1-5..... **5**

**5** Leaves glabrous on the upper face and sparsely mealy on the lower face on unfurling, becoming generally glabrous on both faces at maturity.....**6 [Section *Chenopodiastrum*]**

**5'** Leaves densely mealy on both faces on unfurling, generally remaining more or less mealy at least on the lower face at maturity.....**7 [Section *Chenopodium*]**

**6** Mid-stem leaves on the main stem weakly cordate at base, with 2-4 pairs of teeth, upper face matte in live state; plant rather fetid when rubbed; seeds unkeeled, deeply pitted.....***C. hybridum* (Maple-leaved Goosefoot)**

**6'** Mid-stem leaves on the main stem cuneate to truncate at base, often with >4 pairs of teeth, upper face shiny in live state; plant not fetid when rubbed; seeds keeled, minutely pitted.....***C. murale* (Nettle-leaved Goosefoot)**

**7** Leaves ovate-trullate, unlobed or with one pair of shallow basal lobes; plant reeking of rotting fish.....***C. vulvaria* (Stinking Goosefoot)**

**7'** Leaves various, often lobed or toothed; plant relatively odourless.....**8**

**8** Lower leaves of main stem narrowly hastate, more than 2x as long as broad; middle leaves often with characteristic digitate terminal lobe; surface of seeds with regular pitting bounded by prominent ridges.....***C. ficifolium* (Fig-leaved Goosefoot)**

**8'** Lower leaves of main stem various, if hastate then ≤ 2x as long as broad; pitting of seeds irregular to absent, sometimes with network of raised ridges but flat between them.....**9**

**9** Plant to 2m high, usually with reddish-purple colouring especially in young shoots; some leaves in range 6-14cm long, ovate-trullate to ovate-triangular.....***C. giganteum* (Tree Spinach)**

**9'** Plant usually smaller, and even if >1.5m then all leaves <6cm; if coloured, then without reddish-purple shoots (but sometimes with purple colouring on stem).....**10**

**10** Inflorescence dense and top-heavy; perianth segments coloured straw, yellow, orange or red; seeds typically 1.5-2mm across, at least 1.5mm high, surface honeycombed by raised ridges when ripe.....***C. quinoa* (Quinoa)**

**10'** Inflorescence not top-heavy; perianth segments not brightly coloured; seeds up to 1.5mm across, less than 1.5mm high, surface smooth, granulose or irreguoarly papillate.....**11**

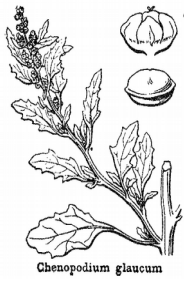
**11** Leaves not or scarcely longer than wide, unlobed or with 1 pair of shallow basal lobes; tepals often fused for ½ their length; inflorescence densely mealy.....***C. opulifolium* (Grey Goosefoot)**

**11'** Leaves distinctly longer than wide; tepals usually joined for < ½ length; plant weakly to densely mealy.....***C. album* agg. (Fat-hen)** (consult Stace for further details)

## Notes on species in Hampshire


Chenopodium Bonus-Henricus

***C. bonus-henricus* (Good-King-Henry)** is the only perennial Goosefoot one is likely to meet, and is distinctive in appearance. It appears to have suffered a catastrophic decline in Hampshire; once widespread, it has only three recent records. All records would be appreciated. If anyone wants to familiarise themselves with this plant, the NE corner of Stockbridge Common Marsh (SU356346, National Trust, open access) is a good place.


Chenopodium glaucum

***C. glaucum* (Oak-leaved Goosefoot)** has had quite a few recent records, both as a wayside casual and as a probable native in coastal lagoons and flats. It could be overlooked as a small, neat Red Goosefoot (*C. rubrum*), but apart from its shallow leaf lobing it is mealy-grey on the underside of the leaf.


Chenopodium rubrum

***C. rubrum* (Red Goosefoot)** is one of the commonest species after *C. album*, and is usually found in very fertile places: well-fertilised crops, dung-heaps, around animal feeding stations and pasture gates. It is distributed throughout the county, but often does not persist in one place.

***C. chenopodioides*** **(Saltmarsh Goosefoot)** is a nationally scarce plant with almost all modern records clustered around the Thames Estuary. But there are old records (up to 1934) in the Hamble estuary and Portsmouth Harbour. Suitable habitat still exists and it would be an excellent refind. The *Plant Crib* provides the distinctions between this and *C. rubrum*.

***C. polyspermum*** **(Many-seeded Goosefoot)** is a reasonably common plant but puzzles many people, as with its unlobed ovate leaves it doesn't look like the common run of Goosefoots and might be mistaken for a member of the Dock family. Also it often turns up in places such as coppiced woodland that are not typical Goosefoot country. The typically 5 tepals give it away, however.


Chenopodium polyspermum

***C. hybridum*** **(Maple-leaved Goosefoot)**: after a period when it was hardly ever seen, this distinctive plant has started turning up again, probably as a bird-seed contaminant. Apart from the foliage, the seeds have a distinctive deep pitting.


Chenopodium hybridum

***C. murale*** **(Nettle-leaved Goosefoot)** is another plant with an upsurge in recent records, worth looking out for in coastal districts and in very nitrogen-rich conditions. It differs from *C. album* in having darker green, fleshier, more deeply toothed leaves and finely toothed (rather than entire) tepals. It differs from *C. rubrum* in having seeds wider than long and being somewhat mealy at least in the inflorescence.


Chenopodium murale

***C. ficifolium*** **(Fig-leaved Goosefoot)** is widespread and frequent, but can be overlooked as C. *album*. The large, obtuse, forward-pointing lobes of the lower leaves distinguish it from that species, and the seeds are shallowly but rather regularly pitted with a surrounding edge to each pit. Once known, it can usually be picked out in a Fat-hen stand without difficulty.

Also worth looking out for, with a couple of recent records, is ***C. opulifolium*** **(Grey Goosefoot)**, a very mealy plant with broader, shorter leaves than *C. album*.


Chenopodium opulifolium

***C. giganteum*** **(Tree Spinach)** is turning up increasingly, sown in game strips and plantings for wild birds, and occasionally persisting for a short while or turning up on waysides and waste ground. There are a dozen or so Hampshire records in the last few years.

***C. quinoa*** **(Quinoa)** is sown as a crop and can persist briefly as a crop relic, or appear in game strip sowings and plantings for wild birds. There are a dozen or so Hampshire records in the last few years.

# Oraches (*Atriplex*)

In flower and especially in fruit, Oraches can be distinguished from Goosefoots by their characteristic bracteoles: paired, usually rhomboid or deltoid and enlarged in fruiting. Vegetative plants can be told by their glands, which are elliptical or bean-shaped rather than circular. Some species in both genera are not glandular, or very lightly so, at maturity; but younger plants generally reveal some, especially around the axils. Also in the axils, *Atriplex* species bear one or more small leaves as well as a shoot; *Chenopodium* have only a shoot.

## Key to the main species of *Atriplex* in Hampshire

**1** Shrubs or sub-shrubs.....**2**
**1'** Annual herbs.....**3**

**2** Lower leaves opposite; bracteoles 1.5-3mm, rounded in general outline, fused only at base.....***A. portulacoides*** **(Sea-purslane)**
**2'** All leaves alternate; bracteoles 2.5-5mm, rhombic or obtrullate with 3 lobes at apex, fused to > ½ length.....***A. halimus*** **(Shrubby Orache)**

**3** Bracteoles papery, untoothed, rounded in outline (except perhaps at apex), generally > 8mm long when mature, found only with some female flowers.....***A. hortensis*** **(Garden Orache)**
**3'** Bracteoles herbaceous or woody, angled or toothed, present with all female flowers.....**4**

**4** Bracteoles hard and stiff at fruiting; fine veining on leaves thick and dark green with small paler "windows" between (Kranz venation); coastal on sand or sandy shingle.....***A. laciniata*** **(Frosted Orache)**
**4'** Bracteoles herbaceous or spongy at fruiting; fine veining of leaves thin and inconspicuous, not dark green; coastal or not.....**5**

**5** Lower leaves linear to linear-lanceolate, often toothed but without a pair of basal lobes; upper saltmarsh, coastal banks, and inland on salted roadsides.....***A. littoralis*** **(Grass-leaved Orache)**
**5'** Lower leaves linear-lanceolate to triangular or trullate, with (usually distinct) basal lobes; coastal or inland.....**6**

**6** Bracteoles fused for ⅓ to > ½ their length.....**7**
**6'** Bracteoles fused at their base only (< ¼ their length).....**9**

**7** Lower leaves linear-lanceolate to trullate, with an acute cuneate base and forwardly directed basal lobes (sometimes vestigial); bracteoles herbaceous at base; coastal and inland.....***A. patula*** **(Common Orache)**
**7'** Lower leaves triangular to trullate, with a truncate or obtuse cuneate base with basal lobes directed sideways or forwards; bracteoles thickened and spongy at base; coastal and estuarine.....**8**

**8** Bracteoles sessile, 4-10mm, not leafy towards the tip.....***A. glabriuscula*** **(Babington's Orache)**
**8'** Bracteoles at least some with stalks (up to 10mm), up to 20mm long, leafy towards the tip.....***A.*** **x** ***taschereaui*** **(Taschereau's Orache)**

**9** Some bracteoles >10mm and leafy in upper parts, with stalks ≥ 5mm.....**10**
**9'** Bracteoles all <10mm, rarely leafy in upper parts, with stalks ≤ 5mm.....**11**

**10** Bracteoles up to 25mm, conspicuously leafy in upper parts, united only at base, the larger ones with stalks to 25mm or more.....***A. longipes*** **(Long-stalked Orache)**
**10'** Bracteoles up to 20mm, not always obviously leafy towards the tip, the smaller often fused to nearly ½ their length, with stalks to 10mm.....***A.*** **x** ***taschereaui*** **(Taschereau's Orache)**

**11** Bracteoles 2-6(-8)mm long, unstalked; coastal or inland.....***A. prostrata*** **(Spear-leaved Orache)**
**11'** Bracteoles to 9mm long, always some with stalks up to 5mm; usually estuarine.....***A.*** **x** ***gustafssoniana*** **(Kattegat Orache)**

## Identification notes

Two species are distinctive for being shrubby; the more familiar of these is the native saltmarsh species ***Atriplex portulacoides*** **(Sea-purslane)** with unlobed elliptic-oblong leaves, which occurs all round the undeveloped Hampshire coast. This was once put into a separate genus *Halimione*. A much taller introduced plant, naturalising occasionally along the coast but on drier ground, is ***Atriplex halimus*** **(Shrubby Orache)**. It has similarly unlobed elliptic-oblong leaves, but the bracteoles are fan-shaped with a circular outline, unlike other members of the genus found here.


Atriplex portulacoides

Amongst the annual herbs, key identification features are the outline of the lower leaves and the shape, stalking and degree of fusion in the bracteoles. Lower leaves are even more critical than in Goosefoots, but have an even greater tendency to drop off in mature plants. You may need to observe a range of ages in a population.

The commoner species of *Atriplex* all have sessile (unstalked) bracteoles and fruit. ***A. prostrata*** **(Hastate Orache)**, known in older books as *A. hastata*, has triangular lower leaves with basal lobes that stick out at right angles to the stem. Its bracteoles are triangular and fused only at the base.


Atriplex hastata

***A. patula*** **(Common Orache)** has leaves from trowel-shaped (trullate) to narrowly lanceolate, but always with forwardly-directed lobes at the base. Its bracteoles may be nearly triangular or trullate, but they are fused to nearly half their length. Both these species are now common inland and often form huge colonies where road salting takes place, but they are not dependent on saline conditions.


Atriplex patula

There are narrow-leaved forms of Common Orache, and by the coast these can be mistaken for ***A. littoralis*** **(Grass-leaved Orache)**. However the lower leaves of the latter, while they may be toothed, never have basal lobes. Also the side veins in *A. littoralis* leaves are much more opaque, and the bracteoles have a spongy base which is not present in *A. patula.* Although it has spread inland along salting routes in other parts of the country, Grass-leaved Orache doesn't appear to have done so yet in Hampshire.


Atriplex littoralis

***A. glabriuscula*** **(Babington's Orache)** is almost exclusively a plant of the coast, in Hampshire on shingle or on broken ground around hard sea defences. In outline its leaves resemble *A. prostrata* but they are fleshy and can be snapped across the middle, and they are usually much more mealy or scurfy. Its bracteoles are fused to half their length and are usually spongier. It is widespread along our coast, and there is also a single record inland by a main road where it was either introduced with shingle or lured ashore by road salt.


Atriplex Babingtonii

Also widespread along the Hampshire coast, but rarer and often in small numbers, is ***A. laciniata*** **(Frosted Orache)**. Its leaves are more akin to *A. patula*, but often more narrowly and sharply lobed, very fleshy and very silvery-mealy. Most distinctively, they have Krantz venation, with small 'windows' of leaf separated by thick, dense, closed networks of secondary veins. The bracteoles are usually very broadly diamond-shaped, joined to half-way and hard at the base, with few or no teeth. This is mostly a plant of extensive sandy beaches along the upper tidal limit, but in the absence of this habitat over much of Hampshire it seems to have found a niche for itself in nooks of the sea defences wherever there is a little accumulation of sand.


Atriplex laciniata

We now come to the plants that habitually have stalked bracteoles. In Hampshire these comprise the species ***A. longipes*** **(Long-stalked Orache)**, and its hybrid with Hastate Orache ***A.*** x ***gustafssoniana*** (Kattegat Orache). (It is possible that another hybrid occurs, that with Babington's Orache known as ***A.*** x ***taschereaui***, but it has not been recorded yet.) *A. longipes* has triangular, untoothed bracteoles fused only at the base that range from 5mm with a very short stalk to 25mm with a 25mm stalk. The hybrid has smaller, usually untoothed, trullate bracteoles fused to various distances, that range from sessile and 3.5mm long to 9mm with 5mm stalks. Both have a characteristic look to the inflorescence rather like bunting strung out along a rope. The smaller pairs of bracteoles tend to occur at the top. Since there is almost continuous variation between plants resembling the *A. longipes* parent and the more extreme hybrids in the other direction, it is difficult to know where to draw the line between species and hybrids; and it may be that the whole complex should really be regarded as a very variable species. Certainly, on a strict interpretation, *A. longipes* is vanishingly rare in Hampshire, whereas in the right habitat it is usually not hard to find quantities of the putative hybrid. The habitat is in estuaries and sheltered shores, usually where there is seepage of fresh water into the back of the saltmarsh, often on the fringes of stands of Reed or Sea

Club-rush and often also where overhung and partially shaded by trees. Here these plants can form an almost continuous sward. They are almost certainly under-recorded and should be looked out for.

## References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**Davy, A J, Bishop, G F & Costa, S B (2001)**, *Salicornia* L, *Biological Flora of the British Isles* No. 219, *Journal of Ecology* 89 pp. 681-707. Good brief characterisations of the species and a wealth of distributional and biological data. Mercifully, one of the instalments that can be downloaded free (see the British Ecological Society's web site):
http://www.blackwell-synergy.com/openurl?genre=article&sid=bes:web&issn=0022-0477&date=2001&volume=89&issue=4&spage=681

**Fitzgerald, R et al. (1998),** *Chenopodium*, *Plant Crib 1998*, BSBI, London.
http://bsbi.org/Chenopodium_Crib.pdf.

There is a good key to many *Amaranthus* species and species accounts, from which I have taken a few fruit illustrations, in **Groom, Q. (2015-)**, *Manual of the Alien Plants of Belgium*, available online at http://alienplantsbelgium.be/taxonomy/term/3010/descriptions.

**Lahondère, C (2004)**, Les salicornes s.l. sur les côtes françaises, *Bulletin de la Société Botanique du Centre-Ouest*, numéro spécial 24, Saint-Sulpice-de-Royan. If you read French, this is a very good review of recent (but not the most recent!) taxonomy, comparing accounts from authors across Europe including the British. All the British species are covered. Even if you don't read French, it has some very useful photographs and line illustrations.

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**Stace, C A (2010)** *New Flora of the British Isles*, Cambridge University Press, Cambridge.