

Is *Artemisia campestris* subsp. *maritima* (syn. *Artemisia crithmifolia*) (Asteraceae) native in Britain?

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Abstract

The recent discovery of *Artemisia campestris* L. subsp. *maritima* Arcang. (syn. *A. crithmifolia* L.) in Britain raises questions over its native status, with possibly significant consequences for the conservation agencies. This review finds difficulties, however, in the biogeographic and ecological arguments for native status, and better evidence for non-native status in the molecular genetic data. These arguments carry different weight but, on balance, *A. campestris* subsp. *maritima* seems more likely to have arrived relatively recently in Britain, by anthropogenic means, and is therefore best understood as a neophyte.

Keywords: native/non-native assessment; molecular genetics; neophyte; conservation significance of subspecies

Distribution of *Artemisia campestris* subsp. *maritima*

The coastal subspecies of Field Wormwood, *Artemisia campestris* L. subsp. *maritima* Arcang., is restricted to the Atlantic countries of Europe and believed to be native from Portugal to the Netherlands, with naturalised populations in Belgium (Tutin *et al.*, 1976). As a recently-recognised taxon in Britain (Smith & Wilcox, 2006), *A. campestris* subsp. *maritima* is thought to be “possibly native” in some areas (Stace, 2019): in particular, at Crymlyn Burrows (Glamorganshire, v.c.41), the Crosby - Sefton dunes (South Lancashire, v.c.59), and perhaps other coastal localities (Clement, 2006; Twibell, 2007).

The legal status of *Artemisia campestris* subsp. *maritima*

The question of native and non-native status has significant legal consequences, however, since Field Wormwood in the wider sense (*A. campestris* s.l.) is protected under Schedule 8 of the Wildlife and Countryside Act of 1981 (renewed in the Countryside and Rights of Way Act 2000). The law here does not distinguish between subspecies, but any native site for *A. campestris* subsp. *maritima* would automatically qualify for notification as a Site of Special Scientific Interest, with penalties for anyone who damaged it. Ironically, however, there would be no protection if, as various authors (e.g. Stace, 2019) suggest, these populations are instead recognised as a distinct species, *A. crithmifolia*, since this species is not listed under Schedule 8.

Comparison with other rare and associated species

The case for *A. campestris* subsp. *maritima* as a native plant depends upon its ability to disperse naturally, and its similar distribution to other, credibly native plants and animals. Clement (2006) suggests that "Britain fits within ... [its] natural distribution ...[on] ... maritime sands of the Atlantic coast", and this does seem to resemble the range of certain other rare native plants, such as Early Sand-grass, *Mibora minima* (L.) Desv. and the endemic Isle-of-Man Cabbage, *Coincya monensis* subsp. *monensis* (L.) Gomez-Campo (Charles Hipkin, pers. comm.). These species all occur in the general Irish Sea area (including the Bristol Channel) but, more locally, they have very differing distributions. The *A. campestris* subsp. *maritima* at Crymlyn Burrows, for instance, is more than 15km from the localities for *Mibora* and *Coincya* on the Gower and, like the Sefton Dunes population, occurs in a very different dune habitat. These differences largely outweigh the more general range similarities and do not, therefore, seem to be a very strong correlation.

There is other associated-species evidence, however, that could support native status, at least in the south Wales population. Numerous specimens of the rare ground beetle, *Amara fusca* Dejean were recorded from the Crymlyn area in the late 19th century (Fowler, 1887) and this species (commonly called the 'Wormwood Moonshiner') is closely associated with *Artemisia campestris* s.l., as its primary food plant. The connection has been used as an argument for indigenous *A. campestris* subsp. *maritima* here: since both "plant and beetle are ... recorded from Crymlyn Burrows on the Glamorganshire coast ...[this] strongly suggests that the Glamorganshire populations of *Artemisia campestris* have been wrongly regarded as alien" (Telfer, 2010).

But other records for *Amara fusca* in West Kent, v.c.16 c. 1942, and Monmouthshire, v.c.35 in 2008 indicate that it can also occur in the absence of *A. campestris*, and there is other evidence that this species feeds independently on Mugwort, *Artemisia vulgaris* L. (Telfer, 2016). On this basis, the presence of *Amara fusca* seems to provide only weak support for *A. campestris* subsp. *maritima* as a native plant in south Wales.

Natural and anthropogenic habitats

Historically, the Crymlyn locality for *A. campestris* subsp. *maritima* seems to have been a species-rich dune habitat, and John Lighfoot, visiting in 1773, noted Sea Stock, *Matthiola sinuata* (L.) W.T. Aiton and Dune Fescue, *Vulpia fasciculata* (Forssk.) Fritsch. in the area. Neither he nor any subsequent 19th and mid-20th century botanists, however, saw *A. campestris* there, and the earliest record is from 1956 (when it was noted in Hb NMW as an "escape"). This coincides with the period when factories were first built at Crymlyn (Anon, 2016), and the only known locality for *A. campestris* subsp. *maritima* was alongside the Swansea eastern approach road, "adjacent to an industrial pipe compound" (Twibell, 2008) (Fig. 1). By the early 1990s this site was dominated by native and non-native trees, such as Holm Oak, *Quercus ilex* L., White Poplar, *Populus alba* L. and Apple, *Malus pumila* Mill (Fig. 2), and in the next few years the population of *A. campestris* subsp. *maritima* was increasingly shaded out by scrub and dense ground vegetation (Jones & Woodman, 1997; D. Guest, unpublished data) (Fig. 3). Despite targeted management and reinforcement with cultivated specimens, the population died out in about 2012. This instability, along with the absence of any early records and anthropogenic habitat

appears more characteristic of a relatively new arrival than an anciently-established species.



Figure 1. *Artemisia campestris* subsp. *maritima* locality and habitat at Crymlyn Burrows (v.c.41), 1993 (Image: Andy Jones)



Figure 2. *Artemisia campestris* subsp. *maritima* (orange flags) at Crymlyn Burrows, 1991 (Image: Andy Jones)



Figure 3. *Artemisia campestris* subsp. *maritima* in dense *Rubus caesius* and *Polypodium interjectum* at Crymlyn Burrows 19/8/2008 (Image: John Twibell)

The similarities between Crymlyn and the Sefton dune site for *A. campestris* subsp. *maritima* are indications that this population is also recently introduced. The Sefton dune habitat, like Crymlyn, is formerly species-rich sand dune but is now much modified by industrial development (ie. a recently installed pump station), and the small, <2 m square population of *A. campestris* subsp. *maritima* occurs here with various non-native associates, such as Hard Fescue, *Festuca brevipila* R. Tracey, Lucerne, *Medicago sativa* L. and Loose Silky-bent, *Apera spica-venti* (L.) P. Beauv. The original description (Smith & Wilcox, 2006) concludes that, most likely, "this [*A. spica-venti*] and also the Field wormwood had their origin in the seed mixture used around the pumping station".

There is less information on other historic records for *A. campestris*, and it is not always easy to identify herbarium specimens to subspecies. However, the generally broader (c.3.5 mm) involucre in subsp. *maritima*, and narrower (≤ 2.5 mm) involucre in subsp. *campestris* are both relatively distinctive and, from these characters, FR was able to identify all *A. campestris* specimens in **BM** (other than those originating from Crymlyn and Sefton dunes) as subsp. *campestris*.

Most if not all the historic records for *A. campestris* s.l. are also from industrial and anthropogenic localities (e.g. Hull Docks, v.c.61 (1902); Par Harbour, Cornwall, v.c.2; Glasgow, v.c.77 (1922); S. Queensferry, v.c.84 (1934); Cardiff (most likely Bute Docks) ST17, v.c.41 (1876); Barmouth, SH61, v.c.48 (1929) and Hartlepool ballast hills, v.c.66 (1844-1867) **BM!**), and this accords with other descriptions of *A.*

campestris s.l. as a significantly adventive or ruderal species (Piggot & Walters, 1954).

Elsewhere, there are few signs that *A. campestris* subsp. *maritima* is native in neighbouring parts of northwest Europe, and strong indications that it has recently been introduced. The populations in northern France, for instance, seem to be unstable or fluctuating (Tison & Foucault, 2014) and it is deemed "invasive" in Holland (Van der Meijden, 2005), where plants from western France were planted to help stabilise the dunes (Weeda, 2009). Contrary to earlier views (i.e. Tutin *et al*, 1976), a more recent assessment (Verloove, 2012) found that the entire Dutch population is "very unlikely" to be native and the Belgian populations are undoubtedly "naturalised". This study concludes that the "recently discovered British populations" are "in all respects identical with the Belgian and Dutch ones".

Molecular genetic evidence.

Perhaps the clearest evidence for native/non-native status, however, comes from differences and similarities within *A. campestris* subsp. *maritima* molecular profiles in Britain and the rest of Europe. A study of their genetic variability found 7 distinct chloroplast DNA haplotypes between Holland and southern Portugal (numbered A – G), with interesting patterns of relatedness to the GB populations (Garcia-Fernandez *et al*, 2017).

In general, most European populations comprise only one haplotype, with Haplotype A the most frequent in populations from France, Belgium and Holland (and also from Sefton dunes). Haplotype C was the next most frequent, occurring mainly in Iberia but, significantly, also at Crymlyn Burrows, representing a clear genetic difference between the two British populations. This might also be reflected in their distinctive morphologies, since plants from Crymlyn are conspicuously prostrate compared to the relatively more upright Sefton dune morphotype (Figs. 4 & 5).



Figure 4. Prostrate *Artemisia campestris* subsp. *maritima* at Crymlyn Burrows 21/9/1990 (Image: John Twibell)



Figure 5. Upright *Artemisia campestris* subsp. *maritima* at Sefton dunes site 20/8/2008 (Image: John Twibell)

This study concludes that patterns of genetic distinctiveness and similarity are more likely to be the result of independent long-distance dispersal events rather than sequential colonisation up the Atlantic coast. These data clearly separate plants at the Crymlyn and Sefton dune sites and this, therefore, further weakens the case for *A. campestris* subsp. *maritima* as a British native.

Conclusions.

On this evidence, the populations of *A. campestris* subsp. *maritima* at Crymlyn and Sefton do not look like fragments of a formerly widespread range. They are distributed differently from other rare dune species in Britain, they have no obligate insects (as was previously believed) and they are absent from early site records. Their relatively recent discovery, in significantly man-modified habitats, with many non-native associates does not necessarily exclude a native or archaeophyte identity, but these traits are more typical of a recently-arrived denizen or neophyte. The two British populations of *A. campestris* subsp. *maritima* (only one of which now appears to be extant) are unlikely to have arrived here 'naturally' – although this is not always a clear distinction in the Anthropocene – since the species has no capacity for long-distance dispersal over hundreds of kilometres. Additionally, there are clear genetic differences between the two British populations, and equally strong linkages in each case to distinct regional groupings. These differences and similarities suggest two independent introductions, and are unlikely to be the result of natural colonisation processes.

The value of molecular evidence has not been very much discussed in earlier analyses of native and non-native statuses (eg. Webb, 1985; Pearman, 2007), but with increased availability, as in this instance, it may provide a valuable insight into plant biogeography and anthropogenic influence.

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