

What are the criteria for presuming native status?

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ABSTRACT

Decisions on native or alien status of British or Irish plants are based all too often on inappropriate criteria, on irrelevant emotions such as local patriotism, or misinterpretation of fossil data, or on an uncritical acceptance of earlier opinions. Neither abundance nor 'looking wild' can be accepted as firm evidence of native status. The frequent practice of treating long-established aliens as equivalent to natives gives rise to confusion in discussions of phytogeography or quaternary history; the former may be hard to distinguish from natives, but they are aliens none the less. Eight criteria are here suggested; very seldom will any one of them give a definite answer, but if several provide circumstantial evidence pointing in the same direction it is reasonable to accept it as decisive. The criteria suggested are: fossil evidence; historical evidence; habitat; geographical distribution; ease of known naturalization elsewhere; genetic diversity; reproductive pattern; supposed means of introduction. A list is presented of species given without qualification as natives in the *Flora of the British Isles* (2nd ed.) by Clapham, Tutin and Warburg, whose status appears to the author to be subject to considerable doubt. The list is not exhaustive.

THE PROBLEM

Most Floras make some attempt to distinguish between native and introduced species, though some of them do so rather half-heartedly. But their authors seldom disclose the evidence which has led them towards their decision, and all too often it would appear that the assignment has been made either by copying uncritically from earlier works or on essentially intuitive grounds. I would like to suggest that the matter deserves more careful and more dispassionate consideration than it usually receives.

It would seem, moreover, that some authors interpret the term 'native' as synonymous with 'long-established'. Tutin (1962) for example, says of *Eryngium campestre** "Native . . . probably introduced in some localities, but certainly established at Plymouth before 1670". Apart from the fact that the small print in Martin & Fraser (1939) suggests that there is room for doubt as to whether the 1670 station is the same as any in which the plant grows today, one must infer that he regards "established since 1670" as different from "introduced". On the other hand Healy & Edgar (1980), discussing the flora of New Zealand, write that "for some species there must always be doubt as to whether they are truly indigenous or adventive . . . a certain proportion of plants considered native to New Zealand could have been quite recent immigrants, especially species whose seeds can be carried by wind or distributed by birds". Since it seems fairly certain that most of the non-endemic species of New Zealand must have arrived in quaternary or late tertiary times by some such methods there is little to be gained by calling a species that so arrived in prehistoric times 'indigenous' and one that arrived by the same means in historic times 'adventive'. This is not to say that great interest may not attach, in the case of some species, to the date of arrival in the territory in question; but if we are to make any sense of biogeography or quaternary history, we must surely recognize that whereas the agents of dispersal that have been operating for millennia are still operating, man has recently become an agent for dispersal on quite a different scale. While he was still a hunter or food-gatherer he may well have shifted some seeds from one place to another, but only in the same manner as a bear or an ape. But as soon as he began to herd flocks and to till the ground his impact on plant-geography suddenly increased enormously, and he ceased to be in any ordinary sense a part of nature but became a phenomenon sui generis.

*Nomenclature throughout follows Tutin *et al.* (1964–80).

In this paper I am concerned with the flora of Britain, and to some extent of Ireland, and I therefore define a native plant as one which evolved in these islands or which arrived there by one means or another before the beginning of the neolithic period, or which arrived there since that date by a method entirely independent of human activity. An alien, on the other hand, is one which reached the British Isles as a consequence of the activities of neolithic or post-neolithic man or of his domestic animals.

The more recent the introduction the easier it is, of course, to be sure of alien status, and it must be frankly admitted that for many species a decision between indigenous status and introduction as a weed of neolithic crops may be difficult or perhaps impossible. Some botanists, therefore, distinguish between 'palaeosynanthropic' and 'neosynanthropic' plants, and for most purposes lump the former with natives. The dividing line between the two is put at about A.D. 1550 when, as a result of the voyages of discovery, plants from America and eastern Asia came flooding in on an unprecedented scale. But this practice, although it saves many question marks and qualifications, obscures an important difference. If we are trying to work out the laws of plant-geography, *Agrostemma githago* must be as firmly classified as alien as is *Buddleja davidii*.

If I challenge a fellow-botanist who asserts that a plant considered by some to be alien is really native, and ask him for his evidence, he is apt to reply either "Well, there are such masses of it" or else "Well, it looks native at such-and-such a place". A glance at *Rhododendron ponticum* in the Killarney woods or at *Senecio squalidus* by the railway-lines of Yorkshire is enough to dispose of the former reply. The unreliability of the latter can be neatly illustrated by two passages from More (1868a,b), writing in the *Journal of Botany*. On p. 255, this leading Irish floristic botanist of the day, and a careful observer and orderly recorder, announced the discovery of *Hippophae rhamnoides* on the Wexford coast and made the following comment:

"From what I have seen I think there is no doubt that the plant is truly indigenous . . . It may be objected that the sandhills adjoin a large park, where much planting has been carried on, and I did notice in one place a young *Acer pseudoplatanus* growing with the *Hippophae*, and also a plant of *Clematis vitalba*, both evidently self-sown, but there is no appearance of the *Hippophae* itself having been planted, and it is too widely spread to be considered an escape or the remains of former cultivation . . . Miss Farmer has also ascertained that the plant has long been known to the inhabitants, who always believed it to be truly wild".

Convincing enough, one might think, but two or three months later there appeared on p. 373 a further note by More:

"From information received through Miss Farmer, I learn that the sea buckthorn was first planted on the sandhills at Kiltennel and Courtown by the father of the present Earl of Courtown, about thirty years ago, and since that time the planting has been continued by the present Earl, few years passing without some additions being made . . . This may serve as a caution against deciding too hastily in favour of any plant being indigenous even when it presents every appearance of being perfectly wild".

It may indeed, though the moral is all too often ignored. It also suggests that information supplied by the local landowner will often be of greater value than that supplied by "the inhabitants".

THE SOLUTION

What, then, is to be our procedure in attempting to decide on status? I suggest that there are eight criteria which may be employed (not all of them applicable to every species), and that although very seldom is any one of them decisive, when several point in the same direction one is justified in accepting the composite evidence as reasonably conclusive. There are, of course, many species for which the evidence will turn out to be very scanty or else conflicting, and in these cases it is best to be honest and to be content with a question-mark as the only answer. The criteria I propose are as follows.

FOSSIL EVIDENCE

A fossil record attributable to a date between the last glaciation and the beginning of neolithic agriculture provides evidence of native status which can be regarded as conclusive. Absence of fossils from this period and plentiful representation at earlier or later dates suggests alien status but cannot prove it. Godwin (1975) provided such evidence of native status for a large number of species, but most of them are plants which nobody ever supposed to be alien, and the list of weeds and ruderals for which such evidence appears to be provided has to be analysed with some caution. In a few cases

the date of the deposit is open to question; in a great many more the identification to species level is admittedly speculative or uncertain; and there are more still for which no uncertainty has been expressed but for which some scepticism is justified. I yield to none in my admiration for the monotonous and patient toil that quaternary botanists endure in picking over piles of compost to find in them the occasional seed or leaf-fragment. But we must recognize that nearly all their macroscopic material is of a kind that the normal taxonomist would reject as totally inadequate for identification, and that their pollen, though usually in better condition, is very often identifiable only to genus, and also, if scanty, is subject to doubts as to long-range transport.

Uncertainty of identification can be exemplified by the annual species of the genus *Polygonum*. I have recently had occasion to examine closely the nuts of many of these and, working with the best fresh material, I have concluded that one can identify with fair certainty the nuts of *P. minus* (by their small size) and of *P. hydropiper* (by their microtuberculate surface). The nuts of *P. mite*, *P. persicaria* and *P. lapathifolium* are, however, so much alike that, although if I were shown a collection of 20 nuts from a number of plants of the same species I might hazard a guess (for there are small differences of average size or shape, though with large overlaps), I should never dare to name a single nut. Yet confident identifications of these species have been made from eroded and sometimes fragmentary nuts in post-glacial deposits, based in many cases on characters which have since been abandoned by taxonomists as unreliable, but which still persist in all but the most recent literature.

Some of Godwin's early results gave clear evidence of the existence in Britain in late-glacial times of a few weedy species which had hitherto been regarded as possibly introduced, and a few more have been added by later workers: *Aethusa cynapium*, *Atriplex patula*, *Solanum nigrum* and *Sonchus oleraceus* may be cited as examples. This important finding was given some well-deserved publicity, but the botanical world in general seems to have got an exaggerated idea of the number of species involved, and the policy which followed, of giving almost every species the benefit of the doubt, was carried much too far. A systematic perusal of the pages of Godwin (1975) has left me much more impressed by the number of weeds and ruderals whose first post-glacial appearance lies in the Bronze Age or later than by the number which have reliable records from the late-glacial or the pre-neolithic part of the post-glacial. But it should in fairness be added that a considerable number of indubitably native species also make their first appearance in Bronze or Iron Age times. This demonstrates how relatively scanty the fossil record still is and the danger of argument from absences.

I do not consider that interglacial fossils give more than very slight evidence in favour of native status. (Once more the name of *Rhododendron ponticum* must be whispered). Godwin implies for some species that, although he does not rule out the possibility of extinction during the last glaciation and subsequent re-introduction by man, he is impressed by the evidence afforded by interglacial fossils that they once grew here in habitats not influenced by man. But this was true, not of present conditions, but of interglacial conditions, when the climate, at least for part of the time, was warmer than it is today, and approximated to the present climate of southern Europe, where many of the disputed species are undoubtedly native. An interglacial fossil, therefore, gives at best a hint as to the possibility of native status, but if this hint is not backed up by a post-glacial and pre-neolithic fossil, or by the occurrence of the species in a natural habitat today, I do not think that it has much weight.

To sum up, then, the fossil record gives us firm evidence for the native status of a few disputed species, but only a few.

HISTORICAL EVIDENCE

We know that *Buddleja davidii* was introduced to England as a supposed novelty in 1896; we know that it is now common in places where the flora was carefully studied and listed a century ago without any mention of it. No more need be said. Such evidence can prove alien status; it can never prove the reverse. Less conclusive, but nevertheless suggestive, is the absence from an early list or Flora of a conspicuous plant of doubtful status. I regard *Muscari neglectum* as alien in Britain, and one of my reasons, though not the only one, is that in Cambridgeshire, where it looks as native as anywhere, it was unknown to Ray, but was first recorded by Henslow in 1828.

As a subheading under this criterion one can mention rate of increase or decline, for if this is very noticeable it provides some presumptive evidence for alien status. Native plants do not, as a rule, behave like *Elodea canadensis* or *Veronica persica* in their spread, or like *Sisymbrium irio* or *Agrostemma githago* in their decline. There are, of course, exceptions: *Epilobium angustifolium* may be cited on the one hand and *Orobanche rapum-genistae* on the other. And there are some aliens like

Inula helenium which persist for centuries without marked increase or decrease. But such exceptions are few, and the rule is of considerable value.

HABITAT

If a plant grows only in man-made habitats it is likely to be alien; if it grows extensively in more or less natural habitats it is likely to be native. This is a sound principle but is, again, subject to qualification and exceptions. Firstly, a few aliens are extensively naturalized in natural habitats; *Epilobium nerterioides* and *Rhododendron ponticum* are perhaps the best examples. On the other hand we must acknowledge the possibility that for some species the natural habitat has virtually disappeared, and that they survive today as refugees in man-made habitats. On the whole, however, it seems fairly safe to regard as alien those species which are very seldom seen except as field or garden weeds, and to admit as native such species as *Anagallis arvensis* and *Stellaria media* which, though commonest as weeds, are seen fairly often in other habitats such as sand-dunes.

This criterion is most useful for weeds; for ruderals it gives less certain guidance, since their habitat is often intermediate between the natural and the artificial, and since plants can arrive in ruderal habitats from very various sources. Hedgerows are particularly difficult to assess from this point of view; they are certainly rich in native woodland plants, but they are also rich in undoubted aliens. For woodland species suspected of alien status, the habitat gives few clues one way or the other, except that one might expect a native to be most abundant in those woods which are furthest from houses and subject to least disturbance, and an alien to be commonest in hedgerows, copses near houses, and woods of large demesnes. By this criterion I think that the snowdrop fails to establish its native status.

GEOGRAPHICAL DISTRIBUTION

This can never give a decisive answer, but it can give a strong hint. For it is reasonable to assert that although striking examples can be found of disjunct but undoubtedly native distributions, more or less continuous distributions are much commoner. If, therefore, a plant of southern England is not accepted as native by the botanists of Holland, Belgium, or France north of Paris, I think that the burden of proof lies on those who wish to treat it as native in England. Sometimes, as with *Arabis stricta* and *Gagea bohemica*, they will be able to put up a good case, but more often not. It is always advisable, when assessing evidence of this type, to consult Hegi's *Illustrierte Flora von Mitteleuropa*, which gives a saner and more careful assessment of the native range of most European plants than any other book I know.

Even among disjunct distributions we can distinguish between those which, improbable though they may appear, are shown by several species, which thereby give each other mutual support for their claim to native status, and others which are unique, and for that reason to be regarded with more suspicion. It is this consideration which helps to justify the claim for native status in Ireland for *Hypericum canadense* made by Webb & Halliday (1973), while no such claim is made for *Juncus planifolius*, which grows not far away in a not very dissimilar habitat. For although there are a few species for which a native bipolar distribution has been claimed, they are all more widely distributed in the northern hemisphere and relatively local in the south; no species is known which is widely distributed in what one may call *Nothofagus*-land and confined to one or two native localities in the north temperate zone. If *Juncus planifolius* were native in Ireland it would represent a unique pattern of distribution, and this fact, coupled with the knowledge that it is naturalized also in Hawaii, is enough to outweigh the difficulty of accounting for the transport of its seeds to a Connemara bog by any known human agency. But there are several species other than *Hypericum canadense* common to north-eastern North America and north-western Europe, and to accept it as native in Ireland raises no problem that is not already raised by *Eriocaulon aquaticum* and *Spiranthes romanoffiana*.

FREQUENCY OF KNOWN NATURALIZATION

If a plant claimed to be native in one locality is becoming more and more widely naturalized in similar habitats not far away, then some reconsideration is called for. Such naturalization cannot prove that it is not native in the first station, but it constitutes strong circumstantial evidence against the claim. *Lonicera xylosteum* provides a good example. It has long been accepted as native in one station near Arundel; this can be traced back to a statement by Borrer, published by Smith (1801), that here it was "growing plentifully and certainly wild". But Borrer was only 19 at the time; the plant still grows in or

near his station, but not plentifully; Smith admitted at the time that it was frequent in gardens and that he had previously regarded it as an escape; and Perring & Walters (1962) show just one hundred stations in England and Wales where it is held to be probably or certainly naturalized. I cannot believe that the statement by the youthful Borrer, copied uncritically from one book to another, outweighs the mass of evidence in the opposite direction.

GENETIC DIVERSITY

It seems reasonable to suppose that if the weed populations of a species show obvious genetic differences from small populations found in natural habitats it is more likely to be native than if the two populations are more or less identical. This is because the pressures on a plant of open ground to adapt itself for life as a weed are greater than are those on an escaped weed to adapt itself to a natural open habitat. The observations by Akeroyd *et al.* (1978) on *Senecio viscosus* seem for this reason to give a little support to the supposition that it is native on shingle beaches, though they would need to be considerably extended before they could be regarded as really compelling. Unfortunately there are very few species for which the relevant data are available.

REPRODUCTIVE PATTERN

It seems reasonable to assume that most native plants are capable of reproducing, at least in part, by seed, and that if a plant reproduces entirely vegetatively it can legitimately be suspected of being an alien. There are, of course, some exceptions to the first part of this statement; they are mostly polyploids of arctic-alpine affinities (*Polygonum viviparum*, *Festuca vivipara*), plants of extremely local relict distribution (*Erica mackaiana*, *Saxifraga cernua*), or self-sterile species with large local clones, such as *Lysimachia nummularia*. The statement is not, of course, convertible, as many aliens reproduce entirely by seed. But even if one did not know from other evidence that it is alien, the sterility of *Veronica filiformis* would bring it under suspicion, and I find it hard to believe that *Petasites hybridus* is native in those rather extensive districts where plants of only one sex are to be found.

POSSIBLE MEANS OF INTRODUCTION

If a species is to be confidently classed as an alien it is obviously desirable that one should have some idea about how it came to be introduced. If no such mechanism can be suggested it is an argument in favour of native status, though this may be overruled by other considerations, as we have seen in the case of *Juncus planifolius*. The various arguments must be weighed against each other as fairly as possible, and the conclusion adopted which, even if rather improbable, seems less improbable than the alternatives.

Who is best qualified to do this weighing? It is hard to say. Detailed local knowledge is often invaluable, but all too often its value is eroded by local patriotism. There is a curious emotional bias, which I have found very widespread (and from which I may not be entirely free myself), which favours native status for an attractive plant or for the botanist's home county. For this reason a cool assessment by an outsider may be more reliable.

SPECIES REQUIRING RECONSIDERATION

It will have become clear to the reader that the scepticism expressed in this paper is somewhat unilateral, for I believe that far more aliens are represented as native than *vice versa*. I conclude, therefore, by presenting a list of species which are accepted as native without question by Clapham *et al.* (1962), but which are in my opinion probably, and in some cases almost certainly, introduced by man. The list is not intended as exhaustive; I have confined it to what seem to be the clearest cases. The order of species follows Tutin *et al.* (1964-80).

Urtica urens
Polygonum rurivagum
Bilderdykia (Fallopia) convolvulus
Ranunculus sardous
Fumaria officinalis
F. parviflora
Lepidium ruderales
Coronopus squamatus
Reseda luteola
R. lutea
Euphorbia exigua
E. peplus
Lavatera cretica
Eryngium campestre

Scandix pecten-veneris
Torilis nodosa
Lithospermum arvense
Echium plantagineum
Anchusa arvensis
Lamium purpureum
L. amplexicaule
Stachys arvensis
Misopates orontium
Kickxia elatine
K. spuria
Veronica triphyllos
V. polita
V. agrestis

Melampyrum arvense
Orobanche minor
Lonicera xylosteum
Valerianella rimosa
Legousia hybrida
Anthemis arvensis
A. cotula
Chamomilla recutita
Centaurea cyanus
Muscari neglectum
Poa annua
Bromus sterilis
Cynodon dactylon

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