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## Notes on some British plants seen in Austria

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While the interest and pleasure of seeing unfamiliar plants and plant communities under the skilful guidance of our Italian and Austrian colleagues rank high among the valuable results of the XI. IPE, it is hardly less instructive to see growing in another country species with which one is familiar at home. These may be plants which one knows as rare and local species of specialized habitats in Britain, but which are common and of wide ecological amplitude in Central Europe, such as *Cotoneaster integerrima*, confined in Britain to one small limestone area at Llandudno in North Wales, or *Artemisia campestris*, confined to a few sandy heaths not far from Cambridge; or they may be common plants of one's own country growing at the limit of their distribution or in unusual habitats elsewhere; for example, *Ilex aquifolium* and *Hookeria lucens*, both widespread and often abundant in the west of Britain, but rare in the East-Alps, or the halophytes such as *Aster tri-polium* and *Plantago maritima*, both abundant on our coasts but also occurring as different races on the saline soils of the Burgenland and Marchfeld.

Some notes follow on a few of the British plants which I was particularly glad to see growing in Austria.

*Impatiens glandulifera* Royle (1835). (Syn. *I. Roylei* Walp. 1842); *I. glanduligera* Lindley (1840). For the nomenclature of this species see Sprague (1933).

Var. *pallidiflora* Hook. f.; shown to us by Professor H. GAMS on wet slopes of the gravelly colluvial cone at FRITZENS, north-east of Innsbruck, 3 August 1956; also seen (from the motorcoach) by the River Traisen near Scheibmühl, 29 July 1956.

*Impatiens glandulifera*, which is now naturalized in many places from the Pyrenees to north-west Russia, and is perhaps nowhere more abundant than along rivers in the north and west of Britain, was first described and figured by J. F. ROYLE in Part V of his 'Illustrations of the Botany of the Himalayan Mountains', this part being published in January 1835 (although the work is dated 1839 on the title-page of each part). In 1839 the Honourable Court of Directors of the East India Company sent seed of four Indian balsams to the (then) Horticultural Society in England, who raised plants in a greenhouse and subsequently distributed seeds to gardeners. One of the taxa was *I. glanduligera* Lindley (Lindley, 1840) with deep rose-magenta flowers identical to Royle's *I. glandulifera*; another was *I. candida* Lindley (Lindley, 1841)

with bright green leaves and white flowers a little speckled with crimson; this is an albino form of *I. glandulifera* which is still sometimes grown in English gardens and is found naturalized occasionally. Not until 1899 do we hear anything of var. *pallidiflora*, described in that year by J. D. HOOKER, with 'floribus . . . pallide roseis rubro maculatis', which appeared spontaneously in his garden near London in about 1895.

In many parts of the British Isles var. *pallidiflora* and intermediate forms grow with the type, especially in the west and north. In the Cambridge district, where the plant has never become fully established, I have seen only var. *pallidiflora*. In the Cambridge University Botanic Garden an isolated patch of var. *glandulifera* maintains itself from year to year without variation in colour, but where var. *glandulifera* and var. *candida* are grown together for a few years forms similar to var. *pallidiflora* appear spontaneously, yet var. *pallidiflora* grown in isolation (as at Fritzens) also seems to show little variation. We are clearly not dealing with a simple Mendelian situation here; possibly there is a multiple allele system for flower colour as in *Antirrhinum majus*. Historically the interesting point is this: *I. glandulifera* was introduced to England as more than one genotype, in contrast to *I. capensis* Meerburgh (*I. biflora* Walt., *I. fulva* Nutt.), which although exceedingly polymorphic in the eastern United States, whence it was introduced to London before 1768, is quite homozygous for flower colour in its many naturalized stations in England, and probably also in France. A similar situation is found in *I. parviflora* DC.: this species is extremely variable in its native localities (see POBEDIMOVA, 1949; COOMBE, 1956) but only a single genotype appears to have spread from the Botanic Garden at Geneva where it was already in cultivation by 1831.

I should be very interested to receive information on the range of flower colour occurring in *I. glandulifera* in various parts of Europe, since this is a character which one can all too seldom study in the herbarium.

*I. noli-tangere* L. With the leaves mined by the Agromyzid fly *Liriomyza impatientis* (Bri.) at the Heiligenkreuzstift, Niederösterreich, 29 July 1956; heavily infected with *Puccinia argentata* (Schultz) Wint. at Lunz-am-See, 31 July 1956.

Although this plant was recorded from the borders of England and Wales in 1633, and from the Lake District of north-west England in 1670, its native status in Britain has often been questioned. The rapidity with which *I. capensis*, *I. parviflora* and *I. glandulifera* have established themselves in natural plant communities in Britain demonstrates the danger of assuming that because a plant is found maintaining itself in climax vegetation it must be native, and while three pollen grains of an *Impatiens* have recently been found in an Interglacial deposit at Bir-

mingham (GODWIN, 1956, p. 101) there are so far no Postglacial records of the genus in Britain which can be accepted with certainty.

An interesting line of evidence as to the native status of *Impatiens noli-tangere* in parts of north and west Britain is based on the occurrence there of certain oligophagous insect feeders. *Liriomyza impatientis* is abundant on *I. noli-tangere* in the English Lake District, and the introduced *I. parviflora* is also attacked by this leaf mining fly where the two *Impatiens* grow together in close proximity, as for example on the western shore of Lake Windermere. But elsewhere in Britain, *I. parviflora* is as yet remarkably free from insect pests (COOMBE, 1956). On the other hand, at the British *locus classicus* of *I. noli-tangere* in Shropshire I recently found abundantly the aphid *Impatientinum balsamines* (Kalt.), while the rare Geometrid moth *Eustroma reticulata* feeds on *I. noli-tangere* in North Wales and the Lake District. Within the last hundred years *I. noli-tangere* has been found in several places in the south of England, usually by streams under *Alnus glutinosa*, but in none of these places are there any insect feeders, except occasionally such polyphagous feeders as the ubiquitous 'white fly' (*Aleyrodes* sp.). The entomological evidence very strongly suggests that *I. noli-tangere* is native in North Wales and the north-west of England, but a recent escape from gardens in the south of England. At Windermere *Liriomyza* has clearly transgressed from the native *I. noli-tangere* to the introduced *I. parviflora*, but since the insect has a very limited power of dispersal it has not succeeded in attacking *I. parviflora* elsewhere in Britain.

It is noteworthy that another Geometrid moth, *Xanthorhoë biriviata* (Bkh.), widespread on the Continent on *I. noli-tangere*, has not been found in Britain on this species, but was newly discovered in 1955 in the south of England on *I. capensis*; in this case the moth is clearly a recent immigrant from the Continent.

*Impatiens parviflora* DC. With abundant *Puccinia komarowi* Tranzsch. at Stift Melk, Wachau, 30 July 1956. The phenomenal spread of this rust fungus in Europe since it was first found in 1933 at Brandenburg is well known. It now occurs from France and Switzerland to Sweden and Finland. An excellent recent account of its spread is given by RAUHALA (1951). I have looked repeatedly without success for *P. komarowi* in England, where *I. parviflora* is abundant in many places (map in COOMBE, 1956), but the English Channel and the North Sea appear to remain a formidable barrier to the migration of the rust. The native European *Puccinia argentata* (Schultz) Wint., on the other hand, has several times been found in England, both on *I. noli-tangere* and *I. capensis*.

*Carex humilis* Leyss. Although this sedge is very widespread on the Continent from Catalonia, north Spain and the Pyrenees eastward to the Kursk steppes (WALTER, 1954), it has a notably disjunct distribution further to the east, occurring in the Altai, and again as the closely-related *C. nanella* Ohwi (*C. humilis* forma *brevimacula* Kük.) in Dauria, the Maritime Territory of the U. S. S. R., Manchuria, Korea and Japan (SCHISCHKIN, 1935; LAVRENKO, 1956). Northwestwards, its distribution in France and England are almost as striking. It scarcely reaches the Atlantic coasts of France except on the Gironde south of Rochefort; in England it occurs very abundantly on the chalk ('die Kreide') of a restricted area in the counties of Wiltshire, Hampshire and Dorset (1° 42' W. of Greenwich to 2° 13' W., and 50° 48' N. to 51° 22' N.), yet is absent from the very extensive areas of the same chalk formation (with its widespread Mesobrometum grasslands) farther east and north-east in England. On the other hand there are three outlying western stations on small areas of the harder Palaeozoic (Carboniferous) limestone: one on the River Wye south of Hereford, one at Bristol, and one on the coast of the Bristol Channel near Weston-super-Mare. At the last two places, especially, it is associated with a number of typical Submediterranean species, e. g. *Allium sphaerocephalum*, *Helianthemum apenninum*, *Koeleria vallesiana* and *Trinia glauca*, an assemblage reminiscent of the Mediterranean Ononido-Rosmarinetea (BRAUN-BLANQUET, 1951), although the turf in which *C. humilis* grows on these shallow limestone soils is nearer a Xerobrometum in many respects (see PROCTOR, 1956, for species lists from Brean Down, near Weston-super-Mare). On the chalk, on the other hand, there are few Submediterranean associates of *C. humilis*, but instead we find such species as *Sieglingia decumbens* (generally regarded as a characteristic heath or moor plant) which assume importance in the British Mesobrometum in districts where the rainfall is more than 40 inches (1000 mm.) per annum, but which are usually absent from the better-known and drier areas of chalk grassland in south-east England, described for example by TANSLEY (1939).

Despite this range of variation in its associated species in Britain, *Carex humilis* is throughout its British range a plant of narrow ecological amplitude, occurring only on unshaded grassland on Ca-humate soils or rendzinas, on south or south-west-facing slopes, at altitudes up to about 300 metres.

In contrast, on the Continent the ecological amplitude of the species is seen to be much wider: I was particularly interested to see how abundant the plant can be (associated with *Sesleria caerulea* ssp. *calcareae*) on north-facing slopes in the 'continental' climate of Mödling, near Vienna, even in the shade of *Pinus nigra* ssp. *nigra*; although in

the more 'oceanic' climate of the Traunsee (Salzkammergut) *C. humilis* was seen to be more closely bound to the south-facing slopes. In the more 'continental' climate of the inner Alpine valleys, and elsewhere in the high mountains, *C. humilis* reaches altitudes which are quite astonishing to one used to a northern, oceanic climate: to 2340 m. in the eastern Pyrenees (BRAUN-BLANQUET, 1948), 2650 m. in the Alps (BRAUN-BLANQUET, 1951, p. 170) and in steppe communities at 2600—2700 m. in the southern Transcaucasus (LAVRENKO, 1956). In consequence, *C. humilis* is associated with a remarkable number of other species throughout its European range, many of them calcicole, thermophilous, and with disjunct distributions. I have compared lists from the abundant literature and find so far over a thousand closely associated species in associations belonging to several orders: Seslerion caeruleae, Bromion erecti and Festucion vallesiaceae (auct. plur.); Genistion lobelii, Ononidion striatae, Aphyllanthion and Rosmarino-Ericion (BRAUN-BLANQUET, 1951); Quercion pubescentis-sessiliflorae (BRAUN-BLANQUET, 1951; Klika, 1932); and the Pineto-Ericion (BRAUN-BLANQUET, PALLMANN and BACH, 1954).

Although *Carex humilis* grows usually on soils rich in calcium carbonate (or magnesium carbonate on dolomite) and is quite exclusive to them in Britain, it occasionally grows on other substrata on the Continent: for example, on serpentine in the Balkans (KRAUSE and LUDWIG, 1956) and Czechoslovakia (ZLATNIK, 1928), on quartz porphyry with a low calcium content (0.25% Ca O) at Rotenfels in the Nahetal, and elsewhere in north Germany, and on basalt and phonolith in Bohemia (HEGI, 1939, vol. 2; KLIKA, 1936). However, although the soils may often be slightly acid they are presumably base-rich and are always well-drained.

One of the most striking features of *C. humilis*, at least in Central and north-west Europe, is its very limited capacity of spreading into disturbed or new habitats, unlike so many of the 'steppe' plants which can rapidly colonize abandoned farm land, vineyards, and other broken land: even *Artemisia campestris* has this ruderal character in its limited range in England. *Carex humilis* in England is strictly confined to grass-which has not been ploughed or afforested for at least 1500 years, although it is abundant on earthworks of Bronze Age and Iron Age date, on the so-called 'Celtic fields' — small square areas presumably last ploughed during the Romano-British period — and on some of the Roman roads which have not been turned into modern highways (see COOMBE in PIGOTT and WALTERS, 1954). This phenomenon is clearly related to the combination of an extremely slow rate of vegetative spread — 3 cm. per year under the most favourable conditions, and usually only 1 to 2 cm. per year — and the very limited capacity for

production and spread of the fruits. This last has been studied in great detail by KRAUSE (1940). While in Central and southern Europe *C. humilis* often produces ripe fruit with seed which germinates readily, at least under cultural conditions (KRAUSE, 1940), the reproductive cycle of the plant is poorly adapted to a more oceanic climate, with a cool moist winter, relatively cool moist summer, and the possibility of sharp frosts in almost any month of the year, except very near the coasts. This has become very clear during the extremely oceanic weather cycle in England of June 1956 to April 1957; in the rather cold, wet summer of 1956, with little sunshine, rather few flower primordia were laid down in most of my collection of European plants at Cambridge; in the mild moist early autumn they failed to become fully dormant, and the young inflorescences had developed to such an extent that the terminal male spike was already up to 9 mm. long in September, and a little leaf and root growth continued through the autumn. Then a spell of sharp frost at the end of November completely killed most of the male inflorescences, and not only in the Botanic Garden at Cambridge but also over much of Wiltshire hardly a flower was to be seen in March and April. Even at Montpellier early in April, 1957, many of the plants in the Rosmarineto-Lithospermetum were sterile, although a few had abundant nearly ripe fruits. (By way of contrast, at the same time plants in a community related to the Stipeto-Ononidetum at 1300 m. in the Alpes Maritimes were only just at anthesis). After the much hotter summer and drier autumn of 1955, and the much colder, 'continental' winter of early 1956, *C. humilis* flowered well in England: but our cool, moist, oceanic spring weather rarely seems to produce much ripe fruit, and I have never succeeded in finding seedlings in the field.

Clearly the disjunction of *C. humilis* in Britain is due to the relict character of the species; it can hardly be a recent arrival, and there is considerable circumstantial evidence to suggest that it has survived in tree-less refugia on rocky slopes in the west of England since at least Late-glacial times (PIGOTT and WALTERS, 1954); its presence on the less rocky chalk in England is more problematic, but with the recent demonstration (PERRIN, 1956; COOMBE and FROST, 1956) that loess-like superficial deposits of presumably aeolian origin are widespread in the south of England, the hypothesis of KLEPOW (quoted in WALTER, 1954, pp. 215—7) that we are dealing with a relict species of a periglacial steppe becomes very attractive; alternatively *C. humilis* may have spread *eastwards* from its Late-glacial refugia during the phase of Neolithic and later forest clearance for which the evidence is now so strong, at least in parts of England (GODWIN, 1956), provided the climate was then more favourable for seed production and seedling establishment than at the present day.

*Trifolium striatum* L. In many plant communities of the south and south-west of England there are a number of genera in which one of two species is Submediterranean in its distribution, the other Subatlantic or Atlantic. In my work on the vegetation of serpentine and related rocks of the Lizard peninsula in the extreme south-west of England I find, for example, uniform stands in which metre quadrats show both *Trifolium scabrum* (submed.) and *T. striatum* (subatl.); or *Aira caryophyllea* (submed.) and *A. praecox* (subatl.); or *Scilla autumnalis* (submed.) and *S. verna* (atl.); or even, sometimes, all six species together in a herb-rich, short turf which may have 30 to 35 species of flowering plants to the square metre. Some of these species-pairs often occur together on the Continent (see, for example, the statements by GAMS in HEGI, 1924, vol. IV. 3, pp. 1326 and 1327); it is therefore a matter of some interest to discover under what conditions the one or the other member of the pair may grow alone. Thus in the south of France recently I was interested to see much *Trifolium scabrum* in ruderal communities on calcareous soils — but no *T. striatum*; and *Aira caryophyllea* and *Scilla autumnalis* as components of the *Isoetetum duriae* in Provence — but no *A. praecox* or *S. verna*. *T. striatum*, on the other hand, is thinly scattered through Central Europe, often in *Stipa capillata* associations (e. g. in the Radotin valley, Central Bohemia; DOMIN, 1928), and I have seen it in a very similar community, with many xerotherm elements, on quartz porphyry in the Nahetal, W. Germany. Both of these annual clovers are tolerant of relatively high sodium chloride concentrations (at least 300 mg. Na<sub>2</sub>O per 100 g. air-dry soil) due to sea spray on the English coasts, but on the whole *T. striatum* is less xerophytic — but presumably more frost-tolerant — than *T. scabrum*. I was therefore very interested to see *T. striatum* growing on a cart-track with incomplete vegetation cover on a moist, clayey, slightly saline soil in the Marchfeld between Marchegg and Siebenbrunn on 29 July 1956, together with *Alopecurus pratensis*, *Aster canus*, *Bupleurum tenuissimum*, *Festuca vallesiaca* ssp. *pseudovina*, *Juncus gerardi*, *Lolium perenne*, *Lotus tenuis*, *Pholiurus* (*Lepturus*) *pannonicus*, *Plantago maritima*, *Polygonum aviculare* and *Trifolium arvense* (on an area of about 1 m.<sup>2</sup>). *T. striatum* was in fruit and I have had abundant germination from the seed.

Incidentally, in England, at least, *T. striatum* and *T. scabrum* are not calcifuge, as often stated: both grow on shallow rendzina soils with abundant calcium carbonate at the level of the roots, and pH values of 7 to 7.5, as well as on acid, leached sands. Where the two species occur together, however, in the same climatic region, *T. scabrum* tends to behave as the more extreme xerophyte of the two, growing on shallower and drier soils generally.

*Asarum europaeum* L. This is another of those common European plants whose native status in Britain, like that of *I. noli-tangere*, has been in considerable doubt. There are several scattered stations for *Asarum* in England and Scotland: in some of these it is quite clearly a recent escape from gardens. In others the case is not so clear: in Wiltshire and Buckinghamshire, for example. Even there it is suspicious that *Asarum* is associated with other species of doubtful native status in Britain: *Tulipa sylvestris* in Wilts. and *Ornithogalum umbellatum* in Bucks. But the plant sociological argument is also helpful here: does *Asarum* grow in communities similar to those in which it is unquestionably native on the Continent? We must remember, of course, that many of the common Continental woodland herbs do not occur in Britain even as established aliens, *Aruncus sylvestris*, *Galium sylvaticum* and *Hepatica triloba*, for example. This question was to me one of the many interesting points about the 'Auenwälder' near Wals, Salzburg, where we saw *Asarum europaeum* under *Tilia cordata* and *Fraxinus excelsior* with abundant *Aposeris foetida*, *Carex alba*, *Lonicera alpi-gena*, etc. *Asarum* is, of course, a very characteristic plant of moist *Fagus sylvatica* woods in Europe, and if it were truly native in Britain it should surely occur in the Chilterns beechwoods of the type on brown earth soil described by A. S. WATT in TANSLEY (1939), with a luxuriant growth of tall herbs and grasses; but this it does not do, occurring in Wiltshire, for example, on a roadside hedgebank on a dry, highly calcareous soil. I can find no insects regularly associated with *Asarum* in Britain, except a polyphagous aphid in the Cambridge University Botanic Garden. The flowers are self-pollinated and produce a good crop of seeds each year, and in the following spring a good crop of seedlings just where the capsule has rotted. Despite the elaborate 'Fliegen-Aasblum' I have never succeeded in finding any insects visiting the flowers for nectar or pollen, and despite the elaiosome the seeds are never dispersed, as far as I know, except by gravity. If any member of the IPE has any evidence to the contrary I shall be most pleased to hear of it.

*Leersia oryzoides* (L.) Sw. Seen in a dystrophic fen community at the edge of the Schwarzsee, Kitzbühel, at about 800 m., 3 August 1956, and in a more eutrophic reedswamp on the Murnauer Moos at about 620 m., 4 August 1956; with included panicles at both places. This grass has a very restricted range by a few lowland rivers, streams, ditches and canals in four of the southern English counties (Dorset, Hampshire, Sussex and Surrey), where it is locally abundant; both of the two main areas are in Eocene basins with predominantly acid, sandy, gravelly or peaty soils; the Sussex station is rather different in that the plant grows in ditches dug into a clayey alluvial soil, but in an area of former acid peat development. It would be tempting to regard *Leersia*, like *Carex*

*humilis*, as a xerotherm relict species; in most years the panicles remain included in the upper leaf sheath and although the spikelets absciss *i n s i t u* they usually remain green and either no seed is formed, or it will not germinate. But the danger of considering the average behaviour of a plant is well illustrated by *Leersia*. It is well known that exserted panicles are produced only in exceptionally hot years; an extremely striking example in Britain was 1859, when *Leersia* was reported growing in Surrey in large patches over six feet (1.8 m.) high with abundant panicles on long culms. In that year the maximum temperatures were reported in the south of England as follows: April, 26° C.; May, 25° C.; June, 27° C.; July, 34° C.; August, 33° C.; September, 24° C.; and October, 27° C. (SALMON and DRUCE, 1911). Specimens collected in August of that year show most of the spikelets abscissed; the remaining ones are dark in colour and the fruit looks fully formed. Other good years in Britain for *Leersia* were 1855, 1901, 1911, 1928 and 1947. In a tropical greenhouse *Leersia* flowers all the year round, but still does not show exserted panicles, at least in my limited experience at Cambridge; possibly high light intensities are required as well as high temperatures. The whole abscissed spikelet readily floats, and there is little doubt that dispersal by water is important after exceptionally hot summers: and we need not look for a Postglacial 'climatic optimum' to provide these, and hence the conditions for the spread of *Leersia*.

Incidentally, the summer of 1955 was also exceptionally hot and sunny in England, but not, I believe, in Austria. Correlated with this is a very striking impression of the XI. IPE: the complete lack throughout Austria not only of any developing fruits of *Fagus sylvatica*, but even of empty cupules, and this at a time when the crop of 'mast' in England was exceptionally heavy, at least where there were no sharp air frosts at the time of flowering in early May 1956.

The flora of Britain is in the main a very poor selection of that of the European mainland, although we do have our Atlantic, Lusitanian and 'American' species to add interest to a flora containing very few endemics. The British flora can, therefore, only be understood against the background of the European flora as a whole, and for a British botanist one of the valuable results of the IPE is the breaking down of the geographic, linguistic and political barriers which have too often hindered the healthy interchange of impressions and ideas.

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