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The distribution, habitat and status of *Hypericum canadense* L. in Ireland

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ABSTRACT

Details are given of the distribution of *Hypericum canadense* L. in western Ireland, including some records hitherto unpublished. The stations may be grouped into 5 distinct localities near Lough Mask and one near Glengarriff. Quadrat analyses from most of these localities show that it is very constantly associated with *Anagallis tenella*, *Carex demissa*, *C. echinata*, *C. panicea*, *Eleocharis multicaulis*, *Hydrocotyle vulgaris*, *Hypericum elodes* and *Ranunculus flammula*. It seems to require acidic, fairly base-poor, sandy or peaty soil with an abundance of water, at least for most of the year, and is most commonly found in flushes or by very small streams in moorland, heath or rough grassland. Grazing and disruption of the turf by cattle are probably of importance in reducing competition and providing open ground for establishment. There is no good reason to suppose, as has been suggested by Westhoff, that the necessary ecological conditions are realized in only a few localities. The claim of the species to native status in Ireland is re-iterated and recent suggestions that it is dispersed by human agency are shown to be based on a misunderstanding.

INTRODUCTION

Hypericum canadense is a predominantly North American species whose relatively recent discovery in north-western Europe has been the subject of some discussion. This paper attempts to summarize the known facts about its European distribution, to give more detailed information on its habitat than has hitherto been published, and to reconsider its status.

DISCOVERY IN EUROPE

The first published record for Europe was by Jonker (1935), who found it the previous year growing in abundance at several localities in the neighbourhood of Almelo, in eastern Holland. Subsequent herbarium investigations showed that unnamed specimens collected in the same region in 1909 were also referable to *Hypericum canadense* (Jonker 1959); it had also been collected a little further to the east in 1918.

More recently it was reported from eastern France by Bouchard (1955a, 1955b). It appears, however, that this identification was erroneous, as plants collected in the same region in 1958 and 1959 have been shown (Jonker 1960) to be *H.majus* (A. Gray) Britton, a related but distinct North American species with somewhat different ecological requirements. *H. majus* has also been found

in Germany by Merxmüller & Vollrath (1956). In both the French and German stations its introduction by American troops seems very plausible.

The occurrence of *H. canadense* in Ireland was first recorded by one of us (Webb 1957, 1958), who found a single plant in 1954 by the west shore of Lough Mask, Co. Mayo,* and on a later visit in 1956 found it in some abundance there in two stations about 1 km apart. Later visits by D. McClintock and J. E. Lousley (McClintock 1970 *in litt.*) in 1965, and by ourselves from 1965 to 1970, revealed a number of new stations in the same region. But in Ireland, as in Holland, the published records are antedated by a herbarium specimen, in this case misnamed as *H. linarifolium*, which was discovered in the herbarium of University College, Aberystwyth, by E. H. Chater (Webb 1969); it had been collected in Glensaul (a valley draining into the western side of Lough Mask) in 1906, apparently by H. H. Haines.

In 1968 *Hypericum canadense* was discovered at Glengarriff, Co. Cork (W. Cork, v.c. H3), by Mr & Mrs K. L. Butcher (Meikle 1969). This station is more than 200 km south of Lough Mask (Fig. 1).

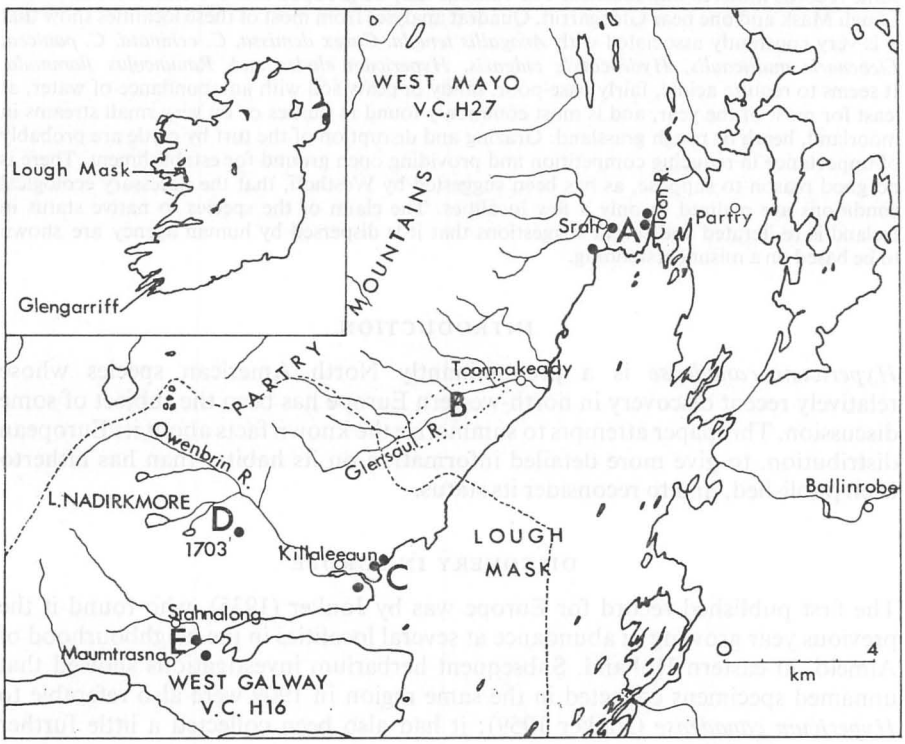

FIGURE 1. Maps showing the location of Lough Mask and Glengarriff and the known sites for *Hypericum canadense* around Lough Mask. Stations C, D and E are now in Co. Mayo, but until 1898 they were in Co. Galway; they are therefore still in v.c. H16. The dashed line is the old comital and the present vice-comital boundary.

* See the legend to Fig. 1.

Finally, it should be mentioned that Lousley (1971) reported that a single plant had been seen in 1967 in a seed-bed in a nursery-garden in Hampshire in southern England (v.c. 12). It apparently did not persist.

THE IRISH STATIONS

In the Lough Mask area at least a dozen distinct stations are now known, but these may be grouped into five 'localities' (Fig. 1), within which the stations are separated by less than a kilometre. From north-east to south-west these localities are as follows:

A. The neighbourhood of Srah (Irish GR M 12.72). The stations extend from the western bank of the Cloon River, a few hundred metres above its entry into the lake, to a point near the lake-shore 1 km south of Srah.

B. A station, not precisely localized, near the Glensaul River, south-west of Toormakeady. This is the source of the Aberystwyth specimen, which is simply labelled 'Glensaul, Tourmakeady'.

C. A stretch of some 1·5 km between the lake and the road, south and east of the hamlet of Killaleeaun (GR M 05.63), a few plants being noted also on the other side of the road. This locality includes the station formerly referred to as Gortmore (Webb 1957, 1958), and is the locality in which the plant is most abundant.

D. A patch of moorland about 1·5 km east of Lough Nadirkmore (GR M 00.64 and over 3 km west of Lough Mask.

E. By the western arm of Lough Mask which extends to near the hamlet of Maumtrasna (GR M 00.60). The stations lie about two-thirds of the distance from Maumtrasna to the lake.

The total distance from A to E is 17 km. A, C and E are at 70–100 ft (20–30 m) above sea-level, B probably between 100 and 300 ft (30–90 m), and D at about 500–600 ft (*c* 175 m).

At Glengarriff we found the plant in six distinct stations in the course of an afternoon's search in August, 1970. All lie within a radius of 1 km, and may be regarded as constituting a single locality. One station is that discovered earlier by Mr & Mrs Butcher; it lies about 0.5 km north of Eccles' Hotel, close to a lane which runs up a steep hill from the main road immediately east of the hotel (GR V 94.57). The other stations lie a little further to the north-east, in the valley of a stream which rises in a lakelet near the county boundary and runs south-westwards to Glengarriff Harbour.

DETAILS OF THE HABITAT

All the localities and most of the individual stations have been visited by G. H. or both of us, and twelve quadrats of 50 cm square have been analysed, using the Domin scale of cover and abundance. In three other stations lists of associated species were made. The results are presented in Table 1, and the habitats briefly described below.

List 1. Margin of old, flooded peat-cutting just south of the Partry road, 0·5 km east of Srah (Locality A). This habitat is quite different from all the others, as the

TABLE 1. ASSOCIATES OF *HYPERICUM CANADENSE* IN WESTERN IRELAND

Quadrat and List Number	1*	2	3	4	5	6*	7	8	9	10	11	12	13	14	15*	Total
Total cover	10	9	9	9	8	—	9	8	10	10	9	9	8	9	—	
Hypericum canadense	+	4	3	4	4	+	4	4	2	4	4	X	3	4	+	15
Juncus bulbosus	+	4	4	5	3	+	4	4	4	.	a	X	4	3	+	14
Carex panicea	.	5	3	5	.	+	a	2	4	4	2	2	5	3	+	13
Ranunculus flammula	+	a	a	a	3	+	3	3	2	.	.	a	1	4	+	13
Sphagnum spp.[1]	+	1	X	3	.	.	.	4	3	1	2	6	4	1	+	12
Anagallis tenella	.	3	.	a	4	+	.	2	3	3	X	3	3	2	+	12
Carex demissa	.	5	3	5	X	.	3	a	.	4	5	a	4	4	+	12
Hypericum elodes	+	2	4	a	5	+	.	3	.	3	4	4	X	.	+	12
Carex echinata	.	4	5	a	X	+	.	a	.	3	a	2	.	a	+	11
Eleocharis multicaulis	.	.	1	3	a	+	X	5	a	4	4	.	4	1	.	11
Molinia caerulea	+	.	.	4	3	+	4	1	.	3	.	X	2	.	+	10
Hydrocotyle vulgaris	+	.	.	X	.	+	3	3	3	.	.	.	2	1	+	9
Agrostis stolonifera[2]	.	.	.	.	a	.	a	2	a	2	.	3	.	.	+	7
Eriophorum angustifolium	+	4	1	X	4	.	.	.	.	.	2	.	1	.	.	7
Juncus articulatus	.	.	.	2	3	+	.	3	4	.	.	.	.	4	+	7
Potamogeton polygonifolius	+	.	2	.	X	.	.	5	.	3	4	.	.	a	.	7
Riccardia pinguis	.	1	X	.	X	+	.	.	.	X	1	X	.	.	.	7
Drosera rotundifolia	+	.	.	.	.	.	.	.	.	2	a	2	a	.	+	6
Pellia epiphylla	.	.	.	.	X	+	.	.	2	.	.	3	1	2	.	6
Viola palustris	+	.	.	.	.	.	.	X	2	2	.	a	.	.	+	6
Acrocladium cuspidatum	.	.	.	1	.	+	.	.	5	.	.	.	1	2	.	5
Carex nigra	.	.	.	a	.	+	.	.	5	.	.	a	.	4	.	5
Drepanocladus exannulatus[3]	.	.	.	1	.	+	.	.	3	.	.	X	1	.	.	5
Galium palustre	.	.	.	.	X	+	3	.	3	.	.	.	.	a	.	5
Juncus acutiflorus	.	.	.	.	.	.	.	.	.	4	.	6	X	4	+	5
Mentha aquatica	.	.	.	.	.	+	X	.	3	.	.	.	1	a	.	5
Potentilla erecta	+	.	.	.	.	.	.	.	.	3	.	a	a	.	+	5
Prunella vulgaris	.	.	.	.	.	+	X	.	2	.	.	.	1	3	.	5
Scutellaria minor	.	.	.	.	a	+	a	.	.	.	.	.	.	X	+	5
Acrocladium sarmentosum	.	.	.	.	.	.	.	.	.	X	X	1	X	.	.	4
Drosera intermedia	+	.	.	.	X	.	.	X	.	.	.	.	3	.	.	4

Juncus effusus	.	a	a	X	.	.	3	.	.	.	.	.	.	.	.	4
Nardus stricta	.	.	.	.	.	+	a	a	.	.	.	.	3	.	.	4
Anthoxanthum odoratum	+	.	.	.	.	.	.	.	.	.	.	X	.	a	.	3
Drepanocladus revolvens	.	.	.	.	X	.	.	.	.	1	.	.	1	.	.	3
Erica tetralix	.	.	.	a	X	.	.	.	.	.	.	.	a	.	.	3
Holcus lanatus	.	.	.	.	.	.	.	.	.	.	.	X	.	2	+	3
Leontodon autumnalis	.	.	.	.	.	+	X	.	.	.	.	.	.	X	.	3
Narthecium ossifragum	.	.	.	.	X	.	.	.	.	3	a	.	.	.	.	3
Rhynchospora alba	+	.	.	.	.	.	.	.	.	a	3	.	.	.	.	3
Sieglingia decumbens	.	X	.	.	.	.	.	.	a	.	.	.	.	.	+	3
Carex hostiana	.	.	.	a	.	.	.	.	.	.	a	.	.	.	.	2
Eleogiton fluitans	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	2
Filipendula ulmaria	.	.	.	X	.	+	.	.	.	.	.	.	.	.	.	2
Hypochaeris radicata	.	.	.	.	.	.	a	.	.	.	.	.	.	X	.	2
Lotus uliginosus	.	.	.	.	.	.	.	.	.	.	.	.	.	X	+	2
Lythrum salicaria	.	.	.	.	.	.	.	.	.	.	.	.	.	2	+	2
Philonotis fontana	.	.	.	.	X	.	.	.	.	.	.	.	.	1	.	2
Rhytidiadelphus squarrosus	.	.	.	.	.	.	.	.	1	.	.	X	.	.	.	2
Salix cinerea	.	.	.	.	.	+	.	.	.	.	.	a	.	.	.	2
Scorpidium scorpioides	.	.	.	.	.	.	.	.	.	1	2	.	.	.	.	2
Senecio aquaticus	.	.	.	.	.	.	.	.	2	.	.	3	.	.	.	2
Succisa pratensis	.	.	.	.	.	.	.	.	.	.	.	4	.	.	+	2
Trifolium repens	.	.	.	.	.	.	3	.	.	.	.	.	.	.	+	2
Triglochin palustris	.	3	a	.	.	.	.	.	.	.	.	.	.	.	.	2
Veronica scutellata	.	.	.	.	.	+	.	.	1	.	.	.	.	.	.	2

Present in only one quadrat: *Achillea ptarmica* 9, *Bellis perennis* 14, *Breutelia chrysocoma* 10, *Bryum pseudotriquetrum* 14, *Callitriche stagnalis* 14, *Cardamine pratensis* 9, *Climacium dendroides* 9, *Cirsium dissectum* 4, *Dactylorhiza maculata* subsp. *ericetorum* 12, *Deschampsia flexuosa* 14, *Equisetum palustre* 6, *Fossombronia* sp. 7, *Hypericum tetrapterum* 14, *Isolepis cernua* 14, *I. setacea* 2, *Luzula multiflora* 14, *Myosotis* sp. 9, *Myrica gale* 13, *Parentucellia viscosa* 14, *Pedicularis palustris* 12, *Peplis portula* 9, *Pinguicula lusitanica* 10, *Polytrichum commune* 12, *Potentilla anserina* 7, *P. palustris* 6, *Radiola linoides* 7, *Ranunculus acris* 14, *R. repens* 9, *Sagina procumbens* 9, *Stellaria alsine* 9, *Thuidium delicatulum* 12.

* Cover not assessed.

a Additional species within 1m of quadrat and in the same habitat.

1 The species were only determined from quadrats 8, 9, 11, 12 and 13 (*S. subsecundum*) and 1 and 12 (*S. palustre*).

2 Some small specimens may have been *Agrostis tenuis*.

3 The species of *Drepanocladus* was not determined in quadrat 4.

plants of *Hypericum canadense* are scattered through a floating mat of vegetation (mainly *H. elodes*), which extends into the pool on its shallower side (Plate 1).

Quadrats 2, 3 and 4. Flushes in wet *Myrica-Calluna* heath on the west side of the Cloon River, just south of the road from Srah to Partry (Locality A). The river is here bordered by a belt of *Sparganium erectum*, beyond which is a zone of heavily grazed poor-fen, followed by a zone of *Alnus glutinosa*. A few isolated plants of *Hypericum canadense* were seen in the poor-fen zone, but these seem to have originated from small flushes a short distance away, between the *Alnus* zone and the road.

Quadrats 5 and 7 and list 6. By a small, sluggish stream trickling through rough, peaty grassland between the road and Lough Mask, 1 km south of Srah (Locality A).

Quadrats 8 and 9. Small flushes in grazed flats at Killaleeaun between the road and Lough Mask (Locality C). The flats are of sand, covered in most places with a thin layer of peat. The flushes percolate down towards the lake from the slightly higher sandy ground inland (Webb 1958, plate 11).

Quadrats 10 and 11. In peaty flushes and by a small stream in moorland on the eastern slopes of the Maumtrasna plateau (Locality D). The moorland is grazed by cattle and slopes gently to the east-north-east (Plate 2). The station lies about midway between the trigonometrical point 1703 ft and the Owenbrin R.

Quadrat 12. By the river-confluence 1 km south of Srahnalong and the same distance east of Maumtrasna village (Locality E); the *Hypericum canadense* occurs by the side of a sluggish, peaty stream choked by *Juncus acutiflorus*. Only two plants were seen.

Quadrat 13. By the side of a small ditch 0·5 km south of Quadrat 7 (Locality E). The ditch, with *Carex rostrata*, *Equisetum fluviatile* and *Nymphaea alba*, separates a marshy meadow from an *Eriophorum angustifolium* bog. The *Hypericum canadense* grows in rather open ground on the meadow side of the ditch.

Quadrat 14. Hummocky, marshy pasture at *c* 300 ft (90 m), sloping gently to the south, about 0·5 km north of Eccles' Hotel, Glengarriff (Plates 3 & 4).

List 15. Small, hummocky flush near a path, about 0·5 km north of Quadrat 14.

In view of the relative floristic poverty of Ireland the total number of associated species (88, including bryophytes) is remarkably high. Only 11 species, however, occur in more than 8 of the 15 lists, and it is these which must be regarded as characterizing the community to which *Hypericum canadense* is restricted. Total plant cover ranges from 50% to 100%, the open ground consisting of bare mud or peat with varying amounts of standing or running water. With so many associated species it is not surprising that no species exceeds 20% of the cover, and only eight reach this figure (*Carex demissa*, *C. echinata*, *C. panicea*, *Eleocharis multicaulis*, *Hypericum elodes*, *Hydrocotyle vulgaris*, *Juncus bulbosus* and *Acrocladium cuspidatum*). *H. canadense* seldom shows a cover value of more than 5%, even at its most abundant.

Most of the species in Table 1 may be regarded, at least in western Ireland, as characteristic of wet, acidic grassland or of wet moorland, e.g. *Carex panicea*, *Juncus articulatus* and *Ranunculus flammula*, and *Eleocharis multicaulis*, *Eriophorum angustifolium* and *Narthecium ossifragum*. Occasional inundation, or the presence of surface water for a considerable part of the year, is suggested by the

presence of *Drepanocladus* spp., *Hypericum elodes*, *Potamogeton polygonifolius* and *Sphagnum* spp., The wet grassland component is especially strong in the Glengarriff station (Quadrat 14), with *Holcus lanatus*, *Hypochaeris radicata*, *Lotus uliginosus* and *Lythrum salicaria*. It is remarkable that List 1, although the plants are here floating on water instead of being rooted in soil, differs very little from those of the other lists and quadrats. The only species in Table 1 which can be said to be in any way remarkable, ecologically or geographically, are a few which have a decidedly western or south-western distribution within the British Isles. These comprise *Eleocharis multicaulis*, *Hypericum elodes* and *Scutellaria minor*; *Anagallis tenella* shows the same tendency, but less strongly. With the exception of the *Scutellaria* (rarely a common plant even in western Ireland), these species occur in 11 of the 15 lists. Of all the associated species *Hypericum elodes* seems to be closest to *H. canadense* in its ecological requirements, and it is certainly the best indicator-species to look for when searching for the latter.

In all the stations which we have examined the soil is normally waterlogged, and surface water is present for a large part of the year. Only in exceptionally dry seasons is the soil likely to dry out. In the flatter areas the water may be almost stagnant, and restricted to the deeper hollows, which are usually the result of cattle-treading. In other areas there is a slow percolation of water down a slope, and in a few cases it cuts itself a sufficiently well-marked channel to be called a stream. In such cases the *Hypericum canadense* is mainly restricted to the margins of the stream. Grazing by sheep and cattle (Plate 2) is a prominent feature of all the stations (except the flooded peat-cutting). This, at least as much as water-movement, is responsible for the patches of open ground which *H. canadense* seems to require for seedling establishment, and the grazing also keeps down the ranker growth with which even established plants would probably be unable to compete.

Soil analyses from six stations are presented in Table 2. These samples were not necessarily collected from the actual areas of the quadrats, but are from similar communities not more than a few metres distant.

TABLE 2. SOIL ANALYSES FROM *HYPERICUM CANADENSE* STATIONS IN WESTERN IRELAND

	pH[1]	Exchangeable bases[2] (m.eq./100g)				% Organic carbon[3]
		Na	K	Mg	Ca	
Killaleeaun (Locality C)	4·2	0·3	0·2	1·3	1·6	7·7
Cloon River (Locality A)	4·5	0·5	0·3	1·8	5·9	17·5
Srah (Locality A)	4·25	0·4	0·3	1·4	4·1	22·9
Srahnalong (Locality E)	4·15	0·5	0·7	1·8	5·0	42·3
Owenbrin moorland (Locality D)	4·0	0·8	0·7	1·8	1·3	40·2
Glengarriff	4·85	0·3	0·2	1·6	5·5	14·0

1. Measured by glass electrode on 1:2·5 soil: water mixture.
2. Extract obtained using N ammonium acetate solution. Na^+ and K^+ determined using flame-photometer, Mg^{++} and Ca^{++} using atomic absorption spectrophotometer.
3. Determined by the Walkley-Black method.

The soils are distinctly acidic (that from Glengarriff least so), low in exchangeable bases, and mostly rich in organic matter. The lowest value for organic carbon is 7·7% from the Killaleeaun flats. Here the lacustrine sand is overlaid by a layer of peat of variable thickness; if the sample had been taken a few yards away a thicker layer of peat might have given a much higher value. Although we have referred to many of the sites as 'flushes', this is to be interpreted purely in a topographical sense as we have no soil analyses from the surrounding grassland or moorland for comparison. Presumably there is some base-enrichment in the flushes, but it may be very small.

WESTHOFF'S 'GRADIENTS'

The Dutch botanist, Professor V. Westhoff, visited the Killaleeaun locality in 1969 and in a recent paper (Westhoff 1971) has published data on four relevés which he made there. He concludes that his lists show the closest affinity with the Eleocharetum multicaulis. Fr J. J. Moore, who has seen our own lists in Table 1, considers that they belong to the *Potamogeton polygonifolius – Hypericum elodes* association. Both associations are in the order Littorelletalia.

Westhoff claims to recognise four ecological gradients. In order of decreasing magnitude these are:

1. a macro-gradient from the waterlogged, base-rich soil near the lake to the drier, acidic soil further up the shore.
2. a mesogradient from the sandy ridges to the boggy flats between them.
3. a minigradient from the more permanently waterlogged to the better-drained patches within the flats.
4. a microgradient of hollows and hummocks formed by cattle-treading.

He maintains that *H. canadense* requires a position on each gradient somewhere between its extremes and that the rarity of the plant is to be explained by the scarcity of terrain where this complete complex of gradients is realised.

As confirmatory evidence he adduces the presence in its Dutch stations of *Scutellaria minor* and *Wahlenbergia hederacea*, both very rare in Holland, and both, presumably, also dependent on complex and unusual 'milieu-gradients'.

We consider that such an analysis is needlessly complex, and we cannot agree with Westhoff's main conclusion. He is, in fact, asserting firstly that *H. canadense* requires a fairly base-poor, moderately acidic, slightly sandy soil, with ample water but not permanently water-logged, and secondly that the west shore of Lough Mask is one of the few places in Ireland where these conditions are realized. With the first assertion we are in partial agreement, but our analyses show that sand content of the soil is irrelevant. In most cases the soil lies very near the acidic end of the pH gradient since blanket bog peat in western Ireland usually has a pH of 4·0–4·2, so that many of our stations for *H. canadense* lie at the extreme end of his 'macrogradient', and some of them, perhaps, outside its range. In this connexion it may be pointed out that Westhoff's lists of associated species contain several which are not represented in Table 1. These include *Apium nodiflorum*, *Littorella uniflora*, *Montia fontana*, *Eleocharis quinqueflora* and *Samolus valerandi*. Of these, the last two are distinctly basiphilous in comparison with the majority of species in Table 1, and *Littorella* is seldom found far from a lake shore. It seems, therefore, that Westhoff's observations at Killaleeaun were made at the extreme lower limit of the *Hypericum canadense* zone. This, indeed,

is in the middle of his 'macrogradient', but the habitat is far from typical for *H. canadense* and represents one extreme of the plant's ecological tolerance.

For his second assertion – that the necessary ecological conditions are realized only in a few localities – we see no real evidence. There are surely hundreds of flushes in western Ireland where the conditions are very close to those of the sites we have studied, and where the list of species is (apart from the absence of *H. canadense*) very similar. Indeed, such habitats may also be found in south-western England. The vegetation of a pond at Burley, in the New Forest (Hampshire), includes within a few square metres 10 of the first 11 associates listed in Table 1 (*Carex echinata* alone is missing), and also the following.

Acrocladium cuspidatum
Agrostis setacea
Apium inundatum
Aulacomnium palustre
Drepanocladus exannulatus
Drosera intermedia
Eleogiton fluitans
Erica tetralix
Galium palustre
Juncus articulatus
Littorella uniflora
Nardus stricta
Peplis portula
Pilularia globulifera
Potamogeton polygonifolius

Of the total of 25 species, 22 have been found associated with *H. canadense* in Ireland, the exceptions being *Apium inundatum*, *Aulacomnium palustre* and *Agrostis setacea*. The last is unknown in Ireland; the other two are common enough in wet, acid habitats in western Ireland, and a further search might well reveal them as associates of *H. canadense* by Lough Mask.

Mr A. O. Chater has kindly provided us with a similar list of species from a muddy, cow-trodden site at Rhostie in Cardiganshire. Of the 31 species recorded within a 2m square and 5 additional species within 20m, 28 species feature in Table 1, including the 15 most constant associates.

HABITATS OUTSIDE IRELAND

Jonker (1970 *in litt.*) finds considerable similarity between our species-lists and the associates of *H. canadense* in Holland. He also mentions it, however, as growing on sandy roads and paths with *Illecebrum verticillatum*; this probably implies a habitat which is seasonally drier than any of the Irish ones.

Westhoff (1971) has published two lists of species associated with *H. canadense* near Farnham, Quebec province, Canada. The only species common to these and the Irish lists is *Sphagnum subsecundum sensu lato* (listed by him as *S. auriculatum*), but a general similarity in the vegetation is suggested by the presence in the Canadian lists of two species of *Juncus* and one each of *Eleocharis*, *Eriophorum* and *Scirpus*. Westhoff concludes, from his admittedly limited observations, that in Canada *H. canadense* requires base-poor soil containing sand and organic material, which is inundated for part of the year. Information (derived from herbarium labels) supplied to us by Dr G. Brassard on its habitats in Newfoundland is in general agreement with this; he mentions 'sandy depressions' 'boggy barrens', 'borders of dried-up pool', 'wet fields', 'rocky bed of stream' and 'submerged rock-mud bottom'. Here, as in Holland, some degree of tolerance of seasonal drought is suggested. Apart from this, however, the ecological requirements of the species seem fairly constant and fairly precise throughout its range.

THE STATUS AND HISTORY OF *H. CANADENSE* IN EUROPE

Jonker (1935, 1959), Webb (1957, 1958) and Westhoff (1971) all conclude that *H. canadense* occurs in Europe as a native and has not been introduced by human agency; this does not of course exclude the possibility that its arrival in Europe by other means is of fairly recent date. Our own observations are entirely in accord with this view, but since Meikle (1970), Heine (1962), Robson (1968, 1970 *in litt.*) and Lousley (1971) have suggested that it is a recently introduced alien spread by human agency, it is necessary to review the evidence.

One misunderstanding should be cleared away at the start. Meikle's note refers to the Glengarriff station as 'a wet, sloping meadow close to the car-park of Eccles' Hotel'; and on the strength of this statement Lousley speculates that 'it is possible that the seeds of *Hypericum canadense* were conveyed [to Glengarriff] on footwear or the tyres of a car which had travelled from Lough Mask.' But in fact none of the stations is anywhere near a car-park. The sign (now vanished) for a minute car-park on the main road was used by Mr and Mrs Butcher merely for the purpose of identifying the lane, which ascends from this point up a steep hill for over 0·5 km until it passes close to one of the stations for *H. canadense*. Nowhere does the plant grow on the lane or on its verges (although such aliens as *Myrtus apiculata* Niedenzu seedlings are to be seen in the ditch); and several of the stations are some hundred metres from a track of any kind. In fact there is nothing in the distribution-pattern of the plant, either at Glengarriff or Lough Mask, to provide the smallest evidence of transport either by pedestrians or vehicles.

The evidence for native status is, as it always must be in the absence of a fossil record, mainly negative: it rests chiefly on the fact that none of the stations in which the plant has been seen are (or have been) the site of human activity which could account for the presence of an alien of any kind, let alone a species from North America which is unlikely to be associated with any cargo transported thence. No alien species grows with it in any of its stations; nor is the community in which it occurs one that has been colonised by an alien anywhere in Ireland. Before an alien status can be accepted some suggestions as to the means of introduction and dispersal are surely necessary.

The principal objections to the hypothesis of native status have already been discussed (Webb 1958). To the problems of perglacial survival and of changes in the level of Lough Mask we have nothing to add to what was said there, except that with the discovery of new stations the problems of the lake-level become less important. Three further notes may, however, be added:

1. Further observation has shown that it is a mistake to regard *H. canadense* as an annual. Numerous seedlings can be found, and some of the weaker plants appear to die after flowering, but the majority produce at ground-level more or less globular buds of a peculiar purplish-grey colour: these unfold in spring and produce the short, wide, crowded leaves which are found near the base of a flowering plant. It would appear that a large proportion of the seedlings do not come to maturity, being crowded out by other species. Doubtless the proportion of seedling-establishment to perennation varies from year to year, in accordance with the weather, but the plant is not exposed to the hazards which a true annual has to face.

2. There is no evidence that the species has spread in Ireland, at least during the past 15 years; certainly in the region of its main station at Killaleeaun there

has been no perceptible change over this period. The argument that Praeger would have seen it if it had been there in 1933 is weakened by the knowledge that it was in Glensaul in 1906. Nor is the fact that only one plant was noticed in 1954 of any significance; no search was made for others.

3. Heine (1962) and Robson (1968) record the presence in Europe of four other species of the section Brathys, to which *H. canadense* belongs; all have their primary centre in North America. In the case of *H. majus*, to which reference has already been made, evidence for recent introduction by human agency is fairly strong. Opinion seems to be divided about the status of the others, and none of them has been studied in detail from this point of view. This is admittedly a curious situation and one which justifies a careful scrutiny of the claims of *H. canadense* to native status in Europe. But analogy, though often suggestive, is never decisive; even if all the other species were shown to be introductions, *H. canadense* might still be native. It is, after all, not the only amphi-Atlantic species with a predominantly American distribution; *Najas flexilis*, with a very similar distribution today, might have been the subject of a similar argument were it not for the abundance of its fruits in quaternary deposits in northern Europe. It is worth recording here that North American and Irish material of *H. canadense* have the same chromosome number, $2n = 16$.*

Dogmatism is particularly out of place in phytogeographical speculation, where we are, all too often, concerned with assessing improbabilities rather than probabilities. We shall merely say that we consider that a hypothesis of human introduction seems to raise much more difficult problems than one of native status. But if the latter is accepted, we must also say that between a theory of recent arrival by long-range dispersal (a phenomenon of which we know virtually nothing, except that it sometimes occurs) and of survival as a relic from a formerly wider distribution in north-western Europe, there appears to be no decisive evidence. For what it is worth, however, we may draw attention to the fact that in some of its Lough Mask stations *H. canadense* grows very close to *Lycopodium inundatum* and *Pilularia globulifera*, which have apparently relict distributions in Ireland.

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* North American material has been counted by Hoar & Haertl (1932) and material from Lough Mask by Dr D. M. Moore (1972 *in litt.*). Voucher material of the latter is at **LTR**.

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PLATE 1. Edge of old peat-cutting near Srah showing floating mat of *Hypericum elodes*, in which *H. canadense* grows, and *Molinia* tussocks behind.

PLATE 2. Small flushes and runnels in grazed moorland between the Maumtrasna mountain plateau (left) and the Owenbrin River (right).

PLATE 3. General view of marshy meadow above Glengarriff looking towards Bantry Bay.

PLATE 4. Corner of the Glengarriff meadow showing the small wet depressions (dark areas) where *Hypericum canadense* grows.