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NOTEWORTHY PLANTS OF THE BURREN:
A CATALOGUE RAISONNÉ

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SUMMARY.

AN annotated list is provided of those elements in the flora of the Burren region of north-west Co. Clare (and a small region of Co. Galway adjoining) which are noteworthy for their abundance, their rarity elsewhere in Ireland or in north-west Europe generally, or for their unusual habitat in this region. The list comprises 140 species of flowering plants, 2 gymnosperms and 11 pteridophytes.

It is curious how little has been written on the flora of that remarkable district of western Ireland usually known as the Burren. (Purists deplore the use of the definite article before the name, but as Burren is the name of a village and of a barony which forms part, but by no means the whole, of the district here considered, I think it is best to adhere to popular usage). Some seven pages in Praeger's *Botanist in Ireland* form the only coherent account, whatever appears in other books being largely based on this. The special papers devoted to the subject are slight and mostly very old. Yet for at least fifty years this district has been famous far outside Ireland for its flora. The botanical visitors keep to a well-worn track, admire, photograph and collect the same plants from the same stations year after year, but make little or no addition to our understanding of the floristics or the ecology of the region.

It was to remedy this state of affairs that I proposed to the British Ecological Society that some sort of ecological survey of the region should be undertaken. It has been impossible to mobilize as much man-power as had been hoped, but over the past few years a considerable number of botanists and zoologists have visited the region with definite programmes of investigation; an attempt has been made to collect sufficient meteorological data to provide some sort of answers to the queries about the climate which inevitably arise; and I have myself tried to traverse the whole region systematically and thereby to see it in better perspective than is possible for a worker who has spent his time on intensive investigation of limited areas.

The results of this work will, I hope, appear in print in the next few years. The present paper, which arises as a by-product of my systematic

survey of the area, is intended as a background against which the others may be viewed—an attempt to define more precisely the nature of the flora and of its peculiarities which have attracted attention to the region in the first instance : to re-state, in fact, in greater detail, the problems which are waiting to be solved. It is too easy, in a perusal of the available literature, to get the impression that the flora of the Burren consists of rarities alone; in fact the background of relatively common species provides, in the form of unusual abundance or scarcity or of unusual habitat, almost as much of interest. I include, therefore, in this catalogue the following categories of plants :

- (1) Those which, whether common or rare elsewhere, are sufficiently abundant in the Burren to form a conspicuous element in its flora;
- (2) Those which are notably commoner in the Burren than in other limestone districts of Ireland;
- (3) Those which find in the Burren a habitat strikingly different from that which they usually favour elsewhere;
- (4) Those whose presence in the Burren is of special ecological or phytogeographical interest. This includes all species present in the Burren which are distinctly rare or local in Ireland as a whole.

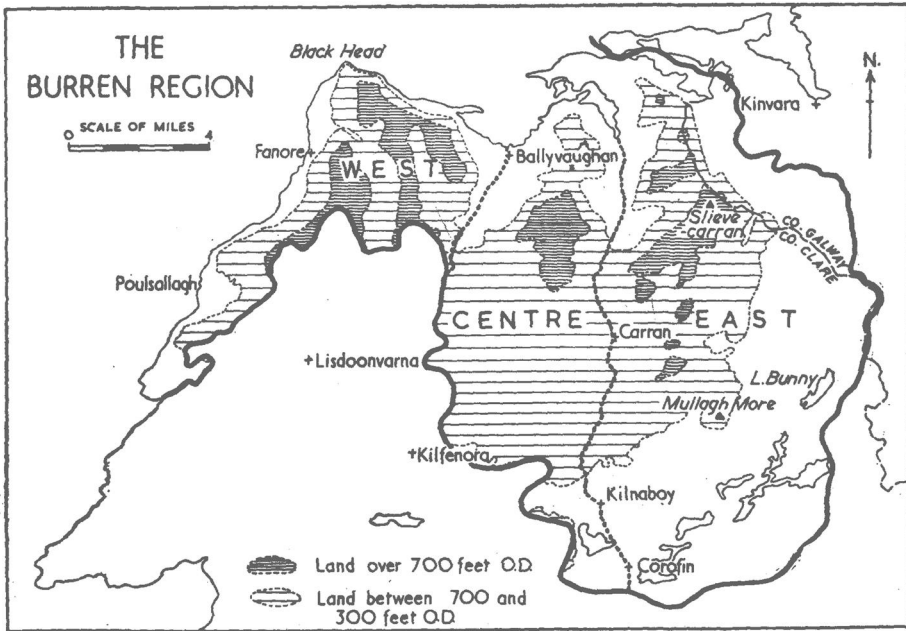
Naturally many plants common in the Burren but common also elsewhere on limestone are omitted. Furthermore, species which occur mainly or entirely in hedgerows, tilled fields or other man-made habitats are excluded.

The comments must be understood as being based on my own observations unless another authority is cited.

DELIMITATION OF AREA.

The Burren area, for the purposes of the survey and for this paper, is delimited as in Fig. 1. It is bounded on the north and west by the sea, on the south-west by the shales which overlie the limestone and bear an entirely different flora, with a dramatically sudden contrast at the geological boundary, and on the south-east and east by arbitrary lines which separate the mainly karst-like country of the Burren area from the adjoining country which, though it contains patches of karst, is mainly drift-covered and similar to the rest of the central limestone plain. (The somewhat tortuous geological boundary has been simplified near Kilfenora and N.E. of Lisdoonvarna by excluding small areas which, though limestone, are mainly farmed and have no floristic interest.)

The area so delimited measures 34 Km. from east to west and 25 Km. from north to south; the total area is about 450 sq. Km. For convenience of reference it is divided, as is indicated in Fig. 1, into western, central and eastern portions. The lines of division follow the roads from Ballyvaughan to Lisdoonvarna, and from Bell Harbour, via Carran and Corofin to Ennis. All three divisions contain summits over 1,000 ft. (*c.* 300 m.).



The Aran Islands are similar to the Burren in their topography and, to some extent, in their flora; they might well have been included in the survey area had not reasons of inconvenience of access ruled them out. They are referred to in this catalogue whenever a Burren species is absent from Aran, or when its abundance or distribution is strikingly different in the islands and the mainland. These data for Aran are extracted from the literature* and are not based on personal observation. It will be seen that despite a general similarity the Aran flora is a good deal poorer. How much this is due to isolation and how much to greater exposure it is not easy to say.

Thalictrum minus L. Scarcely as widespread as might have been expected.

Fairly common in crevices near Black Head and thence south to Poulsallagh; recorded also by Praeger (1905) near the S.E. margin of the Burren. Rare in Aran.

Anemone nemorosa L. Frequent in remarkably exposed situations, e.g. at about 500 ft. above Black Head. It seems probable that in such situations at least low hazel scrub must formerly have existed. It does not, as a rule, grow in crevices. Not in Aran.

Berberis vulgaris L. Usually seen as a hedgerow plant in Ireland; it is conspicuous among scattered pine-trees on limestone pavement about a mile N.E. of Lough Bunny. Not in Aran.

* Hart (1875), Nowers and Wells (1892), Colgan (1893), Praeger (1895). Nothing seems to have been published on the botany of the islands in this century.

- Arabis hirsuta** (L.) Scop. Rather common and occurring from sea-level to the mountain summits; often abundant on summit cairns, e.g. Slieve Carran.
- A. brownii** Jord. Reported from the roadside between Ballyvaughan and Black Head by Murray (1887), but the habitat is rather unlikely and the plant has not been recorded from the Ballyvaughan or Fanore dunes. Recorded also from Aran by Hart (1875) and Praeger (1895); the records here are more convincing.
- Erophila verna** (L.) Chev. Extremely abundant on the pavement everywhere, usually growing in a few millimetres of soil at the edge of closed vegetation or where a hollow contains some humus. The main flowering is in March and April, but Foot (1864) maintains that it flowers throughout the winter, and I have seen it flowering in early August. Rare in Aran.
- Cochlearia scotica** Druce. A very neat, dwarf *Cochlearia* is fairly common on rocks near the sea at Poulsallagh and is usually referred to this species. In cultivation it remains small, but the petals are white and the fruit not notably different in shape from that of *C. officinalis*. I have, therefore, some doubts about the identity of the plant. In Aran apparently only normal *C. officinalis* is recorded.
- Arabidopsis thaliana** (L.) Heynh. Common on the pavement, in habitats similar to those of *Erophila verna*. Not a very common species in Ireland, and usually in purely man-made habitats. Not in Aran.
- Helianthemum canum** (L.) Baumg. Frequent and locally abundant along the west coast from Black Head to Poulsallagh; also on Mullaghmore Hill near the S.E. limit of the region. Local also in Aran, being confined to the N. part of Inishmore.
- Viola stagnina** Kit. Frequent in turloughs, at a level which implies submergence for a large part of the year (see Praeger, 1932). Not in Aran.
- Cerastium arvense** L. Common in thin grassy vegetation overlying pavement; characteristic especially of the central part.
- Arenaria norvegica** Gunn. Recently reported by Heslop-Harrison *et al.* (1961) from about 800 ft. some 2 miles S.E. of Black Head. A notable addition to the boreal flora of the region: the nearest known stations are W. Yorkshire and Rhum. Not in Aran.
- Minuartia verna** (L.) Hiern. Ranges from sea-level at Poulsallagh to near the summit of Slieve Carran; abundant in places, but local and absent over wide areas. Usually on rock-ledges.
- Sagina nodosa** (L.) Fenzl. Very common in any place where water can linger even for a few days.

- Hypericum androsaemum** L. A characteristic ingredient of the crevice-flora, always very undersized.
- H. pulchrum** L. Abundant in all communities which tend towards the heath or moorland type; a constant associate of *Calluna*, *Molinia*, etc.
- Linum catharticum** L. Very common everywhere, from dunes to mountain-summits.
- Geranium sanguineum** L. Perhaps the showiest plant of the Burren, in view of its long flowering season. Very abundant and widespread.
- G. rotundifolium** L. Recorded for near Ballyvaughan (Praeger 1901). Not in Aran.
- G. columbinum** L. Rather common on shallow, unstable soil overlying pavement, especially in the east and centre. Not in Aran.
- G. robertianum** L. Very common on the pavement, often in quite exposed situations. The variety *celticum* Ostenf. is common, especially in exposed positions near the sea, but merges gradually into the type.
- Oxalis acetosella** L. Frequent in exposed positions, but usually where there is evidence of former scrub; Foot, however, cites it as growing "in the most exposed places at elevations of more than 1,000 ft.". Rare in Aran.
- Ilex aquifolium** L. Rather frequent in crevices in the pavement, and occasional on cliffs. Usually very heavily grazed, but here and there well-grown bushes are seen. Not in Aran.
- Euonymus europaeus** L. Frequent in crevices and at margin of scrub, but always heavily grazed and rarely flowering.
- Rhamnus cathartica** L. Common in the south-east, around the lakes and turloughs; often prostrate, but the frequency of erect bushes indicate that this is due simply to grazing and exposure. Rather rare in Aran.
- Frangula alnus** Mill. Frequent round Lough Bunny and in a few other places to the S. and S.W. of this. Always found in a completely prostrate form, even on islands on Lough Bunny where grazing is negligible and wind-exposure only moderate. It seems possible, therefore, that a distinct ecotype may exist in the Burren. Not in Aran.
- Acer pseudoplatanus** L. Locally abundant in crevices in the pavement, but always within a few hundred yards of houses, around which the seed-parents have been planted. It is curious that fruits apparently so well adapted for wind-dispersal do not travel further. Not in Aran.
- Anthyllis vulneraria** L. Locally abundant in grassy or heathy communities overlying pavement, but absent over wide areas.
- Lotus corniculatus** L. Extremely abundant from the sand-dunes to the highest summits; descends also deep into the turloughs.
- Lathyrus montanus** Bernh. Abundant in heathy communities, especially at higher altitudes. Not in Aran.

Filipendula vulgaris Moench. The western part of the very restricted area in which this species occurs in Ireland lies in the Burren; it is found from W. of Lough Bunny northwards to the plain below Slieve Carran, and extends eastwards to beyond the Burren boundary. Within this area it is frequent, though patchy, in grassy and heathy communities. Foot records it as ascending to 550 ft. Not in Aran.

Rubus saxatilis L. Very common on the pavement.

R. caesius L. Characteristic especially of the upper and middle parts of the flood-zone of turloughs. Plants subject to long immersion have deeply lobed leaflets.

Dryas octopetala L. Abundant, and indeed dominant over very wide areas, but capriciously distributed, being totally absent from other wide areas which look very similar. Tends to be more plentiful at the higher altitudes, but descends to below 100 ft. in very many places. Usually in very thin peaty soil overlying pavement, but sometimes luxuriant on gravelly drift. Most abundant, perhaps, in the north and west; rarest in the south-centre. Not in Aran.

Geum rivale L. Common in grassy communities at higher altitudes, especially on north exposures. Such situations on limestone mountains, rather than the river-banks usually mentioned in books, constitute the characteristic habitat of the species in Ireland. Not in Aran.

Potentilla anserina L. The great abundance of this plant in the lower part of the turloughs justifies its mention in this catalogue. It is associated mainly with aquatic or semi-aquatic mosses, and sometimes forms an almost pure sward.

P. fruticosa L. Common over a considerable area in the south-east part of the Burren; the centre of this area is between Bunny and Ballyeigher Loughs, and from here the plant extends locally for about two miles in all directions. It usually forms a rather precise zone around lakes or turloughs, where it receives at least one annual flooding but is dry for most of the year. There is also a large colony occupying the bottom of a rather dry turlough S.W. of Ballyvaughan, and a few bushes in a damp hollow at 700 ft. on the W. side of Gleninagh Mt. Not in Aran.

Poterium sanguisorba L. Rather common, but perhaps less so than the habitat might lead one to expect.

Rosa spinosissima L. Extremely abundant wherever the soil is shallow, and sometimes with *Calluna* in a considerable depth of peat. On the shattered type of bare pavement, where there are no proper crevices but simply a jumble of angular fragments this species and *Teucrium scorodonia* are often in sole possession.

- Sorbus aucuparia** L. Despite its general calcifuge tendency this species is constant as a minor ingredient of woodland wherever it is developed, and seedlings and stunted "trees" of it are frequent on the pavement. Not in Aran.
- S. hibernica** Warb. Scattered thinly here and there on cliffs or on pavement; not as savagely grazed down as most other woody species. Not in Aran.
- Crataegus monogyna** Jacq. Extremely abundant in thickets and scrub, but mainly if not entirely secondary, as an invader of undergrazed pastures. Scrub which is really dense and undisturbed contains little or no *Crataegus*, but if it is partly opened up invasion is rapid. *Crataegus* occurs, therefore, mainly where there is enough soil to have supported pasture in the past; but scattered bushes on bare pavement are also fairly frequent.
- Cotoneaster microphyllus** Lindl. A large plant of this Himalayan species, often bird-sown in remote localities, grows on the summit cairn of Carnsefin (1045 ft.), above Black Head.
- Prunus spinosa** L. Abundant on the pavement, usually very stunted from the combined effect of wind and grazing. Also common, along with *Crataegus*, as an invader of neglected farm-land.
- Saxifraga tridactylites** L. Abundant on the pavement, in small hollows with a very thin skin of soil. Abundant in one region of Aran, but restricted to a small area.
- S. rosacea** Moench. Along the west coast, from Black Head to Poulsallagh, ascending about half-way up the hills. About half a mile south of Black Head it is extremely abundant at the seaward limit of vegetation, growing in large clumps, intermingled with *Armeria maritima* and *Parietaria diffusa*. The Burren and Aran form of this variable species (usually referred to in the literature as *S. sternbergii*) is very characteristic, with a compact, caespitose habit, and glabrous leaves with somewhat mucronate lobes. It comes, in this last character, closer to *S. hypnoides* than does any other variety of *S. rosacea*, and has perhaps been subject to introgressive hybridization (Webb, 1950).
- S. hypnoides** L. Characteristic especially of the central region, where it is abundant, associated often with *Cerastium arvense* in a thin grassy sward over pavement. It ranges, however, from the top of the Slieve Carran cliffs to the slopes above Black Head. Apparently absent from Aran.
- Parnassia palustris** L. Common in all the fens and by lake-shores. Not in Aran.
- Sedum album** L. This species, which is not native to Ireland, is usually seen on walls, close to the cottage from which it escaped. In the Burren, however, it has successfully invaded the pavement, often at some considerable distance from the house in which it was cultivated. Not in Aran.

- S. acre** L. Rather common on the pavement, growing always in small depressions with a minute amount of soil, derived from the decay of mosses or *Nostoc*. Frequent also on the dunes, which are all calcareous.
- Epilobium montanum** L. Fairly frequent in crevices in the pavement.
- Sanicula europaea** L. Common in crevices in the pavement.
- Pimpinella saxifraga** L. Common in grassy communities, but mainly in those which have been substantially modified by grazing, and not as conspicuous an element in the Burren flora as one might expect. Not in Aran.
- Hedera helix** L. Common on the pavement and on cliffs; also in the *Corylus*-scrub.
- Cornus sanguinea** L. Recorded by Corry (1880) near Poulsallagh, and by Praeger (1901) as frequent, but only seen once or twice by me. Frequent in Aran, but very stunted.
- Viburnum opulus** L. Fairly frequent in mixed scrub or as isolated, stunted bushes on the pavement. Local in Aran.
- Rubia peregrina** L. Widespread throughout the district, mainly in crevices in the pavement.
- Galium boreale** L. Abundant round the shores of the lakes and the more slow-moving turloughs. Recorded also by Foot for the valley of the Cahir River, and by Corry for turloughs near Ballyvaughan.
- G. verum** L. Extremely abundant and conspicuous on sand-dunes and on grassy communities over pavement.
- G. pumilum** Murr. Common throughout the greater part of the district.
- Asperula odorata** L. Foot says that this species is "everywhere, in shady clefts and along road-sides". In my experience it is much less common, but is fairly frequent in crevices or in hazel-copse. Not in Aran.
- A. cynanchica** L. Extremely abundant from the sand-dunes to the mountain-tops.
- Succisa pratensis** Moench. Common, as is usual in Ireland, through a wide range of communities, from fen to dry heath.
- Eupatorium cannabinum** L. Frequent along the west coast, and perhaps elsewhere, in crevices of the pavement, in a very stunted form. It occupies a similar habitat on Aran.

- Solidago virgaurea** L. Very common both among *Calluna* and on almost bare pavement. In Aran, noted only for Inishmore.
- Antennaria dioica** (L.) Gaertn. Common, both in predominantly calcicole communities and also in *Calluna*-heath.
- Achillea ptarmica** L. Frequent in fens and on lake-shores in the eastern region.
- Artemisia maritima** L. Noted by Corry (1880) between Ballyvaughan and Black Head. Not in Aran.
- Senecio jacobaea** L. Common on bare pavement. This looks like a natural habitat, as it is not one of the commoner field weeds in the Burren. In Aran the form without ray-florets predominates; this has not been observed in the Burren.
- Carlina vulgaris** L. Very abundant on sand-dunes, pavement and thin grassland.
- Hieracium pilosella** L. Common on pavement, grassland and sand-dunes.
- H. anglicum** Fr. Frequent on cliffs and pavement. Other species of *Hieracium* recorded for the Burren (not for Aran) include *H. iricum* Fr., *H. britannicum* Hanb., *H. crebridens* Dahlst., *H. hypochoeroides* Gibs. and *H. cymbifolium* Purch.
- Mycelis muralis** (L.) Dum. Common on almost bare pavement throughout most of the area. The status of this plant in the Burren is enigmatic. It looks thoroughly native, but Praeger (1901) reckons it a probable alien to Ireland and (1934) a certain alien. It was, incredibly, not recorded for the Burren district till Praeger (1939) cited a record of F. R. Browning (undated, but presumably between 1935 and 1938) for "rocks between Ballyvaughan and Black Head". I am certain that it has been widespread in the district since 1941 at latest, and still believe that it may be native, but the silence of earlier writers is certainly suspicious. Not reported from Aran.
- Sonchus asper** (L.) Hill. Frequent on bare pavement, often far from houses. *S. oleraceus* also occurs, but usually near farms, and *S. arvensis* L. is occasionally seen in crevices.
- Campanula rotundifolia** L. Abundant on dunes, pavement and grassland. This species is distinctly local in the S. half of Ireland, and the Burren is the most southerly district in which it is really common.
- Arctostaphylos uva-ursi** (L.) Spreng. Locally abundant on mountain-tops (where it partly replaces *Dryas*) in the western portion, descending occasionally to about 400 ft. It occurs also at low level in S.E. Galway and perhaps extends here into the N.E. part of the Burren area, but I have not observed it.

Calluna vulgaris (L.) Hull. Very frequent and locally dominant throughout almost the whole area. The abundance of this normally calcifuge plant on limestone in conditions which do not permit leaching being invoked as an explanation is one of the paradoxes of the Burren flora. *Calluna* shows some preference for northern exposures, and for those areas of level pavement which bear some cover of mineral soil derived by down-wash from drift deposits above; but it can also be seen repeatedly in small solution-hollows in drift-free pavement in full sun. Its only requirement seems to be that some peaty soil shall have accumulated by the decay of mosses; if this is present it does not seem to matter if the soil is saturated with calcium bicarbonate.

Erica cinerea L. Accompanies *Calluna* wherever the latter is found in abundance, especially on shallower soils. (It is normally even more strictly calcifuge than *Calluna*.) Rare in Aran.

Pyrola media Sw. Five localities for this species are given by Foot; it is also known from the summit of Carnsefin and was seen there in 1961 (W. A. Watts). All the stations are on or near mountain summits and in the northern part of the Burren. Apart from the Burren this plant is not known in Ireland south of Pontoon (W. Mayo). Not in Aran.

Limonium binervosum (Sm.) Salm., *sensu lato*. The plant of this complex which was named by Pugsley as *L. transwallianum* Pugsley occurs at Pousallagh and thence sparingly up the coast to Fanore. Baker (1954) has cast doubt on the identification, and until the species-concept among these apomicts has been better defined there is little to be gained by pursuing the matter. Baker cites evidence to show that the plant is extending its range. It occurs also in Aran.

Primula vulgaris Huds. Very common in the open, as is often seen in western Ireland; in the Burren it is most abundant in high-level rough grassland. Attention may be drawn to the great frequency of the hybrid *P. variabilis* (*veris* × *vulgaris*) in the Burren. It is commoner in Ireland as a whole than in Britain, perhaps because the parents more often grow in close proximity; and in the region south-west of Lough Bunney it grows with astonishing frequency in roadside hedges and at the margins of hazel-copse. The cowslip (*P. veris*) itself is, as has been pointed out by Praeger (1934), much rarer in the district than one would expect, but it is seen here and there in pastures on drift.

Fraxinus excelsior L. In at least four places there are fragments of woodland as distinct from scrub, and in all of them ash is dominant. It is also very frequent on pavement, usually in a completely prostrate form as the result of grazing, but erect saplings are seen here and there, as are

also occasional trees in the hazel-copse. The fact that all four areas of woodland are in the eastern section suggests that wind as well as grazing and felling plays a part in restricting its growth, but the factors which prevent such large areas of pure *Corylus*-scrub as exist from developing into their presumed climax of *Fraxinus*-wood are obscure. Rare in Aran, and possibly introduced.

Blackstonia perfoliata (L.) Huds. Abundant on sand-dunes and in semi-open communities and thin grassland elsewhere. Local in Aran and not on Inishmore.

Gentianella spp. Foot says of *G. campestris* (L.) Börn. and *G. amarella* (L.) Börn. that they are "abundant everywhere, and at all elevations". I think that this is an overstatement, at least for the latter, which I have seen only on sand-dunes and low-level grassland. *G. campestris* goes up to the summits and is very frequent, but no more so than in many other regions. *G. campestris* is rare in Aran and *G. amarella* unknown.

Gentiana verna L. Well known as the chief glory of the Burren flora, and abundant over the greater part of the region. It grows best where there is a very thin but continuous soil overlying the pavement.

Cuscuta epithymum L. In great profusion on the sand-dunes at Fanore, on *Thymus*, *Lotus*, *Euphrasia* and other plants. It was first noted here in 1947 (Webb, 1947), in much smaller quantity, but Druce's (1909) station ("pasture about a mile south of Black Head") must be very close. First noted in Aran in 1890 (Nowers and Wells, 1892). A rare plant in Ireland, probably spread by human agency.

Calystegia soldanella (L.) R. Br. In moderate quantity at the seaward margin of the Fanore sand-dunes. Also in Aran. These are the only stations on the west coast between Banna, Co. Kerry, and Glencolumbkille, Co. Donegal.

Limosella aquatica L. In small hollows on the pavement at Poulsallagh. Reported by Praeger (1905) as "abundant and fine over an acre of ground" at the north end of Inchquin Lough, Corofin. I have not verified this station. Also at Fisherstreet, which lies at the extreme S.W. tip of the Burren area, and in two places just outside the region near Gort (Praeger, 1901). Not on Aran, and elsewhere in Ireland only in Fermanagh.

Euphrasia spp. "If anyone should ask, why do you mention such a very common plant as the humble *Eye-bright*?—my answer is, "Go to Burren and tell me if you ever saw it growing so luxuriantly, and at such elevations, and of such a size as it does there" (Foot, 1864). This is very true. Unfortunately the identity of many of the plants is obscure. Apart from *E. salisburgensis* (treated separately below) the following more or less distinct forms have been noted :

- (i) *E. micrantha* Rchb., typical, mauve-flowered, in Callunetum; not very common.
- (ii) A plant with small, white flowers which seems to be the Irish representative of *E. scotica* Wettst., but perhaps not identical; it is very frequent in all the fens, among *Schoenus*, etc.
- (iii) Typical *E. brevipila* Burn. & Greml., very common but usually on roadsides or disturbed ground.
- (iv) A very handsome plant with very large, white flowers, similar to *E. brevipila* in many respects, but without glandular hairs, and in some respects coming close to *E. pseudokernerii*. It is common on rock-ledges and thin grass-land, and occurs elsewhere on the limestone of W. Ireland.
- (v) A plant which is apparently *E. nemorosa* (Pers.) Wallr., var. *collina* Pugsl. though one reaches this conclusion mainly by the absence of any characters leading to other species. It is very common, especially on upland grassland.
- (vi) *E. rostkoviana* Hayne; frequent in coarse grassy vegetation.
- (vii) A plant on the sand-dunes which approximates to *E. occidentalis* Wettst., but is (as is usually in Ireland) eglandular.

E. salisburgensis Funck. Abundant on dunes, pavement and shallow soils. It is so constantly associated with *Thymus drucei* that I believe it to be exclusively parasitic on this species, although Crosby-Browne (1950) records it as parasitic on a variety of hosts, including *Dryas octopetala*, in the central Apennines.

Rhinanthus spp. A very characteristic form occurs rather frequently; it is slender, unbranched and small-flowered, and probably referable to *R. calcareus* Wilmott.

Orobanche alba Willd. Fairly frequent throughout; always on *Thymus drucei*. Foot's statement that it occurs only in the centre and east is not correct; it is on the dunes at Fanore; and occasional on the western hills. Not recorded for Aran.

O. hederæ Duby. Recorded by Corry, S. of Black Head; I have not seen it. Also in Aran.

Pinguicula grandiflora Lam. In fair quantity by a spring at about 400 ft., 1½ miles S.W. of Ballyvaughan; discovered here by Heslop-Harrison (1949). There are some smaller colonies not far away along the same seepage-line. This is the most northerly known station for the species. Some of the plants are very pale mauve, almost white, and various intermediates between this and the normal deep violet are found. I have never seen these pale-flowered forms elsewhere. Known also just outside the Burren district at Lisdoonvarna, where it had been suspected as planted, but in the light of the undoubtedly native Burren station the suspicions may be withdrawn. Not in Aran.

- Thymus drucei** Ronn. Extremely abundant throughout, except in certain grassy regions of the south centre.
- Calamintha ascendens** Jord. Commoner here than in most parts of Ireland, but mainly on roadsides.
- Teucrium scordium** L. In the lower parts of turloughs N.E. of Mullaghmore Hill (Praeger, 1905) and also to the S.E. of it. These stations, with a few other turloughs near Gort and one station in Co. Tipperary, represent the only occurrences of the plant outside the middle Shannon basin, where it is common. Not in Aran.
- T. scorodonia** L. Abundant throughout, and especially on bare "shattered" pavement, with *Rosa spinosissima* and little else.
- Ajuga pyramidalis** L. Very sparingly on grassy ledges near the sea at Poulisallagh. Rare also in Aran.
- Plantago maritima** L. Abundant in grassy communities and on pavement throughout the region, up to the mountain-summits. This species is common on limestone far from the sea through most of the western half of Ireland.
- Polygonum minus** Huds. I have no certain record for this species from the region; it occurs in some quantity in Tirneevin turlough (W. of Gort), less than a mile outside the region, and I believe that I have also seen it in turloughs S.W. of Mullaghmore hill. The Polygonums found towards the bottom of the turloughs are hard to diagnose, and I suspect that some of the records—e.g. *P. mite* Schrank for Tirneevin by Praeger (1939)—may be erroneous. *P. persicaria* assumes an unusual form from long immersion, and I believe that the hybrid *P. persicaria* X *minus* may be present.
- Mercurialis perennis** L. Abundant at one spot, Deelin beg, on the boundary between the central and eastern sections; here it is found in hazel-copse, on rocky slopes, and among the stones at the foot of walls. It is the one station in Ireland where the plant looks thoroughly native; at its other stations (not more than a dozen or so) it is confined to a demesne or may be reasonably suspected of having escaped from one. For further discussion see Boatman (1956). Not in Aran.
- Ulmus glabra** Huds. A very few trees may be seen in the remaining fragments of *Fraxinus*-wood in the eastern section, and are undoubtedly native. Not in Aran.
- Parietaria diffusa** Mert & Koch. Among boulders at the upper margin of the storm-beach south of Black Head. It has been reported in a similar habitat further east, at the head of Galway Bay (Praeger, 1939).

- Betula pubescens** Ehrh.* Here and there in scrub or woodland, but usually in small quantity. Praeger (1934) speaks of *Betula-Fraxinus* wood at the foot of the Slieve Carran cliffs, but I think this is misleading; the birch never achieves the status of co-dominant. Not in Aran.
- Corylus avellana** L. Very abundant, and dominant over wide areas, particularly in the eastern section. This species suffers less from grazing than any other tree or shrub; it is apparently distasteful and is rejected unless the grazing pressure is very high. On the other hand it suffers severely from wind-exposure, which causes die-back of the leading shoots. Fruit production is rather poor, and seedlings are seldom seen in any quantity.
- [**Quercus robur** (L.)] The total absence of this tree from the region is worth mention. It is recorded for Aran (Inishmore) by Hart (1875) and it would be interesting to know if it has claims to be considered native there.
- Salix repens** L. Locally abundant on dunes or in heathy vegetation overlying pavement, but absent from wide areas.
- Populus tremula** L. Occasional in the eastern section, and native at least in some places. Not in Aran.
- Empetrum nigrum** L. Abundant on the higher ground in the western and central sections, mostly above 700 ft., but descending locally to about 400 ft. It grows happily in a thin, peaty soil over limestone without showing any sign of chlorosis. Not in Aran.
- Listera ovata** (L.) R. Br. Common not only on the margins of scrub, but in open heathy and grassy situations. Not in Aran.
- Spiranthes spiralis** (L.) Chev. Few of my visits have been late enough to assess the frequency of this species, but it is at least locally common both in the eastern and western sections.
- Epipactis helleborine** (L.) Crantz. Frequent in and around the *Corylus*-scrub, sometimes venturing out on to the pavement. Some puzzling plants apparently intermediate between this species and *E. atrorubens* have been seen: they need further investigation. Not in Aran.
- E. atrorubens** (Hoffm.) Schul. Very frequent in crevices in the pavement, especially between 300 and 800 ft. Not in Aran.
- Anacamptis pyramidalis** (L.) Rich. Abundant on dunes, and also on roadsides, but not common in undisturbed grassland. Local in Aran.
- Orchis mascula** L. "Very abundant and luxuriant, from almost white to deep purple" (Praeger, 1934). This species makes a substantial contribution to the spectacular floral display in early May.

* NOTE ADDED IN PRESS. I have recently come across some fairly extensive woods composed almost entirely of *Betula pubescens* on drift ridges near the eastern boundary of the Burren (6½ miles due west of Gort). Presumably the leaching of the summit of the ridges favoured their establishment in this position. In a few places good regeneration was seen, but in most places *Betula* appears to be yielding to *Corylus*, presumably under the influence of grazing.

- Dactylorchis fuchsii** (Dr.) Verm. Common, but no more so than one would expect in a limestone region. The albino form is, however, very frequent and widespread in the Burren; it is the plant known as *Orchis okellyi* Druce or *Dactylorchis fuchsii* Verm., subsp. *okellyi* Verm. (see Druce, 1909). I am not impressed by the differences (other than colour) which are said to separate it from the type, and I doubt that it deserves subspecific status. The type is on Inishmore; I do not think that the white form is known from Aran.
- D. incarnata** (L.) Verm., subsp. **cruenta** (O.F.M.) Verm. This striking form, with leaves spotted on both sides, grows in fens near the N.E. end of Lough Bunny, but intergrades with the type, which is also plentiful here.
- D. majalis** (Rchb.) Verm. Two subspecies of this complex grow in the area. Subsp. *traunsteineri* (sometimes rated as a species) has been reported near the N.E. end of Lough Bunny (Gough, 1952). Subsp. *occidentalis* (Pugsll.) Hesl.-Harr. f. is said by Summerhayes (1951) to be, in spite of its general preference for acid soil "abundant in the limestone area of the Burren". I think that this is an exaggeration: it is abundant on the shales around Ennistymon and Lisdoonvarna and extends northwards into the Burren, where I think it is found mainly on patches of particularly impermeable drift which give a "sour" grassland dominated by *Molinia*. But it is not a conspicuous member of the Burren flora. Not recorded for Aran.
- Ophrys apifera** Huds. Scattered over the area, but nowhere plentiful.
- O. muscifera** Huds. Frequent in fens near the N.E. end of Lough Bunny, where it grows between tussocks of *Schoenus*. Corry (1880), however, records it "on a rocky plateau at the base of the Glanquin hills" (this is, presumably, somewhere west of Lough Bunny), so that it appears sometimes to grow in drier situations. Not in Aran.
- Gymnadenia conopsea** (L.) R. Br. Very abundant: probably the commonest orchid of the district after *Orchis mascula*. Its habitat ranges from fens to moderately dry grassland.
- Neotinea intacta** (Link) Rchb. f. Widespread and locally frequent, but not as common as some of the literature suggests. I have noted it in several places in the south-east (S.W. of Mullaghmore hill), in the neighbourhood of Ballyvaughan, and in the valley of the Cahir River, and it is probably scattered over most of the district except the south centre. It is mainly on shallow drift, with a grassy vegetation-cover, but at Ballyvaughan it occurs on the dunes. Not in Aran.
- Juncus subnodulosus** Schrank. Common in fens in the eastern section. Not in Aran.

- Potamogeton** × **lanceolatus** Sm. (*P. berchtoldii* × *coloratus*). This rare hybrid is frequent in the middle reaches of the Cahir River. Not in Aran.
- Scirpus tabernaemontani** Gmel. Very large beds of this are found in the brackish lakes along the coast westwards from Ballyvaughan.
- Eriophorum angustifolium** Honck. Not infrequent in fenny communities where the water must be strongly alkaline; such a habitat, though not unknown elsewhere in Ireland, is rare. Not in Aran.
- Schoenus nigricans** L. Abundant in the eastern section in fens and lake-shores; occurs also in smaller quantities on rocky hillsides in places where springs flow intermittently after heavy rain.
- Cladium mariscus** (L.) Pohl. Abundant in fens and reedswamps in the eastern section, flowering and fruiting well. Often seen growing out of crevices in pavement, but at a height above the water-table which makes it probable that its rhizome is usually submerged. Not in Aran.
- Carex elata** All. Plentiful in shallow water on some of the larger lakes. Not in Aran.
- C. flacca** Schreb. Abundant throughout; the large size which it attains in the Burren has been commented on by several authors.
- C. sylvatica** Huds. Apart from its frequent occurrence in scrub, which is in no way remarkable, this species is occasionally seen in crevices of very bare pavement on exposed hillsides. Not in Aran.
- C. lasiocarpa** Ehrh. Frequent in fens in the eastern section. Not in Aran.
- Sieglingia decumbens** (L.) Bernh. Common in all heathy communities.
- Phragmites communis** Trin. Dominant in considerable areas of reedswamp round the larger lakes.
- Sesleria caerulea** (L.) Ard. Extremely abundant; the dominant species in all grassy communities which have not been too much modified by intensive grazing, and usually a minor ingredient of heathy communities as well. Absent only in places where the soil is wet or heavy.
- Molinia caerulea** (L.) Moench. Dominant here and there on patches of especially clayey drift, which are therefore damp, "sour" and unsuitable for farming. Frequent also in smaller quantity in fen and heath.
- Briza media** L. Very abundant in all grassy communities. Recorded from only one station in Aran.
- Catapodium rigidum** (L.) Hubb. Rather frequent on gravelly drift and occasionally on shattered rock.
- Festuca ovina** L. Very frequent, but seldom dominant.
- Brachypodium sylvaticum** (Huds.) Beauv. Common in completely exposed positions on the pavement, as well as on the margins of scrub.

Juniperus communis L. Abundant in places, but curiously local. It is hard to see why certain districts are preferred: it ranges from near sea-level to the summits, from west to east, and from deep drift to bare pavement. It is always quite prostrate, and seems, both in the Burren and Aran to be subsp. *communis*. (In Praeger's earlier writings he referred it to subsp. *nana*, but changed his mind later.)

Taxus baccata L. Frequent on cliffs and on pavement, but always as isolated individual trees. Despite its poisonous nature the yew suffers severely from grazing, mainly it seems by goats, and many plants on the pavement are quite prostrate. It is little affected by wind. Not in Aran.

Ophioglossum vulgatum L. "I never saw it in such abundance as at a place called Gragans, south of Ballyvaughan" (Foot, 1864). Widespread, and more frequent than usual in Ireland.

Pteridium aquilinum (L.) Kuhn. Despite its generally calcifuge tendency this plant is very frequent on pavement, especially in the east. It is rather stunted, perhaps from drought, and groups of chlorotic fronds are frequent, indicating where a rhizome has run into too alkaline a pocket of soil, but most of it is healthy. Apart from this occurrence in a relatively natural environment it is abundant as a secondary invader of rocky pastures that are abandoned or undergrazed, and in these conditions often rises to complete dominance.

Adiantum capillus-veneris L. Recorded from at least ten distinct stations; most of these are in the north of the region, but in its most southern (2 miles north of Corofin) it is very abundant. Usually well protected in crevices in the pavement, but occasionally seen in more open situations.

Phyllitis scolopendrium (L.) Newm. Very common in crevices in pavement everywhere.

Asplenium marinum L. Locally abundant and often luxuriant at Black Head and Poulisallagh. Corry (1880) speaks of "fronds full three feet in length being not uncommon" in crevices in the pavement, up to 200 yards or so from the sea.

A. trichomanes L., **A. ruta-muraria** L., **Ceterach officinarum** DC. These three ferns, usually seen on mortared walls are all common on the pavement, sometimes in shallow crevices, but more often in small pockets.

Cystopteris fragilis Bernh. Common in crevices and on cliffs, especially at higher elevations. Not in Aran.

Polystichum aculeatum (L.) Roth. Common in crevices in the pavement. Foot (1864) says that *P. setiferum* Woyn., though not so abundant, is still very plentiful. My impression is that it is distinctly rare. Only the latter species has been recorded from Aran, but they have been so often confused that this record needs confirmation.

Equisetum × *litorale* Rupr. (*E. arvense* × *fluviatile*). Abundant by the Cahir River (Praeger, 1934), with *E. variegatum*. I have not verified this. *E. variegatum* is in Aran, but not the hybrid.

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CORRIGENDA

- Page 18, last column in both Tables 2 and 3. *For H read N.*
- Page 19, last column in Table 4. *For H read N.*
- Page 77, line 2 of Introduction. *For birfurcata read bifurcata.*
- Page 130, line 12. A single tree of this species has since been found.
(Author's note, added after printing.)
- Page 180, line 2 of acknowledgements. *For finanncial read financial.*
- Page 267, line 14. *For or read of.*
- Page 289, line 9. *For Irishtubrid read Inishtubrid.*