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Michael O'Connell and Karen Molloy

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Journal of the North Atlantic

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Cover Image: Oblique aerial view of north-east and central Inis Meáin. For full legend, see Figure 3B. Photo: 16/06/2010, Michael O'Connell.

Aran Islands, Western Ireland: Farming History and Environmental Change, Reconstructed from Field Surveys, Historical Sources, and Pollen Analyses

Michael O'Connell[1,*] and Karen Molloy[1]

Abstract - The Aran Islands are exceptional cultural landscapes at the Atlantic fringe of Europe. They are strongly influenced by human settlement and small-scale farming that is still pursued according to traditional practices. Reconstruction of changes in farming from the beginning of the early 20th century onwards, and demographic changes beginning in the early 19th century, are discussed in the light of official statistics. Field surveys, aimed mainly at documenting the extent of *Secale cereale* (rye) cultivation, provide more precise information on the extent of rye cultivation in recent decades and give fresh insights into present-day flora, vegetation, and plant biodiversity. Results from a previously published, lake sediment-based Holocene pollen profile from Inis Oírr are re-assessed in the light of modern-day pollen deposition studies that we carried out. We discuss the implications of long-distance pollen transport for the interpretation of Holocene pollen diagrams in relation to the history of trees, including *Pinus sylvestris* (Scots pine), in Ireland, and we emphasize the importance of supporting traditional farming practices, particularly as regards cereal growing, on the Aran Islands.

Introduction

The Aran Islands, comprised of three substantial islands, Inis Mór, Inis Meáin and Inis Oírr, and a few smaller islands, lie off the mid-Atlantic coast of Ireland (Fig. 1). Situated between Connemara, Co. Galway and the Burren, Co. Clare, the Islands straddle the mouth of Galway Bay which, especially in early modern times, gave them a strategic importance.

The exceptional character of the islands and their peoples has long been recognized. Roderic O'Flaherty, a local historian writing in 1684, describes the Islands as follows (published in Hardiman 1846:66–68):

> "They [the Aran Islands] are fenced on the south side with very high clifts some three score, some four score and five score fathoms deep, against the Western Ocean's [Atlantic Ocean] approach. The soile is almost paved over with stones, soe as, in some places, nothing is to be seen but large stones with wide openings between them, where cattle break their legs. Scarce any other stones there but limestones, and marble fit for tomb-stones, chymney mantle trees, and high crosses. Among these stones is very sweet pasture, so that beefe, veal, mutton are better and earlyer in season here, then elsewhere; and of late there is plenty of cheese, and tillage mucking, and corn [...]. In some places the plow goes. On the shore grows samphire [*Crithmum maritimum*] in plenty, ring-root or sea-holy [*Eryngium maritimum*] and sea-cabbage [*Crambe maritima*]. [...] Here are severall wells and pooles, yet in extraordinary dry weather, people must turn their cattell out of the islands, and the corn failes. They have noe fuell but cow-dung dryed with the sun, unless they bring turf in from the western continent [Connemara]."

In this paper, the results from surveys of arable farming that we and others have conducted, and pollen analytical data we have derived from surface-pollen samples, are presented and discussed. The implications of the modern pollen data for interpretation of fossil pollen data from Inis Oírr, and Ireland generally, are considered and an overview is provided of the history of arable farming on the Aran Islands since its inception in the Neolithic period. We strive not only to present information relating to recent and long-term flora changes and traditional farming economy and practices, but also attempt to convey our impressions of the Aran Islands and also impressions given by others, an approach that we contend is still valuable even in this age of quantification and technology (cf. Heneghan 2018).

The Aran Islands as cultural and karstic landscapes

Administratively, the islands belong to Co. Galway, but geologically and floristically, their affinities lie with the Burren, with which they share a Carboniferous limestone geology and several floristic elements. Exceptional features include lack of trees, a scarcity of tall shrubs but overall high plant biodiversity, and a dense network of small fields defined by stone walls that vary considerably in their construction (Feehan 1994, Laheen 2010, Ó Ruairc 2011, O'Sullivan 2017, Roden 1994, Scannell and Jebb 2000, Webb 1980, Webb and Scannell 1983; Figs. 2–4). The Islands have a particularly rich archaeology including megaliths, exceptionally large and spectacularly-sited forts, and several structures dating to the early Medieval period (ecclesiastical buildings, mainly from the 6th to 11th centuries) and also fortifications relating

[1]Palaeoenvironmental Research Unit, School of Geography and Archaeology, National University of Ireland Galway, Galway H91 TK33, Ireland. [*]Corresponding author: michael.oconnell@nuigalway.ie.

to the post-Medieval period (Cotter 2012, Waddell 1994). These field monuments attest to long and substantial human activity and settlement since at least the Neolithic (shortly after 4000 BC; see Discussion and Conclusions).

That the Islands were once wooded, had long been suspected (e.g., O'Flaherty 1825, Webb 1980), but it was not until detailed pollen analytical investigations were carried out on a long lake-sediment core from An Loch Mór, Inis Oírr, that it was shown beyond doubt that Inis Oírr, and also presumably the other large islands, carried woodland for most of the Holocene (Molloy and O'Connell 2004, 2007, 2014; see Discussion and Conclusions).

As regards ethnography, folk-life, and farming history, the Aran Islands are of special significance in national and international contexts. In the 19th and early 20th centuries, they were regarded as among the best surviving exemplars of a way of life that had largely vanished in Ireland and indeed in Europe generally (Carew 2018:54–55, Waddell et al. 1994). In this period, the Islands acquired additional significance as one of the main places in Ireland where the once commonly spoken Celtic language, Irish (Gaelic), survived as the main, and often the only, spoken language (de Paor 1986:272, Duran 2015). In recent times, the special status of the Islands as regards natural history has been recognized by their designation as a Special Area of Conservation (SAC) on account of the presence of several habitats listed in Annexes I/II of the EU Habitats Directive (NPWS 2013). The Islands are a key part of the ongoing application to have the Western Stone Forts of Ireland recognized as World Heritage Sites (Laheen 2010, UNESCO 2018).

Insights into population and farming dynamics provided by official (CSO) statistics

Major demographic and other changes on the Aran Islands are captured in official statistics compiled by the Central Statistics Office (CSO) (Gailey 1959; Royle 1983, 1999; see also Figs. 5, 6). The Great Famine (1845–1852), the immediate cause of which was the failure of the potato crop (Crowley et al. 2012), had little effect, especially on Inis Meáin and Inis Oírr (Gailey 1959). This contrasts with Irish island-populations generally (Fig. 5). A noticeable population decline first registers in the late 19th

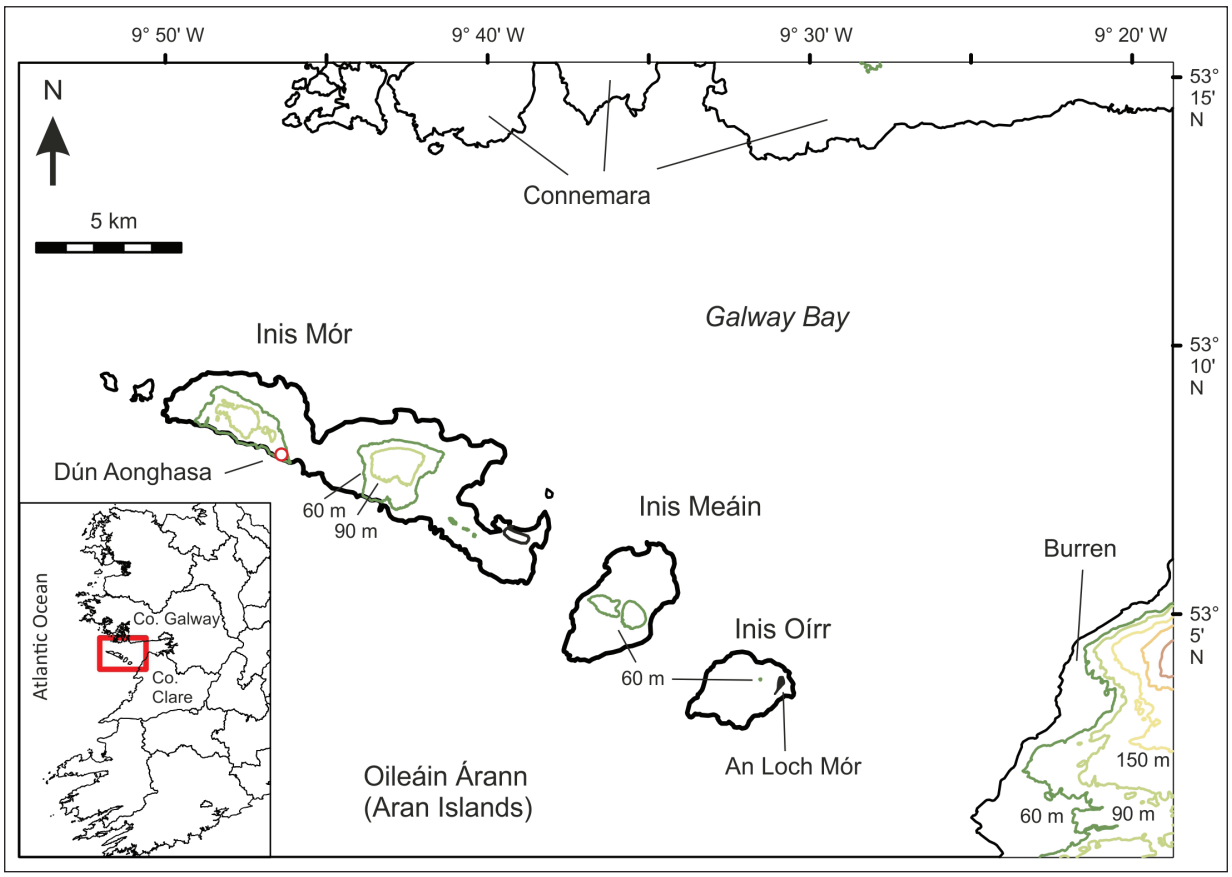


Figure 1. Map of the Aran Islands and nearby parts of the Burren and Connemara. Contours at 60, 90, 150, 200 and 250 m are indicated. The inset map shows part of western Ireland. A rectangle delineates the area shown on the main map and county boundaries are indicated. © Ordnance Survey Ireland. All rights reserved. Licence No. NUIG220212.

century. The population, and especially that of Inis Mór, declined considerably in the 1920s, and then remained fairly stable until the 1950s, when the population on Inis Mór fell to below a thousand for the first time mainly due to emigration, South Boston, USA being a favorite destination (O'Dowd 1994). From the 1980s onwards, the population stabilized, except on Inis Meáin, where decline has persisted (154 in 2006). Interestingly, Inis Oírr, though the smallest island, has the highest population density (Fig. 5), largely because of its proximity to, and strong ties with, the nearby mainland—the harbor at Doolin, Co. Clare is only 8 km distant.

As regards recent farming history, CSO agricultural statistics—detailed breakdown for the three main islands is available for the period 1926–2000 (Fig. 6)—show that a "mixed" farming economy persisted until the 1970s. These statistics were collected by local "enumerators" (cf. Royle 1983) who used imperial measure (acres, etc.) and worked to the CSO. When evaluating the statistics, it should be borne in mind that it was the practice not to record a crop if the acreage was <0.25 acres (0.1 ha) in a particular land-holding. This largely explains the general lack of cereal records in the more recent censuses (small plots that occupy only part of a field or even one or more small fields were generally ignored). From ca. 1990 onwards, changes in the methods used for statistics collection were introduced that included adoption of the metric system (hectare rather than acre), and greater reliance was placed on postal-sample surveys with a view to reducing costs. Independent of the actual enumeration procedures, errors can and did occur as exemplified by the lack of records for rye in 1935 and 1961. The 1991 returns indicate 5 ha under barley and no records for other cereals or potatoes which again cannot be correct. Similarly, the lack of records for goats after 1951 does not reflect the situation on the ground (goats, sometimes feral, continue to be a feature of all three islands and especially Inis Mór). The 1977 returns give the total number of horses as 253, which is regarded as implausible and has therefore been omitted (that number is only exceeded by the 1928 return that was 277).

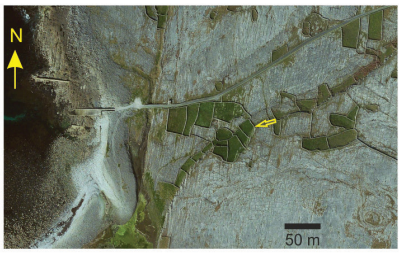
Despite the above shortcomings, the CSO statistics provide important evidence for farming especially during the last century. They show that pastoral farming has been, and continues to be, of major importance. Cattle and sheep were more or less of equal importance in terms of "livestock units" until the late 1960s. After that, sheep numbers declined in favor of cattle (number of cattle approximately doubled and consisted mainly of dry-stock). The initiation of this can be traced to the early 1960s, when sheep numbers declined over some years. In the late 1950s, a steep decline in pig numbers took place, so that by the early 1960s, pigs barely register in the returns (photo in SM-F1 shows pigs on pier in Cill Rónáin being exported to Galway city, ca. 1952; details regarding supplementary files are available in Table 1). The early 1960s witnessed further substantial change in that arable farming began a steep and inexorable decline. The decline in horse numbers was undoubtedly connected with the decline in tillage, and this, in turn, ties in with population decline. In the early 1960s, there was a short-lived increase in poultry numbers. This probably reflected the increased emphasis on poultry at a national level at about this time.

The CSO statistics confirm the overall impression provided by botanists and other visitors to the islands (see Bleasdale 1994:Appendix 1, O'Connell 1994) to the effect that the main crops were potatoes, rye, and oats, in that order of importance (Fig. 6). Other important root crops included turnips and mangels (average acreage, 1926–1971: 9 ha and 8 ha, respectively), the former being used for both human and animal consumption. At the beginning of the 1930s, the acreage under rye fell from ca. 50 ha to initially 29 ha and, for a few years, it was as low as 12 ha before recovering substantially in the mid 1930s (the lack of a record for rye in 1935 is almost certainly an error). In the late 1930s and early 1940s, there was substantial acreage under rye (*Secale cereale*) and a small amount of wheat (*Triticum aestivum*) was grown, in response to increased emphasis on tillage nationally during World War II (wheat growing was especially promoted; Crotty 1966, Evans 2011). Around the same time, there was an increase in oats cultivation. Presumably, the species involved was *Avena sativa*, though almost certainly *A. strigosa* was also grown as a crop in its own right. O'Flaherty (1825:132), for instance, indicates that "the prevailing crops are potatoes, rye, and a small kind of black oats, all which ripen early, and are of good quality".

In the years 1930–1943, CSO enumerators were afforded the possibility of recording "Black" oats (presumably *A. strigosa*; the common English name is bristle oats) versus "White" oats (presumably *A. sativa*). "Black" oats was recorded on the Aran Islands only in 1935 and 1938. It is probable that the distinction was generally not made (or correctly made) by the enumerators. As regards the history of arable farming since the mid 1970s onwards, the CSO statistics are insufficiently detailed (see above) so reliance is placed on other surveys including observations by the authors (see below) and especially the surveys in 1994 by A. Bleasdale that formed the basis of a subsequent detailed report (Bleasdale 1994; see Discussion and Conclusions).

A.1. Rye fields at Bun Gabhla (1989)

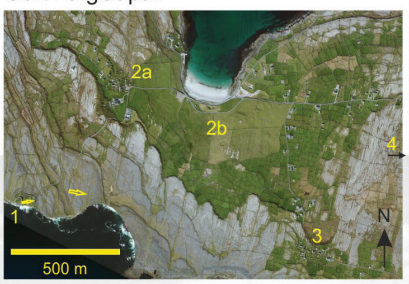
A. Bun Gabhla, Inis Mór (north-west)



A.2. Rye fields at Bun Gabhla (2010)

B.1. View from Dún Aonghasa to NE

B. Dún Aonghasa, Cill Mhuirbhigh, Gort na gCapall



B.2. View from nr. Dún Aonghasa to SE

B.3. View from nr. Dún Aonghasa to SE (Fr. Browne 1938)

B.4. Sickle found on wall beside a rye plot at eastern side of Na Muirbhigh Móra.

B.5. Rye and other crops near Gort na gCapall (view similar to B.3)

Biodiversity in the context of changing demography and farming practices, and surface-pollen sampling

The publication of "The Flora of the Aran Islands" by Webb (1980) is a landmark in the study of the flora of the Aran Islands. It not only critically assessed the higher plant records available up to that point, it also highlighted the many changes that had occurred in the course of well over a century of recording by botanists and other visitors to the Islands. It was not until several years later, however, that the importance of cereal cultivation for biodiversity and conservation on the Aran Islands came to the fore, as a result of the discovery by Curtis et al. (1988) of *A. strigosa* and *Lolium temulentum* (darnel; these authors suggest that over half the rye fields on Inis Meáin was darnel-infested) on all three islands, and *Centaurea cyanus* (cornflower) on Inis Mór and *Bromus racemosus* (smooth brome) on Inis Meáin. Curtis et al. (1988) reported these four species occurring as weeds in rye fields, and also pointed to the importance of *A. strigosa* in the recent past on Aran and in western Ireland where it was once widely cultivated often in preference to *A. sativa* especially in regions, not only in Ireland and also elsewhere in Europe, where soil fertility was low (for an overview of the history of cereals and other crops in a European context, see Körber-Grohne 1995).

Realizing that cereal-growing was rapidly declining and that other changes were taking place (e.g., increase in shrubby vegetation locally and increased afforestation in the wider region and especially in Connemara), it was decided to embark on a study of surface-pollen samples while the opportunity still existed of investigating the relationship between pollen deposition and arable farming within this exceptional cultural landscape under the then prevailing conditions. Initial sampling was carried out in late July 1989 on Inis Mór and, in early August 1992, at a range of sites including sites at/close to fields with cereals (mainly rye) and also at locations distant from arable activity (see Methods). In 2010, a field survey of arable farming on the Aran Islands was undertaken by the authors, during which further surface-pollen samples were collected and the surface-pollen samples that had been collected earlier were pollen analytically investigated.

In the account that follows, plant nomenclature follows Parnell and Curtis (2012) for higher plants and ferns. Older, commonly used Latin names, are given in parentheses. Bryophytes are after Atherton et al. (2010). Placenames mainly follow Robinson (1996) (for an assessment of Robinson's contribution to Aran Island mapmaking, see Cronin 2016 and Rossi 2018).

Methods

Inis Mór was initially visited on 27–30 July, 1989 for the purpose of collecting surface-pollen samples. Much of the island was traversed, but sampling was

Figure 2 (opposite page). Photographs relating to Inis Mór.

A. Aerial view of Bun Gabhla, Inis Mór, north-western end (Bing Maps, 14/02/2018). An arrow points to the fields shown in A.1 and A.2. **A.1.** Photo of rye fields (27/07/1989); **A.2.** Similar view as A.1 but in this photo, dating to 10/06/2010, the fields have reverted to pasture; arable farming ceased in this area ca. 1995. (co-ordinates for photos: 53.14033, -9.82441; MO'C).

B. Cill Mhuirbhigh, Inis Mór (Bing Maps, 14/02/2018). The following are indicated: 1, Dún Aonghasa (fort); 2a, Cill Mhuirbhigh (Kilmurvey) (settlement); 2b, Na Muirbhigh Móra ('sandy sea-plains'); 3, Gort na gCapall (settlement; also name of the area); 4, Oighill megalith (the wedge tomb is located 1 km to the east (direction of black arrow), i.e., outside the area shown in the map. Yellow arrows in B indicate position and direction of photos B.1 and B.2 (see below).

B.1. Photo from inside main outer wall at Dún Aonghasa with a view across Na Muirbhigh Móra ('large sea-plains'; this refers to the lowlying land, part included in mid, left-hand side of photo) to the north-east. Pollen surface sample IMOR-1 was taken close to area (vegetation/habitat similar) shown in the foreground. Photo B.4 is from the middle distance (beside the road, Bóthar Ghort na gCapall). (photo: 08/09/2007, MO'C).

B.2. Photo is from similar location to B.1 but from a somewhat lower elevation and towards the south-east. Gort na gCapall ('field of the horses') is the settlement on the right hand side. Photo B.3 is probably from the field system that adjoins the small cluster of houses close to the middle of the photo. (photo: MO'C, 08/09/2007).

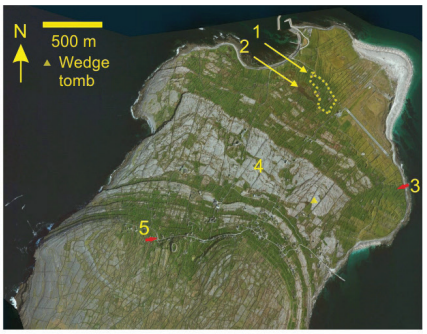
B.3. Photo showing men binding and stooking rye near Gort na gCapall. Dún Aonghasa is visible on the skyline. Photo by Father Browne; it most likely dates to 1938; published by E.E. O'Donnell (1998, p. 44) who states that the men "are pulling up rye-grass by the roots for thatching". Rye is known to have been pulled rather than cut on Aran, especially for thatching (see photos in SM-F1), but in this instance it appears to have been cut by a scythe. (photo: © Davison & Associates).

B.4. Sickle found in a rye plot on Bóthar Ghort na gCapall, i.e., on eastern side of Na Muirbhigh Móra. The cutting edge consists of a fine-toothed iron blade. (photo: 15/06/2010, MO'C).

B.5. Rye and other crops near Gort na gCapall. View is similar to that in B.3. Note: several of the fields on ridge in middle distance are also cultivated. (at ca. 53.126417°N, 9.750058°W; photo: 29/7/1989, MO'C).

A.1. Arable (mainly rye and potatoes)

A. Inis Meáin (aerial view, mid and northern parts)



A.2. Rye shedding pollen

A.3. Poppy-rich fallow

A.4. Species-rich fallow

A.5. Rye harvested and ready for collection

B. Inis Meáin (oblique aerial view to SW)

A.6. Darnel (*Lolium temulentum*) in a rye crop

A.7. *Avena strigosa* in a rye crop

B.1. Views from Cinn an Bhaile towards NE →

B.2. Wedge tomb on pavement

confined to the north and west of Cill Rónáin (Table 2, SM-T1). The main features of the surface-pollen sites were noted. Information collected included the species present and their abundance, presence of plants that were flowering, or had recently flowered, and the spatial relationship of plant-species distribution to where samples were taken. Four years later (4–5 May 1993), Inis Mór was revisited and most of the sites previously sampled were inspected and additional information was gathered.

Inis Meáin was visited on 8 August 1992 with a view to collecting surface-pollen samples. These were collected in the mid and northern parts of the island and relevés were recorded. Other visits included a stay on the island in early April 2007 during which most of the island was traversed and various features, including the flora, were photographically documented.

During summer 2010, all three Islands were visited mainly for the purpose of establishing the status of cereal cultivation. Inis Mór was surveyed on 10, 11 and 15 June, Inis Meáin on 16 June and Inis Oírr on 11 August. The greater part of each island was traversed. Species lists were made, surface-pollen samples were taken, and extensive photographic records were made. In addition to taking GPS readings, sites were marked on detailed maps and fields under cultivation were identified on aerial photographs.

The islands were also visited at other times by one or both authors. The first visit consisted of a botanical expedition of some days to Inis Meáin in late May 1971 as part of a group led by J. White (see Webb [1980:52] who refers to "Mr. J. White and four students", see also SM-T1). The palaeoecological project TIMECHS, which focused on An Loch Mór, Inis Oírr (1999–2001) (Molloy and O'Connell 2007) provided several opportunities for visits, especially to Inis Oírr.

Vegetation was recorded by making species lists mainly at sites where surface-pollen samples were taken. The dafor scale (d, dominant; a, abundant; f, frequent; o, occasional; r, rare) was used to record species abundance. Relevés were recorded at several sites using the Braun-Blanquet system and its 5-point cover/abundance scale (1–5; "+" indicating presence outside the relevé) (cf. White and Doyle 1982).

To investigate modern pollen deposition what was regarded as the most suitable material for surface-pollen samples was collected at various sites. Where feasible, each sample was constituted by taking a few subsamples in close proximity and mixing the material. Bryophytes (mainly mosses; the uppermost 2–3 cm of plant material was collected) were favored as these potentially integrate pollen deposition over a considerable period (months to years). Deposits that had accumulated in solution hollows were also sampled, as well as leaves of *Plantago lanceolata* (ribwort plantain) where no other suitable material was present.

In the laboratory, each surface-pollen sample was swirled in distilled water and strained to remove large debris. The pellets obtained by centrifuga-

Figure 3 (opposite page). Photographs relating to Inis Meáin.

A. Aerial view of Inis Meáin, excluding the southern part which is farmed (almost exclusively pastoral), but without habitation (Bing Maps, 14/02/2018). The following are indicated: 1, the main area for arable farming (mainly rye and potatoes); 2, Loch na gCadhan; 3, the aerial view shown in B starts here and extends to the south-south-west; 4, the large expanse of pavement referred to as Na Creaga Móra (the large crags) which has a collapsed wedge tomb near its eastern end; 5, eastern end of Cinn an Bhaile where photos shown in B.1 were taken (at tip of arrow; the arrow points in the direction of view).

A.1. Part of a relatively extensive arable plot with rye and cultivation ridges with carrots, turnips, onions, and potatoes.

A.2. Rye (*Secale cereale*) shedding pollen.

A.3. *Papaver dubium*-dominated fallow.

A.4. Weed-rich fallow; main species: *Pastinaca sativa*, *Chrysanthemum leucanthemum*, and *P. dubium*.

A.5. Rye harvested, tied in sheaves and ready to be collected, presumably for thatching.

A.6. Darnel (*Lolium temulentum*) in a rye plot.

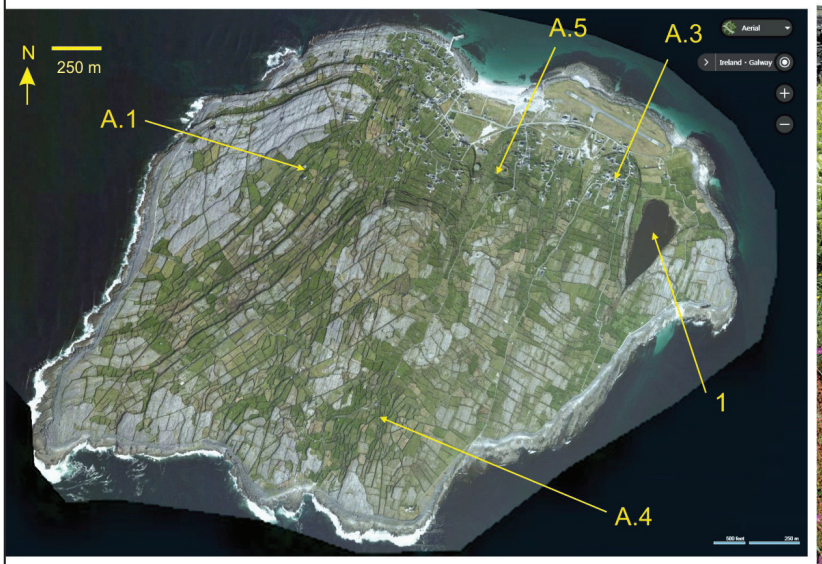
A.7. Brittle oats (*Avena strigosa*) in a rye crop. Photos A.1–A4: 16/06/2010, MO'C; A.6, A.7: 15/08/1992, MO'C.

B. Oblique aerial view of north-east and central Inis Meáin. In the foreground are mainly large fields (pasture) and a double rainwater trough. Cultivation ridges (mainly potatoes) and cereal plots (probably rye), distinguishable in the lower part of the photo, are indicated by red and yellow arrows, respectively. Extensive limestone pavement (Na Creaga Móra) is visible in the middle distance. Beyond this lies terraced terrain that affords shelter from the prevailing south-westerlies. Settlement is concentrated on the leaward side of these terraces. The exposed higher ground beyond the terraces is traditionally devoted to pasture. Photo: 16/06/2010, MO'C.

B.1. Views from eastern edge of Cinn an Bhaile towards the north-east (15/08/1992 and 16/06/2010). The older photo shows considerable arable farming, including four plots of rye; at the later date, only pasture and meadow are obvious. Photos: MO'C.

B.2. Megalithic tomb (wedge tomb) on pavement known locally as Creig na gCaorach; the pavement is an eastern extension of Na Creaga Móra. (photo: 8/04/2007, MO'C).

A. Inis Oírr (aerial view)



A.1. Weed-rich potato ridges

A.2. Oblique aerial view towards south, including An Loch Mór, settlement at Formna and lighthouse in the distance

A.3. Traditional thatched house, Formna

A.4. *Crataegus monogyna* in flower

A.5. View to SW from near O'Brien's Castle

Table 1. Details relating to the supplemental files. Abbreviated file names (first column) are used when referring to these files.

File name	Full name	File contents and web address
SM-F1	Supplemental Figure 1	Photos, Ritchie-Pickow Archive (1952) and aerial view of Inis Meáin (1992). (available online at https://www.eaglehill.us/JONAonline2/supplemental-files/038-O'Connell-SM-F1.pdf, and, for BioOne subscribers, at http://dx.doi.org/10.1656/038-O'Connell.SM-F1).
SM-F2	Supplemental Figure 2	Pollen diagram, Gortboyheen, Burren (Coleman 1978). (available online at https://www.eaglehill.us/JONAonline2/supplemental-files/038-O'Connell-SM-F2.pdf, and, for BioOne subscribers, at http://dx.doi.org/10.1656/038-O'Connell.SM-F2).
SM-T1	Supplemental Table 1	Information on toponymy and details of surface-pollen samples organized in two sheets in an Excel file. (available online at https://www.eaglehill.us/JONAonline2/supplemental-files/038-O'Connell-SM-T1.xslx, and, for BioOne subscribers, at http://dx.doi.org/10.1656/038-O'Connell.SM-T1).
SM-T2	Supplemental Table 2	Relevés and plant lists from Inis Mór and Inis Meáin organized in separate sheets in an Excel file. (available online at https://www.eaglehill.us/JONAonline2/supplemental-files/038-O'Connell-SM-T2.xslx, and, for BioOne subscribers, at http://dx.doi.org/10.1656/038-O'Connell.SM-T2).
SM-T3	Supplemental Table 3	Selected pollen taxa and possible pollen sources. (available online at https://www.eaglehill.us/JONAonline2/supplemental-files/038-O'Connell-SM-T3.pdf, and, for BioOne subscribers, at http://dx.doi.org/10.1656/038-O'Connell.SM-T3).
SM-T4	Supplemental Table 4	Non-pollen palynomorphs (NPPs) and other entities recorded in the surface-pollen spectra. (available online at https://www.eaglehill.us/JONAonline2/supplemental-files/038-O'Connell-SM-T4.pdf, and, for BioOne subscribers, at http://dx.doi.org/10.1656/038-O'Connell.SM-T4).

tion were treated following standard procedures for preparation of fossil pollen samples as implemented in the Palaeoenvironmental Research Unit (PRU), National University of Ireland Galway (NUIG) (Molloy and O'Connell 2004). This included hydroflouric acid (HF) treatment and acetolysis. The samples, mounted in glycerol, were counted using a research-quality microscope. Pollen, spore, and non-pollen palynomorph (NPP) identification was carried out by consulting relevant literature (e.g., Fægri and Iversen 1989, Grospietsch 1972, Moore et al. 1991, Reille 1992, van Geel 1978) and the pollen reference collection in the PRU. *Secale* pollen were distinguished from other cereal-type pollen following the criteria in Beug (2004). Poaceae pollen that fulfilled the criteria for cereal-type pollen, as given by Beug (2004), were categorized as such, but 40 µm, rather than 37 µm, was used as the minimum cut-off size. Cereal-type pollen were further categorized on the basis of size, i.e., 40–44.9 µm, 45–49.5 µm, and ≥50 µm.

Results

Field surveys

Fieldwork on Inis Mór in 1989 showed that, as suspected, rye cultivation was limited as regards amount and distribution. Rye fields were noted at Bun Gabhla in the north-western tip of the island and at Teampall Chiaráin, and oats (*A. sativa*) was cultivated in part of a field beside the coast to the north of Cill Rónáin (Table 2, SM-T2, and Figs. 2–4). An extensive field of rye was noted at Gort na gCapall, in an area close to the site where Fr. Browne in 1938 took several iconic photographs of harvesters laboring in a large field of rye to a background of steep cliffs and the large stone fort, Dún Aonghasa, in the distance (Fig. 2 B.3, Gort na gCapall is regarded by Laheen [2010:56] as having the "aura of an epic landscape"). The re-visit to Inis Mór in 1993 showed that sites with rye where sampling took place in 1989, including the two

Figure 4 (opposite page). Photographs relating to Inis Oírr.

A. Aerial view of Inis Oírr (Bing Maps, 14/02/2018). An Loch Mór is indicated (1) and also the location of selected photos.

A.1. Weed-rich potato crop on ridges. The grassland adjoining the ridges (foreground) is also species-rich. Photo: 3/08/2005, MO'C.

A.2. Oblique aerial view towards south of Inis Oírr. This includes An Loch Mór, the settlement at Formna and the lighthouse in the distance. (photo: 16/06/2010, MO'C).

A.3. Traditional rye-thatched house, now abandoned, in Formna. Note the vigorous growth of ivy (*Hedera helix*) and montbretia (*Crocosmia* x *crocosmiflora*; a garden plant, partly naturalised). (photo: 16/06/2010, MO'C).

A.4. *Crataegus monogyna* flowering vigorously. Stone walls provide shelter in the otherwise very exposed south-easterly part of Inis Oírr. (photo: 14/07/2007, MO'C).

A.5. Landscape view to the south-west from near O'Brien's Castle. In this part, the walls are high and form a dense network. Cultivation ridges (potatoes the most likely crop) occupy part of a field in the middle distance. Cattle are present in two fields. Apart from *C. monogyna* (flowering), the main woody vegetation is *H. helix* and *Rubus fruticosus* agg. (photo: 14/05/2007, MO'C).

Table 2. Details of pollen surface samples for which pollen analytical data are available.

Sample No.	Sample location	Sampled material	Other comments
Twelve samples collected on Inis Mór (27–30 July, 1989) towards end of a six-week period of exceptionally fine weather.			
IMOR-1	Dún Aonghasa	*Dicranum scoparium* (3 cm-thick layer)	Sample from inside the outer semi-circular enclosure, to NNE of the fort centre; low windswept, vegetation; no cultivation in the general area; substantial woody vegetation near Visitor Centre (see SM-T1)
IMOR-2	Bun Gabhla	**Saxifraga rosacea* leaves	1 of 5 samples at rye fields in Bun Gabhla (see also SM-T1). This sample from 5 m outside rye field 1 (RF1)
IMOR-3	Bun Gabhla	**S. rosacea* leaves (similar to IMOR-2)	On ± bare limestone (little vegetation), 4 m outside RF2; *R. rosacea* less important than at IMOR-2
IMOR-5	Bun Gabhla	*Rhytidiadelphus squarrosus*	Inside bounding wall (headland) of R2. Top 5–7 cm of moss sampled
IMOR-6	Bun Gabhla	*Nostoc*	*Nostoc* in a limestone pool on headland of RF1
IMOR-7	Teampall Chiaráin	Bryales spp.	Rye field to NE of Teampall Chiaráin. Sample from narrow headland with much Apiaceae (mainly *D. carota*; also *S. olusatrum*)
IMOR-8	Teampall Chiaráin	*Pseudoscleropodium purum*	A well developed but low grassy sward in a much overgrown cemetery. **L. corniculatus* growing through the moss sward
IMOR-9	Port Mhuirbhigh	*Dicranum scoparium*	Rye field on shore road to east of Port Mhuirbhigh (Kilmurvey); samples from 10 m to east of boundary wall of rye field. Field where sample taken had a complete, closely grazed, grassy sward
IMOR-10	Carcair na Coille	*D. scoparium*, *Helianthemum canum*	Grassy field to south of wedge tomb; some low *Corylus* nearby
IMOR-11	NE of Cill Rónáin	*P. purum*	Coastal location. Crop (*A. sativa*) 75% cut. *F. rubra* growing through the moss. Sample site at 10 m west of oat crop
IMOR-12	N of Dún Eoghanachta	*Nostoc* (3 solution hollows)	Closely grazed grassland with little in flower. No cultivated fields in the area. Some *Corylus* and *Hedera* nearby
Nine samples from Inis Meáin (IM), collected on 8 August 1992.			
IM-20	West of airstrip	Mosses; mainly *R. squarrosus*	IM-20 in pasture; 10 m from a *Secale* plot incl. *A. strigosa* and *R. crispus*. Samples IM-20–23 from NE of Loch Mhuirbhigh, main centre of arable farming on IM
IM-21 & 22	West of airstrip	*P. lanceolata* leaves	*c*. 25 m west of IM-20; in same field but closer to contiguous field with *A. sativa* and potatoes. IM-21 has **Hypochoeris radicata* and *P. lanceolata* (not flowering). In IM-22 *P. lanceolata* dominant and seed set
IM-23	West of airstrip	*R. squarrosus*	Pasture beside field with *A. sativa*. There was a wide headland to S of oat crop with abundant *P. lanceolata* and occasional *C. rotundifolia*
IM-24	W of Dún Chonchúir	Mainly *Plagiochila* and *Calliergonella cuspidata*	Sample from steeply sloping ground on N side of main east-west road in Baile na Seoigeach. Immediately to N, several (6+) rye fields. Much *Urtica*; *Rubus* in flower nearby
IM-25	N of Dún Chonchúir	*R. squarrosus*	W of road that runs N of Baile an Dúna. Near N. edge of grassy fields; extensive pavement to N Grazed; little flowering; no rye in immediate vicinity
IM-26a	S edge of Na Creaga Móra	Bryophytes in a gryke	ca. 200 m N of IM-25; immediately to south of the limestone pavement. *Lonicera*, *Sesleria* and *Viola* in gryke
IM-26b	As IM-26a	*Nostoc* in a hollow	Near IM-26a. 100 m to NE, a small field with *Secale* and *L. temulentum*
IM-27	Na Creaga Móra	*Nostoc* in a hollow	Towards N of the limestone pavement; immediately to W of road and holiday houses (not built when sampling). *Pteridium*, *Rubus* and *Teucrium* main spp.

* Indicates flowering. IMOR = Inis Mór; IM = Inis Meáin. Grid references and further details in SM-T1.

relatively large rye fields (each ca. 300 m^2) at Bun Gabhla at the north-west tip of the island, were now in grassland, and supported mainly pasture with much *Bellis perennis*, and some *P. lanceolata* and *Taraxacum* (Fig. 2 B.1, B.2). A local farmer at Bun Gabhla indicated that rye was grown there as late as 1992, but that cultivation had ceased because "the fields were too dry" and "rye was no longer needed for thatching". The latter was probably the more pertinent reason as thatched houses were by this time a rarity (traditionally, rye was used for thatching, as there is little reed or rush on the Islands; Fig. 4 A.3; see also SM-F1 which includes photos from the Richie-Pickow Collection, NUIG).

In 2010, though having been informed by local sources prior to fieldwork that cereal cultivation had ceased on Inis Mór, rye plots (also vegetable plots and fallow) were recorded in fields beside the coastal road immediately to the east of Port Mhuirbhigh (Fig. 2, SM-T2). Several rye plots were noted in the vicinity of Gort na gCapall which indicates strong continuity in the tradition of rye cultivation in this area (Fig. 2 B.5). The south-eastern part of Inis Mór (Cill Éinne and Iaráirne) was not explored as earlier visits indicated that there was little cereal cultivation in this part of the island. In the not-so-distant past, however, this was not so as Cill Éinne was the main settlement on the Aran Islands before Cill Rónáin rose to prominence and superseded it as the main administrative and population centre in the mid-19th century (Gailey 1959).

As regards Inis Meáin, at the time of the initial survey in August 1992, rye, oats, potatoes, and other vegetables were still commonly grown (Fig. 3, SM-T1, and SM-T2). Several rye and oat (*A. sativa*) plots were recorded in the well-defined field system in the vicinity of Loch na gCadhan, west of the air-strip. There was also considerable cultivation (cereals—mainly rye and also oats, root crops, etc.) in small terraced fields towards the western end of the main east-west road between the low-lying northern part of the island (Ceathrú an Lisín) and the high, exposed ground to the south (Ceathrú an Teampaill). *L. temulentum* and *A. strigosa* were recorded growing within the rye crop (Fig. 3 B.1). In 2010, several rye plots (some

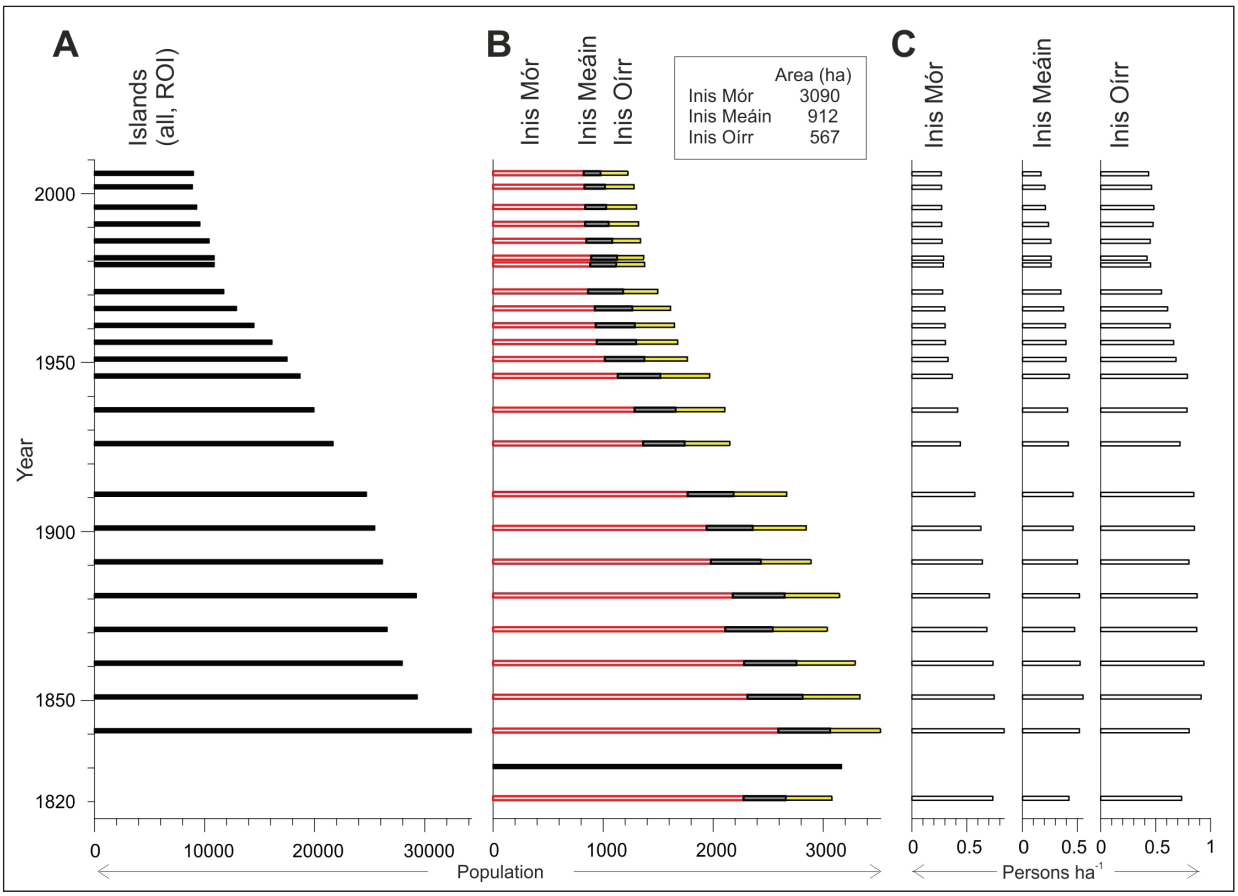


Figure 5. Island population statistics. **A.** Islands, Republic of Ireland (1841–2006); **B.** Aran Islands (1821–2006); statistics for the individual islands not available for 1831; **C.** Aran Islands, population densities. Breakdown of statistics for 1831 in respect of the individual islands not available. Data source: Central Statistics Office, Ireland (CSO).

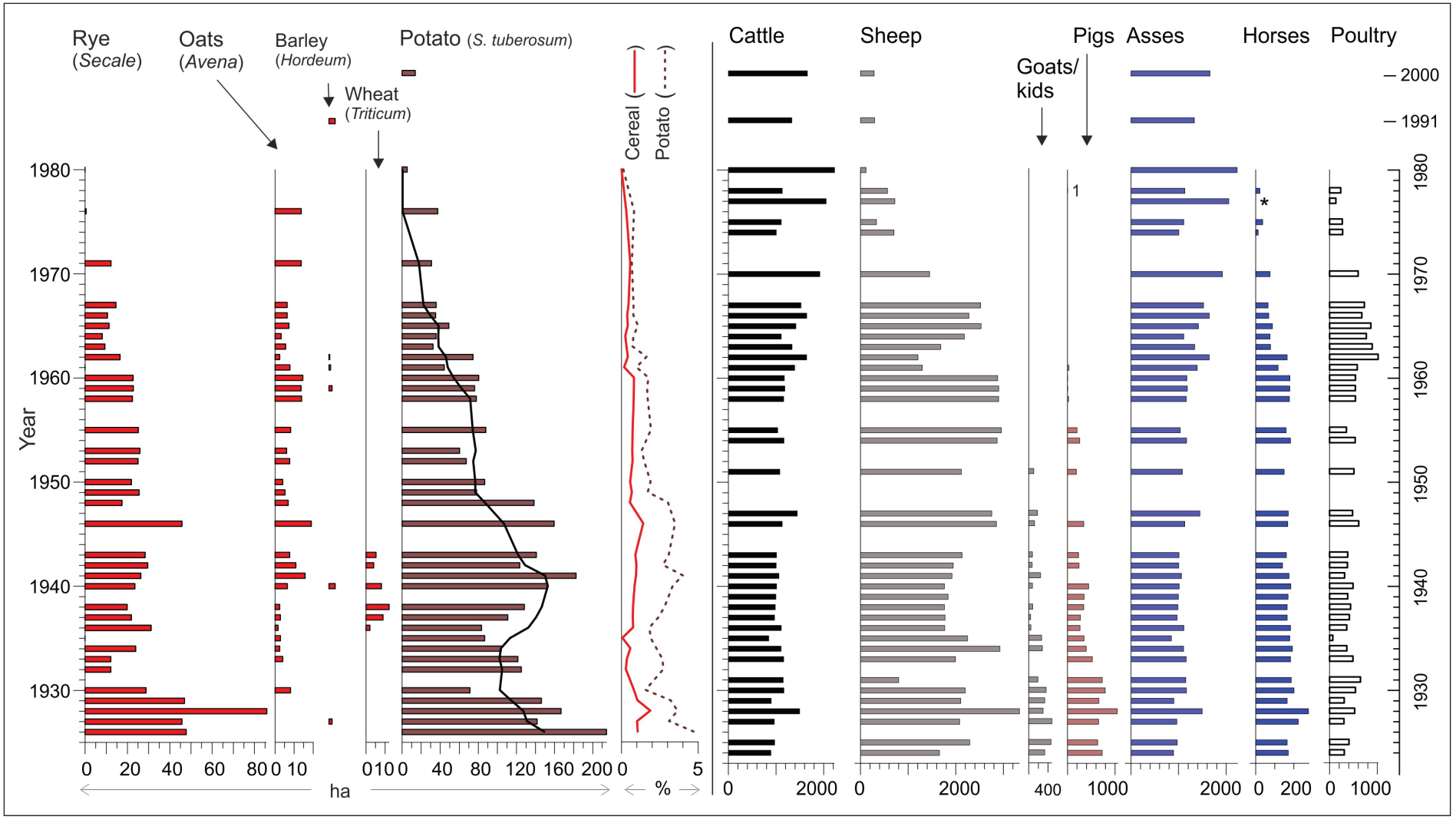


Figure 6. Main crops (in ha) and livestock numbers on Aran Islands (Inishmore DED), 1926–1980. A running mean (5) is also shown for potatoes. Percentage curves, with respect to the total area of the three main islands, are shown for cereals and potatoes.

Crop records span the years 1926–2000. For 1991 and 2000, no cereals were recorded, and 12 ha of potatoes were recorded in 2000 and none in 1991 (presumably an error). Holdings with crops that occupied less than 0.25 acres (<0.1 ha) were ignored so inevitably there is under-recording of acreage under crops. Apart from the most recent years, the original records are in acres (1 ha = 2.4711 acres).

Livestock records span 1924–2000. Horses include ponies. For 1977, '*' given rather than 253 which is considered to be erroneous (see text). Asses include jennets and mules (only occasional records after 1951); Pig and poultry records cease in 1961 (but 1 pig recorded in 1978) and 1978, respectively. Goat (this includes kid goats) records are available up to 1951; subsequently, goats appear not to be recorded. Data source: CSO.

with *A. sativa*) were noted in the vicinity of Loch na gCadhan, i.e., in the same area, and possibly the same fields, as in 1992. Most of the fields in the central part of the island that were previously cultivated (in 1992) had reverted to pasture or carried only vegetables, including potatoes (Fig. 3). One small rye plot was recorded in Cinn an Bhaile from within an arable field that also carried cabbages, onions and potatoes. In this plot and also in a rye plot at Loch na gCadhan, rye was actively shedding pollen (Fig. 3 A.2).

The uninhabited southern part of Inis Meáin, i.e., Ceathrú an Teampaill, was not explored during the 2010 visit. The area, which is traditionally used for winterage, i.e., grazing of cattle during the winter (Gailey 1959 refers to winterage on Aran as "winter grazing on the back"), was traversed in April 2007. Cereal cultivation seemed to be no longer taking place. A few fallow plots that had recently carried cereals or other crops were, however, noted.

Inis Oírr was not included in the 1989 and 1992 surveys, but we have records of cereal plots from fieldwork carried out the 1990s and as late as 2004. The plots were mainly of rye, but oats was also noted (*A. sativa* as a crop and also growing within rye plots). These cereal plots were located to the east of the main pier (that used by the ferry boats), and in the vicinity of An Loch Mór and at the nearby settlement at Formna. During the course of the 2010 survey, cereal cultivation was not observed, but several fields (eight) with potatoes growing in ridges were noted (Fig. 4 A.1, A.5).

Vegetation and floristic data

Vegetation and floristic descriptions and related data are presented in SM-T2. This file includes three Excel sheets in which details of the vegetation in arable (fallow is included here), pasture and pavement stands are presented. As well as the information collected during fieldwork, information on recent species distribution on the three islands is included (mainly after Webb 1980). In an additional sheet in SM-T2, information on four arable-weed species that are now exceptionally rare in Ireland, i.e., *A. strigosa*, *B. racemosus*, *C. cyanus,* and *Stachys arvensis*, is summarized. Present and recent distribution patterns (sources include Bleasdale 1994, BSBI 2018, Curtis et al. 1988, Sheehy Skeffington 2015), status from a rare-plant viewpoint (Wyse-Jackson et al. 2016), geographical and other details, and an overview of the history of each species (various sources including Jebb 2017) are provided.

As regards arable sites, a potato crop immediately to the east of Cill Mhuirbhigh Bay had highest plant biodiversity (IMOR-54) with 30 taxa (all higher plants) recorded (SM-T2). Rye plots were also relatively species-rich (20 and 19 taxa recorded in IMOR-55, -56, respectively) though rye crops on Inis Mór (e.g., those at Bun Gabhla) were relatively weed-free. The relatively weed-free status of rye on Inis Mór concurs with the observations by Curtis et al. (1988) and Bleasdale (1994). Fallow was often species-rich and sometimes highly colorful (e.g., IM-72; Fig. 3 A.4, A.5). A striking feature of fallow was the large admixture of taxa and especially the presence of many taxa more usually associated with grassland (various grass spp., *Ranunculus bulbosus*, *Trifolium* spp., etc.). *P. lanceolata* also frequently occurred, and often achieved dominant status, in fallow and freshly seeded pasture (cf. relevé IM-22). Bleasdale (1994:46) remarks on the frequent dominance of *P. lanceolata* on fallow as follows: "*Plantago lanceolata* [...] is a very common species in fields that are left fallow after rye cultivation". He contrasts this with *L. temulentum* and *A. strigosa* that are seldom found on fallow. Interestingly, Dudley Stamp (1969:101) considers *P. lanceolata* to be a "favourite of cattle" and suggests it may have considerable fodder value.

In the arable data set, none of the rare arable species referred to above is recorded. However, *A. strigosa* and *L. temulentum* were noted and photographed (Fig. 3 A.6, A.7) in rye fields on Inis Meáin during the 1993 visit, but relevés that included these species were not recorded, as the focus was on recording vegetation at/close to where pollen surface samples were collected. In subsequent visits, these and other weed species may have been missed as they are easily overlooked (Curtis et al. 1988). Curtis et al. (1988) estimated that, in 1987, when they carried out their surveys, more than half the "arable crops" on Inis Meáin were badly infested with *L. temulentum* (it was recorded in both rye and oat plots; also by Bleasdale 1994). Cattle that are fed rye straw that includes darnel do not appear to be poisoned, so farmers do not have a pressing incentive to eliminate the species (Curtis et al. 1988) with the result that *L. temulentum* still persists in cereal crops on Inis Meáin.

Pasture received more attention than other habitats (17 vs. 12 plant listings for both arable and pavement), which, partly at least, contributes to the relatively high number of taxa recorded (91) (see SM-T2). Species typifying grassland and meadow on Aran that are not actively managed and also rough grazing include *Anthriscus sylvestris, Centaurea nigra, C. scabiosa, Galium verum, Geranium sanguineum, Leucanthemum vulgare*, *Lotus corniculatus, Orchis mascula*, *Orobanche minor*, and *Sesleria caerulea*.

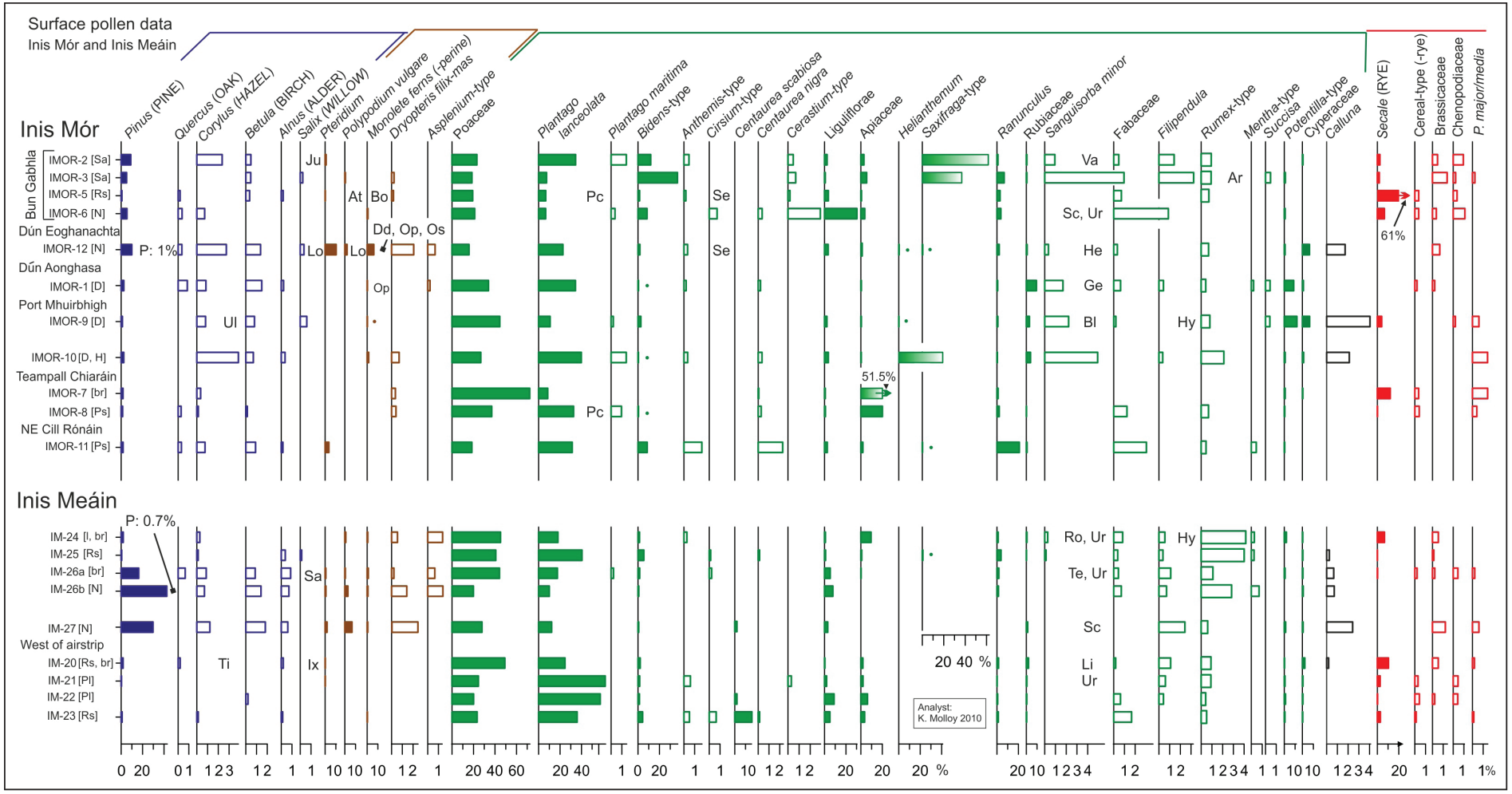


Figure 7. Percentage pollen data (main curves) in surface pollen samples collected on Inis Mór and Inis Meáin.

Conventions used are as follows: color coding indicates the main ecological/indicator groups (trees, shrubs, ferns etc); boxes without infill indicate use of an exaggerated x-scale; graded infill indicates that a modified pollen sum is used (see text). Small dots emphasise low values that otherwise may not be obvious. Occasional records are indicated using abbreviations as follows.

Trees: P, *Picea*; Sa, *Sambucus*; Ti, *Tilia*; Ul, *Ulmus*. Shrubs: Ix, *Ilex*; Ju, *Juniperus*; Lo, *Lonicera*

Ferns: At, *Athyrium filix-femina*; Dd, *Dryopteris dilatata*; Os, *Osmunda*; Bo, *Botrychium*; Op, *Ophioglossum*

Herbs (grassland): Ar, *Armeria*; Bl, *Blackstonia perfoliata*; Ge, *Geranium*; He, *Heracleum sphondylium*; Hy, *Hydrocotyle vulgaris*; Li, *Linum catharticum*; Pc, *Plantago coronopus*; Ro, Rosaceae p.p.; Se, *Serratula*-type; Sc, Scrophulariaceae; Te, *Teucrium scorodonia*; Ur, *Urtica;* Va, *Vaccinium*-type.

Material sampled is indicated beside the sample name and within brackets as follows:

br, bryales; D, *Dicranum scoparium*; H, *Helianthemum canum*; l, liverworts; N, *Nostoc* in solution hollows; R, *Rhytidiadelphus squarrosus*; Pl, *Plantago lanceolata* leaves; Ps, *Pseudoscleropodium purum*; Sa, *Saxifraga rosacea* leaves.

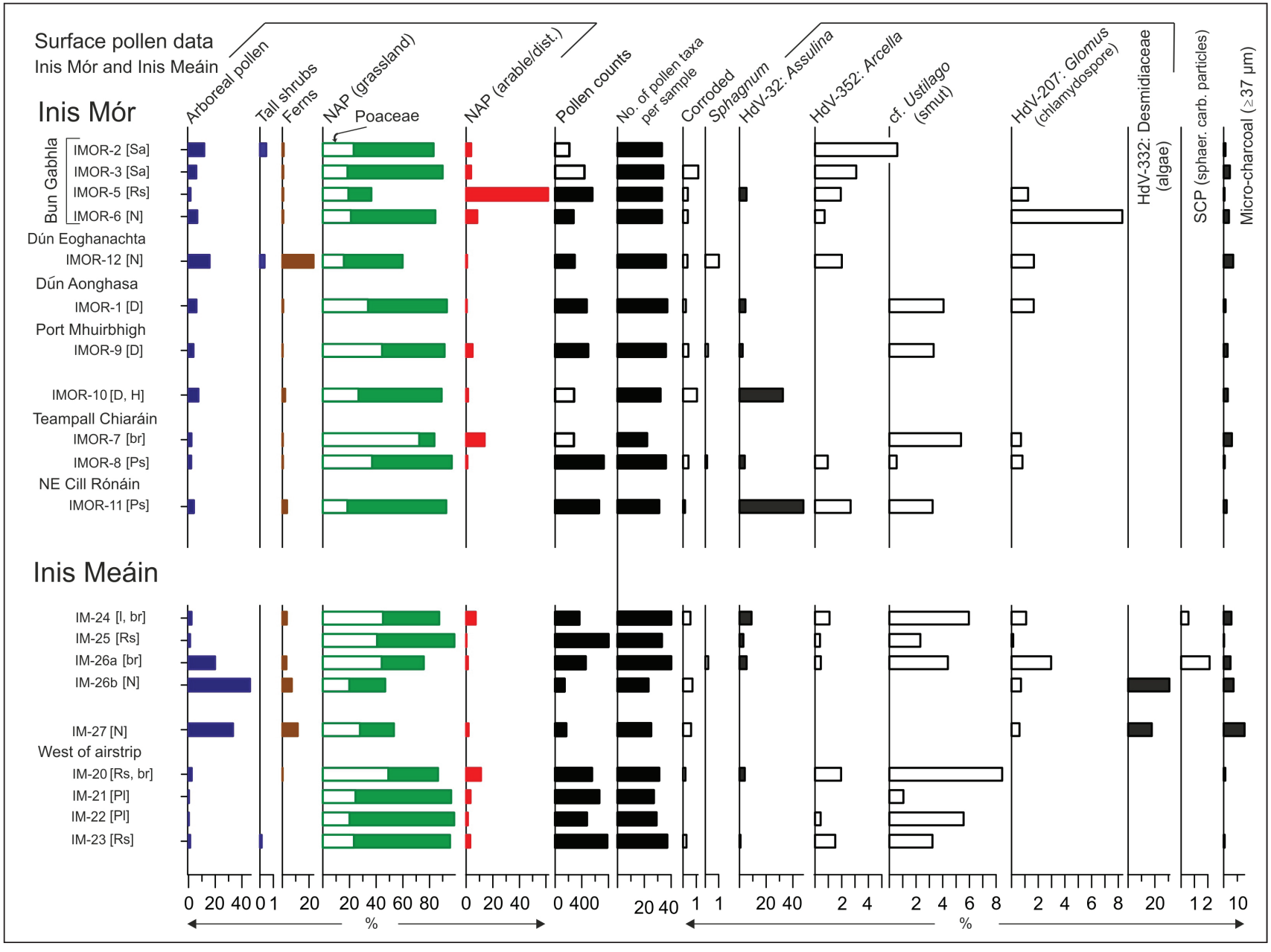


Figure 8. Percentage pollendata(composite and NPP curves), pollen counts, pollen taxa per sample (taxa plotted to the right are not included), and SCP (sphaeroidal carbonaceous particles) and micro-charcoal particle data in the surface pollen samples are plotted. Pollen counts per sample are shown as filled or open boxes, the latter being used to indicate that a locally dominant taxon is not included in the count (see text). Other conventions are as Figure 7.

Also noteworthy in this context are *Helianthemum canum* and *Gentiana verna*. The former is locally abundant on Inis Mór while the latter is known from all three islands but, according to Webb (1980), has seldom been recorded (it is in relevé IMOR-9 and has been seen and photographed in the southern upland part of Inis Meáin). Common but typical Aran species that are not represented in the dataset include *Campanula rotundifolia*, *Linum catharticum*, and *Rhinanthus minor*. Somewhat unexpected species in view of their typical habitat requirements include *Calluna vulgaris* which is an acidophile, though it is common on limestone on Aran and the Burren, and *Schoenus nigricans*, a fen and blanket bog species that typically occurs in wet depressions within pavement on Aran. Also noteworthy is the presence of woody plants, typically as low shrubs (listed in order of frequency: *Rubus fruticosus* agg., *Rosa pimpinellifolia*, *Hedera helix*, and *Salix repens*). *Juniperus communis*, which is relatively common in grassland and also on pavement on Inis Mór (also present on Inis Meáin; regarded as extinct on Inis Oírr [Webb 1980]), was not recorded in our vegetation data.

The pavement data set includes a wide variety of species (SM-T2). Particularly noteworthy are woody plants which, in order of frequency (and importance) are as follows: *P. spinosa* (Webb [1980] regards this as "much the commonest shrub on the islands"), *R. fruticosus* agg., *H. helix*, *Lonicera periclymenum*, *Corylus avellana*, *Euonymus europaeus*, and *Rubus caesius*. Locally typical species include *H. canum* and *Saxifraga rosacea*, (apart from Aran and the Burren, these are absent or rare in Ireland) and *Thymus polytrichus*.

Surface-sample pollen data

Percentage pollen data derived from surface samples are presented in Figures 7 and 8 as histograms. Percentage values were calculated relative to a pollen sum (PS) based on total terrestrial pollen (TTP), i.e., all taxa excluding *Sphagnum*, corroded pollen, and NPPs. In a few samples, pollen taxa derived from locally present plants (*Saxifraga*-type in IMOR-2 and IMOR-3; Apiaceae in IMOR-7 and *Helianthemum* in IMOR-10) dominated. To avoid undue distortion of the percentage data, the counts for these taxa (339, 252, 299, and 197, respectively) in the above-mentioned spectra were excluded from the PS. Percentage values in these samples for the taxa in question are expressed relative to the PS + counts for that taxon. Similarly, NPPs and also corroded grains, *Sphagnum*, etc. (curves to the right of "Pollen taxa/sample" in Figure 8) are expressed relative to the PS + counts for the particular taxon or group of taxa.

An overview of the pollen data in relation to the flora at/close to the sampling sites and on the Aran Islands generally is provided in SM-T3. In this table, interpretations are provided and suggestions given as to the origin of the recorded pollen, e.g., local, regional or long-distance, and implications for interpretation of the pollen profile from An Loch Mór and percentage pollen diagrams generally are considered (see also Discussion and Conclusions).

In interpreting the surface-pollen data, specific factors connected with the time of sampling, the presence of plants that were flowering or had recently flowered, local site characteristics, and the type of sample material used, should be borne in mind (Brayshay et al. 2000, Court-Picon et al. 2006, Vuorela 1973). The twelve samples from Inis Mór were collected towards the end of a six-week period of exceptionally fine weather that was largely rain-free, apart from a few thundery showers during two days prior to beginning of sampling (25 July 1989). It is expected that the fine weather favored pollen production and especially dispersal, while showers in the days prior to sample collection would have had the effect of removing most particulate matter, including pollen, from the atmosphere (Fægri and Iversen 1989). Furthermore, cereals were ripe and ready for harvesting. In the case of sample IMOR-11, the oat crop had been largely harvested by hand which can be expected to promote cereal pollen dispersal. The nine samples from Inis Meáin were collected at a time when the cereals were ripe, but not harvested.

Local site characteristics and the material sampled are expected to have had a major bearing on the pollen assemblages. Some samples are from sheltered environments, e.g., on the headland in a rye field with high enclosing stone walls (e.g., IMOR-5 at Bun Gabhla; Fig. 2), or from relatively sheltered environments as in the case of samples IM-20, 21, 22 and 23. The latter are from a well-defined network of stone walls in a low-lying and sheltered part of Inis Meáin. In such samples, pollen of local and extra-local origin is expected to dominate. The exceptionally high *Secale* value (61%) in IMOR-5, and the substantial *Secale* and *P. lanceolata* values in Inis Meáin samples referred to above, are therefore as expected. This contrasts sharply with samples from exposed situations. From Inis Mór, a pertinent example is IMOR-1, collected in the vicinity of Dún Aonghasa, an exposed site with a low grassy, wind-swept sward that probably does not produce much pollen (Fig. 2 B.1). Regional and long-distance-transported pollen can be expected to be better represented here, though this is not obvious from the data (Figs. 7 and 8). More pertinent examples in this regard are available from Inis Meáin. Samples IM-26a, b, and IM-27 are from Na Creaga Móra, a large expanse of limestone

pavement in which vegetation is largely confined to grykes (fissures in the limestone; here often regular and deep). In these samples, arboreal pollen (AP) achieves its maximum value (46% in IM-26b; *Pinus* is the main contributor; see below), there are records for *Picea* and *Tilia* and also elevated micro-charcoal values. In IM-24 and 25, sphaeroidal carbonaceous particles (SCP) are recorded that again are indicative of long-distance transport of small particulate matter (the SCPs probably derive from the coal-burning power-station at Moneypoint, on the Shannon estuary, commissioned in 1985).

The type of material collected can potentially have a major bearing on pollen trapping. The material sampled ranged from wet, jelly-like material (probably the blue-green alga, *Nostoc*; Doddy and Roden 2018) in small solution hollows in otherwise mainly bare limestone (IMOR-6, 12, IM-26b, 27) to leaves of flowering plants (IMOR-2, 3: *S. rosacea*; IM-21, 22: *P. lanceolata*). The former can be expected to preserve pollen that has been deposited over a relatively long period (weeks) while pollen retained on leaves is presumed to be dominated by pollen deposited in the days/weeks immediately prior to collection and especially by local pollen if the plant in question was flowering. As regards bryophyte samples (mainly mosses; occasionally liverworts), two broad categories of moss may be distinguished: mosses with tufted, upright growth-form (acrocarpous) such as *Dicranum scoparium* (*Rhytidiadelphus squarrosus*, though a pleurocarpous moss, has a similar growth-form), and mosses that are highly branching and with a mainly prostrate growth-form (pleurocarpous). The former growth-form is particularly favorable for pollen retention and potentially integrates pollen deposited over periods of months.

In particular samples, the overriding factor determining pollen composition is the presence/absence of a high pollen producer at/in the immediate vicinity of a sample (e.g., *S. rosacea* at IMOR-2, 3; *P. lanceolata* at IM-21, 22). In the area where the *P. lanceolata* leaf-derived samples were collected on Inis Meáin, there was a lot of ribwort plantain not only at/near the sampling sites, but also generally, the species being strongly favored by the fallow conditions that pertain after rye and potato crops cease to be cultivated in particular fields or parts of fields. The high representation of *P. lanceolata* in these samples does not grossly over-estimate the importance of ribwort plantain locally or extra-locally. In situations such as described here, *P. lanceolata* pollen is essentially an indicator of arable activity as has been pointed out by Behre (1981), rather than pastoral farming as is usually assumed in interpretations of fossil pollen data (see also Discussion and Conclusions).

As regards rye, *Secale* pollen dominates in only one sample, i.e., IMOR-5 (61%). The high value is achieved as a result of proximity to the pollen source, the sample being from a narrow headland within a rye field. The sampling material, *R. squarrosus*, is probably also a contributory factor insofar as this moss is expected to be a good receptor and retainer of pollen (see above). Another sample, based on pleurocarpous mosses, from a similar situation (IMOR-7), has a much lower *Secale* value (12%; and this after Apiaceae pollen was removed from the PS). The *Secale* value is probably depressed by high Poaceae (72%; the maximum in the data set). At the time of sampling, there was much tall ripe grass and umbel-rich meadow vegetation in this sheltered area at Teampall Chiaráin, Inis Mór. Moving even a short distance (<10 m) from a rye crop results in values for *Secale* dropping to <5% and other cereal-type pollen are also very poorly represented. In IMOR-11, cereal-type pollen has not been recorded though the sample is from within 10 m of an oat crop (*A. sativa*) which had been largely harvested probably by scythe, a process that would have favored pollen dispersal (Vourela 1973). These data illustrate the severe under-representation of cereals, including rye which is anemophilous, in pollen records.

In general, the importance of long-distance pollen transport should not be under-estimated. Illustrative of this are the exceptionally high values for *Pinus*—a maximum of 43% is achieved—in samples IM-26a, b and 27. That *Pinus* pollen is often present in considerable quantities even when pine is not present locally, and even regionally, is a well-known phenomenon (e.g., Court-Picon et al. 2006; but see also Fossitt 1994). In the samples referred to above, low pollen input by other taxa (due to poor pollen production and/or dispersal) undoubtedly contributes to the high *Pinus* percentage values. Other AP of distant origin include *Quercus*, *Alnus*, and *Tilia*, but even more surprising is *Picea* (four pollen recorded in IM-26b) which is usually under-represented in pollen records relative to *Pinus* (Lang 1994). Another notable record attributable to long-distance transport is *Osmunda regalis*, the spore of which is large and heavy. The most probable source is Connemara where the royal fern commonly occurs (Webb and Scannell 1983). On the other hand, *Hedera* pollen was not encountered during routine counting though ivy is frequent and locally abundant on the Islands (SM-T3). Given this severe under-representation, the particular set of circumstances that gave rise to the remarkably high values for *Hedera* during the late Bronze Age/early Iron Age in the An Loch Mór profile is difficult to envisage (in zone C6 and in the bottom three spectra of C7, *Hedera* averages 5% and 9%, respectively;

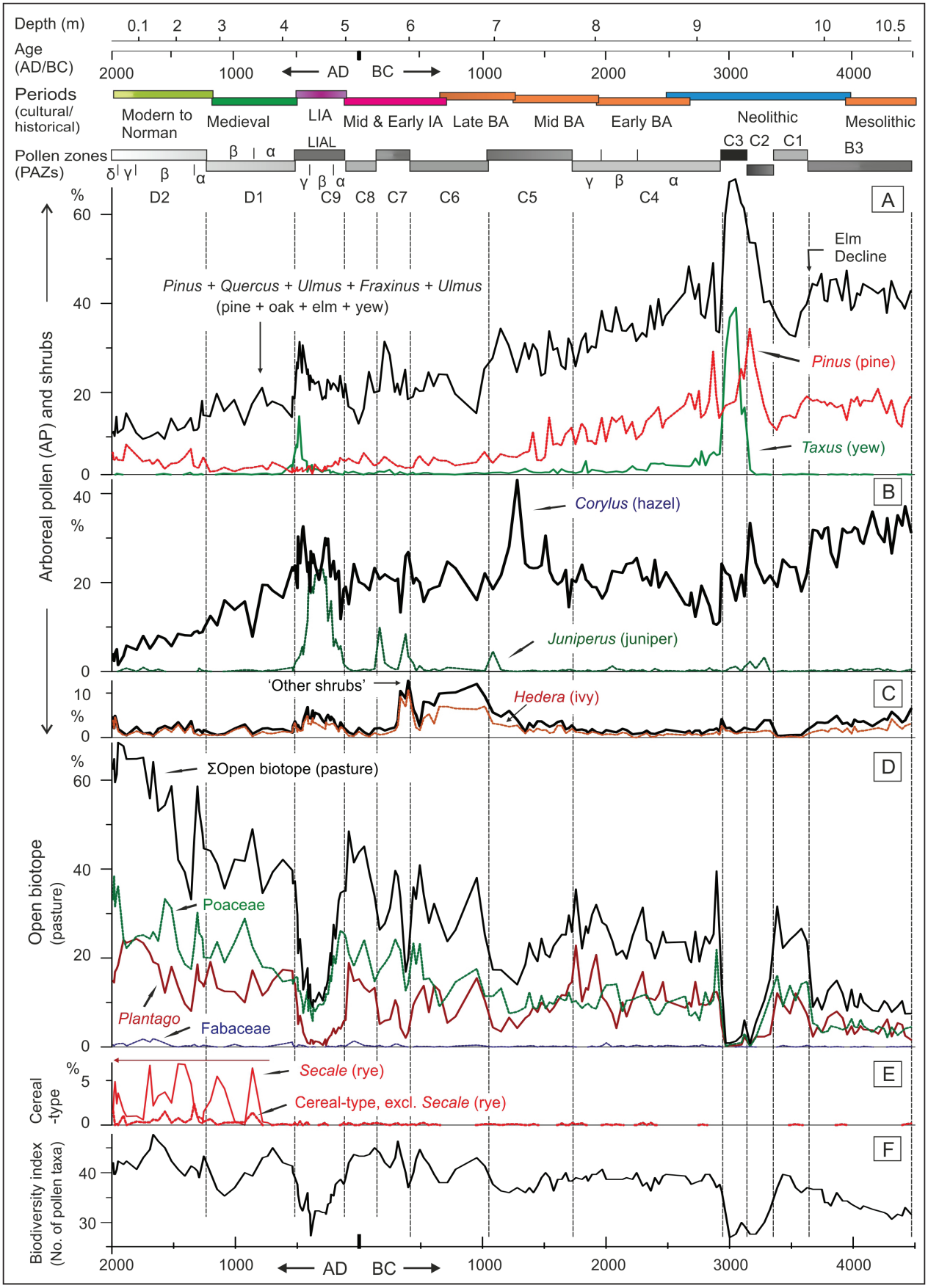

Depth (m)
0.1 2 3 4 5 6 7 8 9 10 10.5
Age (AD/BC)
2000 1000 AD BC 1000 2000 3000 4000
Periods (cultural/ historical)
Modern to Norman
Medieval
LIA
Mid & Early IA
Late BA
Mid BA
Early BA
Neolithic
Mesolithic
Pollen zones (PAZs)
LIAL
C3 C2 C1
B3
D2 D1 C9 C8 C7 C6 C5 C4
A
Elm Decline
Pinus + Quercus + Ulmus + Fraxinus + Ulmus
(pine + oak + elm + yew)
Pinus (pine)
Taxus (yew)
Arboreal pollen (AP) and shrubs
B
Corylus (hazel)
Juniperus (juniper)
'Other shrubs'
Hedera (ivy)
C
ΣOpen biotope (pasture)
D
Open biotope (pasture)
Poaceae
Plantago
Fabaceae
Secale (rye)
Cereal-type, excl. Secale (rye)
Cereal -type
E
Biodiversity index (No. of pollen taxa)
F
2000 1000 AD BC 1000 2000 3000 4000

Fig. 9). Ivy was no doubt locally important and climatic conditions, especially in autumn, when ivy flowers must have been such as to strongly favor flowering and pollen dispersal of *H. helix*.

Discussion and Conclusions

Overview of rye cultivation and arable farming on Aran within the wider European context

Rye has an interesting history in that its wide-scale adoption as a crop in Europe, including Ireland, occurred relatively late in prehistory. In mid-latitude Europe, rye appeared as a weed in cereal crops as early as the Neolithic (Linearbandkeramik) in Poland (Behre 1992). It was not, however, until Roman times that it was commonly sown as a crop though it was not favored within the Roman Empire (Behre 1992; Grikpėdis and Matuzevičiūtė 2016). As regards etymology, rye in modern Irish is *Seagal*, which is similar to the Latin *Secale*. Kelly (1997:221) indicates that "in Old Irish [rye] is *secal*, a borrowing from post-Classical Latin *secale*". The Latin name, however, may derive from a Celtic language and, as such, was accepted and used by the Romans (Behre 1992); this too serves to emphasize the Roman-period connection.

Rye continues to be widely grown today in small fields within cultural-landscape settings comparable to the Aran Islands in various parts of continental Europe such as in the uplands of Serra da Estrela, central Portugal, where there is a history of rye cultivation that extends back to the mid/late Bronze Age (ca. 1300 BC) (Jansen 2011:114, van den Brink and Janssen 1985). Interestingly, recent genetic investigations have shown that rye cultivated by farmers in Serra da Estrela and adjoining uplands in northern Portugal has an unexpectedly high level of genetic distinctiveness so that these crops, and possibly also crops from similar cultural landscapes, such as the Aran Islands, may have considerable potential in cereal breeding programmes (Monteiro et al. 2016).

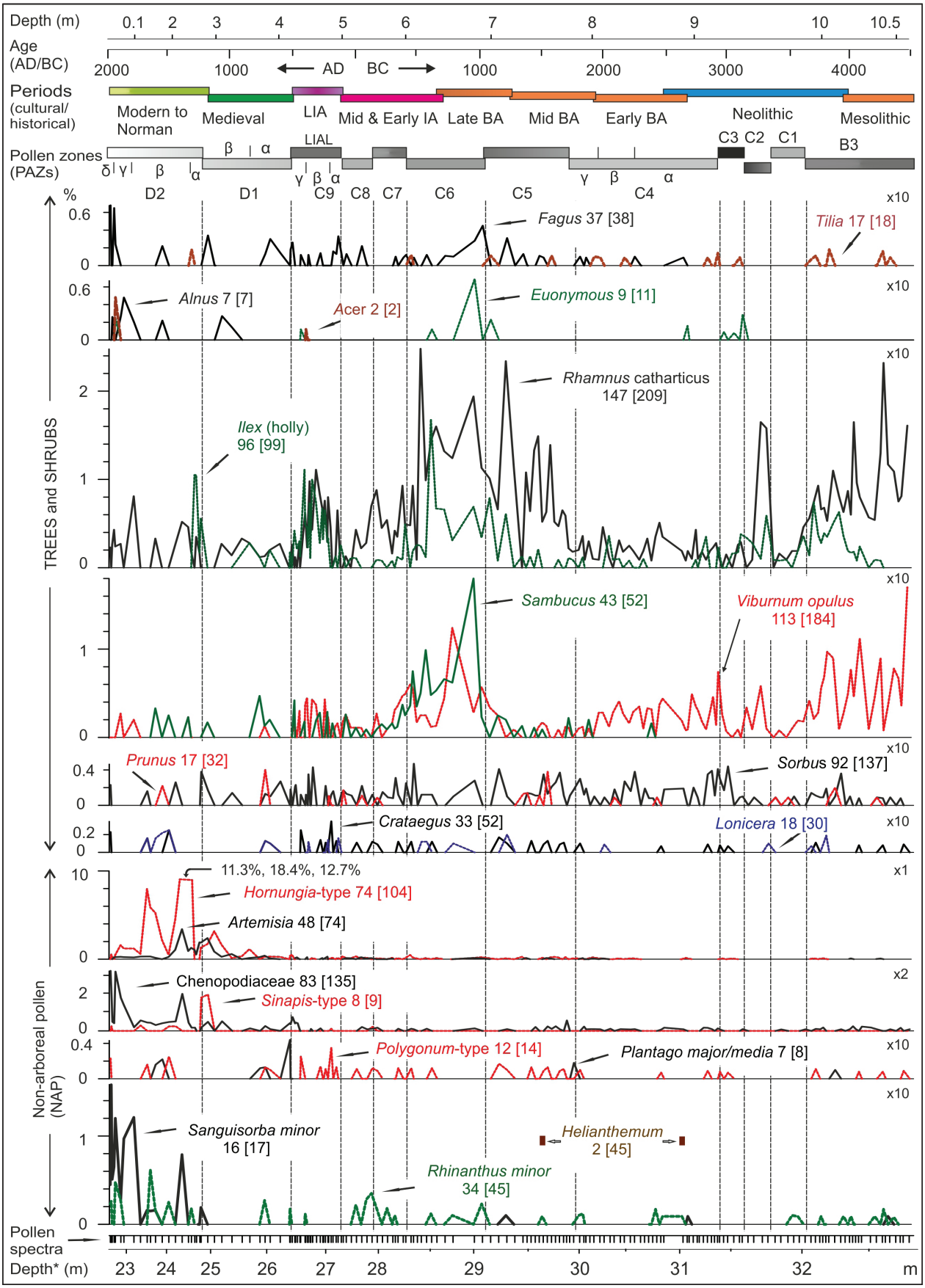
As regards Britain and Ireland, early records of rye date to the Bronze Age (Chambers and Jones 1984), but in Ireland, it is only in medieval times that it assumed importance as a crop (Kelly 1997; McClatchie et al. 2015) though not everywhere (McClatchie et al. 2015, Monk 1991, Overland and O'Connell 2011). There is literary evidence from the 12th century that it was grown as a winter crop (Kelly 1997). On Aran, however, rye seems to be generally spring-sown though there appears to be considerable flexibility with early winter and also summer sowing (as an additional source of fodder) being practiced (Bleasdale 1994). O'Loan (1964:260) has suggested that rye, as a long-strawed cereal, "is subject to lodging in high rainfall areas and, therefore, not well suited to our [Irish] climate". Contrary to what might be expected given its Atlantic setting, rainfall is not exceptionally high on Aran (in most months it averages <100 mm; Walsh 2016). Indeed, the main threat to the crop is lack of rain in the growing season, a factor already alluded to in the 17th century by R. O'Flaherty (see Introduction).

Bleasdale (1994) recorded in his detailed survey of 1994 the following statistics for rye cultivation on Aran (numbers of patches or plots were reported): 41 on Inis Meáin, 14 on Inis Mór (also a field of barley and of oats), and 10 on Inis Oírr. Inis Meáin had the highest acreage at 1.5 ha (3.6 acres). The field surveys carried out in 2010 confirmed that rye was still cultivated on both Inis Mór and Inis Meáin, but oats seemed to be no longer grown as a crop (neither *A. sativa* nor *A. strigosa* which once was also common). On the other hand, cereal cultivation seemed to have ceased on Inis Oírr (as of 2010), our last available record being from 2004. Rye continues to be cultivated on Inis Meáin and possibly also on Inis Mór (as of 2017), but in greatly diminished quantity, compared even with 1994.

At the time of our earlier surveys, rye crops frequently occupied entire fields. Nowadays, rye cultivation may be reduced to merely a plot within a field, the rest of the field being devoted to other

Figure 9. Plot summarising the main pollen analytical and other data from An Loch Mór, Inis Oírr. The part of the record spanning the mid and late Holocene is included (from ca. 4500 BC to AD 1990). The data are plotted to a calendar/calibrated timescale derived from a revised age/depth model as used in Molloy and O'Connell (2014). Differences with respect to the original age/depth model over the interval in question are minor (see Molloy and O'Connell 2004 for a similar plot in which the original age/depth model was used). Sample depths are given with respect to the top of the sediment. Cultural/historical periods are as widely accepted for Ireland (cf. Mitchell and Ryan 1997). Abbreviations, etc.: BA, Bronze Age; IA, Iron Age; LIAL, Late Iron Age Lull (when pollen suggests greatly reduced human impact); the Norman period begins with arrival of the Normans in Ireland in AD 1169. Pollen assemblage zones are as in earlier publications.

The curve labelled "Other shrubs" includes *Sorbus, Sambucus, Crataegus*, *Prunus*-type*, Rhamnus catharticus, Viburnum opulus, Euonymus europaeus, Ilex, Hedera, Lonicera,* and *Rubus* (see Fig. 10 for plots of individual curves). *Hedera* is also plotted separately. The curve for *Plantago* includes *P. lanceolata, P. maritima*, and *P. coronopus*. The vertical axis is exaggerated x2 in plot E (cereal-type curves). A horizontal line with an arrow indicates the interval in which *Secale* pollen is recorded. The lowermost curve (plot F) shows the number of pollen taxa per spectrum (running average with an interval of 3).


Depth (m)
0.1 2 3 4 5 6 7 8 9 10 10.5
Age (AD/BC)
2000 1000 AD BC 1000 2000 3000 4000
Periods (cultural/ historical)
Modern to Norman
Medieval
LIA
Mid & Early IA
Late BA
Mid BA
Early BA
Neolithic
Mesolithic
Pollen zones (PAZs)
LIAL
C3 C2 C1
B3
D2 D1 C9 C8 C7 C6 C5 C4
TREES and SHRUBS
Fagus 37 [38]
Tilia 17 [18]
Alnus 7 [7]
Acer 2 [2]
Euonymous 9 [11]
Rhamnus catharticus 147 [209]
Ilex (holly) 96 [99]
Sambucus 43 [52]
Viburnum opulus 113 [184]
Prunus 17 [32]
Sorbus 92 [137]
Crataegus 33 [52]
Lonicera 18 [30]
Non-arboreal pollen (NAP)
11.3%, 18.4%, 12.7%
Hornungia-type 74 [104]
Artemisia 48 [74]
Chenopodiaceae 83 [135]
Sinapis-type 8 [9]
Polygonum-type 12 [14]
Plantago major/media 7 [8]
Sanguisorba minor 16 [17]
Helianthemum 2 [45]
Rhinanthus minor 34 [45]
Pollen spectra
Depth* (m)
23 24 25 26 27 28 29 30 31 32 m

crops (especially potatoes), left fallow, or used as meadow or pasture (Fig. 3 A.1). This severe reduction, though regrettable, is not surprising given that the only commercial incentive today for rye cultivation is the requirement for rye straw in thatching the few remaining houses with thatched roofs that are maintained mainly in connection with tourism. In addition to this monetary aspect, there is also the personal interest by a few farmers to maintain a tradition that goes back centuries (see below).

While rye has been, and continues to be, the main cereal crop on Aran, oats was also of some importance at least in recent centuries. This was true for *A. sativa* and to a lesser extent *A. strigosa*, and even wild oats, *A. fatua*, has been sown and fed to animals, and especially horses, and also used for human consumption (details in Bleasdale 1994; for Ireland generally see Kelly 1997, McClatchie et al. 2015, Monk 1991). Barley, and wheat to a lesser extent, did not find favor as crops on Aran in recent times, though both have a long island history (see below).

As regards arable weeds such as *B. racemosus*, *C. cyanus*, and *L. temulentum*, the Aran Islands are of particular importance, given how rare these species have become within Ireland and elsewhere in Europe, especially since the mid 1900s (SM-T2). Indeed, arable fields on the Aran Islands are now the main habitat for *L. temulentum* in Ireland (Bleasdale 1994, Curtis et al. 1988, see also overview in SM-T2). This grass survives in rye crops on Aran, thanks in no small measure to the commitment of farmers on Inis Meáin to retaining traditional methods of rye cultivation that include use of locally sourced and uncleaned seed rather than relying on "clean" imported seed. The continued survival of the other two species mentioned above, and arable weeds generally (e.g., *Stachys arvensis,* and *Papaver* and Chenopodiaceae spp.), is largely dependent on the continuation of arable farming along traditional lines, so it is imperative that policies are formulated and implemented to ensure that these traditional farming practices survive on Aran.

Long-term history of farming on Aran and farming impact on flora and vegetation

To obtain a long-term perspective on farming and its impact on flora and landscape, pertinent details from the results of the pollen analytical investigations of lake sediments from An Loch Mór, Inis Oírr, are presented in Figures 9 and 10. Selected percentage pollen curves from the mid and late Holocene part of the profile are shown, i.e., the interval immediately prior to the start of farming in the early Neolithic and subsequent farming during prehistory and the historical period, i.e., the base of PAZ B3 to the top of the profile (4500 BC–AD 1990; chronology is based on the revised dating model used in Molloy and O'Connell 2014). In PAZ B3 (4500–3700 BC), AP (including *Corylus*) contributes, on average, 81% of TTP. There is substantial representation of Poaceae and *P. lanceolata*, which suggests opening-up, rather earlier than expected, of what had previously been more or less full woodland cover, oak, pine, and elm being the dominant tall-canopy trees (Molloy and O'Connell 2004). In PAZ C1 (3700–3390 BC), AP declined and non-arboreal pollen (NAP), including *P. lanceolata*, increased substantially. This is "Landnam", *sensu* Iversen (1941), i.e., woodland clearance in the context of early farming. During the remainder of the prehistoric period (3390 BC–AD 500; PAZs C2–C9) (the earliest part of the early Medieval/Christian period is probably included here) there are substantial fluctuations in the pollen curves that reflect changes in intensity of human impact and farming, and corresponding phases of woodland clearance followed by regeneration of woody plants. The contribution by various trees and shrubs, and especially pine, yew, hazel, and juniper, also varied considerably over time. Changes in woodland extent and composition seem to be mediated mainly by farming activity, but climate may also have played a role, especially in the expansion of yew in the late Neolithic/early Bronze Age (ca. 3100 BC; Molloy and O'Connell 2014). The overall trend towards increasing openness and diminution of woodland accelerated in the early Medieval period (beginning ca. AD 500). By the early Norman period (ca. AD 1200), the surviving woodland was confined to scattered copses, but some trees probably survived on Inis Oírr into the 16th century and possibly later (Molloy and O'Connell 2004).

With respect to the type of farming pursued, the NAP data and especially the so-called anthropogenic-indicator taxa are the most reliable guide. In both the present-day and fossil pollen datasets, *P. lanceolata* is the most important overall indicator of human

Figure 10. Curves for selected pollen taxa from An Loch Mór that have low percentage values. Vertical scales (y axis) are varied/exaggerated to suit the range of values for the various curves. The degree of exaggeration is indicated, as follows: x1 (no exaggeration), x2 and x10. *Polygonum*-type includes *Polygonum* pollen (incl. *P. aviculare*) and *Fallopia convolvulus* (single record in PAZ C5). *Helianthemum* records consist of single pollen at 750 cm and 880 cm, respectively. In the case of each taxon, the number of records in the plotted spectra (173) and in all spectra (259) are indicated, the latter within brackets. Sample depths are given with respect to the top of the sediment and also relative to the lake surface at the time of coring (see Depths*). Other conventions are as in Figure 9.

activity and especially farming, and not only pastoral, but also arable activity as is abundantly clear from the surface-sample pollen data. At this point, however, we focus on cereal-type pollen as this is one of the best pollen indicators of cereal cultivation which is of primary interest.

Cereal-type pollen are recorded in low numbers in zones A1–B3 (0.02% of TTP). The records in question predate what is generally regarded as the start of the Neolithic in Ireland (ca. 4000 BC; Cooney et al. 2011) and so cannot, and should not, be interpreted as evidence for cereal cultivation on Inis Oírr or indeed in the wider region (Behre 2008, O'Connell 1987). *Secale* pollen, when consistently recorded, can be taken as a reliable indicator of local rye cultivation (Tolonen 1985). It is recorded at low values (0.3% and 0.4%) towards the top of subzone D1β (AD 740) and first achieves a high value (6.4%) at the bottom of subzone D2α (AD 860); 6.9% is the maximum achieved (AD 1450). Taking into consideration the relatively modest *Secale* representation in the surface-pollen samples, it appears justified to regard the initial low values in subzone D1β as signaling the start of rye cultivation locally and the subsequent high values as reflecting substantial expansion. The strong emphasis on cereal and, especially, rye cultivation in the vicinity of An Loch Mór from the mid-Medieval period onwards is also suggested by the increased representation, that began in subzone D1α (ca. AD 500), of pollen of weeds (especially Brassicaceae pollen, i.e., *Hornungia*-type *and Sinapis*-type; also Chenopodiaceae and *Artemisia*) normally associated with arable activity (Figs. 9 and 10). *Pediastrum* values also greatly increase, in response, no doubt, to favorable within-lake conditions for this green alga as a result of increased soil erosion caused by arable farming (Molloy and O'Connell 2004).

In the course of the pollen analytical investigations, cereal-type pollen were further differentiated into *Triticum*, *Hordeum* and *Avena* types on the basis of the exine pattern as seen using phase contrast (Beug 2004, 2015). In zone C1, i.e., during the Neolithic Landnam phase, only one cereal-type pollen, namely *Hordeum*-type, was recorded (in 980 cm) and cereal-type pollen was not recorded in zones C2 and C3 during which woodland regenerated strongly. Arable farming seems to have been unimportant during the Neolithic, even during Landnam (C1). In the Bronze Age and Iron Age (C4–C9), cereal-type pollen were more frequent, but overall representation at 0.06% of TTP is low. *Triticum*-type pollen were more frequent than *Hordeum*-type (25 vs. 5 grains) which suggests that wheat was more important than barley. That the arable component was indeed small, is supported by low values for arable weed pollen (Fig. 10). Excavations at Dún Aonghasa yielded only "meagre evidence" for cereal cultivation (mainly *Hordeum*; a few *Triticum* macroremains; Cotter 2012:Vol. 2) which supports the idea of little arable farming on Aran during the late Bronze Age. In zones D1 and D2 (AD 500–1990), of a total of 31 cereal-type pollen (excluding 373 pollen identified as *Secale*), 16, 6 and 2 were assignable to *Triticum*, *Hordeum* and *Avena* types, respectively. This suggests that, for most of the historical period, wheat, after rye, was also the more important crop. During the last two hundred years, the CSO agricultural statistics show that oats was second in importance to rye. *Avena*-type pollen, however, is recorded only as single pollen in two of the top spectra. Pollen of oats seem to be much under-represented in the fossil record (also in the modern-day samples), but the discrepancy may also be due to the difficulty in assigning cereal pollen to type (differentiation was impossible in about half of the cereal pollen counted due to difficulties in observing the exine pattern, etc.).

As regards potato, *S. tuberosum* pollen was not recorded, but this is not entirely unexpected, given that it is largely silent in pollen records (Hall 1989, O'Connell 1986). The elevated values for Chenopodiaceae in zone D2 (Fig. 10) probably reflect indirectly potato cultivation in that chenopods are often the main weeds in potato and root crops (Bleasdale 1994, White and Doyle 1982).

The biodiversity index curve (Fig. 9, F), based on the number of different pollen taxa (TTP only) counted in the fossil pollen spectra, gives an insight into the changing diversity of terrestrial pollen that is reaching the lake through time and hence reflects changes in biodiversity though in a complex manner (Broström et al. 1998, Odgaard 1999). During the Neolithic, Landnam resulted in a major increase in biodiversity that was followed by a sustained decline as human impact decreased and woodland regenerated (zones C1-C3; 3700–3000 BC). Early and mid Bronze Age farming activity resulted in relatively high biodiversity (zones C3–C5; 3000–1050 BC), with a further substantial increase registering in the late Bronze Age, and early and mid Iron Age (zones C6–C8; 1050–100 BC). Strong regeneration of woody vegetation in the late Iron Age (zone C9, 100 BC–AD 500), that involved mainly juniper, resulted in a sharp decline in biodiversity. The trend is then reversed with the commencement of early medieval farming. In recent decades, there is a trend towards decreasing biodiversity that also manifests itself in lower *P. lanceolata* values. This decrease probably reflects a decline in the ribwort-plantain population as the farming economy becomes almost exclusively pastoral based as a result of the steady

decline in arable farming and hence fallow and/or freshly sown grassland which are the main habitats for ribwort plantain.

Fossil and surface-pollen data from Aran: Implications for interpreting Holocene pollen records from Ireland

The surface-pollen data presented here have wider implications insofar as they inform our interpretation of Irish pollen profiles generally. Recently, Stolze and Monecke (2017) argued that trees such as *Carpinus* and *Tilia,* and also *Fagus* and *Juglans*, are not recent introductions deriving from systematic planting that commenced in the early 18th century. Rather, they concluded that these trees have had a much longer presence in Ireland, i.e., as native species or as archaeophytes if introduced prior to ca. AD 1500. As supporting evidence they point to the rather large number of Irish pollen profiles that show relatively high frequency of pollen of the trees in question, though never in large quantities and seldom as continuous curves. The fossil and modern surface-pollen data from the Aran Islands, and especially the evidence these provide for long-distance-transported pollen, suggest that the evidence presented by Stolze and Monecke (2017) is not, in itself, sufficient to gainsay the widely accepted view, namely that the trees mentioned above are relatively recent introductions (Godwin 1975, Mitchell and Ryan 1997; for a general discussion, see, for example, Lisitsyna et al. 2011). Ultimately, proof for an early presence, independent of human intervention, of these and other species that are poorly represented in the pollen record require macrofossil records from well provenanced and securely dated contexts.

The late-Holocene history of pine (*P. sylvestris*) in Ireland has also been the subject of recent revision based on investigations of short core sequences from Rockforest, south-eastern Burren (McGeever and Mitchell 2016; Roche et al. 2016, 2018). The two short pollen profiles that have been published suggest rather different local histories of pine. Furthermore, the published ^{14}C dates from Killarney and the Burren, that have been drawn on by McGeever and Mitchell (2016) to support their arguments, are inappropriate. The ^{14}C date cited from the northern Burren (Lios Láirthín Mór), for instance, relates to a profile that does not include the final pine decline (Jeličić and O'Connell 1992). As regards the Gortlecka profile from near Rockforest, there are considerable uncertainties associated with the dating that are not alluded to, though these uncertainties were referred to in the initial publication (Watts 1984). Interestingly, a short unpublished pollen diagram by Coleman (1978) from Gortboyheen Lough in the northern central Burren (SM-F2; see pollen assemblage zones 2–4) has similarities to that published by McGeever and Mitchell (2016). Local survival of Scots pine at Gortboyheen is not, however, regarded as likely for various reasons including that there are no known records for the local presence of pine. This pine pollen record is probably best explained as due to long-distance pollen transport and taphonomic processes connected with the karstic hydrology. We therefore suggest, especially in view of long-distance transport of *Pinus* pollen and possible complications arising from the karst hydrology, that more substantial evidence is required before the hypothesis that Scots pine (*P. sylvestris*) survived without interruption into modern times in the Burren, and hence in Ireland, is accepted.

By way of conclusion, the fossil and modern-day pollen data serve to emphasize the complexities involved in interpreting fossil pollen data, especially as regards deducing presence/absence of particular species and also the nature of the farming economy, even at the basic level of arable vs. pastoral, as it changes over time. The information presented also serves to emphasize the importance of traditional farming, in its varied manifestations, for maintaining high biodiversity, especially in exceptional and sensitive environments such as the Aran Islands. Furthermore, as demonstrated by Monteiro et al. (2016) for Portugal, the rye and oat crops on the Aran Islands may have exceptional genetic characteristics of potential value in crop breeding programmes. It is therefore important that initiatives such as the EU-funded Aran Life Project (https://www.aranlife.ie/reports-and-publications. Accessed 30 May 2018) are adequately supported. Ultimately, it is only by working with, and supporting, the local farming communities in their efforts to maintain traditional farming practices that many of the more important habitats of the Aran Islands will be conserved.

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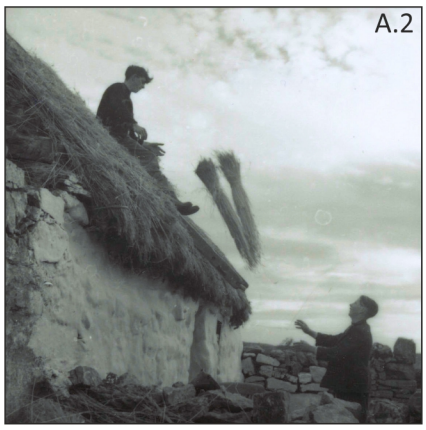
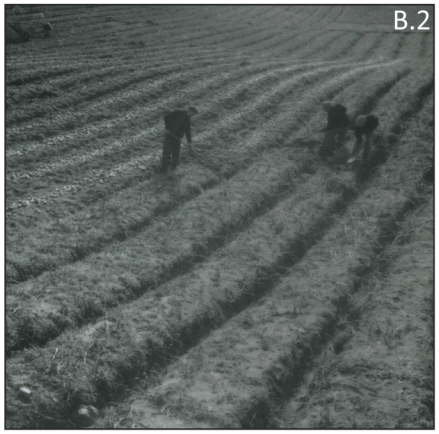
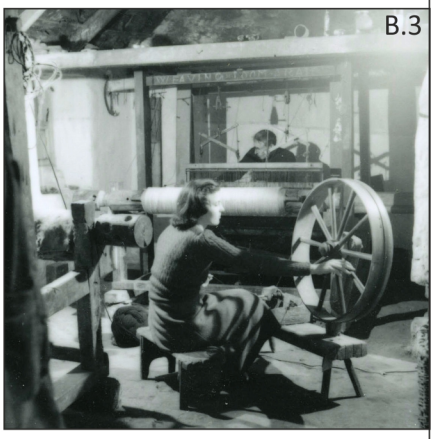
Photograph series **A**, **B** and **C** show scenes from Inis Mór (ca. autumn 1952; source: Ritchie-Pickow Collections)







D. Aerial view of part of Inis Meáin (towards NW; additional details given in SM_Doc1). Photo: 15/08/1992, MO'C.

Legends for photos in Supplementary Material, file SM-F1

Photograph series **A, B and C** show scenes from Inis Mór (probable date: autumn 1952). Source: Ritchie-Pickow Collection, © NUI Galway Digital Collections.

Photograph **D**. Aerial view of part of Inis Meáin (towards NW). Photo: 15/08/1992, MO'C.

Detailed legends for individual photographs, series A, B and C

NUIG archive identifier numbers are given in parentheses

A.1–A.3. Thatching using rye as thatch. In A.1, a pole with a rope attached appears to be used as a crane. Normally rye used for thatching was pulled from the ground rather than cut. This would appear to be the case here (see photos A.2 and A.3). (p102702, p102602, p102806)

B.1. Seaweed being transported by horse and side panniers for use as manure. NUIG archive includes the following details: "Peter 'Phatch' Faherty and his grey pony walking along with a load of seaweed [...] He wears a hat with a bobble, a dark jumper and grey trousers". (p103404)

B.2 Harvesting potatoes grown in cultivation ridges within a large field. NUIG archive indicates "3 men digging up potatoes beside Kilmurvey graveyard [...] in a large field of lazy beds sloping down towards the sea". The photograph may relate to the extensive cultivation ridges, now under pasture, at Cill Mhuirbhigh (western side of Na Muirbhigh Móra). (p101507)

B.3 Man operating a hand-loom; woman sitting at a spinning wheel. Until the early 1950s, clothes and shoes (pampooties) were mainly home-made. Details from the NUIG archive: Patcheen Faherty operates the loom; the name of the woman is not given nor is the location (presumably Inis Mór). (p100708)

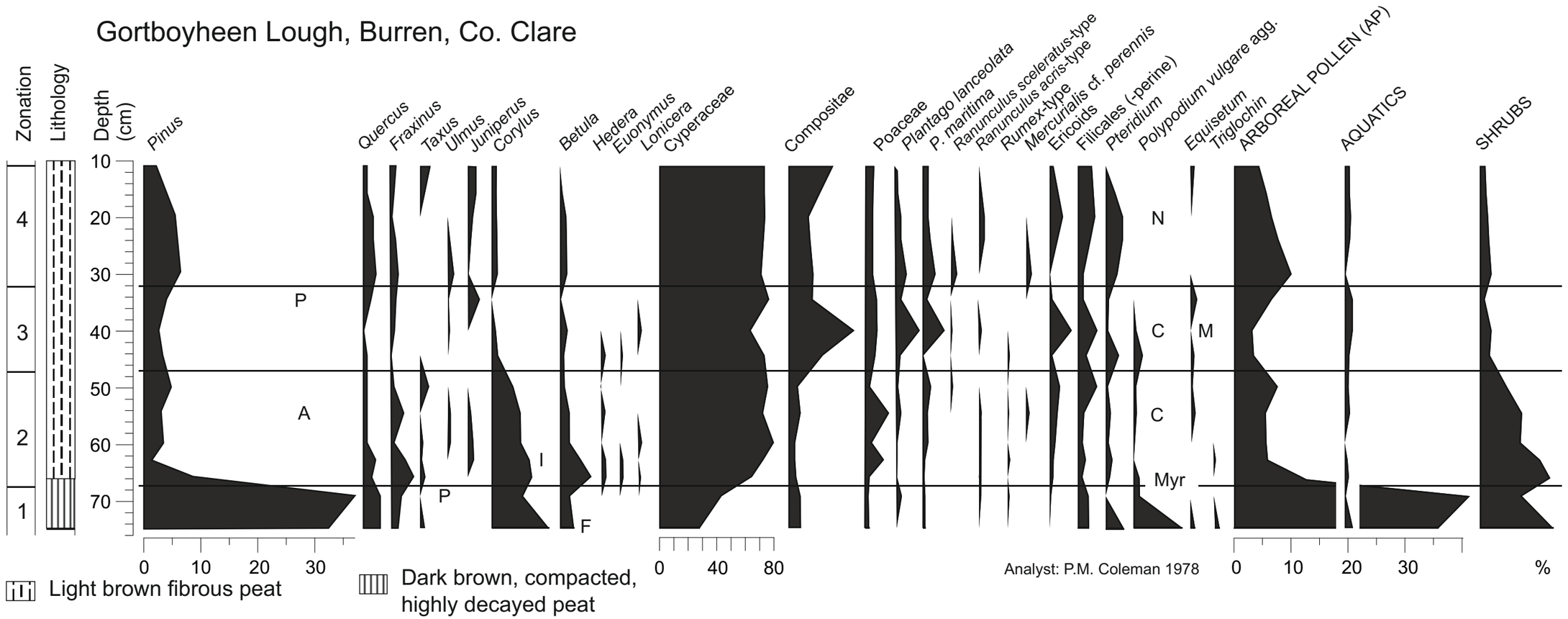
C.1. Pigs on quay at Cill Rónáin (most likely for export to Galway city). (p100303)

C.2. Two men involved in wall maintenance. NUIG archive indicates 'building a dry stone wall'. The wall is probably of recent construction. (p103010)

C.3. Traditional thatched cottage (note ropes to secure thatch; also visible in A.3) built on pavement; a man with a donkey in foreground. NUIG archive does not indicate which island but probably Inis Mór. (p101110)

Detailed legend for photograph D

D. Aerial view of part of Inis Meáin (view towards NW), Galway Bay is in the middle distance and Connemara mountains are in the background. Regular rows of fields on terraces are in mid view. These fields and also the houses (main settlements of the island) are in the shelter of the escarpments. The large fields on the plateau to the south-west (left-hand side) are used mainly for winterage. The area referred to as Na Creaga Móra (large expanse of limestone pavement) is to the right.
(photo: 15/08/1992, M. O'Connell)



Supplementary Material, Fig. 2.

Percentage pollen diagram from Gortboyheen Lough, northern Burren (co-ords: 53.09377, -9.08228; 26 m asl) (after Coleman 1978).

Depths are with respect to the surface of the peat deposit at lake/turlough edge where the core was taken..

All pollen taxa are included in the pollen sum. All curves are drawn to the same x-axis scale except Cyperaceae (reduced scale used).

Composite curves (following taxa are included):

AP: *Pinus*, *Fraxinus*, *Quercus*, *Taxus*, *Ulmus*, *Populus*

Shrubs: *Betula*, *Corylus*

Aquatics: *Caltha palustris*, *Equisetum*, *Mentha*-type; *Myriophyllum; Nymphaea; Triglochin*

Abbreviations of taxon names: A, *Acer*; C, *Caltha palustris*; F, *Frangula alnus*; I, *Ilex*; M, *Mentha*-type; Myr, *Myriophyllum*; N, *Nymphaea*; P, *Populus.*

Note: *Alnus* not in the diagram nor mentioned in the text. *Alnus* is rare in the Burren; it is possible, however, that it was omitted in error (original counts no longer available).

Zonation (PAZs and main features). No independent evidence of dating available; chronology below based on what is known about the regional vegetation history)

4 AP recover somewhat. The period of reduced farming impact from *c.* AD 1850 to mid twentieth century is presumably represented.

3 *Corylus* and AP generally at lowest values. The zone probably spans the period of major population growth and farming impact that preceded the Great Famine (*c.* AD 1700–1850).

2 *Pinus* falls to low values but *Corylus* values remain steady. Part (only) of decrease in *Pinus* is a result of increase in Cyperaceae (sedges expand locally; lithology also changes). The base of the zone probably relates to the late medieval period when high levels of human impact are expected (there are two tower houses in the immediate vicinity of the lake). A hiatus is suspected given that there is no evidence that pine survived in such quantities well into the medieval period in this part of the Burren. A change in lithology supports the idea of a hiatus.

1 High *Pinus*; other AP taxa (especially *Corylus*, *Quercus* and *Fraxinus*) have moderate values.

Records for *Mercurialis perennis* pollen considered to be attributable to introduction in the medieval period (cf. Lambe et al. 1978). Webb (1978) and Curtis (1981) suggest native status in the Burren.

Pollen diagram traced by M. O'Connell from the original in Coleman (1978); commentary by M.O'C.

Supp. Table SM-T1.1: placenames and other geographical details, Aran Islands				
Placenames (Robinson 1986)	*Anglicised version(s)*	*English translation*	*Comment*	Co-ordinates
Oileáin Árann (Árainn)	Aran Islands (*or simply* Aran)	See comment	Gaelic speakers traditionally referred to the largest island as Árainn. Oileáin Árann (ridge of islands) designates the group of islands (Robinson 1996)	
Inis Mór	Inishmore	Large Island	Robinson (1996) gives a summary of the history of the name. He prefers, and uses, Árainn (translates to kidney or ridge of land). We use Inis Mór as this (anglicised version: Inishmore) has come into general usage	
Inis Meáin	Inishmaan	Middle Island		
Inis Oírr	Inisheer	Eastern Island (Island of the East)	There has been considerable debate as to the name itself, possible meanings and most appropriate pronunciation	
Inis Mór				
An Trá Mór	None in common use	The large strand	Robinson notes (and marks on map) 'traces of old field-walls, possibly prehistoric, running down below high water mark show that the sea-level was once a good deal lower here'.	53.100706, -9.649160
An Turlach Mór	Turloughmore	The large turlough (seasonal lake)	SE of Cill Rónáin	53.11449, -9.68673
Baile na mBocht	None in common use	Settlement of the poor	On the high ridge between Cill Mhuirbhigh and Cill Rónáin; area to the east of Oghil wedge tomb (on high plateau)	53.12661, -9.71659
Bothar Ghort na gCapall	None in common use	Road [of/to] Gort na gCapall	This road runs south from Cill Éinne to Gort na gCapall	53.12818, -9.74266
Bun Gabhla	Bungowla	Bottom of fork	Settlement of Bun Gabhla in located near NW tip Inis Mór	53.14363, -9.80558
Cill Éinne	Killeany	Church of [St] Enda	SE of Cill Rónáin; it was the main settlement until overtaken by Cill Rónáin in early C19	53.10448, -9.6629
Cill Mhuirbhigh	Kilmurvy (Kilmurvey)	Church of the sea-plain	See also Na Muirbhigh below	53.13186, -9.75849
Cill Rónáin	Kilronan	Church of Ronán	This is the main settlement with good pier facilities	53.11931, -9.66934
Corrúch	Cowragh	see Port Chorrúch (below)	One of the four settlements of Eochaill (Oghil); others are Mainister, Eoghaill & Baile na Cre	53.13089, -9.7141
Dún Aonghasa	Dunaengus	Fort of Aengus	The largest and spectacularly sited fort on the Islands (Cotter 2012, 2014)	53.12555, -9.76684
Eochaill	Oghil	Yew	This townland name generally regarded as deriving from 'eo' / ibar, indicating yew	53.13088, -9.70358
Fearann an Choirce	Oatquarter	Quarter of the oats	East of Cill Mhuirbhigh	53.13123, -9.72506
Gort na gCapall	Gortnagapple	Field of the horses	OSI in the past gave Ourtnagapple (presumably an error)	53.12277, -9.74104
Iaráirne	Eararna	back/rear of a ridge	This settlement is near the SE end of IMOR at Sunda Ghríora (Gregory's Sound)	53.09805, -9.65163
Na Muirbhigh	Murvey	Sandy plains	Muirbhig is used in several placenames, e.g. the settlement Cill Mhuirbhigh to the NW	53.12874, -9.74804
Na Seacht dTeampaill	Seven Churches	The Seven Churches	Waddell (1994) points out that there are only 2 churches; other structures appear to be domestic dwellings	53.14597, -9.77773
Port Chorrúch	Portcowrugh	port of the *corr-fhuach* , i.e. bent creek	Webb (1980) refers to this as Portcowrugh. Another version is Portcowroogh	53.1393, -9.70955
Teampall Bheanáin	St Benan's Church	Church of St Benan (Benignus)	On base limestone pavement overlooking Cill Rónáin Bay	53.10234, -9.66614
Teampall Chiaráin	Monasterkieran (St Ciaran's Church)	Church of Kieran		53.13189, -9.68506
Teaghlach Éinne		Household of [St] Enda	Located in a graveyard at An Trá Mór (Trawmore; big strand)	53.10122, -9.65266
Inis Meáin				
Townlands				
Ceathrú an Teampaill		Quarter of the chapel	This townland, on N & E side of island, has settlements (villages) T1-T4 (see below)	
Ceathrú an Lisín	Carrownlisheen	Quarter of the small *lios* , i.e. fairy mound	This townland on S & W side of island, has settlements (villages) L1-L4 (see below)	

Supp. Table SM-T1.1: placenames and other geographical details, Aran Islands				
Placenames (Robinson 1986)	*Anglicised version(s)*	*English translation*	*Comment*	Co-ordinates
Main settlements on main E-W road, i.e. an Bothar an Oileáin (Road of the Island) (listed E to W)			See also maps in Laheen 2010, p. 39	
Baile an Mhothair (L1)		Settlement of the fort, referring to Dún Fearbhaí (also called An Mothar)	Robinson (1986) suggests that Fearbaí may derive from a word indicating 'cultivated area'	53.08316, -9.57992
Móinín na Ruaige (L2)		Grass patch of the rout or attack		53.08526, -9.58445
Baile an Lisín (L3)		Settlement of the small fairy mound	Robinson (1986): uncertain which fairy mound is referred to	53.0843, -9.58857
Baile an Teampaill (T1)	Ballintemple	Settlement of the church	Refers to an old chapel/church that was replaced by new church in 1939	53.08421, -9.59182
Baile an Dúna T2	Ballindoon	Settlement of the fort	Dún/fort refers to Dún Chonchúir (Connor's Fort); 1 of 2 forts on IM; other is Dún Fearbhaí	53.08435, -9.5934
Baile na Seoigeach (T3)		Settlement of the Joyces	Marked on a stone set in a wall	53.08403, -9.59692
Cinn an Bhaile (T4)	Kinbally	Head (top) of the settlement	Marked on a stone set in a wall as Cinn a Bhaile	53.0852, -9.59926
Other placenames				
Baile na Creige	None in common use	Settlement of the crags	Thatch; Curtis et al. 1988 recorded L. temulentum on thatch & in oat crop	53.08596, -9.59274
Na Creaga Móra	None in common use	The big crags	The extensive band of exposed limestone (mainly pavement) north of centre (runs the width of the island)	53.090122, -9.581965
Creig na gCaorach	None in common use	Crag of the sheep	Name for the area of limestone pavement N of pier with the collapsed wedge tomb	53.08716, -9.57569
Dún Fearbhaí	None in common use		See Baile an Mhothair above	
Loch na gCadhan	Lough Wirrabee	See Comment	Robinson (1996) suggests the name derives from Loch Chró na gCadhan, i.e. lake of hutch/pen of the Ó Cadhain clan	53.09604, -9.5753
Inis Oírr				
An Loch Mór		The large lake	There is no small lake! indeed there is no other water body on the island.	53.059089, -9.508194
Five settlements on Inis Oírr (listed from W to E)			See also maps in Laheen 2010, p. 39	
An Baile Thíos (An Baile Thiar)		Lower / western settlement	Settlements nearest the main pier; main centres of commercial activity	53.067895, -9.525528
Baile an Lurgain	Largy	Settlement of shank (narrow strip of land)		53.065411, -9.525155
Baile an tSéipéil		Settlement of the chapel	Church built 1901; dedicated to St Chaomhán; his medieval church is in the dunes immediately N of Formna	53.063189, -9.525287
Baile an Chaisleáin	Carrowcastle (from Ceathrú an Chaisleáin)	Settlement of the castle	Castle is a towerhouse (O'Brien clan of Co. Clare; from late C14) within the much older hill fort, Formna	53.062287, -9.517312
Formna (Baire an Fhormna)	Furmina	Settlement on a shoulder/ridge	Settlement largely overlooking An Loch Mór	53.061667, -9.510646
Note:				
Webb (1980) makes reference to 'Mr J. White and four students' who spent four days on Inis Meáin in late May 1971. The students were: Hester Heuff, Éanna Ní Lamhna, Michael O'Connell and Jim Ryan				
Compiled by M. O'Connell	20/03/2018			

Supp. Table SM-T1.2: pollen surface samples; location deta This is additional to details in Table 2, main text. Additional details incl. co-ordinates and altitude

Sample No.	Sample location	Co-ordinates (WGS84)	Altitude (m; asl)	Sampled material	Other comments
Twelve samples collected on Inis Mór (27–30 July, 1989) towards end of a six-week period of exceptionally fine weather					
IMOR-1	Dún Aonghasa	53.12652, -9.76502	54	Dicranum scoparium (3 cm-thick layer)	Sample from inside the outer semi-circular enclosure, to NNE of the fort centre; low windswept, vegetation; no cultivation in the general area; substantial woody vegetation near Visitor Centre.
IMOR-2	Bun Gabhla	53.140587, -9.824383	20	*Saxifraga rosacea leaves	1 of 5 samples at rye fields in Bun Gabhla (see also MS-2). This sample from 5 m outside rye field 1 (RF1)
IMOR-3	Bun Gabhla	53.140460, -9.824592	22	*S. rosacea leaves (similar to IMOR-2)	On ± bare limestone (little vegetation), 4 m outside RF2; R. rosacea less important than at IMOR-2
IMOR-5	Bun Gabhla	53.140673, -9.824807	18	Rhytidiadelphus squarrosus	Inside bounding wall (headland) of R2. Top 5–7 cm of moss sampled
IMOR-6	Bun Gabhla	53.140642, -9.824491	19	Nostoc	Nostoc in a limestone pool on headland of RF1
IMOR-7	Teampall Chiaráin	53.13206, -9.684	12	Bryales spp.	Rye field to NE of Teampall Chiaráin. Sample from narrow headland with much Apiaceae (mainly D. carota; also S. olusatrum)
IMOR-8	Teampall Chiaráin	53.13193, -9.68485	16	Pseudoscleropodium purum	A well developed but low grassy sward in a much overgrown cemetery. *L. corniculatus growing through the moss sward
IMOR-9	Port Mhuirbhigh	53.13361, -9.74283	10	D. scoparium	Rye field on shore road to east of Port Mhuirbhigh (Kilmurvey); samples from 10 m to east of boundary wall of rye field. Field where sample taken had a complete, closely grazed, grassy sward
IMOR-10	Carcair na Coille	53.12364, -9.71839	105	D. scoparium & Helianthemum canum	Grassy field to south of wedge tomb; some low Corylus nearby
IMOR-11	NE of Cill Rónáin	53.12164, -9.6648	3	P. purum	Coastal location. Crop (A. sativa) 75% cut. F. rubra growing through the moss. Sample site at 10 m west of oat crop
IMOR-12	N of Dún Eoghanachta	53.1427, -9.77645	28	Nostoc (3 solution hollows)	Closely grazed grassland with little in flower. No cultivated fields in the area. Some Corylus and Hedera nearby
Nine samples from Inis Meáin (IM), collected on 8 August, 1992					
IM-20	Loch na gCadhan area (west of	53.0956, -9.57277	3	Mosses; mainly R. squarrosus	IM-20 in pasture; 10 m from a Secale plot incl. A. strigosa and R. crispus. Samples IM-20–23 are from east of Loch Mhuirbhigh, main centre of arable farming on IM
IM-21	Loch na gCadhan area (west of	53.09566, -9.57304	3	P. lanceolata leaves	c. 25m west of IM-20; in same field but closer to field with A. sativa and potatoes. IM-21 with *Hypochoeris radicata and P. lanceolata (not flowering). In IM-22 P. lanceolata dominant; it had flowered
IM-22	Loch na gCadhan area (west of	53.0956, -9.57277	3	P. lanceolata leaves	See IM-21 (above)
IM-23	Loch na gCadhan area (west of	53.0953, -9.57375	2	R. squarrosus	Pasture beside field with A. sativa. There was a wide headland to S of oat crop with abundant P. lanceolata and occasional C. rotundifolia
IM-24	W of Dún Chonchúir	53.0852, -9.59858	52	Mainly Plagiochila and Calliergonella cuspidata	Sample from steeply sloping ground on N. side of main east-west road in Baile na Seoigeach. Immediately to N, several (6+) rye fields. Much Urtica; Rubus in flower nearby
IM-25	N of Dún Chonchúir	53.08754, -9.59769	23	Rhytidiadelphus squarrosus	W of road that runs N of Baile an Dúna. Near N edge of grassy fields; extensive pavement to N. Grazed; little flowering; no rye in immediate vicinity
IM-26a	S edge of Na Creaga Móra	53.08936, -9.59683	13	Bryophytes in a gryke	ca. 200 m N of IM-25; immediately to south of the limestone pavement. Lonicera, Sesleria and Viola in gryke
IM-26b	As IM-26a	53.08937, -9.59684	13	Nostoc in a solution hollow	Near IM-26a. 100 m to NE, a small field with Secale and L. temulentum
IM-27	Na Creaga Móra	53.09263, -9.58342	19	Nostoc in a solution hollow	Towards N of the limestone pavement; immediately to W of road and holiday houses (not built when sampling). Pteridium, Rubus and Teucrium main spp.

* indicates flowering.

Supp. Table SM-T2.1: Relevés and species lists: arable and fallow

	Inis Mór									Inis Meáin						Designations as in Webb (1980)^			Introductions to Aran (Webb 1980)
	2010							1989/9		2010									
Surface sample No.	IMOR-53	IMOR-54	IMOR-55	IMOR-56	IMOR_WP 469	IMOR_WP 470	IMOR-61b	IMOR-7	Webb (1980)-IMOR	IM-70a	IM-70b	IM_WP 484	IM-72	Webb (1980)-IM	Webb (1980)-IO				
Relevé size (m2)	n/a	25	100	225	96	108	150	n/a		n/a	n/a	n/a	15						
Arable type (rye/potato/fallow)																			
Field / part of field (Plot)	Fallow		Plot	Plot		Plot	Plot	Field		Plot	Fallow	Fallow	Fallow						
Total vegetation cover (%)	50	80	60	90	n/a	n/a	n/a	n/a		n/a	n/a	n/a	n/a						
Pollen sample (ps) / Pollen spectrum (PS	ps	ps	ps	ps			ps	PS		ps	–		ps						
Agrostis stolonifera		p*	p		p*		p*		AL	p*	p*		1*	AL	AL	*N*	***M***	*S*	
Allium babingtonii									F			p		F	F	*N*	*M*	*S*	†
Anagallis arvensis	p*	p*			p*				A	p*			+*	A	A	*N*	*M*	*S*	
Anthriscus sylvestris		p*							A		p*			A	A	*N*	*M*	*S*	
Arabis hirsuta						p*			WL					WL	WL	*N*	**M**	*S*	
Arrhenatherum elatius		p*	p*						A	p				A	A	*N*	*M*	*S*	
Avenula pubescens									F		p*			F	F	*N*	**M**	**S**	
Bellis perennis			p*						A					A	A	*N*	*M*	*S*	
Fallopia convolvulus	p	p							O					O	O	*N*	*M*	*S*	‡
Brassica napus									?		p*					*N*			
Brassica rapa	p*								F	p*	p*			F	F	*N*	**M**	**S**	*
Brassica sp.													+*						#
Bromus hordeaceus				p					F					F	F	*N*	*M*	*S*	
Capsella bursa-pastoris						p*			O-F					O-F	O-F	*N*	*M*	*S*	†
Cerastium spp	p*	p*	p*	p*					A					A	A	*N*	*M*	*S*	#
Chenopodium cf. album						p			O			p		O	O	*N*	*m*	*S*	#
Chenopodium rubrum		p	p				p		R	p						*N*			
Cirsium arvense		p							F	p				F	F	*N*	*M*	*S*	
Cirsium vulgare		p*				p			F		p		+*	F	F	*N*	*M*	*S*	
Convolvulus arvensis					p	p			F			p			n/a	*N*		*S*	
Crepis capillaris		p*							F					F	A	*N*	*M*	*S*	

Key to arable types		Key to spp. colour coding	
	Rye		Arable weed s
	Potato		Crop sp.
	Fallow		Grasses (non-

Supp. Table SM-T2.1: Relevés and species lists: arable and fallow

	Inis Mór									Webb (1980)-IMOR	Inis Meáin				Webb (1980)-IM	Webb (1980)-IO	Designations as in Webb (1980)^			Introductions to Aran (Webb 1980)
	2010							1989/9			2010									
Surface sample No.	IMOR-53	IMOR-54	IMOR-55	IMOR-56	IMOR_WP 469	IMOR_WP 470	IMOR-61b	IMOR-7			IM-70a	IM-70b	IM_WP 484	IM-72						
Relevé size (m2)	n/a	25	100	225	96	108	150	n/a			n/a	n/a	n/a	15						
Arable type (rye/potato/fallow)																				
Field / part of field (Plot)	Fallow		Plot	Plot		Plot	Plot	Field			Plot	Fallow	Fallow	Fallow						
Total vegetation cover (%)	50	80	60	90	n/a	n/a	n/a	n/a			n/a	n/a	n/a	n/a						
Pollen sample (ps) / Pollen spectrum (PS	ps	ps	ps	ps			ps	PS			ps	–		ps						
Crepis cf. vesicaria				p*						F		p*	p	1*	F	F	**N**	**M**	**S**	†
Dactylis glomerata		p*		p*						A			p	+*	A	A	*N*	*M*	*S*	
Daucus carota	p	p	p	p				p		A		p	p		A	A	*N*	*M*	*S*	
Elymus farctus			p*							A					A	A	*N*	**M**	**S**	
Elymus repens										R		p			R	R	*N*	**M**	**S**	
Euphorbia helioscopia					p*		p*			O					O	O	*N*	**M**	*S*	‡
Euphorbia peplus					p*					F					F	F	*N*	*M*	*S*	
Festuca rubra										A				1*	A	A	*N*	*M*	*S*	
Festuca sp		p*																		
Fumaria sp.	p*				p	p	p*				p*		p				N	M	S	
Galium aparine		p								F					F	F	*N*	*M*	*S*	†
Galium verum		p*	p							A					A	A	*N*	*M*	*S*	
Geranium molle			p*							F	p*			+*	F	A	*N*	*M*	*S*	
Heracleum sphondylium		p*								A					F	R	*N*	*M*	**S**	
Holcus lanatus				p*						A				+*	A	A	*N*	*M*	*S*	
Honkenya peploides		p								AL					AL		*N*	*M*		
Leucanthemum vulgare	p*							p		A	p*	p*	p	+*	A	A	*N*	*M*	*S*	
cf. Leontodon					p															
Lolium perenne				p*						A				+*	A	A	*N*	*M*	*S*	
Lotus corniculatus		p*								A					A	A	*N*	*M*	*S*	
Medicago lupulina				p*						F					F	F	*N*	*M*	*S*	

Key to arable types		Key to spp. colour coding	
	Rye		Arable weed s
	Potato		Crop sp.
	Fallow		Grasses (non-

Supp. Table SM-T2.1: Relevés and species lists: arable and fallow

	Inis Mór									Webb (1980)-IMOR	Inis Meáin				Webb (1980)-IM	Webb (1980)-IO	Designations as in Webb (1980)^			Introductions to Aran (Webb 1980)
	2010							1989/9			2010									
Surface sample No.	IMOR-53	IMOR-54	IMOR-55	IMOR-56	IMOR_WP 469	IMOR_WP 470	IMOR-61b		IMOR-7		IM-70a	IM-70b	IM_WP 484	IM-72						
Relevé size (m2)	n/a	25	100	225	96	108	150		n/a		n/a	n/a	n/a	15						
Arable type (rye/potato/fallow)																				
Field / part of field (Plot)	Fallow		Plot	Plot		Plot	Plot		Field		Plot	Fallow	Fallow	Fallow						
Total vegetation cover (%)	50	80	60	90	n/a	n/a	n/a		n/a		n/a	n/a	n/a	n/a						
Pollen sample (ps) / Pollen spectrum (PS	ps	ps	ps	ps			ps		PS		ps	–		ps						
Myosotis arvensis										F				+*	F	F	*N*	*M*	*S*	
Orobanche minor			p*	p*						AL					AL	AL	**N**	**M**	**S**	#
Papaver dubium	p*	p*								O	p*	p*	p		O	O	*N*	*M*	*S*	#
Pastinaca sativa	p*									R			p			R	*N*		**S**	#
Plantago lanceolata	p*	p*	p	p*	p*	p*				A			p	+*	A	A	*N*	*M*	*S*	
Poa cf. pratensis		p*	p*							F					F	F	*N*	*M*	*S*	
Poa trivialis						p*	p*			A					A	A	*N*	**M**	**S**	
Polygonum sp.												p*								
Potentilla reptans										F				1*	A		*N*	*M*		
Ranunculus bulbosus		p*	p*	p*						A					F	F	*N*	*M*	**S**	
Ranunculus repens	p*				p*	p*	p*			A	p*			1*	A	A	*N*	*M*	*S*	
Raphanus raphanistrum	p*									O					O	F	*N*	*M*	*S*	
Rhinanthus minor		p*		p						F					F	F	*N*	*M*	*S*	
Rumex acetosa	p*	p*								A					A	A	*N*	*M*	*S*	
Rumex conglomeratus						p*				n/a					n/a	n/a	*N*	**M**	**S**	†
Rumex crispus	p*	p*	p*	p		p*				A	p*	p*		1*	A	A	*N*	**M**	**S**	‡
Secale cereale			p*	p			p		p		p*		p							
Senecio vulgaris	p*	p*	p*	p*		p*				F	p*				F	F	*N*	*M*	*S*	
Sinapis arvensis										O	p*	p*			O	O	*N*	*M*	*S*	‡
Sonchus arvensis		p*	p		p*								p				*N*	*M*	*S*	
Solanum tuberosum	p	p	p	p		p*	p					p	p	+						

Key to arable types		Key to spp. colour coding	
	Rye		Arable weed s
	Potato		Crop sp.
	Fallow		Grasses (non-

Supp. Table SM-T2.1: Relevés and species lists: arable and fallow	Inis Mór								Webb (1980)-IMOR	Inis Meáin				Webb (1980)-IM	Webb (1980)-IO	Designations as in Webb (1980)^			Introductions to Aran (Webb 1980)	Key to arable types		Key to spp. colour coding	
	2010							1989/9		2010													
Surface sample No.	IMOR-53	IMOR-54	IMOR-55	IMOR-56	IMOR_WP 469	IMOR_WP 470	IMOR-61b	IMOR-7		IM-70a	IM-70b	IM_WP 484	IM-72										
Relevé size (m2)	n/a	25	100	225	96	108	150	n/a		n/a	n/a	n/a	15								Rye		Arable weed s
Arable type (rye/potato/fallow)																					Potato		Crop sp.
Field / part of field (Plot)	Fallow		Plot	Plot		Plot	Plot	Field		Plot	Fallow	Fallow	Fallow								Fallow		Grasses (non-
Total vegetation cover (%)	50	80	60	90	n/a	n/a	n/a	n/a		n/a	n/a	n/a	n/a										
Pollen sample (ps) / Pollen spectrum (PS	ps	ps	ps	ps			ps	PS		ps	–		ps										
Smyrnium olusatrum								p	A					O	A	*N*	*M*	*S*	#				
Taraxacum spp.			p		p*	p*			A	p*	p*		+*	A	A	N	M	S					
Trifolium dubium	p*	p*		p*					A					A	A	*N*	*M*	*S*					
Trifolium pratense		p*	p*	p*	p*				F			p	2*	F	F	*N*	*M*	*S*					
Trifolium repens				p*					A				1*	A	A	*N*	*M*	*S*					
Veronica sp.					p*											N	M	S					
Moss (cf. Eurhynchium)								p															
No. of plant spp. (higher plants) →	17	30	20	19	13	14	8	4		16	16	15	20										
69	Total no. of higher plants & ferns recorded																						
Notes																							
Braun-Blanquet cover/abundance scale +, 1-5; value given where c/a values recorded																							
otherwise presence only indicated (by p)																							
*: flowering																							
PS / ps: pollen sample collected; analysed / not analysed																							
Webb (1980) categories (modifi	Abb.	Comment																					
Abundant	A																						
Abundant but local	AL																						
Frequent	F																						
Occasional	O																						
Occasional to frequent	O-F																						

Supp. Table SM-T2.1: Relevés and species lists: arable and fallow	Inis Mór								**Webb (1980)-IMOR**	Inis Meáin				**Webb (1980)-IM**	**Webb (1980)-IO**	Designations as in Webb (1980)^	Introductions to Aran (Webb 1980)	Key to arable types		Key to spp. colour coding	
	2010							1989/9		2010											
Surface sample No.	IMOR-53	IMOR-54	IMOR-55	IMOR-56	IMOR_WP 469	IMOR_WP 470	IMOR-61b	IMOR-7		IM-70a	IM-70b	IM_WP 484	IM-72								
Relevé size (m2)	n/a	25	100	225	96	108	150	n/a		n/a	n/a	n/a	15						Rye		Arable weed s
Arable type (rye/potato/fallow)																			Potato		Crop sp.
Field / part of field (Plot)	Fallow		Plot	Plot		Plot	Plot		Field	Plot	Fallow	Fallow	Fallow						Fallow		Grasses (non-
Total vegetation cover (%)	50	80	60	90	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a								
Pollen sample (ps) / Pollen spectrum (PS	ps	ps	ps	ps			ps		PS	ps	–		ps								
Rare	R	this additional category has been added																			
Unsure of abundance/frequency	n/a	this additional category has been added where we are unsure of abundance/frequency on the particular island																			
Rejected as errors or requiring co	E	No voucher specimens retained																			
Maroon colour used to highlight sp. that differ in abundance/freq. on the islands																					
Above 'Webb' categories are given for Inis Mór, Inis Meáin and Inis Oírr (Webb-IMOR, -IM and -IO, respectively)																					
Species names in CAPITALS: plants not hitherto recorded for the islands (except in a few cases as dots in the Atlas); this designation has not been used (to avoid possible																					
^Plant record designations (after Webb 1980):																					
N: Inishmore; M: Inishmaan; S: Inisheer																					
Bold: species had not been recorded before for that island; e.g. **N**																					
Lower case instead of capitals: failed to confirm an old record for that island (but no reason to doubt the record); e.g. n																					
Capital letters in italics indicate an old record which we confirmed; e.g. *N*																					
? indicates uncertainty																					
Introductions (to Aran Islands; not Ireland) (after Webb 1980):																					
Certainly	#																				
Probably	‡																				
Possibly	†																				
Note:																					
re. Webb 1980 *Journal of Life Sciences* paper: a 'CONSOLIDATED FLORA list' is appended to a pdf of Webb (1980).																					
Webb 1980 paper and the consolidated flora list is available at:																					
http://botanicgardens.ie/herb/books/webbaran.pdf																					
Information in Webb (1980) is used in the compilations given in this EXCEL file																					

Supp. Table SM-T2.1: Relevés and species lists: arable and fallow			
Surface sample No.	**Comments** incl. remarks on distribution (mainly after Webb 1980)		
Relevé size (m2)	p.		
Arable type (rye/potato/fallow)			
Field / part of field (Plot)	cultivated) & Plantago spp.		
Total vegetation cover (%)			
Pollen sample (ps) / Pollen spectrum (PS			
Agrostis stolonifera			
Allium babingtonii			
Anagallis arvensis			
Anthriscus sylvestris			
Arabis hirsuta			
Arrhenatherum elatius			
Avenula pubescens			
Bellis perennis			
Fallopia convolvulus	Webb gives Bilderdykia and Polygonum as alternative names		
Brassica napus			
Brassica rapa			
Brassica sp.	Webb: B. rapa very frequent on roadsides and fields; may be recent introduction		
Bromus hordeaceus			
Capsella bursa-pastoris			
Cerastium spp			
Chenopodium cf. album			
Chenopodium rubrum			
Cirsium arvense			
Cirsium vulgare			
Convolvulus arvensis			
Crepis capillaris			

Supp. Table SM-T2.1: Relevés and species lists: arable and fallow			
Surface sample No.	**Comments** incl. remarks on distribution (mainly after Webb 1980)		
Relevé size (m2)	p.		
Arable type (rye/potato/fallow)			
Field / part of field (Plot)	cultivated) & Plantago spp.		
Total vegetation cover (%)			
Pollen sample (ps) / Pollen spectrum (PS			
Crepis cf. vesicaria			
Dactylis glomerata			
Daucus carota			
Elymus farctus	Elytrigia juncea; also Agropyron junceiforme		
Elymus repens	Agropyron repens; Webb indicates: Rather rare; seen only in grassland and in wall, not in cultivated ground		
Euphorbia helioscopia			
Euphorbia peplus	Webb: Very frequent to abundant, mainly on roadsides		
Festuca rubra			
Festuca sp	Webb has records for both F. rubra & F. ovina from the 3 islands		
Fumaria sp.	F. muralis is frequent; limited records for other spp.; these remarks apply to 3 islands. See comment in 1st cell of the row		
Galium aparine			
Galium verum			
Geranium molle			
Heracleum sphondylium			
Holcus lanatus			
Honkenya peploides	Webb: sandy shores; more sparingly on boulder-beaches		
Leucanthemum vulgare			
cf. Leontodon			
Lolium perenne			
Lotus corniculatus			
Medicago lupulina			

Supp. Table SM-T2.1: Relevés and species lists: arable and fallow			
Surface sample No.	**Comments** incl. remarks on distribution (mainly after Webb 1980)		
Relevé size (m2)	p.		
Arable type (rye/potato/fallow)			
Field / part of field (Plot)	cultivated) & Plantago spp.		
Total vegetation cover (%)			
Pollen sample (ps) / Pollen spectrum (PS			
Myosotis arvensis			
Orobanche minor	Webb: probably introduced into Aran in the 1900s		
Papaver dubium	Webb: Occasional, but apparently fairly securely naturalized. KM & MO'C: abundant on fallow in Inis Meáin (2010)		
Pastinaca sativa	Webb: Small colonies at two or three places on each island		
Plantago lanceolata			
Poa cf. pratensis			
Poa trivialis			
Polygonum sp.			
Potentilla reptans			
Ranunculus bulbosus	Webb: Abundant on dunes and in sandy fields on Inis Mór; rarer elsewhere		
Ranunculus repens			
Raphanus raphanistrum	Webb reports subsp. maritimus only; subsp. raphanistrum recorded in past; KM & MO'C: didn't attempt the distinction		
Rhinanthus minor			
Rumex acetosa			
Rumex conglomeratus			
Rumex crispus	Webb: possibly introduced to Aran in early 1900s		
Secale cereale	Webb does not record crop plants		
Senecio vulgaris			
Sinapis arvensis	Webb: probably recent introduction		
Sonchus arvensis	Webb: on roadsides and boulder-beaches		
Solanum tuberosum			

Supp. Table SM-T2.1: Relevés and species lists: arable and fallow			
Surface sample No.	**Comments** incl. remarks on distribution (mainly after Webb 1980)		
Relevé size (m2)	p.		
Arable type (rye/potato/fallow)			
Field / part of field (Plot)	cultivated) & Plantago spp.		
Total vegetation cover (%)			
Pollen sample (ps) / Pollen spectrum (PS			
Smyrnium olusatrum			
Taraxacum spp.			
Trifolium dubium			
Trifolium pratense			
Trifolium repens			
Veronica sp.	Webb: records for several Veronica spp.		
Moss (cf. Eurhynchium)			
No. of plant spp. (higher plants) →			
69			
Notes			
Braun-Blanquet cover/abundance			
otherwise presence only indicated			
*: flowering			
PS / ps: pollen sample collected;			
Webb (1980) categories (modifi			
Abundant			
Abundant but local			
Frequent			
Occasional			
Occasional to frequent			

Supp. Table SM-T2.1: Relevés and species lists: arable and fallow			
Surface sample No.	**Comments** incl. remarks on distribution (mainly after Webb 1980)		
Relevé size (m2)	p.		
Arable type (rye/potato/fallow)			
Field / part of field (Plot)	cultivated) & Plantago spp.		
Total vegetation cover (%)			
Pollen sample (ps) / Pollen spectrum (PS			
Rare			
Unsure of abundance/frequency			
Rejected as errors or requiring co			
Maroon colour used to highlight s			
Above 'Webb' categories are give			
Species names in CAPITALS: pla	confusion)		
^Plant record designations (aft			
N: Inishmore; M: Inishmaan; S: In			
Bold: species had not been recor			
Lower case instead of capitals: fa			
Capital letters in italics indicate ar			
? indicates uncertainty			
Introductions (to Aran Islands; no			
Certainly			
Probably			
Possibly			
Note:			
re. Webb 1980 *Journal of Life Sci*			
Webb 1980 paper and the consol			
http://botanicgardens.ie/herb/bool			
Information in Webb (1980) is use			

Supp. Table SM-T2.2: Releves and species lists — pasture		Inis Mór											Inis Meáin														
	2010						1989/93					1989/93						2010									
Surface sample No.	IMOR-50a	IMOR-50b	IMOR_WP 384	IMOR-60a	IMOR-60b	IMOR-61a	IMOR-1	IMOR-8	IMOR-9	IMOR-11	Webb (1980)-IMOR	IM-24	IM-25	IM-20	IM-21	IM-22	IM-23	IM-71	Webb (1980)-IM	Webb (1980)-IO	Taxa recorded also in arable plots	Designations as in Webb (1980)^			Introductions to Aran (Webb 1980
Relevé size (m2)	0.4	4	9	4	1	1	n/a	100	n/a	1		0.1	250	1	1	1	1	4							
Total herb cover (%)			100	25	20	40				98					100	100									
Total moss cover (%)	100			80	100	60																			
Total bare rock (%)																									
Pollen sample (ps) / Pollen spectrum (PS)	ps	ps		ps	ps	ps	PS	PS	PS	PS		PS	PS	PS	PS	PS	PS	ps							
Achillea millefolium				+	+*	+			p		F		+						F	F		*N*	*M*	*S*	
Agrostis stolonifera	1*	1*	2		1						AL								AL	AL	$	*N*	***M***	*S*	
Ammophila arenaria											AL			+	+				AL	AL		*N*	*M*	*S*	
Antennaria dioica									p		F								F	F		*N*	*M*	*S*	
Anthoxanthum odoratum						1*					FL								FL	FL		*N*	*M*	*S*	
Anthriscus sylvestris								2			A								A	A	$	*N*	*M*	*S*	
Anthyllis vulneraria										p	A								A	A		*N*	*M*	S	
Armeria maritima							p																		
Arrhenatherum elatius											A			1		+	1	+	A	A	$	*N*	*M*	*S*	
Avenula pubescens										p	F								F	F	$	*N*	**M**	**S**	
Bellis perennis			2	+*	+*			2		p	A								A	A	$	*N*	*M*	*S*	
Blackstonia perfoliata				+					p		O								R	O		**N**	*M*	*S*	
Brassica sp.															+	+					$				
Bromus hordeaceus			2								F					+			F	F	$	*N*	*M*	*S*	
Calluna vulgaris									p		F								F	F		*N*	*M*	*S*	
Campanula rotundifolia							p	p	p		FL								FL	FL		*N*	*M*	*S*	
Cardamine pratensis	+										F							+	F	F		*N*	*M*	*S*	
Carex arenaria											AL			1	1				AL	AL		*N*	**M**	**S**	
Carex panicea				2*	1*				p		O								O	O		*N*	*M*	**S**	
Carex spp.	+								p																

Supp. Table SM-T2.2: Relevés and species lists — pasture		Inis Mór											Inis Meáin														
	2010						1989/93					1989/93						2010									
Surface sample No.	IMOR-50a	IMOR-50b	IMOR_WP 384	IMOR-60a	IMOR-60b	IMOR-61a	IMOR-1	IMOR-8	IMOR-9	IMOR-11	Webb (1980)-IMOR	IM-24	IM-25	IM-20	IM-21	IM-22	IM-23	IM-71	Webb (1980)-IM	Webb (1980)-IO	Taxa recorded also in arable plots	Designations as in Webb (1980)^			Introductions to Aran (Webb 1980
Relevé size (m2)	0.4	4	9	4	1	1	n/a	100	n/a	1		0.1	250	1	1	1	1	4							
Total herb cover (%)			100	25	20	40				98					100	100									
Total moss cover (%)	100			80	100	60																			
Total bare rock (%)																									
Pollen sample (ps) / Pollen spectrum (PS)	ps	ps		ps	ps	ps	PS	PS	PS	PS		PS	PS	PS	PS	PS	PS	ps							
Carlina vulgaris									p		F								F	F		*N*	*M*	*S*	
Centaurea nigra						+			p	p	F								F	F		*N*	*M*	*S*	
Centaurea scabiosa											FL					+	2*		FL	FL		*N*	*M*	*S*	
Cerastium fontanum											F				+	+			F	F		*N*	*M*	*S*	
Cerastium spp			1	+														+*							
Cirsium vulgare			+								F								F	F	$	*N*	*M*	*S*	
Crepis capillaris			1								F								F	A	$	*N*	*M*	*S*	
Crepis cf. vesicaria											F				+	1	+*		F	F	$	**N**	**M**	**S**	#
Cynosurus cristatus			+	1*	1*						A							+*	A	A		*N*	*M*	*S*	
Dactylis glomerata			+		+*	+*		1		p	A				+	+		+*	A	A	$	*N*	*M*	*S*	
Danthonia decumbens											O-F		+						O-F	O-F		*N*	**M**	**S**	
Daucus carota			1								A				+	1	2*		A	A	$	*N*	*M*	*S*	
Eleocharis palustris	+	3*									AL								AL	AL		*N*	**M**	**S**	
Euphrasia sp.				+*		+*																			
Festuca ovina											F		2						F	F		*N*	*M*	*S*	
Festuca rubra							p			p	A	4		5		+			A	A	$	*N*	*M*	*S*	
Festuca sp	1			2	2*	2*		5										1*							
Filipendula ulmaria	+	+									FL								FL	FL		*N*	*M*	*S*	
Galium verum					+	1				p	A		1	1	1	1			A	A	$	*N*	*M*	*S*	
Gentiana verna									p		O								O	O		*N*	*M*	*S*	
Geranium molle			1								F								F	A	$	*N*	*M*	*S*	

Supp. Table SM-T2.2: Relevés and species lists — pasture		Inis Mór											Inis Meáin														
	2010						1989/93					1989/93						2010									
Surface sample No.	IMOR-50a	IMOR-50b	IMOR_WP 384	IMOR-60a	IMOR-60b	IMOR-61a	IMOR-1	IMOR-8	IMOR-9	IMOR-11	Webb (1980)-IMOR	IM-24	IM-25	IM-20	IM-21	IM-22	IM-23	IM-71	Webb (1980)-IM	Webb (1980)-IO	Taxa recorded also in arable plots	Designations as in Webb (1980)^			Introductions to Aran (Webb 1980
Relevé size (m2)	0.4	4	9	4	1	1	n/a	100	n/a	1		0.1	250	1	1	1	1	4							
Total herb cover (%)			100	25	20	40				98					100	100									
Total moss cover (%)	100			80	100	60																			
Total bare rock (%)																									
Pollen sample (ps) / Pollen spectrum (PS)	ps	ps		ps	ps	ps	PS	PS	PS	PS		PS	PS	PS	PS	PS	PS	ps							
Geranium robertianum							p				A								A	A		*N*	*M*	*S*	
Geranium sanguineum						+*	p	p			A								A	A		*N*	*M*	*S*	
Hedera helix								1			A								A	A		*N*	*M*	*S*	
Helianthemum canum									p*		A											N			
Heracleum spondylium								+			A								F	R	$	*N*	*M*	***S***	
Holcus lanatus	+	+	+	+	+*	+*		1		p	A				2	1		1*	A	A	$	*N*	*M*	*S*	
Hydrocotyle vulgaris	1										FL								FL	FL		*N*	*M*	*S*	
Hypochoeris radicata	+									p	A				2*	1			A	A		*N*	*M*	*S*	
cf. Leontodon					+	+																			
Leucanthemum vulgare										p	A								A	A	$	*N*	*M*	*S*	
Listera ovata									p		O-F								O-F	O-F		N	***M***	***S***	
Lolium perenne		+	2								A				1	1		+*	A	A	$	*N*	*M*	*S*	
Lotus corniculatus				1*	+*	1*		3*	p	p	A			1		2	2*		A	A	$	*N*	*M*	*S*	
Luzula campestris						+*		2		p	FL		1						FL	FL		N	***M***	***S***	
Medicago lupulina				+*							F					2			F	F	$	*N*	*M*	*S*	
Orchis mascula									p		FL								FL	FL		*N*	*M*	***S***	
Orobanche minor				+*							AL								AL	AL	$	***N***	***M***	***S***	#
Hieracium pilosella									p		F								F	F		*N*	*M*	*S*	
Plantago lanceolata	+*		+	1*	1*	1*		3		p	A				3	5		1*	A	A	$	*N*	*M*	*S*	
Polygonum aviculare											O	+							O	O		*N*	*M*	*S*	†
Potentilla anserina	+*	4									AL					5			AL	AL		*N*	*M*	*S*	

Supp. Table SM-T2.2: Relevés and species lists — pasture		Inis Mór											Inis Meáin														
	2010						1989/93					1989/93						2010									
Surface sample No.	IMOR-50a	IMOR-50b	IMOR_WP 384	IMOR-60a	IMOR-60b	IMOR-61a	IMOR-1	IMOR-8	IMOR-9	IMOR-11	Webb (1980)-IMOR	IM-24	IM-25	IM-20	IM-21	IM-22	IM-23	IM-71	Webb (1980)-IM	Webb (1980)-IO	Taxa recorded also in arable plots	Designations as in Webb (1980)^			Introductions to Aran (Webb 1980
Relevé size (m2)	0.4	4	9	4	1	1	n/a	100	n/a	1		0.1	250	1	1	1	1	4							
Total herb cover (%)			100	25	20	40				98					100	100									
Total moss cover (%)	100			80	100	60																			
Total bare rock (%)																									
Pollen sample (ps) / Pollen spectrum (PS)	ps	ps		ps	ps	ps	PS	PS	PS	PS		PS	PS	PS	PS	PS	PS	ps							
Potentilla erecta									p		F								F	F		*N*	*M*	*S*	
Potentilla reptans	+*										F						+		A		$	*N*	*M*		
Ranunculus acris		1*						2			A								A	A		*N*	*M*	*S*	
Ranunculus bulbosus								2		p	A							+*	F	F	$	*N*	*M*	**S**	
Ranunculus repens		1*	1		+*	+*					A					+	+		A	A	$	*N*	*M*	S	
Rosa pimpinellifolia								1	p		A							1*	A	A		*N*	*M*	*S*	
Rubus fruticosus agg,						1		2			A	1				+			A	A		*N*	*M*	*S*	
Rumex acetosa								1			A	+					+		A	A	$	*N*	*M*	*S*	
Rumex conglomeratus		1									n/a								n/a	n/a	$	*N*	**M**	**S**	†
Rumex crispus											A					+			A	A	$	*N*	**M**	**S**	‡
Salix repens									p		O								O			*N*	*M*		
Sanguisorba minor							p		p		A								A	A		*N*	*M*	*S*	
Schoenus nigricans									p		FL								FL			*N*	**M**		
Senecio aquaticus		+									O								O	O		*N*	*M*	*S*	
Senecio jacobea	+									p	A						+		A	A		*N*	*M*	*S*	
Senecio vulgaris											F				+				F	F		*N*	*M*	*S*	
Sesleria caerulea									p													*N*	*M*	*S*	
Solanum tuberosum															+										
Taraxacum spp.								1			A	+	+			+			A	A	$	N	M	S	
Teucrium scorodonia											F								F	F		*N*	*M*	*S*	
Thymus polytrichus						+*	p	p			A								A	A		N	*M*	*S*	

Supp. Table SM-T2.2: Relevés and species lists — pasture		Inis Mór											Inis Meáin															
	2010						1989/93					1989/93						2010										
Surface sample No.	IMOR-50a	IMOR-50b	IMOR_WP 384	IMOR-60a	IMOR-60b	IMOR-61a	IMOR-1	IMOR-8	IMOR-9	IMOR-11	Webb (1980)-IMOR	IM-24	IM-25	IM-20	IM-21	IM-22	IM-23	IM-71	Webb (1980)-IM	Webb (1980)-IO	Taxa recorded also in arable plots	Designations as in Webb (1980)^			Introductions to Aran (Webb 1980
Relevé size (m2)	0.4	4	9	4	1	1	n/a	100	n/a	1		0.1	250	1	1	1	1	4							
Total herb cover (%)			100	25	20	40				98					100	100									
Total moss cover (%)	100			80	100	60																			
Total bare rock (%)																									
Pollen sample (ps) / Pollen spectrum (PS)	ps	ps		ps	ps	ps	PS	PS	PS	PS		PS	PS	PS	PS	PS	PS	ps							
Trifolium dubium			+								A					1			A	A	$	*N*	*M*	*S*	
Trifolium pratense	1*		+	+*	+*	1*		2			F				+	+			F	F	$	*N*	*M*	*S*	
Trifolium repens		2*	2	+	+*					p	A		1	1	1	1	1*	1*	A	A	$	*N*	*M*	*S*	
Veronica chamaedrys								2			A								A	A		*N*	*M*	*S*	
Veronica sp.												+	1									N	M	S	
Viola sp.				+					p													N	M	S	
FERN																									
Asplenium scolopendrium								2			**A**								**A**	**A**		*N*	*M*	*S*	
Pteridium aquilinum								3	p	p	A								A	A		*N*	*M*	*S*	
MOSSES																									
cf. Brachythecium				3											+										
Calliergonella cuspidata	5											1						+							
Dicranum scoparium							3		5																
Plagiochilla asplenoides												4													
Pseudoscleropodium purum								3		5															
Rhytidiadelphus squarrosus				3	5	4							5	3			2	5							
Bryales sp.																+									
No of higher flowering plants and ferns →	14	11	17	15	14	16	7	22	21	16		6	7	7	16	24	10	12							
91	Total no. of higher plants & ferns recorded																								

Supp. Table SM-T2.2: Relevés and species lists — pasture		Inis Mór										Webb (1980)-IMOR		Inis Meáin								Webb (1980)-IM		Webb (1980)-IO	Taxa recorded also in arable plots		Designations as in Webb (1980)^		Introductions to Aran (Webb 1980
		2010						1989/93						1989/93						2010										
Surface sample No.	IMOR-50a	IMOR-50b	IMOR_WP 384	IMOR-60a	IMOR-60b	IMOR-61a	IMOR-1	IMOR-8	IMOR-9	IMOR-11			IM-24	IM-25	IM-20	IM-21	IM-22	IM-23	IM-71										
Relevé size (m2)	0.4	4	9	4	1	1	n/a	100	n/a	1			0.1	250	1	1	1	1	4										
Total herb cover (%)			100	25	20	40				98						100	100												
Total moss cover (%)	100			80	100	60																							
Total bare rock (%)																													
Pollen sample (ps) / Pollen spectrum (PS)	ps	ps		ps	ps	ps	PS	PS	PS	PS			PS	PS	PS	PS	PS	PS	ps										
Notes																													
Braun-Blanquet cover/abundance scale +, 1-5; value given where c/a values recorded																													
otherwise presence only indicated (by p)																													
*: flowering																													
PS / ps: pollen sample collected; analysed / not analysed																													
Webb (1980) categories (modified)	Abb.	Comment																											
Abundant	A																												
Abundant but local	AL																												
Frequent	F																												
Frequent but local	FL																												
Occasional to frequent	O-F																												
Occasional	O																												
Rare	R	this additional category has been added																											
Unsure of abundance/frequency	n/a	this additional category has been added where we are unsure of abundance/frequency on the particular island																											
Rejected as errors or requiring confirm	E	No voucher specimens retained																											
Maroon colour used to highlight sp. that differ in abundance/freq. on the islands																													
Above 'Webb' categories are given for Inis Mór, Inis Meáin and Inis Oírr (Webb-IMOR, -IM and -IO, respectively)																													
Species names in CAPITALS: plants not hitherto recorded for the islands (except in a few cases as dots in the Atlas); this designation has not been used (to avoid possible c																													
^Plant record designations (after Webb 1980):																													
N: Inishmore; M: Inishmaan; S: Inisheer																													
Bold: species had not been recorded before for that island; e.g. **N**																													
Lower case instead of capitals: failed to confirm an old record for that island (but no reason to doubt the record); e.g. n																													

Supp. Table SM-T2.2: Releves and species lists — pasture		Inis Mór										Webb (1980)-IMOR		Inis Meáin							Webb (1980)-IM	Webb (1980)-IO	Taxa recorded also in arable plots	Designations as in Webb (1980)^	Introductions to Aran (Webb 1980
		2010						1989/93						1989/93						2010					
Surface sample No.	IMOR-50a	IMOR-50b	IMOR_WP 384	IMOR-60a	IMOR-60b	IMOR-61a	IMOR-1	IMOR-8	IMOR-9	IMOR-11			IM-24	IM-25	IM-20	IM-21	IM-22	IM-23	IM-71					
Relevé size (m2)	0.4	4	9	4	1	1	n/a	100	n/a	1			0.1	250	1	1	1	1	4					
Total herb cover (%)			100	25	20	40				98						100	100							
Total moss cover (%)	100			80	100	60																		
Total bare rock (%)																								
Pollen sample (ps) / Pollen spectrum (PS)	ps	ps		ps	ps	ps	PS	PS	PS	PS			PS	PS	PS	PS	PS	PS	ps					
Capital letters in italics indicate an old record which we confirmed; e.g. *N*																								
Introductions (to Aran Islands; not Ireland) (after Webb 1980):																								
Certainly	#																							
Probably	‡																							
Possibly	†																							
Sampling details																								
27– 30 July, 1989: MO'C on Inis Mór; collected surface samples and made vegetation descriptions at/near sampling sites																								
08/08/1992: MO'C (with A. Bleasdale) visited Inis Meáin; recorded relevés and took surface samples																								
4–5 May 1993: MO'C revisited sites on Inis Mór that were sampled in 1989; additional notes made (info. merged with 1989 data - hence designation 1989/93)																								
10, 11 & 15 June, 2010: KM and MO'C on Inis Mór. Vegetation descriptions made and surface samples collected																								
16/06/2010: KM and MO'C on Inis Meáin. Vegetation descriptions made and surface samples collected																								
11/08/2010: MO'C (with B. Ghilardi) on Inis Oírr. The island was traversed and arable fields noted																								
Note:																								
re. Webb 1980 *Journal of Life Sciences* paper: a 'CONSOLIDATED FLORA list' is appended to a pdf of Webb (1980).																								
Webb 1980 paper and the consolidated flora list is available at:																								
http://botanicgardens.ie/herb/books/webbaran.pdf																								
Information in Webb 1980 paper is used in the compilations given in this EXCEL file																								

Supp. Table SM-T2.2: Relevés and species lists — pasture						
Surface sample No.	**Comments incl. remarks on distribution after Webb (1980)**					
Relevé size (m2)			Grasses (non-cultivated) & Plantago			
Total herb cover (%)			Tall woody sp.			
Total moss cover (%)			Potato (crop plant)			
Total bare rock (%)						
Pollen sample (ps) / Pollen spectrum (PS)						
Achillea millefolium	Webb: widespread, but nowhere abundant					
Agrostis stolonifera						
Ammophila arenaria	Webb: abundant on Cill Éinne (Killeany) dunes; local elsewhere; planted at airstip on Inis Meáin					
Antennaria dioica	Webb: frequent on pavements					
Anthoxanthum odoratum	Webb: widespread but rather local					
Anthriscus sylvestris						
Anthyllis vulneraria	Webb: abundant, though somewhat local					
Armeria maritima						
Arrhenatherum elatius						
Avenula pubescens						
Bellis perennis						
Blackstonia perfoliata	Webb: occasional in E. Inis Mór; rare in IM; occasional on IO					
Brassica sp.	Webb: B. rapa very frequent on roadsides and fields; may be recent introduction					
Bromus hordeaceus						
Calluna vulgaris	Webb: widespread on pavement but nowhere abundand; assoc. sp. but rarer: E. cinerea					
Campanula rotundifolia	Webb: locally frequent; apt discription as observed by us					
Cardamine pratensis						
Carex arenaria	Webb: abundant in the main dune-systems					
Carex panicea						
Carex spp.						

Supp. Table SM-T2.2: Relevés and species lists — pasture						
Surface sample No.	**Comments incl. remarks on distribution after Webb (1980)**					
Relevé size (m2)			Grasses (non-cultivated) & Plantago			
Total herb cover (%)			Tall woody sp.			
Total moss cover (%)			Potato (crop plant)			
Total bare rock (%)						
Pollen sample (ps) / Pollen spectrum (PS)						
Carlina vulgaris						
Centaurea nigra						
Centaurea scabiosa						
Cerastium fontanum						
Cerastium spp						
Cirsium vulgare						
Crepis capillaris						
Crepis cf. vesicaria						
Cynosurus cristatus						
Dactylis glomerata						
Danthonia decumbens						
Daucus carota						
Eleocharis palustris						
Euphrasia sp.	Webb lists several Euphrasia spp. incl. E. salisburgensis (widespread on pavement)					
Festuca ovina						
Festuca rubra						
Festuca sp						
Filipendula ulmaria						
Galium verum						
Gentiana verna	Webb suggests widespread but not frequent. Flowering specimens seen by MO'C on 8/04/2007 on high plateau on IM					
Geranium molle						

Supp. Table SM-T2.2: Relevés and species lists — pasture						
Surface sample No.	**Comments incl. remarks on distribution after Webb (1980)**					
Relevé size (m2)			Grasses (non-cultivated) & Plantago			
Total herb cover (%)			Tall woody sp.			
Total moss cover (%)			Potato (crop plant)			
Total bare rock (%)						
Pollen sample (ps) / Pollen spectrum (PS)						
Geranium robertianum						
Geranium sanguineum	Webb: extremely abundant on pavement; also pastures on relatively deep soil					
Hedera helix	Webb: abundant; esp. inland cliffs					
Helianthemum canum	Webb: widespread on pavement, though local. MO'C: in W half of IMOR, in parts extensive, dominant and flowering vigorously (1/06/2003)					
Heracleum spondylium						
Holcus lanatus						
Hydrocotyle vulgaris						
Hypochoeris radicata						
cf. Leontodon						
Leucanthemum vulgare						
Listera ovata						
Lolium perenne						
Lotus corniculatus						
Luzula campestris						
Medicago lupulina						
Orchis mascula						
Orobanche minor	Webb: can be very abundant; probably intorduced to Aran early 1900s					
Hieracium pilosella						
Plantago lanceolata						
Polygonum aviculare						
Potentilla anserina	Webb: abundant especially in the small turloughs					

Supp. Table SM-T2.2: Relevés and species lists — pasture						
Surface sample No.	**Comments incl. remarks on distribution after Webb (1980)**					
Relevé size (m2)			Grasses (non-cultivated) & Plantago			
Total herb cover (%)			Tall woody sp.			
Total moss cover (%)			Potato (crop plant)			
Total bare rock (%)						
Pollen sample (ps) / Pollen spectrum (PS)						
Potentilla erecta	Webb: frequent on pavement and in grassland					
Potentilla reptans	Webb remarks on its unexpected absence from IO					
Ranunculus acris						
Ranunculus bulbosus	Webb: Abundant on dunes and in sandy fields on Inis Mór; rarer elsewhere					
Ranunculus repens						
Rosa pimpinellifolia						
Rubus fruticosus agg,						
Rumex acetosa						
Rumex conglomeratus						
Rumex crispus	Webb: possibly introduced to Aran in early 1900s					
Salix repens	Webb: occasional on pavement; occasional records also for other Salix spp.					
Sanguisorba minor	Webb: much more common than in the Burren					
Schoenus nigricans	Webb: locally frequent on the pavement [in depressions, grykes]					
Senecio aquaticus						
Senecio jacobea						
Senecio vulgaris						
Sesleria caerulea	Webb: very abundant throughout (*S. albicans*)					
Solanum tuberosum						
Taraxacum spp.						
Teucrium scorodonia	Webb: very frequent on pavement and in lanes					
Thymus polytrichus	Webb: abundant everywhere					

Supp. Table SM-T2.2: Relevés and species lists — pasture						
Surface sample No.	**Comments incl. remarks on distribution after Webb (1980)**					
Relevé size (m2)			Grasses (non-cultivated) & Plantago			
Total herb cover (%)			Tall woody sp.			
Total moss cover (%)			Potato (crop plant)			
Total bare rock (%)						
Pollen sample (ps) / Pollen spectrum (PS)						
Trifolium dubium						
Trifolium pratense						
Trifolium repens						
Veronica chamaedrys						
Veronica sp.	Webb: records for several Veronica spp.					
Viola sp.						
FERN						
Asplenium scolopendrium	Phyllitis scolopendrium					
Pteridium aquilinum	Webb: abundunt despite calcifuge tendencies					
MOSSES						
cf. Brachythecium						
Calliergonella cuspidata						
Dicranum scoparium						
Plagiochilla asplenoides						
Pseudoscleropodium purum						
Rhytidiadelphus squarrosus						
Bryales sp.						
No of higher flowering plants and ferns →						
91						

Supp. Table SM-T2.2: Relevés and species lists — pasture						
Surface sample No.	**Comments incl. remarks on distribution after Webb (1980)**					
Relevé size (m2)			Grasses (non-cultivated) & Plantago			
Total herb cover (%)			Tall woody sp.			
Total moss cover (%)			Potato (crop plant)			
Total bare rock (%)						
Pollen sample (ps) / Pollen spectrum (PS)						
Notes						
Braun-Blanquet cover/abundance scal						
otherwise presence only indicated (by						
*: flowering						
PS / ps: pollen sample collected; analy						
Webb (1980) categories (modified)						
Abundant						
Abundant but local						
Frequent						
Frequent but local						
Occasional to frequent						
Occasional						
Rare						
Unsure of abundance/frequency						
Rejected as errors or requiring confirm						
Maroon colour used to highlight sp. tha						
Above 'Webb' categories are given for						
Species names in CAPITALS: plants ɒnfusion)						
^Plant record designations (after W						
N: Inishmore; M: Inishmaan; S: Inishee						
Bold: species had not been recorded						
Lower case instead of capitals: failed t						

Supp. Table SM-T2.2: Relevés and species lists — pasture						
Surface sample No.	**Comments incl. remarks on distribution after Webb (1980)**					
Relevé size (m2)			Grasses (non-cultivated) & Plantago			
Total herb cover (%)			Tall woody sp.			
Total moss cover (%)			Potato (crop plant)			
Total bare rock (%)						
Pollen sample (ps) / Pollen spectrum (PS)						
Capital letters in italics indicate an old						
Introductions (to Aran Islands; not Irela						
Certainly						
Probably						
Possibly						
Sampling details						
27– 30 July, 1989: MO'C on Inis Mór;						
08/08/1992: MO'C (with A. Bleasdale) visit						
4–5 May 1993: MO'C revisited sites or						
10, 11 & 15 June, 2010: KM and MO'C						
16/06/2010: KM and MO'C on Inis Mea						
11/08/2010: MO'C (with B. Ghilardi) or						
Note:						
re. Webb 1980 *Journal of Life Science*						
Webb 1980 paper and the consolidate						
http://botanicgardens.ie/herb/books/we						
Information in Webb 1980 paper is use						

Supp. Table SM-T2.3: Relevés and species lists — pavement	Inis Mór										Webb (1980)-IMO	Inis Meáin		Webb (1980)-IM	Webb (1980)-IO	Taxa recorded only in this set of relevés	Designations as in Webb (1980)^ (only for taxa not in other lists)			Introductions to Aran (Webb 1980)
	2010											1992								
Surface sample No.	IMOR-57b	IMOR-51a	IMOR-51b	IMOR-52a	IMOR-52b	IMOR-62	IMOR-2	IMOR-3/4	IMOR-10	IMOR-12		IM-26a/b	IM-27							
Relevé size (m2)	4	1	25	1	25	0.5				9										
Total herb cover (%)						30														
Total moss cover (%)				80		90														
Bare rock (%)							40	80		80										
Total cover (%)		8	8		10															
Pollen sample (ps) / Pollen spectrum (PS)	ps	ps	ps	ps	ps	ps	PS	PS		PS		PS	PS							
Achillea millefolium	+					+		p												
Anthoxanthum odoratum	+					+														
Anthyllis vulneria	+*																			
Armeria maritima																				
Bellis perennis							p*	p*												
Briza media	1*										AL			F	R	&	*N*	**M**	**S**	†
Calluna vulgaris						1														
Campanula rotundifolia									p	p										
Carex flacca						+					A			A	A	&	*N*	*M*	*S*	
Carex panicea	1*		+*		p*															
Carex spp.							p		p											
Carlina vulgaris	+																			
Centaurea nigra	+																			
Cerastium arvense								p*												
Cerastium sp.	+*																			
Corylus avellana									p	p	F			R		&	*N*	*M*	*s*	
Crepis cf. vesicaria																				
Cynosurus cristatus	1*							p*												
Dactylorhiza incarnata	+*										R					&	**N**			
Euonymus europaeus									p		O			O	O	&	*N*	*M*	*S*	
Eupatorium cannabinum		+	1*		p						F			F	F	&	*N*	*M*	*S*	

Supp. Table SM-T2.3: Relevés and species lists — pavement	**Inis Mór**										Webb (1980)-IMO	**Inis Meáin**		Webb (1980)-IM	Webb (1980)-IO	Taxa recorded only in this set of relevés	Designations as in Webb (1980)^ (only for taxa not in other lists)			Introductions to Aran (Webb 1980)
	2010											**1992**								
Surface sample No.	IMOR-57b	IMOR-51a	IMOR-51b	IMOR-52a	IMOR-52b	IMOR-62	IMOR-2	IMOR-3/4	IMOR-10	IMOR-12		IM-26a/b	IM-27							
Relevé size (m2)	4	1	25	1	25	0.5				9										
Total herb cover (%)						30														
Total moss cover (%)				80		90														
Bare rock (%)							40	80		80										
Total cover (%)		8	8		10															
Pollen sample (ps) / Pollen spectrum (PS)	ps	ps	ps	ps	ps	ps	PS	PS		PS		PS	PS							
Euphrasia sp	+*																			
Festuca rubra																				
Festuca spp		+*				1*		p												
Galium verum	+*					1														
Geranium robertianum			+*							p										
Geranium sanguineum	2*	+*	1*		p*	1*		p*												
Hedera helix			+	1	1			p	p											
Heracleum sphondylium					p*															
Helianthemum canum	1*								p											
Hypochoeris radicata			+*																	
Leontodon sp						+*														
Linum catharticum	2*										A			A	A	&	*N*	*M*	*S*	
Leucanthemum vulgare										p										
Lonicera periclymenum			+*		p*				p		A	p		A	A	&	*N*	*M*	*S*	
Lotus corniculatus	1*					1*		p*												
Luzula campestris								p												
Phyllitis scolopendrium			+					p*												
Pilosella vulgaris	1*																			
Plantago lanceolata					p*	+*		p*												
Plantago maritima		+*																		
Potentilla erecta	+*				p*															
Polygala vulgaris	+*																			

Supp. Table SM-T2.3: Relevés and species lists — pavement	Inis Mór										Webb (1980)-IMO	Inis Meáin		Webb (1980)-IM	Webb (1980)-IO	Taxa recorded only in this set of relevés	Designations as in Webb (1980)^ (only for taxa not in other lists)			Introductions to Aran (Webb 1980)
	2010											1992								
Surface sample No.	IMOR-57b	IMOR-51a	IMOR-51b	IMOR-52a	IMOR-52b	IMOR-62	IMOR-2	IMOR-3/4	IMOR-10	IMOR-12		IM-26a/b	IM-27							
Relevé size (m2)	4	1	25	1	25	0.5				9										
Total herb cover (%)						30														
Total moss cover (%)				80		90														
Bare rock (%)							40	80		80										
Total cover (%)		8	8		10															
Pollen sample (ps) / Pollen spectrum (PS)	ps	ps	ps	ps	ps	ps	PS	PS		PS		PS	PS							
Primula vulgaris	+*							p												
Prunus spinosa			1	4*	4*		p	p		p	F			F	F	&	*N*	*M*	*S*	
Ranunculus bulbosus							p*													
Rhinanthus minor	+*																			
Rosa pimpinellifolia	+*		1*		p*			p		p										
Rubus caesius			+								F			F	F	&	*N*	*M*	*s*	
Rubus fruticosus agg.		+		+	+			p		p			p							
Rumex acetosa								p												
Sanguisorba minor	1*					+*														
Saxifraga rosacea							p*	p*			F			F	F	&	*N*	*M*	*S*	
Senecio jacobea										p										
Senecio vulgaris	1*																			
Sesleria albicans			+*		p*	1*	p*	p*				p								
Succisa pratensis	1										F			F	F	&	*N*	*M*	*S*	
Taraxacum sp								p												
Teucrium scorodonia					p					p			p							
Thymus polytrichus	+*					+*	p	p	p											
Vicia sepium					p*						O			O	O	&	*N*	*M*	*S*	
Viola sp.												p								
FERNS																				
Polypodium vulgare agg.								p		p	F			F	F	&	N	M	S	

Supp. Table SM-T2.3: Relevés and species lists — pavement	Inis Mór										Webb (1980)-IMO	Inis Meáin		Webb (1980)-IM	Webb (1980)-IO	Taxa recorded only in this set of relevés	Designations as in Webb (1980)^ (only for taxa not in other lists)	Introductions to Aran (Webb 1980)
	2010											1992						
Surface sample No.	IMOR-57b	IMOR-51a	IMOR-51b	IMOR-52a	IMOR-52b	IMOR-62	IMOR-2	IMOR-3/4	IMOR-10	IMOR-12		IM-26a/b	IM-27					
Relevé size (m2)	4	1	25	1	25	0.5				9								
Total herb cover (%)						30												
Total moss cover (%)				80		90												
Bare rock (%)							40	80		80								
Total cover (%)		8	8		10													
Pollen sample (ps) / Pollen spectrum (PS)	ps	ps	ps	ps	ps	ps	PS	PS		PS		PS	PS					
Pteridium aquilinum									p				p					
MOSSES																		
Dicranum scoparium									3									
cf. Brachythecium						2												
Neckera crispa				3	3													
Homalothecium sericeum				1	1													
Hypnum jutlandicum						1												
Bryales (non-id; sp 2)												3						
No of higher flowering plants and ferns →	26	5	12	3	14	13	7	21	9	10		3	3					
64	Total no. of higher plants & ferns recorded																	
Notes																		
1, 2, etc: Braun-Blanquet c/a values																		
p: present																		
*: flowering																		
Pollen sample (ps) / Pollen spectrum (PS)	ps indicates sample collected & analysed																	
	PS indicates sample collected only																	
Notes																		

Supp. Table SM-T2.3: Relevés and species lists — pavement	Inis Mór										Webb (1980)-IMO	Inis Meáin		Webb (1980)-IM	Webb (1980)-IO	Taxa recorded only in this set of relevés	Designations as in Webb (1980)^ (only for taxa not in other lists)	Introductions to Aran (Webb 1980)
	2010											1992						
Surface sample No.	IMOR-57b	IMOR-51a	IMOR-51b	IMOR-52a	IMOR-52b	IMOR-62	IMOR-2	IMOR-3/4	IMOR-10	IMOR-12		IM-26a/b	IM-27					
Relevé size (m2)	4	1	25	1	25	0.5				9								
Total herb cover (%)						30												
Total moss cover (%)				80		90												
Bare rock (%)							40	80		80								
Total cover (%)		8	8		10													
Pollen sample (ps) / Pollen spectrum (PS)	ps	ps	ps	ps	ps	ps	PS	PS		PS		PS	PS					
Braun-Blanquet cover/abundance scale +, 1-5; value given where c/a values recorded																		
otherwise presence only indicated (by p)																		
+: flowering																		
PS / ps: pollen sample collected; analysed / not analysed																		
Webb (1980) categories (modified)	Abb.	Comment																
Abundant	A																	
Abundant but local	AL																	
Frequent	F																	
Frequent but local	FL																	
Occasional to frequent	O-F																	
Occasional	O																	
Rare	R	this additional category has been added																
Unsure of abundance/frequency	n/a	this additional category has been added where we are unsure of abundance/frequency on the particular is																
Rejected as errors or requiring confirmation	E	No voucher specimens retained																
Maroon colour used to highlight sp. that differ in abundance/freq. on the islands																		
Above 'Webb' categories are given for Inis Mór, Inis Meáin and Inis Oírr (Webb-IMOR, -IM and -IO, respectively)																		
Species names in CAPITALS: plants not hitherto recorded for the islands (except in a few cases as dots in the Atlas); this designation has not been used (t																		
^Plant record designations (after Webb 1980):																		
N: Inishmore; M: Inishmaan; S: Inisheer																		
Bold: species had not been recorded before for that island; e.g. **N**																		
Lower case instead of capitals: failed to confirm an old record for that island (but no reason to doubt the record); e.g. n																		
Capital letters in italics indicate an old record which we confirmed; e.g. *N*																		

Supp. Table SM-T2.3: Relevés and species lists — pavement	**Inis Mór**										Webb (1980)-IMO	**Inis Meáin**		Webb (1980)-IM	Webb (1980)-IO	Taxa recorded only in this set of relevés	Designations as in Webb (1980)^ (only for taxa not in other lists)		Introductions to Aran (Webb 1980)
	2010											**1992**							
Surface sample No.	IMOR-57b	IMOR-51a	IMOR-51b	IMOR-52a	IMOR-52b	IMOR-62	IMOR-2	IMOR-3/4	IMOR-10	IMOR-12		IM-26a/b	IM-27						
Relevé size (m2)	4	1	25	1	25	0.5				9									
Total herb cover (%)						30													
Total moss cover (%)				80		90													
Bare rock (%)							40	80		80									
Total cover (%)		8	8		10														
Pollen sample (ps) / Pollen spectrum (PS)	ps	ps	ps	ps	ps	ps	PS	PS		PS		PS	PS						
Introductions (to Aran Islands; not Ireland) (after Webb 1980):																			
Certainly	#																		
Probably	‡																		
Possibly	†																		
Note:																			
re. Webb 1980 *Journal of Life Sciences* paper: a 'CONSOLIDATED FLORA list' is appended to a pdf of Webb (1980).																			
Webb 1980 paper and the consolidated flora list is available at:																			
http://botanicgardens.ie/herb/books/webbaran.pdf																			
Information in Webb 1980 paper is used in the compilations given in this EXCEL file																			

Supp. Table SM-T2.3: Relevés and species lists — pavement						
Surface sample No.	**Comments** **incl. remarks on distribution after Webb (1980)** (only for taxa not in other lists)					
Relevé size (m2)						
Total herb cover (%)			Grasses & Plantago			
Total moss cover (%)			Tall woody sp.			
Bare rock (%)						
Total cover (%)						
Pollen sample (ps) / Pollen spectrum (PS)						
Achillea millefolium						
Anthoxanthum odoratum						
Anthyllis vulneria						
Armeria maritima						
Bellis perennis						
Briza media	Webb: abundant only in places on IMOR; widespread on IM; in only 1 small hollow on IO					
Calluna vulgaris						
Campanula rotundifolia						
Carex flacca	Webb: very abundant & luxuriant on pavement					
Carex panicea						
Carex spp.						
Carlina vulgaris						
Centaurea nigra						
Cerastium arvense						
Cerastium sp.						
Corylus avellana	Webb: F on IMOR, where sheltered forms small patches of scrub (MO'C: more important than this might convey); R on IM; apparently extinct on IO					
Crepis cf. vesicaria						
Cynosurus cristatus						
Dactylorhiza incarnata	Webb: a few plants at An Turlach Mór (Turloughmore)					
Euonymus europaeus	Webb: usually stunted due to grazing					
Eupatorium cannabinum						

Supp. Table SM-T2.3: Relevés and species lists — pavement						
Surface sample No.	**Comments** **incl. remarks on distribution after Webb (1980)** (only for taxa not in other lists)					
Relevé size (m2)						
Total herb cover (%)			Grasses & Plantago			
Total moss cover (%)			Tall woody sp.			
Bare rock (%)						
Total cover (%)						
Pollen sample (ps) / Pollen spectrum (PS)						
Euphrasia sp						
Festuca rubra						
Festuca spp						
Galium verum						
Geranium robertianum						
Geranium sanguineum						
Hedera helix						
Heracleum sphondylium						
Helianthemum canum						
Hypochoeris radicata						
Leontodon sp						
Linum catharticum						
Leucanthemum vulgare						
Lonicera periclymenum	Webb: very abundant on pavement and in walls					
Lotus corniculatus						
Luzula campestris						
Phyllitis scolopendrium						
Pilosella vulgaris						
Plantago lanceolata						
Plantago maritima						
Potentilla erecta						
Polygala vulgaris						

Supp. Table SM-T2.3: Relevés and species lists — pavement						
Surface sample No.	**Comments** **incl. remarks on distribution after Webb (1980)** (only for taxa not in other lists)					
Relevé size (m2)						
Total herb cover (%)			Grasses & Plantago			
Total moss cover (%)			Tall woody sp.			
Bare rock (%)						
Total cover (%)						
Pollen sample (ps) / Pollen spectrum (PS)						
Primula vulgaris						
Prunus spinosa	Webb: very frequent on pavement, though usually stunted, much the commonest shrub					
Ranunculus bulbosus						
Rhinanthus minor						
Rosa pimpinellifolia						
Rubus caesius	Webb: very frequent on pavement					
Rubus fruticosus agg.						
Rumex acetosa						
Sanguisorba minor						
Saxifraga rosacea	Webb: frequent and locally abundant on pavement & roadsides					
Senecio jacobea						
Senecio vulgaris						
Sesleria albicans						
Succisa pratensis						
Taraxacum sp						
Teucrium scorodonia						
Thymus polytrichus						
Vicia sepium						
Viola sp.						
FERNS						
Polypodium vulgare agg.	Webb: P. cambricum (P. australe) very frequent; P. interjectum - a few plants seen					

Supp. Table SM-T2.3: Relevés and species lists — pavement						
Surface sample No.	**Comments** **incl. remarks on distribution after Webb (1980)** (only for taxa not in other lists)					
Relevé size (m2)						
Total herb cover (%)			Grasses & Plantago			
Total moss cover (%)			Tall woody sp.			
Bare rock (%)						
Total cover (%)						
Pollen sample (ps) / Pollen spectrum (PS)						
Pteridium aquilinum						
MOSSES						
Dicranum scoparium						
cf. Brachythecium						
Neckera crispa						
Homalothecium sericeum						
Hypnum jutlandicum						
Bryales (non-id; sp 2)						
No of higher flowering plants and ferns →						
64						
Notes						
1, 2, etc: Braun-Blanquet c/a values						
p: present						
*: flowering						
Pollen sample (ps) / Pollen spectrum (PS)						
Notes						

Supp. Table SM-T2.3: Relevés and species lists — pavement						
Surface sample No.	**Comments** **incl. remarks on distribution after Webb (1980)** (only for taxa not in other lists)					
Relevé size (m2)						
Total herb cover (%)			Grasses & Plantago			
Total moss cover (%)			Tall woody sp.			
Bare rock (%)						
Total cover (%)						
Pollen sample (ps) / Pollen spectrum (PS)						
Braun-Blanquet cover/abundance scale +, 1						
otherwise presence only indicated (by p)						
+: flowering						
PS / ps: pollen sample collected; analysed /						
Webb (1980) categories (modified)						
Abundant						
Abundant but local						
Frequent						
Frequent but local						
Occasional to frequent						
Occasional						
Rare						
Unsure of abundance/frequency	and					
Rejected as errors or requiring confirmation						
Maroon colour used to highlight sp. that diffe						
Above 'Webb' categories are given for Inis M						
Species names in CAPITALS: plants not hith	o avoid possible confusion)					
^Plant record designations (after Webb 1						
N: Inishmore; M: Inishmaan; S: Inisheer						
Bold: species had not been recorded before						
Lower case instead of capitals: failed to cont						
Capital letters in italics indicate an old record						

Supp. Table SM-T2.3: Relevés and species lists — pavement						
Surface sample No.	**Comments** **incl. remarks on distribution after Webb (1980)** (only for taxa not in other lists)					
Relevé size (m2)						
Total herb cover (%)			Grasses & Plantago			
Total moss cover (%)			Tall woody sp.			
Bare rock (%)						
Total cover (%)						
Pollen sample (ps) / Pollen spectrum (PS)						
Introductions (to Aran Islands; not Ireland) (a						
Certainly						
Probably						
Possibly						
Note:						
re. Webb 1980 *Journal of Life Sciences* pap						
Webb 1980 paper and the consolidated flora						
http://botanicgardens.ie/herb/books/webbara						
Information in Webb 1980 paper is used in tl						

Supp. Table SM-T2.4: Overview of rare weeds of cereal fields, incl. distribution and history

Species	Curtis et al. 1988	Bleasdale 1994	Distribution - Ireland	Distribution - Great Britain	Rare plant evaluation (Ireland Red List)
Avena strigosa (bristle oat)	IMOR, IM, IO	IMOR, IM, IO	Scattered records, mainly from NE Ireland	Predominantly Outer Hebrides; also Shetlands; otherwise a scatter of records	Least Concern
Bromus racemosus (smooth brome)	IM	Single record for *B. commutatus* (c/a: 1) recorded; this may be regarded as a subspecies of *B. racemosus* (Wyse-Jackson et al. 2016)	Scattered records; several old records from SW Ireland; new records from SE & NW central Ireland	Predominantly S & E England	Near Threatened
Centaurea cyanus (cornflower)	IMOR	In 1 relevé from IMOR (presumably relevé from Curtis et al 1988). In all 109 relevés from arable plots	Rare and thought to have been extinct until recorded by Curtis et al. 1988. Sheehy Skeffington (2015) reported several flowering specimens in 08/2013 in two fields at Finavarra, N. Clare. Two flowering specimens noted on a wide strip of gravel at road edge (land side of substantial shingle on upper shore) at Flaggy Shore, Finavarra (53.15903°, -9.09319°) on 27/05/2018; may be recent introductions (M. O'Connell, unpublished)	Many records from England; distinctly fewer from Wales & Scotland	Waiting List
Lolium temulentum (darnel)	IMOR, IM, IO	In 61% of the relevés (mainly rye but also oat fields with *A. fatua*); frequent with c/a value of 2; occasionally a c/a value of 3, i.e. it can be co-dominant with rye	Few and scattered records from Ireland. Recent record from east Cos. Mayo and Limerick (BSBI Plant Atlas 2018)	Old records mainly from England. Very few recent records	Endangered
Stachys arvensis (field woundwort)		IM	Webb (1980) considered it to be extinct; he noted old records from IMOR & IO. Several recent records from SE Ireland; otherwise, occasional only	Mainly England (esp. S & SW) and Wales (esp. W)	Least Concern
Key to abbreviations					
IMOR	Inis Mór				
IM	Inis Meáin				
IO	Inis Oírr				
Terminology					
AN	Neophyte, alien introduced after 1500				
AR	Archaeophyte, alien introduced before 1500				
Ant	Anthropocore: a plant that is spread humans either deliberately (as crops) or accidentally (as weeds)				

Supp. Table SM-T2.4:	
Species	Overview of history
Avena strigosa (bristle oat)	Bleasdale (1994, p. 37): 'It is clear, however, that black oats or bristle oats [*A. strigosa*] have been cultivated in Ireland for centuries'
Bromus racemosus (smooth brome)	Native (Jebb 2017). Spalton (2002, p. 199): '*B. racemosus* occurs in wet pasture and old hay-meadows; it was formerly found in watermeadows. It is now rare in the British Isles because of habitat destruction'
Centaurea cyanus (cornflower)	Bleasdale (1994, p. 42) considered it not to have been 'anything other than occasional in the past one hundred years'. He and others (e.g. Jebb 2017; Sheehy Skeffington 2015) regard it as an archaeophyte. It is probably best regarded as an anthropocore (see Discussion)
Lolium temulentum (darnel)	Archaeophyte (Jebb 2017). Once frequent; rapid decline in 20th century; it was presumed to be extinct in Ireland prior to finds on Aran Islands (Curtis et al. 1988). It is assumed to be still present on Aran, and especially on IM
Stachys arvensis (field woundwort)	Archaeophyte (Jebb 2017)
Key to abbreviations	
IMOR	
IM	
IO	
Terminology	
AN	
AR	
Ant	

Supp. Table SM-T2.5: Co-ordinates and other details relating to relevés and species lists

Sample No.	Co-ordinates (WGS84)	Altitude (m, asl)	Location	Date sampled	Sampled by	Pollen data	Arable type	Field / part of field (Plot)	Additional information	Key to arable types
										Rye
Arable										Potato
IMOR-53	53.1483, -9.77862	3	On coast, to north of Na Seacht dTeampaill	10/06/2010	KM & MO'C	ps		Fallow		Fallow
IMOR-54	53.1321, -9.74604	4	Cill Mhuirbhigh (East)	10/06/2010	KM & MO'C	ps		Potato plot		
IMOR-55	53.13282, -9.74547	5	Cill Mhuirbhigh (East)	10/06/2010	KM & MO'C	ps		Plot		
IMOR-56	53.13251, -9.74548	6	Cill Mhuirbhigh (East)	10/06/2010	KM & MO'C	ps		Plot		
IMOR_WP 469	53.12831, -9.74316	13	Bothar Ghort na gCapall (w side of road; beside new house)	15/06/2010	KM & MO'C				Comments on the potato plot	
IMOR_WP 470	53.12835, -9.74334	13	Bothar Ghort na gCapall; a rye plot, same field as potato crop (WP 4	15/06/2010	KM & MO'C			Plot		
IMOR-61b	53.12866, -9.75233	4	Poll an Chapaill (rye crop)	15/06/2010	KM & MO'C	ps		Plot	Comments on the rye crop, etc.	
IMOR-7	53.13206, -9.684	12	Teampall Chiaráin: rye field to NE of monastic remains	27/07/1989	MO'C	PS		Field	Additional details	
IM-70a	53.09466, -9.57358	2	Loch na gCadhan area (1st rye field to west of airstrip)	16/06/2010	KM & MO'C	ps		Plot	Additional details	
IM-70b	53.09451, -9.57364	2	Loch na gCadhan area (nr. 70a; fallow; formerly rye & potat	16/06/2010	KM & MO'C	–		Fallow	Additional details	
IM_WP 484	53.0971167, -9.57475(	2	Loch na gCadhan area (L-shaped field; formerly rye/potatoe	16/06/2010	KM & MO'C			Fallow	Additional details	
IM-72	53.08546, -9.59883	49	Cinn an Bhaile (main E-W rd.)	16/06/2010	KM & MO'C	ps		Fallow	Additional details	
Pasture										
IMOR-50a	53.14339, -9.81374	33	Bun Gabhla (Turlach) (c. 9 m diameter with a swallow hole)	10/06/2010	KM & MO'C	ps			Additional spp in vicinity in comment	
IMOR-50b	53.14339, -9.81374	33	Bun Gabhla (Turlach) (c. 9 m diameter with a swallow hole)	10/06/2010	KM & MO'C	ps				
IMOR_WP 384										
IMOR-60a	53.12846, -9.74318	13	Bothar Ghort na gCapall (immediately to N of potato/rye field - WP 4	15/06/2010	KM & MO'C	ps			Additional spp in vicinity in comment	
IMOR-60b	53.12888, -9.74329	13	Bothar Ghort na gCapall; to N of 60a; in same pasture	15/06/2010	KM & MO'C	ps			Additional spp in vicinity in comment	
IMOR-61a	53.12886, -9.75265	5	Poll an Chapaill (within a meadow 15 N of a rye field)	15/06/2010	KM & MO'C	ps			Additional spp in vicinity in comment	
IMOR-1	53.12652, -9.76502	54	Dún Aonghasa (grassy area inside outer (4th) boundary wa	27/07/1989	MO'C	PS			Details in: SM-1_Aran_toponymy_ss-co-ordinates.xlsx	
IMOR-8	53.13193, -9.68485	16	Teampall Chiaráin (a well developed but low grassy sward i	27/07/1989	MO'C	PS				
IMOR-9	53.13361, -9.74283	10	Rye field on shore road to east of Port Mhuirbhigh (Kilmurv	27/07/1989	MO'C	PS			Details re. pollen sample location	
IMOR-11	53.12164, -9.6648	3	NE of Cill Rónáin; coastal location. Crop (A. sativa) 75% cu	27/07/1989	MO'C	PS				
IM-24	53.0852, -9.59858	52	W of Dún Chonchúir	08/08/1992	MO'C & AB	PS			Details re. location, etc.	
IM-25	53.08754, -9.59769	23	N of Dún Chonchúir	08/08/1992	MO'C & AB	PS			Details re. location, etc.	
IM-20	53.0956, -9.57277	3	Loch na gCadhan area (west of airstrip)	08/08/1992	MO'C & AB	PS			Details re. location, etc.	
IM-21	53.09566, -9.57304	3	Loch na gCadhan area (west of airstrip)	08/08/1992	MO'C & AB	PS			Details re. location, etc.	
IM-22	53.0956, -9.57277	3	Loch na gCadhan area (west of airstrip)	08/08/1992	MO'C & AB	PS			See details in IM-21	
IM-23	53.0953, -9.57375	2	Loch na gCadhan area (west of airstrip)	08/08/1992	MO'C & AB	PS			Details of pasture beside A. sativa	
IM-71	53.09433, -9.57381	9	Loch na gCadhan area (west of airstrip)	16/06/2010	KM & MO'C	ps			Details of grazed field	

Pavement											
IMOR-57b	53.13418, -9.74161	10	Fearann an Choirce (Oatquarter) (small area of pavement r	15/06/2010	KM & MO'C	ps			Additional spp. (outside releve)		
IMOR-51a	53.1403, -9.82476	14	Bun Gabhla (small releve; 1mx1m)	15/06/2010	KM & MO'C	ps					
IMOR-51b	53.1403, -9.82476	14	Bun Gabhla (large releve; 5mx5m; same area as IMOR_51	15/06/2010	KM & MO'C	ps			Details as IMOR-51a		
IMOR-52a	53.1407, -9.82411	15	Bun Gabhla (13 m to E of eastern wall of RF1 (as of 1989)	15/06/2010	KM & MO'C	ps			Additional details		
IMOR-52b	53.1407, -9.82411	15	Bun Gabhla (13 m to E of eastern wall of RF1 (as of 1989)	15/06/2010	KM & MO'C	ps			Details as IMOR-52a		
IMOR-62	53.12711, -9.71899	105	Carcair na Coille	15/06/2010	KM & MO'C	ps			Additional details		
IMOR-2	53.140587, -9.824383	20	Bun Gabhla; from 5 m outside rye field 1 (RF1)	27/07/1989	MO'C	PS			Details of spp.		
IMOR-3/4	53.140460, -9.824592	22	Bun Gabhla; on ± bare limestone (little vegetation)	27/07/1989	MO'C	PS			Details of spp.		
IMOR-10	53.12364, -9.71839	105	Carcair na Coille	27/07/1989	MO'C	PS			Details of spp.		
IMOR-12	53.1427, -9.77645	28	N of Dún Eoghanachta	27/07/1989	MO'C	PS			Details of spp.		
IM-26a/b	53.08936, -9.59683	13	Na Creaga Móra (southern edge)	08/08/1992	MO'C & AB	PS			See comment for further details		
IM-27	53.09263, -9.58342	19	Na Creaga Móra (northern edge)	08/08/1992	MO'C & AB	PS			See comment for further details		
Butterflies and moths											
Transparent burnet (Zygaena purpuralis)											
BunGabhla_100610_13_Thymus.jpg (also BunGabhla_100610_12_Thymus.jpg)											
53.141905, -9.823430		Bun Gabhla, Inis Mór, Aran Islands									
on Thymus polytrichus (T. drucei); date: 10/06/2010; photo: MO'C											
[images in folder: IMOR1_tele]											
Common blue butterfly (Polyommatus icarus) (female)											
IM_100616_T-88_rye3.jpg (also ....rye2 and ....rye1)											
53.085396, 9.598880		Cinn an Bhaile, Inis Meáin, Aran Islands									
on rye (several spikelets shedding pollen); date: 16/06/2010; photo: MO'C											
[images in folder: IM_tele]											
Above two species checked by Maria Long and ident. confirmed by Roy Anderson											

Supplementary Table 3 (SM-T3). Pollen taxa and possible sources of pollen: an overview with emphasis on taxa of specific interest

Pollen taxon	Main/potential pollen contributors	Present-day status*	Remarks (pollen representation, pollen sources^, etc.)
Arboreal pollen			
Alnus	*A. glutinosa*	No reliable record	Av.: 0.4%; freq. 50%; LD
Betula	*B. pubescens*	Not recorded	Av.: 0.8%; freq. 65%; LD
Corylus	*C. avellana*	Frequent, esp. on Inis Mór	Av.: 1.1%; freq. 75%; Extra-L and R
Picea	*P. abies, P. sitchensis*	Not recorded in Webb but a low (young) specimen noted near VC by MO'C	In IMOR-12 and IM-26b, 1% and 0.7%, respectively, recorded; LD
Pinus	*P. sylvestris, P. contorta*	Not recorded	Av.: 7.1%; max.: 43% (in IM-26b); freq. 95%; LD
Quercus	*Q. robur, Q. petraea*	No reliable record	Av.: 0.4%; freq. 40%; LD
Salix	*Salix* spp. (mainly *S. repens*)	*S. repens, S. atrocinerea*; *S. caprea* and *S. viminalis* (planted to give scallops for thatching)	Av.: 0.3%; freq. 20%; L1, R and LD
Sambucus	*S. nigra*	Frequently planted; probably 4introduced	Av.: 0.2%; freq. 5%; R and LD
Tilia	*T. cordata*, *T. platyphyllos*	Not recorded	1 pollen recorded; 0.2%; LD
Tall shrubs			
Ilex, *Juniperus*, *Lonicera*	*I. aquifolium, J. communis, L. periclymenum*	Common to abundant	Pollen of these three spp. each recorded in single sample only. Under-represented[1]
Ferns			
Pteridium	*P. aquilinum*	Abundant	Av.: 2.2%; freq. 45%; 10.5% an exceptionally high value
D. dilatata, O. regalis and *Ophioglossum;* also *A. filix-mas* and *B. lunularia*	Comments are confined to taxa of particular interest	*D. dilatata, O. regalis* and *Ophioglossum* all recorded in IMOR-12. These very rare or absent on the islands. Spores most likely ascribable to LD. *A. filix-mas* and *B. lunularia* single spore records, probably ascribable to LD. Webb gives only one record for *A. filix-mas* and no modern record for *B. lunularia*	
NAP (grasslands)			
Poaceae	All non-cultivated grasses	At most sampling sites, grasses were common incl. at margins *of/at close proximity to cereal fields*	Av.: 31%; freq. 100%; range: 16–72%; median: 26%
Plantago lanceolata	*P. lanceolata*	Abundant; samples IM-21 & IM-22 consisted of leaves of *P. lanceolata*	Av.: 26%; freq. 100%; range: 7–62%; median: 24%
P. maritima, P. coronopus	Same as pollen taxa	*P. maritima* abundant; *P. coronopus* confined ± to coastal areas	*P. coronopus* in two samples only as single grains; *P. maritima* has 30% frequency but values low (aver. 0.8%)

[1] *Hedera* pollen is present in the samples but it was not recorded in the counts; strongly under-represented. *H. helix* is frequent and locally abundant, especially on inland cliffs on the Aran Islands.

Pollen taxon	Main/potential pollen contributors	Present-day status*	Remarks (pollen representation, pollen sources^, etc.)
Bidens-type[2]	Potentially includes several Asteroideae (Tubuliflorae) spp.; e.g. *Antennaria dioica*, *Bellis perennis, Senecio* ssp., *Eupatorium cannabinum* and *Aster tripolium*	Most of the spp. mentioned are abundant/frequent on the Aran Islands. *A. tripolium* ± strictly coastal and not recorded near sampling sites	Av.: 4.8%; freq. 95%; range: 0.4–37%. Most spectra have low values (≤8%). 37% recorded in IMOR-3 is exceptionally high. Sample consists of leaves of *S. rosacea* in ± bare pavement nr. rye fields at Bun Gabhla. *B. perennis*, abundant is nearby grasslands, is probably the main pollen contributor
Anthemis-type	Includes Asteroideae spp. such as *Achillea millifolium* and *Leucanthemum vulgare*	*A. millifolium* is widespread but not abundant. *L. vulgare* is 'Very abundant'	Av.: 0.5%; freq. 45%; range: 0.2–1.7%. These species are greatly under-represented probably due to poor pollen dispersal
Cirsium-type	*Cirsium* spp.	*C. arvense* and *C. vulgare* are 'Very frequent'	Av.: 0.4%; freq. 10%; range: 0.2–0.7%. Strongly under-represented probably due to poor pollen dispersal
Serratula-type	*Carlina*	*C. vulgaris* is 'Very frequent'	Recorded in only 2 spectra (0.2%, 0.7%). Under-represented
Centaurea nigra, C. scabiosa	Same as pollen taxa	These spp. are 'Very frequent' and 'Locally frequent', resp.	*C. nigra:* av.: 0.5%; freq. 40%; max.: 2.3%. *C. scabiosa*: low freq. (15%) and v. low values except in IM-23 (17.6%). Under-represented
Cerastium-type	Various *Cerastium* spp.; esp. *C. diffusum, C. arvense* and *C. fontanum*; also *Stellaria media*	The listed *Cerastium* spp. are abundant or at least frequent. *S. media* is common. Associated with grassland and/or disturbed habitat	Av.: 0.9%; freq. 25%; range: 0.2–2.9%. low frequency suggests poor pollen dispersal; under-represented
Liguliflorae	Includes *Taraxacum, Crepis*, *Carlina, Hypochaeris, Leontodon* and *Sonchus* (cf. footnote 2)	Several species of this group are widespread and often abundant	Av.: 4.4%; freq. 95%; range: 0.4–30%. Mostly low values but one exceptional value (30% in IMOR-6) due to local pollen.
Apiaceae[3] (Umbelliferae)	Several spp. including *Anthriscus sylvestris*, *Daucus carota* and *Heracleum sphondylium*	These spp. are generally well distributed and abundant	Av.: 6.2%; freq. 90%; range: 0.2–52%[4]. High values are recorded where there is substantial local presence
Helianthemum	*H. canum*	Common, often abundant and usually flowers strongly	In IMOR-10, 41%[5]; only recorded in two other samples (≤0.3%)

[2] *Bidens*-type is the pollen taxon name used in Moore and Webb (1978); the taxon is comparable to *Aster*-type as defined in Moore et al. 1991.

The family Asteraceae (Composite) is usually divided into subfamilies Asteroideae (Tubuliflorae; includes many spp. of daisy type) and Cichorioideae (Liguliflorae; includes *Taraxacum, Crepis, Hypochaeris*, etc.). Asteroideae pollen can be relatively easily subdivided into various pollen taxa; it is also possible to subdivide Cichorioideae but this is difficult and has not been attempted.

[3] Most of the Apiaceae (Umbelliferae) pollen recorded are assignable to the taxon Umbelliferae 2 (Moore and Webb 1978)

[4] In sample IMOR-8, the percentage value is relative to PS+Apiaceae (for this spectrum only). Apiaceae has been excluded from the PS to avoid unduly depressing the representation of the other pollen taxa in this spectrum.

[5] In sample IMOR-10, the percentage values are relative to PS+*Helianthemum* (see footnote 6 for rationale). *H. canum* is common locally but, nevertheless, the value is unexpectedly high, especially given that the pollen appears to be poorly dispersed. It is possible but very unlikely that *H. nummularium* pollen is contained in this pollen taxon. This species is very rare in Ireland and has not been recorded from Aran Islands or the wider region (Webb and Scannell 1983).

Pollen taxon	Main/potential pollen contributors	Present-day status*	Remarks (pollen representation, pollen sources^, etc.)
Saxifraga-type	*S. rosacea, S. tridactylites*	Both frequent; *R. rosacea* locally abundant	Exceptionally high values in IMOR-2, IMOR-3 (62%, 37%[6]). In general, this pollen taxon is strongly under-represented
Ranunculus[7]	Main species: *R. acris, R. repens, R. bulbosus,* and *R. ficaria*	First three spp. the most like origin of the recorded pollen	Av.: 2.8%; freq. 95%; range: 0.2–21%
Rubiaceae	*Galium verum*, *G. aparina, Rubia peregrina*; other *Galium* spp. present but not abundant	*G. verum* is undoubtedly the main contributor, given that it is abundant and flowers profusely.	Av.: 1.6%; freq. 75%; range: 0.1–9.3%. Dispersal may be poor but, overall, relationship between plant and pollen abundance good
Sanguisorba minor	Same as pollen taxon (=*Poterium sanguisorba)*	Abundant. Noted as important at some samples (e.g. IMOR-1)	Av.: 2.2%; freq. 40%; range: 0.1–7.4%. Poor dispersal and generally under-represented[8]
Fabaceae[9]	Includes several legume species	Genera *Trifolium, Lotus, Anthyllis* and *Vicia* well represented in the flora	Av.: 1.1%; freq. 75%; range: 0.2–5.1%. *T. repens* and *Lotus* (presumably *L. corniculatus*) are well expressed in the pollen data
Filipendula	*F. ulmaria*	Wet places; 'occasional on drier grassland'	Av.: 1.1%; freq. 60%; range: 0.4–3.2%. Generally under-represented but the high freq. suggested that *Filipendula* pollen is rather well dispersed
Rumex-type	Mainly *R. acetosa* and *R. crispus*; also *R. obtusifolius*	These spp. abundant and so probably the main pollen contributors	Av.: 1.3%; freq. 90%; range: 0.4–4.2%. Data support idea that *Rumex* pollen is well dispersed (small, light, plentiful pollen; wind dispersed)
Mentha-type	Mainly *Thymus praecox* and *Mentha* spp.	*T. praecox* abundant; presumably the main pollen contributor	Av.: 0.3%; freq. 30%; range: 0.1–0.7%. Strongly under-represented
Succisa	*S. pratensis*	Frequent	Av.: 0.4%; freq. 15%; range: 0.4–0.5%. Strongly under-represented
Potentilla-type[10]	Mainly *P. erecta, P. reptans, P. anserina*	These spp. are frequent and are sometimes locally abundant	Av.: 1.9%; freq. 80%; range: 0.2–11.7%. Under-represented apart from samples IMOR-1 and IMOR-9 where high value probably reflect local presence
Cyperaceae	Includes several *Carex* spp. but especially *C. flacca* which is very abundant	Carex, and especially *C. flacca*, contributes substantially. *Schoenus nigricans* is 'Locally frequent on pavement'	Av.: 6.7%; freq. 75%; range: 0.3–6.7%. Generally under-represented

[6] In samples IMOR-2 and IMOR-3, the percentage values are relative to PS+*Saxifraga*-type. These samples consist of *S. rosacea* leaves so it can be assumed that the pollen is ± exclusively ascribable to this species.

[7] In most samples, *Ranunculus* pollen was ascribable to *R. acris*-type, a type expected to include pollen of *R. acris, R. repens,* etc. *R. sceleratus*-type was much rarer (incl. *R. flammula*, etc.). Beug (2004) considers that *R. acris*-type should be regarded as including most *Ranunculus* species and also *Anemone*, etc. *Ranunculus* as presented here may be regarded as equivalent to *R. acris*-type as defined by Beug.

The exceptionally high value (21%) recorded in IMOR-11 is presumed due to local presence of *Ranunculus* (probably *R. bulbosus*).

[8] At Bun Gabhla, max. value recorded (IMOR-3) but no record at IMOR-5. This and absences from over half samples supports poor dispersal and under-representation. *S. minor* pollen curve presented in Fig. 10.

[9] Following pollen taxa were recognised and recorded (average value cited): *T. repens* (0.8%), *T. pratense* (0.2%), *Lotus*-type (0.6%), *Vicia*-type: (0.2%), Fabaceae pp (not further differentiated) (0.2%). *A. vulneraria*, which is relatively easily distinguished, not recorded (that it was placed in Fabaceae p.p. cannot be excluded).

[10] As well as *Potentilla* spp., this pollen taxon may also include *Fragaria vesca* which is frequent.

Pollen taxon	Main/potential pollen contributors	Present-day status*	Remarks (pollen representation, pollen sources^, etc.)
Calluna	*C. vulgaris*	Widespread but nowhere abundant	Av.: 1.5%; freq. 40%; range: 0.2–4%. Reasonably well represented[11]
NAP (arable/disturbed)			
Secale	*Secale cereale*	On IMOR, 5 of 12 samples were at/close to rye plots. On IM, such samples numbered 3 of 8	Av.: 7.9%; freq. 70%; range: 0.1–61%. Though an anemophilous cereal, dispersal appears to be only moderate. Overall, probably under-represented[12]
Cereal-type (-rye)[13]	*Avena sativa*; additionally, *A. strigosa* on IM.	*Avena* much less common than *Secale*. *A. strigosa* present in oats plots on IM.	Av.: 0.3%; freq. 45%; range: 0.1–0.3%. Strongly under-represented due to poor pollen production and dispersal
Brassicaceae[14]	As well as taxa referred to in footnote 14, also included here *R. raphanistrum, Brassica rapa*, etc.	Few Brassicaceae noted in the cereal or potato fields	Av.: 0.5%; freq. 55%; range: 0.1–1.4%. Representation ± as expected
Chenopodiaceae	*Arenaria serpyllifolia, Beta vulgaris, Chenopodium album*, etc.	Many of the spp. listed are frequent. Chenopods are also associated with coastal locations	Av.: 0.5%; freq. 40%; range: 0.2–1.1%. Under-represented; best represented in Bun Gabhla samples due perhaps to contribution by coastal chenopods.
Plantago major/media	*P. major*[15]	*P. major* is very frequent	Av.: 0.6%; freq. 45%; range: 0.1–1.4%. Reasonably consistently represented but at low value (good dispersal; poor pollen production)

* Status of contributing taxa locally and regionally; IMOR: Inis Mór; IM: Inis Meáin; IO: Inis Oírr. Status cited and also quoted text is as given by Webb unless otherwise indicated. Webb = Webb (1980).

^ Abbreviations used to indicate pollen sources: L1, pollen of local origin, L1a, species growing at the sampling site; Extra-L, pollen originating within ca. 10 m of the sampling site; R, pollen arising from Aran Islands and possibly nearby Burren and Connemara; LD, long-distance pollen transport

Other abbreviations: Av., average; Freq., Frequency. The average is based on samples with values >0; same applies in the case of the range. In general, order of presentation of pollen taxa follows that in the main pollen diagram (Fig. 7).

[11] *Calluna* is often dwarf-sized due to grazing and wind exposure and so conditions are not optimal for flowering. *E. cinerea* is also common but its pollen was not recorded.

[12] Apart from 61% achieved in IMOR-5 (narrow headland of rye field at Bun Gabhla), values are not exceptionally high given the proximity of sample to the rye crop in several of the samples. LD transport seems to be restricted presumable due to the weight and size of the *Secale* pollen.

[13] This potentially includes any cereal-type pollen, excluding *Secale*. Some *Secale* pollen, in which the distinguishing features were not obvious, may have been erroneously placed in this category.

Pollen grains were mainly in the size range 40–44 µm, i.e. rather small. A few pollen ≥50 µm were recorded.

[14] Pollen assignable to *Hornungia*-type include 'many common small weedy [crucifer] species as well as rarer plants' (Moore et al. 1991); e.g. *Capsella bursa-pastoris, Cardamine* spp., *Arabis* spp., etc.

[15] *P. media* not recorded on the Islands and is rare in Ireland (regarded as an introduction) and so can be excluded from consideration

Supplementary Table 4 (SM-T4). Non-pollen palynomorphs (NPPs) and other entities recorded in the surface pollen spectra

Taxon/entity	Representation in dataset	Significance (in general and specific to this dataset)
Assulina (HdV-352) (testate amoeba)	Freq. 55%; exceptionally high values in IMOR-10 and IMOR-11 (33%, 48%, resp.)	Usually associated with *Sphagnum* peat (Grospietsch 1972; van Geel 1978; van Geel et al. 1981). Samples IMOR-10 and IMOR-11 consisted mainly of mosses (*D. scoparium* and *P. purum,* resp.) which probably provide suitably acidic, moist conditions
Arcella (HdV-352) (testate amoeba)	Freq. 65%. Values rather low (≤6%). Discoid theca is the part that is preserved	*Arcella* inhabits a wide range of wet habitat; eutrophic conditions seem to be preferred (https://www.arcella.nl/arcella). Acetolysis tends to destroy *Arcella* and other entities (van Geel et al. 1981)
cf. *Ustilago* (smut) (rust fungal spores)	Freq. 60%. Moderate values (≤8.5%)	According to van Geel (1978), specific identification is "virtually impossible" (there are >300 spp.). *Ustilago* is a parasite of monocots (esp. grasses). Lack of records at Bun Gabhla not easily explained
Glomus (HdV-207) (chlamydospores)	Freq. 55%. Moderate values (≤8.5%); not recorded in IM-20–23	This endomycorrhizal fungus occurs in the roots of a variety of host plants. Soil erosion can transport it to lakes, etc. (van Geel et al. 2003). High values in IMOR-6 (*Nostoc*-filled hollow in headland of rye field) probably arise from soil erosion
Desmidaceae (HdV-332) (green algae)	Desmid spores recorded only in IM-26b and IM-27 but with high values	Both samples are from *Nostoc* hollows on IM where conditions are presumably favourable for desmids
SCP (sphaeroidal carbonaceous particles; an important component of fly-ash)	Recorded only IM-24 and IM-25 and with low values Indicator of long-distance transport of small particulate matter	SCPs are formed as a result of incomplete high-temperature combustion of fossil fuels, esp. in power stations. SCPs peaked in Britain in the late 1970s and then declined rapidly (Swindles 2011; Swindles et al. 2015). A closer and more likely source than Britain or other power stations in Ireland is Moneypoint, a 915 MW, coal-burning station on the Shannon Estuary (Co. Clare) (commissioned 1985–87; still operating)
Micro-charcoal (≥37 µm)	Micro-charcoal particles recorded in all samples	These small light particles (large particles, if present, were removed by the initial sieving) are probably mainly of regional origin