## Supplementary Materials: Tables S1–S5

Supplementary material (figures, plates and tables) for manuscript on Connemara, western Ireland in MDPI journal *Geographies:*

*Holocene vegetation dynamics, landscape change and human impact in western Ireland as revealed by multidisciplinary, palaeoecological investigations of peat deposits and bog-pine in lowland Connemara*

Authors: O'Connell, M., Jennings, E., Molloy, K.

November 2021; Available online at https://www.mdpi.com/journal/geographies

## Tables S1–S6 and S8 (S7 is a separate Excel file)

**Summary**

Tables S1, S2, S3: $^{14}C$ dates from peat cores.

Tables S4, S5, S6: $^{14}C$ dates from pine timbers.

Tables S7, S8. Stratigraphical data, Ballydoo Bog and overview of pollen assemblages from core BDB I, Ballydoo

********

**Table S1.** $^{14}C$ dates, peat core BDB I, Ballydoo Bog.

**Table S2.** $^{14}C$ dates, peat cores at Derryinver (DYR series).

Note: $^{14}C$ dates for Letterfrack pollen profiles, FRK II, and FRK III and FRK IV, are available in PANGAEA (O'Connell 2018a and2018b, respectively).

**Table S3.** $^{14}C$ dates, peat core CNR I, Crocknaraw and peat cores CLD I and CLD II, Claddaghduff.

**Table S4.** $^{14}C$ dates, pine timbers, Ballydoo Bog.

**Table S5.** $^{14}C$ dates and dendrochronological data relating to pine timbers from Connemara National Park, Letterfrack.

**Table S6.** $^{14}C$ dates and dendrochronological data relating to pine timbers from Derryeighter.

**Table S7.** Data from stratigraphical investigations at Ballydoo Bog, Cornamona, north-east Connemara.

(in a separate Excel file)

**Table S8.** Overview of pollen assemblage zones in BDB I and reconstruction of vegetation and landscape development.

**Table S1.** $^{14}$C dates, pollen profile BDB I, Ballydoo Bog.

| $^{14}$C lab. no. | G lab. no.* | Depth (cm) | $^{14}$C (BP) | Age range* | Median* | Comments |
|---|---|---|---|---|---|---|
| Gd-6603 (S1) | BDB I-5 | 40–41 | 260±60 | 490–? | 310 | Age range (2σ): younger part out of range; age range (1σ): 440–151 cal. BP |
| GrN-21812 | BDB I–10 | 86–88 | 1000±40 | 960–790 | 900 | Date accepted; at/above this level, peat accumulation rate increases greatly |
| GrN-21811 | BDB I-9 | 132–134 | 2690±60 | 2930–2730 | 2810 | *Pinus* more or less consistently <0.3% above 134 cm |
| Gd-9034§(S2) | BDB I-6 | 152–154 | 3280±90 | 3820–3270 | 3510 | Not used in age/depth model; regarded as too young |
| GrN-21810 | BDB I-8 | 178–180 | 5620±60 | 6550–6290 | 6400 | High *Pinus* begins at 176 cm (see BDB I-4) |
| GrN-21809 | BDB I-7 | 228–230 | 8830±60 | 10176–9678 | 9900 | Early Holocene *Corylus* maximum at 224 cm |
| | | | | | | |
| Gd-7370¶ (S2) | BDB I-3a | 202–204 | 6810±60 | 7780–7520 | 7650 | Repeat measurement; *Alnus* expanding rapidly |
| Gd-6904¶ (S2) | BDB I-3a | 202–204 | 6910±90 | 7930–7590 | 7750 | Repeat measurement; *Alnus* expanding rapidly |
| *Gd-6904, Gd-7370 combined* | | | | | *7672±52* | *OxCal modelled age and error (2σ) indicated* |
| | | | | | | |
| Gd series 1 dates; rejected; too young | | | | | | |
| Gd-6602 (S1) | BDB I-4 | 176–177 | 5170±80 | 6190–5730 | 5930 | Age/depth model suggests *c.* 6300 cal. BP |
| Gd-6601 (S1) | BDB I-3 | 200–201 | 6170±80 | 7260–6850 | 7060 | Age/depth model suggests *c.* 7500 cal. BP |
| Gd-6600 (S1) | BDB I-2 | 224–225 | 7650±80 | 8600–8220 | 8450 | Age/depth model suggests *c.* 9400 cal. BP |
| Gd-4800§ (S1) | BDB I-1 | 248–249 | 8230±140 | 9530–8780 | 9200 | Age/depth model suggests *c.* 1150 cal. BP |

* G = Galway; age ranges (2σ) and median ages in cal. years BP as given by OxCal (rounded to nearest 10 years, except the combined age of Gd-6904 and Gd-7370).

§ $^{14}$C lab. indicated 'small sample'; reliability of date is uncertain. S1 and S2 refer to Gliwice series 1 and series 2 dates; S1 dates were initially obtained; S2 were obtained subsequently.

¶ Repeated run on same $CO_2$ obtained from combustion of organic matter; similar results; dates were combined using OxCal and result was used in constructing age/depth model.

**Table S2.** $^{14}C$ dates relating to pollen profiles from Derryinver.

| **$^{14}C$** lab. no. | G lab. no.* | Depth (cm) | $^{14}C$ (BP) | $\delta^{13}C$ (‰) | Ages (cal.)¶ | | | Comments |
|---|---|---|---|---|---|---|---|---|
| Profile DYR V (long profile) (all samples given acid/alkali treatment by $^{14}C$ lab.) | | | | | | | | |
| KI-3077 | DYR V-8 | 93–91 | 900±35 | -27.1 | 905–735 | 805 | -1145 | Obtained *c.* 1990 |
| KI-2933 | DYR V-4 | 137–134 | 1320±50 | -27.6 | 1295–1175 | 1235 | -715 | |
| KI-3076 | DYR V-7 | 166–163 | 1610±70 | -28.5 | 1550–1400 | 1485 | -465 | Obtained *c.* 1990 |
| KI-2932 | DYR V-3 | 240–237 | 2760±65 | -28.1 | 2930–2775 | 2865 | 915 | |
| KI-2898 | DYR V-3a | 294–291 | 3160±65 | -28.4 | 3455–3265 | 3380 | 1430 | |
| KI-2897 | DYR V-3b | 348–345 | 3670±65 | -28.0 | 4090–3905 | 4005 | 2055 | *P. lanceolata* peaks to 44% |
| KI-3075 | DYR V-6 | 354–351 | 3730±65 | -28.1 | 4225–3975 | 4085 | 2135 | Obtained *c.* 1990 |
| KI-2896 | DYR V-6a | 381–378 | 3740±70 | -28.2 | 4230–3980 | 4100 | 2150 | Too young |
| KI-2931 | DYR V-2 | 426–423 | 3190±75 | -28.1 | 3485–3270 | 3410 | 1460 | Too young by *c.* 1000y! |
| KI-3074 | DYR V-5 | 442–439 | 4190±55 | -29.7 | 4840–4620 | 4715 | 2765 | Obtained *c.* 1990 |
| KI-2930 | DYR V-1b | 474–471 | 5790±90 | -29.2 | 6730–6485 | 6590 | 4640 | From below Elm Decline; originally 5610±90 BP but later corrected by $^{14}C$ lab. |
| Profile DYR VIIA (mid-segment of long core at ~15 m north of DYR V) | | | | | | | | |
| Gd-6459 | DYR VIIA-1 | 339–336 | 4340±100 | n/a | 5265–4825 | 4950 | 3000 | At 320 cm clay and *P. lanceolata* curve ceases |
| Gd-6460 | DYR VIIA-2 | 318–315 | 5060±100 | n/a | 5915–5660 | 5800 | 3850 | *Quercus* rises steeply; terminus post quem for soil erosion |
| Profiles DYR I, II, III, VI | | | | | | | | |
| KI-2748 | DYR I | 0.5 to 0 | 2370±60 | n/a | 2670–2335 | 2430 | 480 | Immediately beneath pre-peat stone wall at DYR I |
| KI-2749.01 | DYR II-1 | -21 to -22 | 300±46 | n/a | 440–300 | 380 | -1570 | Peat, profile DYR II |
| KI-2749.02 | DYR II-2 | 0 to -2 | 1690±55 | n/a | 1695–1525 | 1585 | -365 | Basal peat, profile DYR II |
| KI-2749.03 | DYR II-3 | 3 to 0 | 1850±60 | n/a | 1830–1640 | 1760 | -190 | Top of mineral soil at DYR II |
| KI-2750 | DYR III | 0.5 to 0 | 2390±90 | n/a | 2700–2335 | 2470 | 520 | Top of mineral soil beneath wall at DYR III |
| KI-3012.02 | DYR VI-1 | -13.2 to -14.5 | 2210±80 | -29.4 | 2330–2125 | 2205 | 255 | Peat, profile DYR VI (enclosure/hinge) |
| KI-3012.01 | DYR VI-2 | -0.7 to -0.2 | 2910±120 | -29.3 | 3210–2880 | 3065 | 1115 | Basal peat, profile DYR VI (enclosure/hinge) |

* G = Galway. Depths are with respect to the peat/mineral soil interface (above this is negative).

¶ Calibrated ages (rounded to nearest 5 y) as follows: age range (2σ; cal. BP); median ages in cal. BP and AD/BC (AD is negative). Calibration by OxCal 4.4 using InterCal20 calibration curve.

**Table S3.** Radiocarbon dates, profiles CNR I (Crocknaraw), and CLD I and CLD II (Claddaghduff).

| $^{14}$C lab. no. | G* lab. no. | Depth (cm) | $^{14}$C (BP) | $\delta^{13}$C (‰) | Age range | Age (med1) | Age (med2) |
|---|---|---|---|---|---|---|---|
| CNR I (Crocknaraw) | | | | | | | |
| GrN-21813 | CNR I-3 | -29 to -31 | 3180±40 | n/a | 3470–3270 | 3405 | 1455 |
| GrN-21640 | CNR I-2 | -9 to -11 | 4030±60 | n/a | 4815–4300 | 4510 | 2560 |
| GrN-21639 | CNR I-1 | -4 to -6 | 4930±40 | n/a | 5735–5590 | 5650 | 3700 |
| CLD I and II (Claddaghduff) | | | | | | | |
| KI-2751.01 | CLD I-1 | -18 to -17 | 2750±37 | -29.0 | 30–2765 | 2835 | 885 |
| KI-2751.02 | CLD I-2 | 0 to 1 | 3380±50 | -29.4 | 3820–3470 | 3615 | 1665 |
| KI-2751.03 | CLD I-1 | 8 to 9 | 3820±80 | -28.8 | 4420–3980 | 4220 | 2270 |
| KI-2752 | CLD II-1 | 0 to 1 | 3550±55 | -28.4 | 3985–3650 | 3840 | 1890 |

G* = Galway. Depths are with respect to the peat/mineral soil interface (above this is negative); age range (2σ) and age (med1), and age (med2) are in cal. BP and cal. BC, respectively. Calibration by OxCal v. 4.4 using IntCal20. Calibrated ages rounded to nearest 5 years.

**Table S4.** $^{14}$C dates from pine timbers, Ballydoo Bog.

| $^{14}$C lab. no. | G lab. no.* | $^{14}$C (BP) | Age range* | Median* | Sample details and comments |
|---|---|---|---|---|---|
| GrN-20063 | BDB W3a | 3350±30 | 3690–3490 | 3570 | Eight outer rings from a small stump near cutover bog surface |
| GrN-20709 | BDB W3b | 3380±25 | 3690–3520 | 3620 | Wood from same rings as GrN-20063 (see above) |
| *GrN-20063, GrN-20709 combined* | | | *3690–3495* | *3606±39* | *OxCal (v. 4.4 and IntCal20) modelled age and error (2σ) are given* |
| Gd-7032 (S1) | BDB W1 | 3230±50 | 3563–3365 | 3440 | Outer 13 rings of large stump; age *c.* 700 y too young (cf. Gd-7360 and peat-derived dates in BDB I); rejected |
| Gd-7360 (S2) | BDB W2 | 3800±60 | 4407–3990 | 4190 | 10 rings from inside the timber used for Gd07032 |

* G = Galway; age ranges (2σ) and median ages in cal. years BP as given by OxCal (rounded to nearest 10 years, except the combined age of GrN-20063 and GrN-20709)

BDB W1 is from a large pine stump (63 rings counted, at least 100 additional rings once present; outermost rings and bark not preserved). The stump had been removed by a digger from a drain ~10 m west of BDB I. The dated samples, W1 and W2, are from a small block of wood cut at ~30 cm from the base of the stump. W1 consists of wood from outermost available 13 rings; W2 consists of timber from ~10 rings from immediately inside sample W1. Samples were dated in Gliwice. BDB W3 is from a small stump projecting from the surface of the bog at 30 m west of BDB I. No. of rings <100 (counting difficult due to poor preservation). Two samples, W3a, W3b, were submitted to Groningen. Outermost rings (8 rings) were used in each case. Sample weights W1, W2, and W3a and W3b: 64, 86, 42 g, respectively.

**Table S5.** $^{14}$C dates and dendrochronological data relating to pine timbers from Connemara National Park at Letterfrack.

| Lab. nos/dendro[§] | Material sampled | Age1 / Age2 / Age3[¶] | Location<br>(geographical co-ordinates, altitude in m asl and other details) |
|---|---|---|---|
| FRK W1<br>GrN-21884 | Decayed stump on ~40 cm of peat. Outer 20 rings dated. Ring width pattern very distorted; centre not pinpointed | 4080±15<br>4500–4450<br>4570 | 53.54674, -9.94307; 88 m<br>High ground overlooking Owengarve R. basin; immediately to east of bog road. Dendro attempted but ring widths unclear. FRK W2 from nearby (to NE; at 53.5467963, -9.9429695) examined but not sampled (no trunk; stump too decayed)) |
| FRK W3<br>GrN-21885<br>Rs: 87<br>3.2 mm | Largest pine stump in valley basin, 79 m SW of profile FRK II. Downslope side on deep peat (>90 cm); upslope ±on mineral soil. Rings 40–50 **$^{14}$C** dated | 4455±15<br>5278–4974<br>5180 | 53.54311, -9.93632; 96 m<br>Stump is the largest of several stumps on a ridge that slopes to river. Ring widths available for W3 (but not dendro matched) and nearby W4 (smaller stump that was cross-matched with W5). W3 probably overlaps with early years of W5 and also W4. |
| FRK W4<br>Rs: 95[1]<br>1.5 mm | Medium-sized stump 30 m NW of FRK W3 on 1.4 m of peat | No $^{14}$C date | 53.5431483, -9.9359110; 95.5 m<br>This stump crossed-matched early years of W5 but was much shorter lived that W5, i.e. 5037–4934 cal. BP (based on dendro) |
| FRK W5<br>GrN-21886<br>Rs: 180[1]<br>1.0 mm | Large stump, 50 cm ⌀, 2 m SW of core FRK II.<br>Rings 31–45 **$^{14}$C** dated | 4420±20<br>5257–4874<br>5000 | 53.54374, -9.93596; 95 m<br>Stump exposed by peat cutters but in situ; on 1.7 m, and prior to peat cutting it was overlain by ~1.5 m of peat. August 2021 hidden; now overlain by ~30 cm of peat. 5037–4858 cal. BP (based on dendro and $^{14}$C date) |
| FRKC W6<br>GrN-21887<br>Rs: 123 | Long trunk from Carrow-kennedy, Co. Mayo[2].<br>Timber from 10–15 rings (counted from outside) at breast height dated | 6250±20<br>7260–7030<br>7220 | 53.71103, -9.55517; 88 m<br>From bog to north of Carrowkennedy, west Mayo (Leenane/Westport road).<br>More or less complete ring sequence was measured. Tree probably not more than 150 y old. It is older than the floating chronologies from Letterfrack, Derreighter and Garrynagran |
| FRKC W7<br>GrN-21888 | Small trunk from same area as FRKC W6[3]. Outer 45 rings dated. | 7780±20<br>8600–8460<br>8560 | 53.71111, -9.55532; 88 m (co-ordinates for W6 and W7 are best estimates). W7 is much older than floating chronologies referred to above. Not sampled for dendrochronology |
| FRKC W8<br>GrN-23605 | Corboley Td., Barna, SE Connemara. Outer rings of outermost 30 rings dated | 5075±25<br>5905–5746<br>5810 | 53.2909406N, 9.1452075W; 27 m<br>Recovered from blanket bog prior to new house construction in Corboley Td. in 1997; mid-way between Corboley and Drum (map: DS 45), 6.5 km NW of Galway City centre. To be collected by CNP (hence FRK**C** W8) |

[1] W4: bark observed 2 cm below sample, so 95 y a reliable estimate of age of tree; W5: Heartwood/sapwood boundary was observed only in this sample so 180 y a minimum (but good indicator) of age of tree

[2] A long trunk displayed at the back stairway in the Visitor Centre (VC), Connemara National Park (CNP)

[3] The smaller of two pine trunks in VC. It is displayed in the main exhibition area

[§] Galway lab. no. is followed by $^{14}$C lab. no. (if $^{14}$C date available). Dendro, i.e. dendrochronological details, follow: Rs = no. of rings (life-span of tree); average ring width in parentheses; in W5, rings 1–70 and 71–180 averaged 1.6 and 0.6 mm, respectively, i.e. in the final >100 years ring widths are very narrow. Ring sequences from W3 and W5 cross-matched. W5 began life *c.* 10 years earlier and lived for *c.* 70 y longer than W4, i.e. from *c.* 3100–2900 BC (5.05–4.85 ka). W3 did not give a significant cross-match; it is relatively short lived and the $^{14}$C date suggest it started life somewhat earlier than W4 and W5 so that any overlap in age will be small.

[¶] Age1 = $^{14}$C date (BP); Age2 = cal. age range (cal. BP; 2σ prob.); Age 3 = cal. BP, median age rounded to nearest 10 y. Calibration by OxCal v. 4.4 using IntCal20 curve.

$^{14}$C dates for pollen profiles FRK II (11 dates), FRK III (2 dates) and FRK IV (4 dates) are available in PANGAEA.

**Table S6** $^{14}C$ dates and dendrochronological data relating to pine timbers from Derryeighter

| Lab. nos/dendro[§] | Material sampled/$^{14}C$ dated material | Age1/Age2/Age3[¶] | Location (location and other details) |
|---|---|---|---|
| *DTR-W1 (G15A) GrN-21110 Rs: 203 | G15, Area 2. Trunk sliced 30 cm above root. Rings 71–97 | 4410±20 5047–4874 4978 | Repeated run on $CO_2$ from this sample also returned 4410±20 BP. 4410±20 BP was used by Jennings (1997) to 'fix' DTR P1. G19 gave an equally acceptable date |
| *DTR-W2 (G19Ad) GrN-21111 Rs: 184 | G19, Area 1. Trunk sliced ~80 cm above root. Rings 59–98 | 4400±15 5041–4874 4958 | $^{14}C$ date used to fix P1; i.e. mid-ring 84 = 5054 cal. BP (Jennings 1997) |
| *DTR-W3 (G4Ab) GrN-21112 Rs: 360 | G4, Area 1. Stump sliced 20 cm above root. Rings 200–273 | 4532±15 5310–5054 5153 | Heartwood/sapwood boundary present. G4 is the only Derryeighter specimen with a more or less complete ring sequence. It links the shorter sequences G9? and G18, and G15 and G19. These timbers and G4 are included in P1 |
| ^DTR-W4 (G10Aa) GrN-21113 Rs: 154 | G10, Area 1. Stump sliced close to root (within ~2 cm). Rings 68–102 | 5020±20 5893–5659 5789 | Compression wood (centre displaced to NE). *t*-value 5.80 with P1M but visually match not satisfactory so not included in master sequence. Rings difficult to measure. Same applies to G17 which gave t-value of 4.57. $^{14}C$ confirms that G10 is older than P1 |
| DTR-W5 (G11Ad) GrN-21433 | G11, Area 1. Stump sliced close to root. Rings 130–162 | 4690±20 5473–5323 5383 | No cross-match with any DTR timber or P1. G11 may have a short overlap with oldest part of P1 sequence |
| ^DTR-W6 (G5Af) GrN-21434 | G5, Area 1 (*not* in situ). Stump sliced ~2 cm above root. Rings 48–101 | 4490±20 5257–4874 5000 | Six radii (because of difficulties encountered) used to obtain mean sequence for G5. Not cross-matched with any DTR timber or P1 but the $^{14}C$ date suggests that it lies within P1 |
| ^DTR-W7 (G3Ad) GrN-21435 | G3, Area 1. Small trunk sliced 50 cm above root. Rings 115–177 | 4620±20 5446–5306 5419 | Heartwood/sapwood boundary present. Impossible to obtain satisfactory mean ring-width sequence. $^{14}C$ suggests it may be in older part of P1 |
| DTR-W8 (G2Aa) GrN-21436 | G2, Area 1. Small trunk sliced 50 cm above root. Rings 33–77 | 4180±20 4832–4622 4724 | Heartwood/sapwood boundary present. No cross-match with any DTR timber or P1; it may overlap slightly with young end of P1 |
| DTR-W11a (G9Ac) GrN-123290 Rs: 126 | G9, Area 1. Small trunk sliced 50 cm above root. Rings 85–96 | 4125±20 4815–4530 4668 | Trunk ~60 cm long; no side branches. The original sample (rings 85–105) was subdivided in $^{14}C$ lab. and the subsamples were $^{14}C$ dated |
| DTR-W11b (G9Ac) GrN-123514 | G9, Area 1 (as above) Rings 96–105 | 4203±19 4840–4647 4739 | G9 has no cross-match with any DTR timber or P1; it may overlap with young end of P1. Duplicate $^{14}C$ confirm its age |
| DTR-W12 (G17Aa) GrN-123291 Rs: 158 | G17, Area 2 (*not* in situ). Large stump sliced 15 cm above root. Rings 53–59 | 5442±18 6294–6202 6234 | 1 of 2 $^{14}C$ dates for this timber (see below). No cross-match with any DTR timber or P1 (much older than all the other timbers) |
| DTR-W12 (G17Aa) GrN-123515 Rs: 158 | G17, Area 2 (*not* in situ). Large stump sliced 15 cm above root. Rings 60–67 | 5487±20 6310–6213 6290 | 2 of 2 $^{14}C$ dates for this timber. Oldest $^{14}C$ date from Derryeighter. No cross-match with any DTR timber or P1. $^{14}C$ dates confirm that this is oldest specimen from Derryeighter |

Timbers in situ unless otherwise indicated. Root refers to the root buttress.
DTR-W11a, b (G9Ac) and DTR12 (G17Aa) (two dates) are additional to $^{14}C$ dates in Jennings (1997).
§ Galway lab. no. is followed by $^{14}C$ lab. no.; Rs = no. of rings (life-span of tree); average ring width in parentheses;
¶ Age1 = $^{14}C$ date (BP); Age2 = cal. age range (cal. BP; 2σ prob.); Age 3 = cal. BP, median age rounded to nearest 10 y. Calibration by OxCal v. 4.4 using IntCal20 curve.
* $^{14}C$ date directly relevant to P1 chronology (P1 used in this table as an abbreviation for pine sequence DTR P1M)

^ $^{14}C$ date supports possibility that the particular timber is part of DTR P1M though this was not dendrochronologically confirmed and/or potentially extends P1.

**Table S7.** Data from stratigraphical investigations at Ballydoo Bog, Cornamona, NE Connemara.
See separate EXCEL file: Table S7_Ballydoo-Bog_stratigraphy-transect.xlsx

**Table S8.** Overview of pollen assemblage zones in BDB I and reconstruction of vegetation and landscape development at Ballydoo Bog.

| PAZ / Spectra / Age (ka) | Name and main features of PAZ | Additional remarks and interpretations (incl. subzone features) |
|---|---|---|
| Surface pollen spectra | These are dominated by *Pinus* (13.0%), *Alnus* (7.6%), Poaceae (55.6%) and *P. lanceolata* (5.6%) (average values are cited). Low values for *Pteridium* contrast strongly with high values in subzone 13b.<br>Samples (*S. papillosum*; uppermost two centimetres of moss layer) collected in January 1992. Pollen are regarded as relating mainly to the 1980s and 1990 and 1991 | The high *Pinus* reflected recent afforestation (probably *P. contorta* rather that *P. sylvestris* which has not been used in recent afforestation). Low values for *Betula* are noteworthy given that birch and alder (also willow) are the main tall trees in the rather extensive wetlands to the north of Ballydoo L.<br>These spectra contrast sharply with the uppermost spectra of BDB I. This supports the idea that the top of profile BDB I pre-dates extensive afforestation, a feature of the twentieth century (afforestation had commenced by the mid eighteenth century in Co. Galway; Dutton 1824) |
| Profile BDB I | | |
| 13<br>42–12<br>0.38–0.23 | *P. lanceolata*-*Pteridium*-cereal-type PAZ. NAP increased greatly in diversity and quantity, and particularly in subzone 13b. The exceptional peaks in *P. lanceolata* (31%) and *Lotus*-type (13%) in mid subzone 13b (*c.* AD 1700) are noteworthy | A more or less totally cleared landscape is reflected in this PAZ. Farming impact is high throughout and especially in subzone 13b (AD 1640–1720). Note: given the weakly constrained chronology in the upper part of the profile, the dates quoted should be regarded as indicative. *Myrica* is greatly reduced but the mire surface remains wet (cf. Cyperaceae p.p., *Rhynchospora*, *Potamogeton* sect. *Potamogeton*; *Assulina*) |
| 12<br>54–46<br>0.38–0.31 ka | *Betula*-Poaceae-*Myrica* PAZ. Three spectra with elevated *Betula* values and a peak in *Myrica* (80%). The cereal-type curve is interrupted | In this zone which spans *c.* AD 1500–1570 there are substantial changes mainly in the mire vegetation and probably also some woodland regeneration on mineral ground (cf. increased *Ilex*). Human impact seems to have declined |
| 11<br>94–58<br>1.09–0.46 ka | Poaceae-*P. lanceolata*-*Myrica* PAZ. Poaceae increase substantially and attain 61% in mid zone (top of subzone 11a). *P. lanceolata* peak to 31.2% in mid subzone 11a; in 11a AP falls to 7.9%. See Fig. 7 for selected pollen data plotted to a depth scale (from top of 11b upwards) | Further substantial reduction in woodland due to farming impact. Emphasis on pastoral farming in subzone 11a (AD 860–1270) followed by greater emphasis on cereal production (to top of zone, i.e. AD *c.* AD 1500). Rapid increase in peat accumulation rate contributed to mainly by *S. papillosum* is the dominant macrofossil from subzone 11b to the top of the profile |
| 10<br>132–98<br>2.95–1.09 ka | *Betula*-*Corylus*-Poaceae PAZ. *Pinus* has fallen to 0.3±0.07% but is recorded in all spectra. *Quercus* declines and *Betula* rises; *Corylus* is better represented in subzone 8b, i.e. from *c.* 2.05 ka | Pine is probably extinct locally (since *c.* 3 ka). The decline in *Quercus* probably indicates sustained woodland clearance and farming activity. Birch and hazel are probably favoured by clearance; the former is probably also growing on the mire surface. A substantial increase in NAP as the zone ends reflects a substantial increase in farming including arable farming (*c.* AD 700, i.e. early Medieval period) |
| 9<br>152–134<br>4.76–2.95 ka | *Corylus*-*Quercus*-*Fraxinus*-Poaceae PAZ. *Pinus* declines sharply to low values (average 1.7% compared with 29% in PAZ 8). Within the zone, *Corylus* decreases and *Quercus* rises but AP has lower values. There is a continuous *Fraxinus* curve (average: 2.4%). An overall shift towards higher and more diverse NAP including cereal-type pollen takes place | Pollen evidence suggests that pine was locally scarce. $^{14}C$ dates from a pine timber indicate that pine was grew on the mire as late as 3.6 ka (see inset in Fig. xx). Coinciding with the top of the previous zone, there is a distinct shift in the lithology towards less decomposed peat. This and several other indicators (*Rhynchospora* and *E. tetralix* (pollen and macro-remains), and a substantial *M. gale* curve) indicate increased mire surface wetness. The increased wetness probably resulted in premature death bog pines. McVean (1963a) states that a single wet season may be sufficient to kill pines growing in a situation marginal to their survival. Elevated values for charcoal, ash content and NAP indicate substantial local farming activity (early and mid-Bronze Age) that led to increased firing and mineral erosion |
| 8<br>164–154<br>5.72–4.76 ka | *Pinus*-Poaceae-*Calluna* PAZ. *Pinus* is again well represented. Poaceae and *Calluna* increase and a *P. lanceolata* curve commences | The mid-Holocene Elm Decline is placed at zones 7/8 boundary based on increase in NAP (*P. lanceolata* curve initiated in the PAZ) rather than the *Ulmus* curve (low *Ulmus* values; average and maximum in BDB I: 0.7±0.08% and 3.5%, respectively). Neolithic farming (cf. Poaceae and *P. lanceolata*; cereal-type pollen first recorded at 5 ka) is presumably impacting on woodlands but there is no evidence for a Landnam-type event. *Assulina* records suggest a wetter mire (also *Scirpus lacustris* (Fig. xx)) but *Calluna* is also well represented. There is probably considerable micro-scale variation on the mire |
| 7<br>176–168<br>6.32–5.72 ka | *Pinus*-*Corylus*-*Alnus* PAZ. At the base of the zone *Pinus* has high values (average: 39%). Of the AP, *Quercus* in particular is depressed (average: 7.3%). A *Calluna* curve is initiated and begins to rise. Towards top of zone, *Pinus* declines and *Corylus* increases | The pollen and stratigraphic data suggest a dynamic situation on the mire surface. The high *Pinus* values probably largely reflect pine growing on the mire (pine timbers recorded lower in the profile (Fig. xx; Table xx) derive probably from the trees that gave rise to the pine pollen). This bog-pine phase probably lasted only about two centuries centred on *c.* 6.2 ka) |

| PAZ / Spectra / Age (ka) | Name and main features of PAZ | Additional remarks and interpretations (incl. subzone features) |
|---|---|---|
| 6<br>204–178<br>7.93–6.32 ka | *Quercus-Alnus* PAZ. *Alnus* expands and has high values (~40%) in several mid-zone spectra. *Quercus* is the other main AP contributor. *Pinus*, *Betula* and especially *Ulmus* are minor contributors | At 202 cm (7.644 ka), alder has expanded. This is preceded by substantial charcoal (macro and micro) which suggests low fires. A major expansion of oak that coincides with a sharp decline in pine follows. This pattern (*Quercus* high and *Pinus* low) continues to the top of the zone; it probably reflects woodland composition on mineral ground. Several records for *H. wilsonii* indicate oak woodlands with much filmy fern. Low *Pteridium* suggests closed structure woodland. Poaceae probably arise from grasses growing on the mire. Pine timbers were encountered during coring but these do not appear to be reflected in the pollen data. Pollen productivity of pine growing on peat is probably low |
| 5<br>228–208<br>9.87–7.93 ka | *Pinus-Corylus-Quercus-Ulmus* PAZ. At base of zone, *Betula* peaks and *Corylus* continues to expand. Rise of *Pinus* is the main feature of the zone. *Quercus* and *Ulmus* have only minor curves. First records for *Hedera* and *Lonicera* | Main feature is the establishment locally of pine (Scots pine) and its expansion locally and probably regionally<br>• 5b (220–208 cm; 9.22–7.93 ka). Pine achieves dominance at the expense of birch and hazel. Oak and elm probably present but fail to expand. Much bracken (*Pteridium*); this suggests that woodland was rather open.<br>• 5a (228, 224 cm; 9.87–9.22 ka). Pine spreads and begins to expand. Hazel achieves its maximum (but relatively low in Irish context) and birch contracts |
| 4<br>252–232<br>11.27–9.87 ka | *Betula-Corylus-Salix* PAZ. In addition to the zone naming taxa, fern spores, Cyperaceae, Poaceae and *Sphagnum* are important. *Juniperus* curve ceases at top of subzone 4a. Consistent record for macro-charcoal begins at the base of subzone 4b | Tall shrubs incl. birch and hazel, spread and expand<br>• 4b (236, 232 cm). At *c.* 10.5 ka, hazel and also birch expand and tall shrub communities dominate (NAP declines)<br>• 4a (252–240 cm). Birch (probably *B. pubescens*) and willow (*Salix* trees/shrubs) largely replaces juniper. Hazel probably present locally. Ferns, including bracken (*Pteridium*) important. Locally wet conditions (cf. *Potamogeton* sect. *Eupotamogeton, Hydrocotyle vulgaris, Rhynchospora* (achenes)). *Sphagnum* important (spores; macro-remains not recorded) |
| 3<br>254, 6, 8<br>11.49–11.27 ka | *Juniperus*-Cyperaceae PAZ. *Juniperus* peaks (53%) at the top of the zone. *Sphagnum* and *Tilletia sphagni* also expands sharply; *Hydrocotyle vulgaris* and *Filipendula* are well represented and *Lotus*-type declines | The typical early Holocene expansion of juniper is reflected in this zone. Ash values at ~5% indicate lower minerogenic inwash (a pattern established at the top of zone 2). Trees are not yet present. Herbaceous communities continue to be important, at least locally (cf. *Lotus*-type, Cyperaceae and Poaceae) |
| 2<br>266–260<br>11.7–11.49 ka | Poaceae-*Rumex*-type-Cyperaceae PAZ. *Rumex*-type peaks first (42%) and then Poaceae (53%). *Lotus*-type achieves a high value at the top of the zone | Herbaceous communities (sedges, grasses, dock) are more dominant than in the previous zone and willow is less important. Higher pollen concentration and accumulation rates suggest a rise in temperature |
| 1<br>269<br>11.7 ka | *Salix* (56%) and Cyperaceae (32%) dominated pollen spectrum. Poaceae and *Rumex*-type also important. Pollen concentration values low | Early Holocene plant communities. Willows — presumably including Arctic willows such as *S. herbacea, S. reticulata*, etc. dominant. Grass and sedge communities also important. Dock incl. alpine dock (Oxyria digyna) important. Pollen of tall trees arise from long-distance transport. High ash values suggest unstable soils |

Note: spectra are indicated by their depths, i.e. the top depth of 1-cm thick samples; AD, BC = CE, BCE (respectively).