

THE DISTRIBUTION OF DRYOPTERIS BORRERI NEWM. IN THE BRITISH ISLES

By J. P. PUGH

INTRODUCTION

The fern that has been called *Dryopteris filix-mas* var. *paleacea* has been well known to botanists for many years. Manton (1950, 54) has given reasons for raising this fern to specific rank as suggested by Newman (1854, 189) and the plant is now known as *Dryopteris borrieri* Newm. in Britain. This work was undertaken with a view to determining the distribution of *D. borrieri* in the British Isles, correlating this with its distribution on the continent, and comparing it with the distribution of *D. filix-mas*. A general account is given in this paper ; detailed cytological work has been started and will be reported at a later date.

DESCRIPTION OF *D. BORRERI* NEWM.

The distinguishing characters of *D. borrieri* are :—

- (1) The large number of ramenta (scales) extending along the abaxial side of the rachis of the frond from base to apex, which tend to be red-brown in colour as opposed to those of *D. filix-mas* which are far less abundant and yellow-brown in colour.
- (2) The pinnules tend to be truncate and less toothed than those of *D. filix-mas* and also they are incompletely separated at the base (fig. 1).



Fig. 1. Ventral view of pinnules of *D. borrieri* (left) and *D. filix-mas* (right) ($\times 2$).

- (3) The fronds of *D. borrieri* tend to be tougher than those of *D. filix-mas*, persisting long into the autumn and often overwintering.
- (4) In the spring the indusium is tucked under the edges of the sorus, whereas in *D. filix-mas* the indusium lies flat on the surface of the frond around the sorus (fig. 2).
- (5) Fresh specimens exhibit a small area of black pigment at the base of the pinna rachis where it joins the main rachis of the frond. This pigment is absent in herbarium specimens and has been found to disappear within a month of collection.
- (6) *D. borrieri* reproduces apogamously, the sporophyte arising directly from the tissues of the gametophyte without the formation of archegonia. Hence there is no sexual fusion, although fertile male gametes may be formed. Reproduction is quite normal in *D. filix-mas*.

Wide variation occurs throughout this species, and the most reliable character seems to be the large number of ramenta on the rhachis. It has been known for some time that the fronds of *D. borrieri* tend to overwinter whereas those of *D. filix-mas* do not, and this characteristic is obvious in winter when green plants of *D. borrieri* are most prominent amidst brown, tangled remains of *D. filix-mas*.

In spring, the indusial character, as shown in fig. 2, is unmistakable, but this condition does not persist for long.

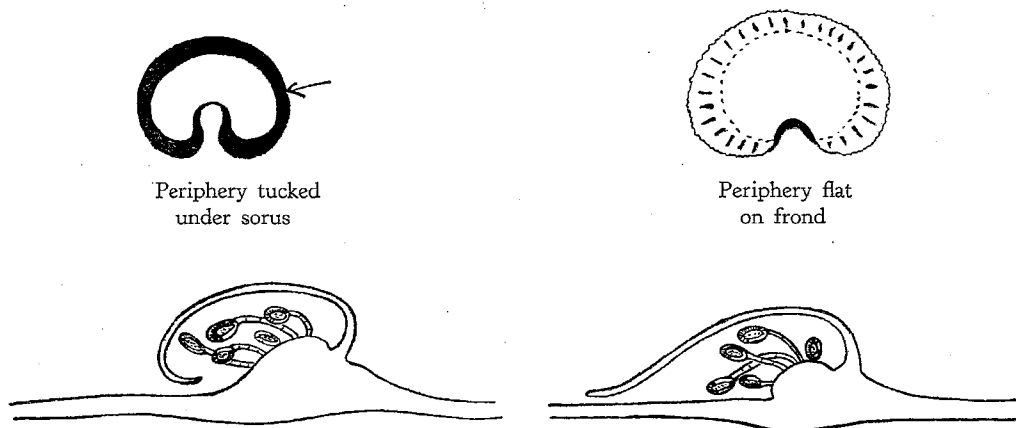


Fig. 2. Surface views and diagrammatic longitudinal sections of the sori of *D. borrieri* (left) and *D. filix-mas* (right) ($\times 20$).

The truncate nature of the pinnules is sometimes very marked, but a gradation series between the truncate form and the tapering form characteristic of *D. filix-mas* has been observed. However, in specimens of *D. borrieri* which exhibited more or less tapering pinnules, the periphery of the pinnules was more entire and less toothed than comparable pinnules of *D. filix-mas*.

D. borrieri has been described as yellow-green in colour (Newman, 1854, 191; Warburg, 1952, 38). Manton (1950, 54) records it as often more yellow-green. Material is abundant in the British Isles and on the continent which is definitely dark green. Therefore colour is not a reliable diagnostic character and conditions affecting the colour are being investigated.

Information regarding the distribution of *D. borrieri* in the British Isles is still very incomplete and any records of localities would be most welcome, especially from Ireland. The inclusion of a small note regarding topography and geology (where possible) would also be useful, as these will greatly assist in the determination of ecological requirements.

DISTRIBUTION

The following list shows the records as they are known at present; it is composed of all the localities for which there is an herbarium specimen; these localities are represented on the map (fig. 4) as solid dots. The open circles on the map represent all the localities mentioned in the literature and a list of these has been deposited in the Cryptogamic Room of the British Museum (Natural History). I am indebted to the following for personal communication of several localities:— D. E. Allen, O. Buckle, J. G. Dony, Miss E. J. Gibbons, J. D. Grose, J. W. Heslop-Harrison, H. A. Hyde, R. M. Payne, H. Milne-Redhead, Miss C. M. Rob, W. A. Sledge and A. E. Wade.

KEY TO HERBARIA

| | | | |
|---------------------------------|-------------|---------------------------|-----------|
| Aberdeen University | (Ab U) | C. B. Burt at Kew | (K.Burt) |
| British Museum (Nat. Hist.) | (B.M.) | Moore at Kew | (K.Moore) |
| Boswell-Syme at B.M. | (B.M.Bosw.) | Watson at Kew | (K.Wats) |
| Sowerby at B.M. | (B.M.Sow.) | A. J. Lacey | (Lacey) |
| Ley at Birmingham University | (B.U.Ley) | Luton Museum | (Lut) |
| Cambridge University | (Cam) | National Museum (Ireland) | (NMI) |
| Carlisle Museum | (Car) | Norwich Castle Museum | (Norw) |
| Royal Botanic Garden, Edinburgh | (E) | Oxford University | (Ox) |
| Royal Albert Museum, Exeter | (Ex.Hiern) | R. M. Payne | (Payne) |
| J. Gibbons | (Gibb) | J. P. Pugh | (Pugh) |
| Brody at Gloucester Museum | (Glo.Brod.) | F. Rose | (Rose) |
| Kew | (K) | P. Taylor | (Tayl) |
| Borrer at Kew | (K.Borr.) | Welsh National Herbarium | (WNH) |

RECORDS WITH HERBARIUM SPECIMENS

- V.c. 1. W. CORNW. : nr. Chygarkye, 1936, *R. Melville*, (K); Madron, 1946, *E. Milne-Redhead*, (K); Penryn, 1856, *G. Dawson*, (K.Moore); Penzance, 1887, *A. Bennett*, (B.M.).
2. E. CORNW. : Callington, 1936, *R. Melville*, (K); Charlestown, 1926, *E. Thurston*, (K); nr. Egloskerry, 1915, *E. Thurston*, (K); nr. Fowey, 1949, *J. P. M. Brenan*, (K); Lostwithiel, 1839, *Babington*, (Cam); Veryan, 1938, *A. H. G. Alston*, (B.M.).
3. S. DEVON : Cockington, Torquay, 1943, *G. V. C. Last*, (K); between Colebrooke and Shaugh, 1878, *T. R. Archer Briggs*, (B.M. & K.Wats); Kilmington, 1937, *A. H. G. Alston*, (B.M.); nr. Plymouth, 1877, *T. R. Archer Briggs*, (B.M.); Sidmouth, 1935, *J. W. Wyatt*, (K); bank of Tavy, 1884, *J. Vaughan*, (Ox).
4. N. DEVON : Barnstaple, 1859, *Jackson*, (K. Moore); Bratton Fleming, 1918, *A. J. Wilmott*, (B.M.); nr. Brendon, 1917, *W. C. Barton*, (B.M.); Clovelly, 1890, *F. R. Terrast*, (Cam); Combe Martin, 1839, *Babington*, (Cam); Lynmouth, 1902, *C. B. Green*, (Ox); Lynton, 1879, *W. J. Lawson*, (Ab U); North Molton, 1939, *Hiern*, (Ex.Hiern); Rodney, nr. Lynmouth, 1919, *H. W. Pugsley*, (B.M.).
5. S. SOM. : Dulverton, 1892, *R. P. Murray*, (B.M.); Elworthy, 1865, *T. Moore*, (K.Moore); West Lyn Valley, 1913, *F. Long*, (Norw); Otterford, 1949, *E. Milne-Redhead*, (K).
6. N. SOM. : Badgworth, 1886, *H. W. Pugsley*, (B.M.); Portbury, 1899, *H. W. Pugsley*, (B.M.); Stourton Woods, 1892, *E. F. Linton*, (B.M.); Clifton, 1951, *P. Taylor*, (Tayl); Hallatrow, 1918, *I. M. Roger*, (Cam & Ox); Weston-Super-Mare, 1860, *Mrs. Walker*, (K.Moore).
8. S. WILTS. : Landford, several localities, 1952, *J. P. Pugh*, (Pugh); nr. Stourton, 1892, *R. P. Murray*, (B.M.).
9. DORSET : Bovington, 1818, *J. Ladbrook*, (B.M.Bosw); Charmouth, 1848, *H. D. Geldart*, (Norw); Halstock, 1918, *I. M. Roper*, (Norw).
10. WIGHT : Alum Bay, 1889, *C. E. Palmer*, (Ox).
11. S. HANTS. : Islands Thorns Inclosure, 1952, *J. P. Pugh*, (Pugh); Pondhead Inclosure, Lyndhurst, 1952, *J. P. Pugh*, (Pugh).
13. W. SUSSEX : Horsham, 1864, *F. J. Broods*, (K).
14. E. SUSSEX : Eridge, 1950, *A. H. G. Alston*, (B.M.).
15. E. KENT : Dungeness, 1952, *F. Rose*, (Pugh).
16. W. KENT : nr. Bidborough, 1883, *F. H. Ward*, (B.M.Sow); nr. Hawkhurst, 1952, *F. Rose*, (Pugh); Tunbridge Wells, 1850, *Miss Beever*, (K.Moore); nr. Goudhurst, 1952, *F. Rose*, (Pugh).
17. SURREY : nr. Haslemere, 1938, *A. H. G. Alston*, (B.M.); Kew, 1879, *G. Nicholson*, (Ab U); Leith Hill, 1952, *J. P. Pugh*, (Pugh); Pirbright, 1870, *H. C. Watson*, (K.Wats); Woking Heath, 1870, *H. C. Watson*, (K.Wats).
18. S. ESSEX : Epping Forest, 1951, *R. M. Payne*, (Pugh).
19. N. ESSEX : Stour Woods, 1951, *J. P. Pugh*, (B.M. & Pugh).

25. E. SUFF. : Bentley Long Wood, 1951, *J. P. Pugh*, (B.M. & Pugh).
27. E. NORF. : Aylmerton, 1952, *J. P. Pugh*, (B.M. & Pugh); Little Plumstead, 1952, *J. P. Pugh*, (B.M. & Pugh); Rockland, 1952, *J. P. Pugh*, (B.M. & Pugh); Walsham, 1952, *J. P. Pugh*, (Pugh); Bacton Wood, 1952, *J. P. Pugh*, (Pugh).
30. BEDS. : Chiltern Green, 1946, *P. Taylor*, (B.M. & K); Heath & Reach, 1946, *P. Taylor*, (Lut); Kings Wood, 1946, *P. Taylor*, (Lut); Luton Hoo, 1946, *P. Taylor*, (Lut).
31. HUNTS. : Holme Fen, 1951, *F. Rose*, (Rose).
33. E. GLOS. : Driffield Wood, 1910, *W. C. Barden*, (B.M.); Haresfield Beacon, 1926, *C. B. Burt*, (K.Burt).
34. W. GLOS. : Huntley, 1946, *P. Taylor*, (B.M. & Tayl); Mitcheldean, *A. Ley*, (Glo.Brody); Putten Edge, *A. Ley*, (B.U.Ley).
35. MON. : Black Mts, 1871, *A. Ley*, (B.M.Bosw, K.Wats, Ox); Buckholt Wood, 1945, *S. G. Charles*, (WNH); Cross ash, 1944, *S. G. Charles*, (WNH); Cwn Glyn, nr. Pontypool, *T. H. Thomas*, (WNH); Dingestow, 1948, *S. G. Charles*, (WNH); Grossmont Wood, 1944, *S. G. Charles*, (WNH); Kilgwrrwg, 1908, *W. H. Shoolbred*, (WNH); Llandogo, 1944, *S. G. Charles*, (WNH) Newport, *E. Newman*, (B.M.); Reddings Enclosure, nr. Monmouth, 1945, *R. Lewis*, (B.M., K, WNH); Talycoed, 1943, *S. G. Charles*, (WNH).
36. HEREF. : nr. Bromyard, 1951, *P. Taylor*, (Tayl).
40. SALOP : nr. Broseley, 1855, *Maw*, (K.Moore, Ab U, Norw); Quillus Wood, 1883, *G. C. Druce*, (Ox).
41. GLAM. : Caerphilly Mt., *H. A. Hyde & A. E. Wade*, (WNH); nr. Maersaraul Ely, 1873, *T. Moore*, (K.Moore); Merthyr Tydfil, 1839, *Babington*, (Cam); Mountain Ash, 1904, *W. C. Barton*, (B.M.); Taffs Well, 1928, *A. E. Wade*, (WNH).
42. BRECON : nr. Cefn, 1903, *W. C. Barton*, (B.M.); Grwyne Valley, 1944, *S. G. Charles*, (WNH); Llandetty, 1946, *E. Milne-Redhead & H. K. Airy Shaw*, (B.M.); Taren yr Esgob, 1942, *S. G. Charles*, (WNH).
44. CARM. : Ammanford, 1951, *H. Davies*, (Pugh); Ystrad ffin, 1950, *H. A. Hyde & A. E. Wade*, (WNH).
45. PEMB. : Cilgwyn, 1932, *A. H. G. Alston*, (B.M.); Castle Malgwyn, 1856, *W. Hutchinson*, (K); between Narbeth and St. Clears, 1931, *A. H. G. Alston*, (B.M.).
46. CARD. : nr. Aberystwyth, 1951, *P. Taylor*, (Tayl).
47. MONT. : Casseinion, 1951, *P. Taylor*, (Tayl); Cwm Einion, 1945, *P. W. Richards* (Cam).
48. MER. : Abergwynant, 1951, *P. Taylor*, (Tayl); nr. Barmouth, 1857, *W. A. Leighton*, (Cam); Cader Idris, 1948, *P. Taylor*, (K); nr. Cymeron Falls, 1941, *J. A. Webb*, (WNH); N. of Dyffrydau, 1948, *E. Milne-Redhead*, (K, WNH); between L. Gwernan and Dolgelley, 1951, *W. C. Barton*, (B.M.); Moel Cynwch, 1886, *W. Moyle Rogers*, (B.M.); Dolgelley, 1854, *T. Hawley*, (D, NMI).
49. CAERN. : nr. Bangor, 1945, *I. Manton*, (B.M.); Beddgelert, 1869, *Steele*, (NMI); nr. Capel Curig 1863, *Mrs. Battersby*, (K.Moore); Dolgarrog, 1928, *A. Wilson*, (WNH); Llanberis, 1875, *A. Bennett*, (B.M.); lower slopes of Moel Hebog, 1951, *P. Taylor*, (Tayl); Waenfawr, 1909, *C. W. Welfitt-Nicholls*, (K).
50. DENB. : Pentre-Foelas, 1854, *C. E. Palmer*, (Ox); Ruthin, 1855, *T. Pritchard*, (K.Moore).
53. S. LINCS. : Norton Disney, 1951, *J. Gibbons*, (Gibb); Stapleford Moor, 1951, *J. Gibbons*, (Gibb).
54. N. LINCS. : Croppers Gorse, 1951, *J. Gibbons*, (Tayl); Holton le Moor, 1951, *J. Gibbons*, (B.M.); Raithby Brackens, 1951, *J. Gibbons*, (Gibb); Roxton Wood, 1951, *J. Gibbons*, (Tayl); Walesby, 1951, *J. Gibbons*, (Gibb); Welton le Marsh, 1945, *A. H. G. Alston*, (B.M.).
57. DERBY : Edlaston, 1887, *W. R. Linton*, (Cam).
60. W. LANCS. : nr. Thrang End, 1951, *P. Taylor*, (Tayl).
62. N.E. YORK : Beckdale, 1841, *J. G. Baker*, (K.Wats); Kirkleatham, 1862, *J. Duncan*, (K.Moore).
63. S.W. YORK : nr. Barnsley, 1880, *H. Johnson*, (B.M.); Bilberry, nr. Holmfirth, 1894, *R. S. Standen*, (B.M.).
64. M.W. YORK : Bolton Abbey, 1946, *P. Taylor*, (Tayl); nr. Buckden, 1934, *A. H. G. Alston*, (B.M.); Harrogate, 1837, *C. A. Stevens*, (Car); Ingleborough, 1879, *E. Newman*, (B.M.Sow).

65. N.W. YORK : Cautley Spout, 1934, A. H. G. Alston, (B.M.); Holwick, 1925, C. I. & N. Y. Sandwith, (K).
66. DURHAM : High Force, 1886, H. J. Muswell & A. Bennett, (B.M.).
67. NORTHUMB. S. : nr. Featherstone Castle Ravine, 1951, P. Taylor, (Tayl).
68. CHEVIOTL. : Beanley, 1867, (K.Moore).
69. WESTMORL. : Barbondale, 1946, P. Taylor, (Tayl); Hilton Rigg Wood, 1951, P. Taylor, (Tayl); Hodge Hill, Cartmell Fell, 1929, L. Baker, (K); Kentmere, 1886, F. H. Ward, (B.M.Sow); Pennybridge, 1863, R. Morris, (K.Moore); Troutbeck, 1879, G. Nicholson, (Ab U); Windermere, 1859, W. C. Barton, (B.M.); Whitbarrow Scar, 1951, P. Taylor, (Tayl); St. Helens, Dalton, 1921, W. H. Pearsall, (Ox).
70. CUMB. : Carlisle, 1885, P. Shepherd, (Car); Eskdale, 1927, R. H. Williamson, (Car); Grange, Borrowdale, 1951, A. J. Lacey, (Lacey); Keswick, 1926, Mrs. Reynolds, (K); Skiddaw, 1870, E. F. Linton, (B.M.); St. Bees Head, 1950, C. W. Muirhead, (Car).
72. DUMFR. : Moffat, 1860, J. Anderson, (K.Moore); Penton, 1949, P. Taylor, (K).
73. KIRKC. : nr. Mainsriddle, 1951, P. Taylor, (Tayl).
75. AYR : Kilmarnock, 1881, W. Birrell, (K).
77. LANARK : Biggar Shiels Wood, 1868, N. Fraser, (E); Lamington Glen, 1863, N. Fraser, (E).
78. PEEBLES : nr. Mossfenman, 1868, N. Fraser, (E).
80. ROXB. : Newcastleton, 1951, P. Taylor, (Tayl).
83. EDINB. : Hawthornden, 1865, T. Moore, (K.Moore); Pentland Hills, Edinburgh, 1841, H. C. Watson, (K.Wats); nr. Cramond, 1833, W. MacGillivray, (Ab U); Bavelaw Wood, 1902, W. E. Evans, (E); Roslin, 1837, (E); Lasswade, 1859, W. R. McNab, (NMI); nr. Edinburgh, 1858, R. Brown, (Ab U).
85. FIFE : Balmuto, 1874, J. Boswell-Syme, (B.M., Cam, Ab U); Glassmane Hill, Kilrie, 1874, J. Boswell-Syme, (B.M.Bosw); Kinross, 1874, M. Ridley, (K.Moore); Orrock Hill, 1874, J. Boswell-Syme, (B.M.Bosw); Cullalo, 1874, J. Boswell-Syme, (B.M.Bosw).
86. STIRL. : Campsie, 1851, (Ab U); Inversnaid, 1854, T. Moore, (K.Moore).
87. W. PERTH : Pass of the Trossachs, 1854, T. Moore, (K.Moore); Loch an Balloch, 1855, T. Moore, (K.Moore); Tillicoultry Glen, 1876, J. Boswell-Syme, (B.M.Bosw); Callander, 1864, N. Fraser, (E).
88. MID PERTH : Ben Lawers, 1855, T. Moore, (K.Moore); Cairnie, 1910, J. Farquharson, (Car); Glenturret, nr. Crieff, 1899, C. B. Clarke, (K); Loch-na-Larige, 1932, G. Taylor, (B.M.); Perth, 1946, A. H. G. Alston, (B.M.).
89. E. PERTH : nr. Ballinluig, 1888, E. S. Marshall, (Cam).
90. FORFAR : Clova Mts, 1835, J. Backhouse, (K); Glen Fiagh, Clova, 1923, R. H. Williamson, (Car); cliffs by Loch Brandy, Clova, 1921, H. W. Pugsley, (B.M.); nr. Loch Long, 1947, A. H. G. Alston, (B.M.); Shieldhill, 1924, (B.M.).
92. S. ABERD. : Robslaw Den, nr. Aberdeen, 1876, J. W. H. T., (Ab U).
94. BANFF : nr. Fordyce, 1949, A. H. G. Alston, (B.M.).
95. ELGIN : Dunphail, nr. Forres, 1859, F. Browne, (K.Moore); Moseley, nr. Birnie, 1863, N. Fraser, (E).
96. EASTERNESS : nr. Drumnadrochit, 1947, C. C. Townsend, (B.M.); Dalwhinnie, 1839, H. C. Watson (K.Wats); Dunean Hill, 1866, N. Fraser, (E); Badger Fall, Fasnakyle, 1947, N. Y. Sandwith, (K).
97. WESTERNESS : nr. Arisaig, 1950, M. E. D. Poore & C. D. Pigott, (B.M.); Cairndow, 1855, T. Moore, (K.Moore); Glen Cripesdale House, 1884, (B.M.); Glen Spean, 1891, G. C. Druce, (Ox); by L. Sunart, 1884, E. F. Linton, (B.M.).
98. MAIN ARGYLL : Ardchattan, 1860, W. Haliday, (Ox); Ardrishaig, 1855, T. Moore, (K.Moore); Glen Coe, 1855, T. Moore, (K.Moore); Glen Croe, 1855, T. Moore, (K.Moore); Glen Gillip, T. Moore, (K.Moore); Glen Kinglas, 1855, T. Moore, (K.Moore).
99. DUNB. : Luss, 1857, A. O. Brodie, (E); Tarbet, 1855, T. Moore, (K).
100. CLYDE ISLES: Glen Shant, Brodick, Arran, 1852, (Ab U); Bute, 1827, Greville, (E).

101. KINTYRE : Campbeltown, 1950, *M. H. Cunningham*, (B.M.).
 104. N. EBUDES : S.W. of Kil-Marie, Strathaird Peninsula, Skye, 1951, *D. J. Griffiths*, (B.M.); Armadale, Skye, 1903, *W. C. Barton* (B.M.); Quiraing, Skye, 1884, *E. F. Linton*, (B.M.).
 105. W. ROSS : Diabaig, 1936, *A. J. Wilmott*, (B.M.); Strome Ferry, 1884, *E. F. Linton*, (B.M., Ox Cam).
 106. E. ROSS : Isle of Cromarty, 1881, (Ox).
 108. W. SUTH. : Ben Hope, 1833, *W. R. McNab*, (NMI); Lochinver, 1890, *E. S. Marshall*, (Cam); Melvich, 1886, *E. S. Marshall*, (Cam).
 111. ORKNEY : E. Corrie, on N.W. face of Hoy Hill, 1880, *H. H. Johnston*, (NMI); Hammers, Syradale, Firth, 1883, *H. H. Johnston*, (Ox); Houton, 1952, *J. T. Syme*, (K.Wats); Ramsdale, Swanbister, 1873, *J. T. Boswell-Syme*, (B.M.Bosw); Swartages, Birsay, 1921, *H. H. Johnston*, (E); nr. Wastdale Mill Farm, Firth, 1880, *J. T. Boswell-Syme*, (B.M.Bosw).
- H.
1. S. KERRY : nr. Cloonee Loughs, 1952, *A. H. G. Alston*, (B.M.).
 2. N. KERRY : Killarney, 1952, *A. H. G. Alston*, (B.M.).
 3. W. CORK : Inchigeelagh, 1952, *A. H. G. Alston*, (B.M.).
 4. MID CORK : E. of Macroom, 1952, *A. H. G. Alston*, (B.M.).
 7. S. TIPP. : Newcastle, 1882, *J. Britten & C. Nicholson*, (B.M.).
 8. LIM. : Foynes, 1902, *C. G. Brien*, (NMI).
 9. CLARE : Glen at Ennistymon, 1865, *Hb. Churchill*, (K); Kilfenora Bog, 1947, *J. G. Dony*, (K).
 12. WEXF. : nr. Mt. St. Benedict, 1952, *A. H. G. Alston*, (B.M.).
 15. S.E. GALW. : Slieve Aughty, Dalystown, 1945, *I. Manton*, (K).
 16. W. GALW. : Clifden, 1907, *J. W. White*, (Cam); banks of Glen Inagh, 1900, *J. S. Gamble*, (K); Kylemore, 1855. *R. Barrington*, (K.Moore).
 20. WICKLOW : Ballyarthur, 1894, *R. Lloyd Praeger*, (NMI); nr. Enniskerry, 1894, *R. Lloyd Praeger*, (NMI); Templemichael, Arklow, 1882, *W. Fawcett*, (B.M.); nr. Up. Lough Bray, 1855, *R. Barrington*, (K.Moore).
 22. WESTMEATH : Knock Drin, 1895, *E. S. Gregory*, (B.M.).
 27. W. MAYO : Ballycray Mts, 1855, *R. Barrington*, (K. Moore); Inishturk, 1906, *R. Lloyd Praeger*, (WNH, NMI).
 28. SLIGO : Lough Gill, 1855, *R. Barrington*, (K.Moore).
 33. FERM. : Slieve Rushen, 1949, *P. Taylor*, (Tayl).
 35. N. DON. : Killybegs, 1855, *R. Barrington*, (K.Moore).
 36. TYRONE : Omagh, 1896, *M. C. R.*, (NMI).
 38. DOWN : Sandy Warren, Newcastle, 1893, *S. A. Stewart*, (NMI).
 40. DERRY : below Glenbourne Pass, on road to Maghera, 1930, *M. M. Whiting*, (K).

DISCUSSION

Von Wolf (1936) produced the map (fig. 3) to show the northern limits of *D. borrieri* Newm. in Europe :

The map (fig. 4) showing the detailed distribution of *D. borrieri* in the British Isles, is in agreement with von Wolf's. From this map it can be seen that this species occurs rather irregularly throughout the British Isles and, like most native ferns, is more abundant in the west than in the east, since the higher humidity in the west offers a more favourable habitat for this group of plants. The vice-comital distribution also requires comment. *D. borrieri* may well be absent from Cambridgeshire, since there are so few woods in this county, but would be expected to occur fairly frequently in Yorkshire, Northumberland and Durham. The alkalinity of the soil in East Anglia may, in some measure, inhibit *D. borrieri*, although there is a small, isolated fen in the

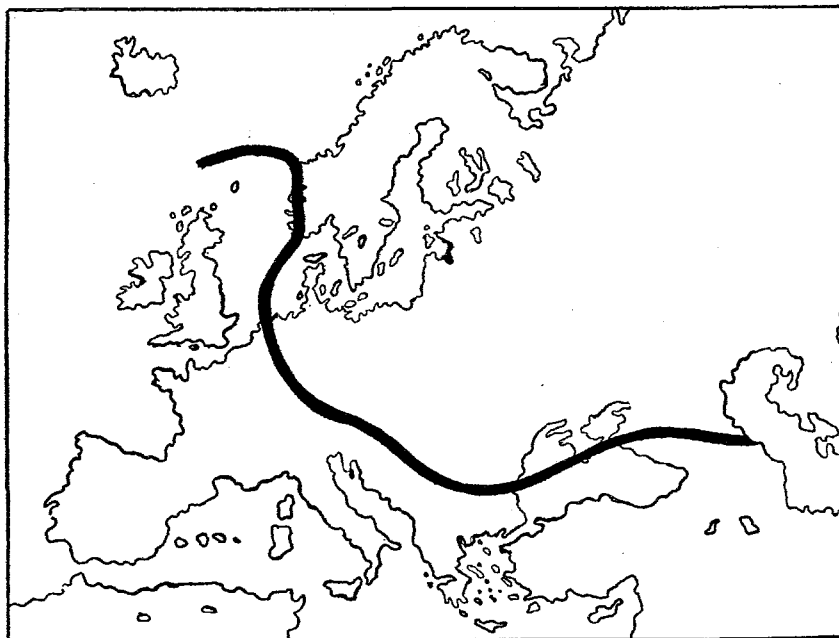


Fig. 3. Northern limit of *Dryopteris borreri* in Europe.

south of England in which this fern is present. The pH of the soil has not yet been investigated and, therefore, no definite information on this point is available. Of the several localities in Norfolk and Suffolk, in which this fern has been found, none is markedly alkaline and it is probable that *D. borreri* occurs in many other localities which have not yet been recorded. Lee (1933) reports that *D. borreri* is common in Ayrshire and a few localities in the south-east corner of Kirkcudbrightshire. The latter localities have been confirmed by representative specimens collected in 1951 by P. Taylor. It therefore seems most improbable that this fern is entirely absent from Wigtown although there are, as yet, no records. The apparent absence of this fern from Caithness, East Sutherland and East Ross as well as from North Aberdeenshire seems surprising and is probably due to the failure of botanists to distinguish *D. borreri* from *D. filix-mas*, since the latter is recorded from these vice-counties. The apparent distribution in Ireland is also unexpected and a similar explanation probably applies here.

Detailed work on the ecology of this species may prove interesting since *D. borreri* is usually found in damper and more shaded situations than *D. filix-mas*, although not invariably so. It is hoped that this will be touched on in the investigation of the distribution of polyploid races which is now being undertaken. Manton (1950, 59) has demonstrated diploid and triploid strains; it will be interesting to see if there are any other chromosome races and also if chromosome number has any bearing on the ecological requirements.

Local populations of *D. borreri* may be almost pure, being in fact clonal, and may exhibit differences in small details of the characters which are given above in the paragraph on description, from populations of other localities. Owing to the absence of gametic fusion, gene exchange does not occur, and hence small genetic changes within a plant are retained throughout succeeding generations and local stands may exhibit remarkable similarity among themselves but dissimilarity from other stands. It is important to remember these facts when identifying plants of *D. borreri*. Hybrids between *D. borreri*

and *D. filix-mas* may also be formed where these plants occur in close association. *D. filix-mas* is always the female and *D. borrieri* the male parent since fertile spermatozoids of *D. borrieri* are formed but no ova; such hybrid plants are being investigated.

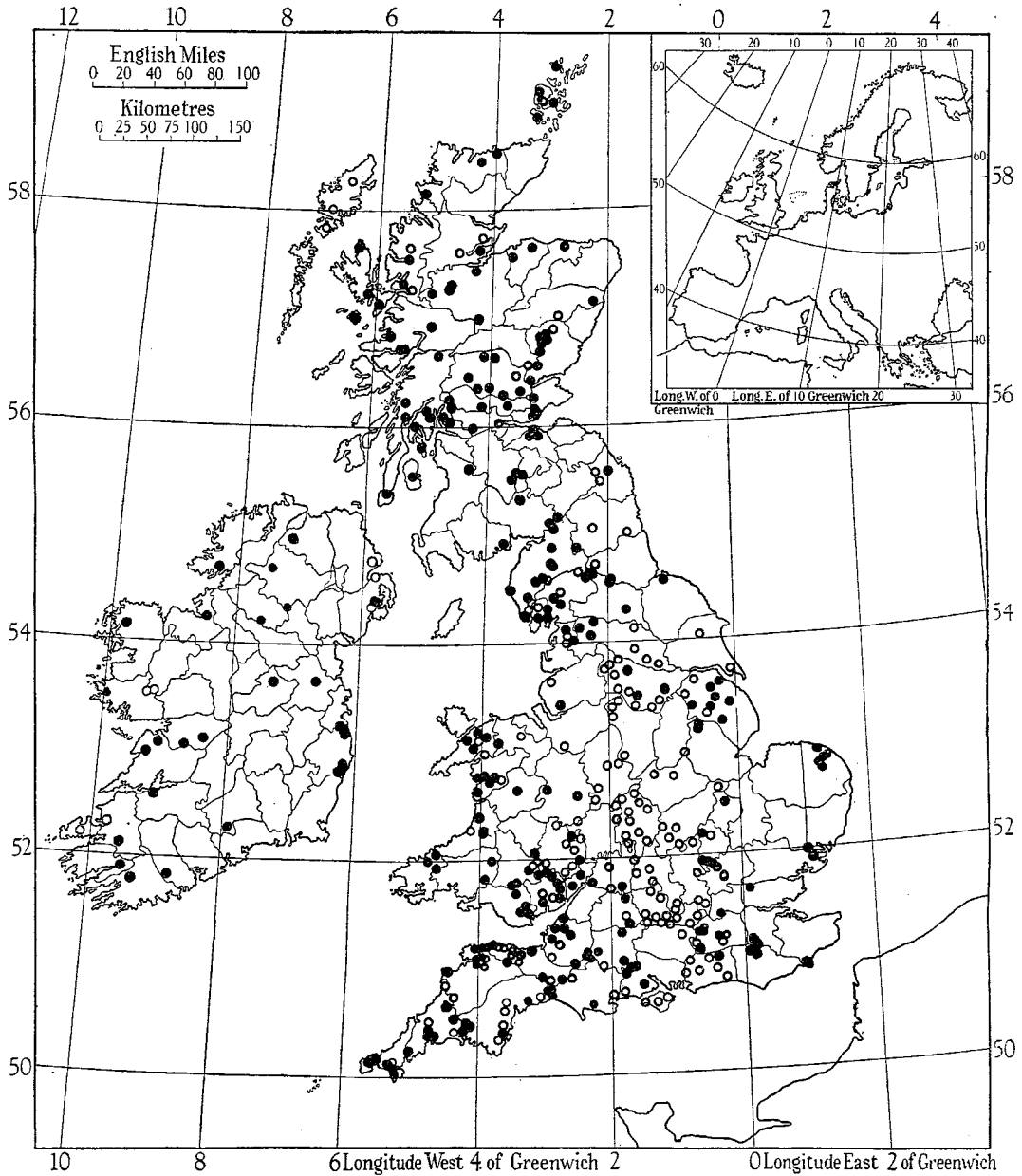


Fig. 4. Distribution of *Dryopteris borrieri* in the British Isles.

It is evident that much more work on this species is required but, as was mentioned in the introduction, this is only a general account and from this it can be seen that *D. borrieri* is distributed throughout the British Isles, and that some important facts may ensue from a study of the polyploid races.

SUMMARY

- (1) The characteristics of *D. borrieri* Newm. are given.
- (2) All the existing records of the occurrence of *D. borrieri* in the British Isles are presented on a map and a list is given of herbarium specimens.
- (3) Von Wolf's map showing the northern limits of *D. borrieri* in Europe is reproduced: the occurrence of this species throughout the British Isles (except the Shetland Islands) agrees very well with its distribution on the continent.
- (4) The scarcity of this fern in some parts of the British Isles is discussed and accounted for mainly by the lack of distinction from *D. filix-mas* by collectors.
- (5) *D. borrieri* seems to prefer damper and shadier situations than *D. filix-mas*.
- (6) Some points which may be clarified by cytological work now being undertaken are mentioned.

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