

Distribution of Pteridophyta in Wales

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ABSTRACT

New 10-km square maps are presented for pteridophytes in Wales. The time-spans used for these maps are pre-1950, 1950-69 and 1970-1990.

INTRODUCTION

An interest by botany staff of the National Museum of Wales in recording the distribution of pteridophytes in Wales has been evident since H. A. Hyde and A. E. Wade wrote the original edition of *Welsh Ferns*. This descriptive handbook, published jointly by the National Museum of Wales and the University of Wales in 1940, was written in response to a perceived need for a simple and inexpensive text. Its usefulness outside the Principality was anticipated correctly by the inclusion of brief accounts of British species not occurring in Wales. Notes were given on the distribution of the species in Wales and lists included of specimens in the Welsh National Herbarium. Specimen lists for the very common species were impractical so only vice-counties were listed.

This system was followed in the next three editions, published in 1948, 1954 and 1962, although the third edition was largely a lithographical reprint of the second. There were, however, several changes in the fourth edition which reflected an increased knowledge of fern distribution in Wales. The three species of *Polypodium*, the two subspecies of *Asplenium trichomanes*, and hybrids of *Asplenium* and *Polystichum* were included for the first time. Details of *Dryopteris* hybrids were expanded. The varieties of *Asplenium*, *Athyrium*, *Ceterach*, *Cystopteris* and *Dryopteris*, which had been included earlier, were omitted.

The larger fifth edition (1969) was revised and expanded by S. G. Harrison, to include the clubmosses, quillworts and horsetails. The sixth edition (1978) gave many more descriptions of hybrids with corresponding details of their known distributions in Wales.

Throughout these six editions there was a marked increase in the number of listed herbarium specimens, thereby giving greater information on species, subspecies and hybrid distributions in Wales. For example, the number of listed specimens for *Phegopteris connectilis* increased from 20 to 51 and for *Hymenophyllum wilsonii* from 22 to 66. There is a clear increase in the number of sites listed for many taxa and therefore a greater known distribution for them. More species lists simply became too large so they were omitted when every vice-county in Wales was represented. The authors also recorded the overall increase in the total number of specimens held in the herbarium. Numbers of British ferns were given as 1,660 in 1940, 1,990 in 1948, 2,200 in 1954 and 2,260 in 1962, then the number of British Pteridophyta as 3,200 in 1969 and 3,900 in 1978. The herbarium now includes 6700 British Pteridophyta of which 3900 are Welsh.

Meanwhile, there was the general move towards recording the distribution of plants by the grid square system, rather than by vice-counties, and the publication of the *Atlas of the British flora* (Perring & Walters 1962). The pteridophyte maps in the latter were, however, widely accepted to be imperfect because they went to the printers within six years of the start of the mapping scheme (Jermy *et al.* 1978). This was rectified considerably when the *Atlas of Ferns of the British Isles* was published (Jermy *et al.* 1978). Even so, some of these later maps were clearly still incomplete, especially those of the commonly less well understood species, hybrids of *Polypodium* and *Dryopteris*, and the subspecies of *Asplenium trichomanes* and *Dryopteris affinis*.

It was against this background of recording the distributions of pteridophytes that we commenced work on a new edition of *Welsh Ferns*. Clearly, the idea of incorporating lists of herbarium

specimens is no longer practical, nor is it a suitable method of portraying the distribution of taxa. We decided instead to record distribution on a 10-km grid square system. With the completion of the B.S.B.I. Monitoring Scheme (1987–88) and talk of a new atlas of the British flora, although funds have not yet been allocated, 1990 is a convenient date to end the current time span. These maps we present here, in advance of a new *Welsh Ferns*, to ensure their early availability to a wide audience in the hope that these will stimulate further interest in Welsh pteridophytes and their distribution.

COMPILATION OF MAPS

The base-maps used were those of Perring & Walters (1962) and Perring & Sell (1968) with nomenclature modified according to Derrick *et al.* (1987). To these were added records held by the Biological Records Centre, Monks Wood Experimental Station in November 1986 which included all the records of Jermy *et al.* (1978). Information from all the specimens at NMW was checked as was that from specimens of the more critical taxa at BM. Appropriate literature sources were also checked. The records in the Welsh Plant Records data-files held at NMW were added (including records received which applied up to the end of 1990).

Updated maps were sent, for modification and comment, to all Welsh vice-county recorders and several interested members of both the B.S.B.I. and the British Pteridological Society. However, maps of those taxa considered to be rare were only sent on a vice-county basis to the relevant vice-county recorder(s). Several records were added at this stage and recorders were also able to point out former mapping errors. A healthy correspondence on queries followed, which included obtaining more details from records at the Biological Records Centre. Generally, the wishes of vice-county recorders were complied with, especially the removal of doubtful records. Untraceable records were not used for the maps and on the boundary with England only records from the Welsh side of the 10-km square were included. The 10-km square records which appeared in the *Atlas of the British flora* as 1930 onwards that could not be traced are given a separate symbol because they cannot be assigned to either side of the 1950 time span boundary used in our maps.

Following this stage of the work it has been possible to add numerous records that resulted mostly either from field work associated with current county flora surveys or determinations of new specimens sent to NMW. Finally, the pteridophyte maps compiled from the B.S.B.I. Monitoring Scheme (1987–1988) were added.

The maps are presented in Figs 1–84, arranged in alphabetical order. Symbols used for the maps are as follows:—

- 1970–1990
- 1950–1969
- 1930–1969 untraced *Atlas of the British flora* record
- pre-1950
- ◆ Introduced 1970–1990
- ◇ Introduced pre-1970

Critical taxa have been looked at very carefully and many specimens of them examined. Maps for the main ones, which are outlined here, are still considered incomplete.

Asplenium trichomanes L. Since the *Atlas of the British flora*, a new subspecies (*A. trichomanes* subsp. *pachyrachis* (Christ) Lovis & Reichst.) and a nothosubspecies (*A. trichomanes* nothosubsp. *staufferi* Lovis & Reichst.) have been identified for Wales (Rickard 1989). *A. trichomanes* subsp. *trichomanes* is considered under-recorded especially in the southern half of Wales. New records for this area were only accepted after microscopic measurement of the exospores according to the method of Reichstein (Hegi 1984). The *A. trichomanes* distribution map is identical with that for *A. trichomanes* subsp. *quadri-valens* D. E. Meyer emend. Lovis, and is omitted.

Dryopteris affinis (Lowe) Fraser-Jenkins. An understanding of *Dryopteris affinis* as comprising three subspecies in the British Isles has only emerged in the second half of the 1980s (Fraser-Jenkins 1987). Var. *paleaceo-lobata* sensu Fraser-Jenkins is included under subsp. *affinis* and var. *robusta* (Oberholzer & von Tavel ex Fraser-Jenkins) Fraser-Jenkins & Salvo under subsp. *borreri* (Newman) Fraser-Jenkins, but records of these varieties were almost zero.

Polypodium vulgare L. agg. The records of *Polypodium vulgare* were treated with caution as many applied to *P. vulgare* sensu lato. Where accurate identification could not be established records were

treated as *P. vulgare* agg. For *P. × font-queri* Rothm. and *P. × shivasiae* Rothm. only records confirmed by R. H. Roberts are mapped. Many of the records of the commonest hybrid, *P. × mantoniae* Rothm., have also been confirmed by R. H. Roberts.

Ophioglossum azoricum C. Presl. Only the records recognized by Paul (1987) are included.

Trichomanes speciosum Willd. The distribution map includes only records for sporophytes. Other sites where only gametophytes have been found are not included.

ACKNOWLEDGMENTS

We thank all Welsh vice-county recorders, other interested members of the B.S.B.I. and the British Pteridological Society for adding to the updated base-maps, for pointing out erroneous records and answering numerous queries. C. D. Preston allowed access to the record-card files at the Biological Records Centre, Monks Wood Experimental Station, provided a set of pteridophyte maps resulting from the B.S.B.I. Monitoring Scheme (1987–1988) and answered numerous queries about the records. A. C. Jermy allowed us to examine specimens in the cryptogamic herbarium, BM. Thanks are due to referees for determinations and help with the taxonomy, especially C. R. Fraser-Jenkins (*Dryopteris affinis*) and R. H. Roberts (*Polypodium*), and A. C. Jermy. We also thank the numerous recorders who sent in specimens for determination and J. G. Gavan for preparing the maps.

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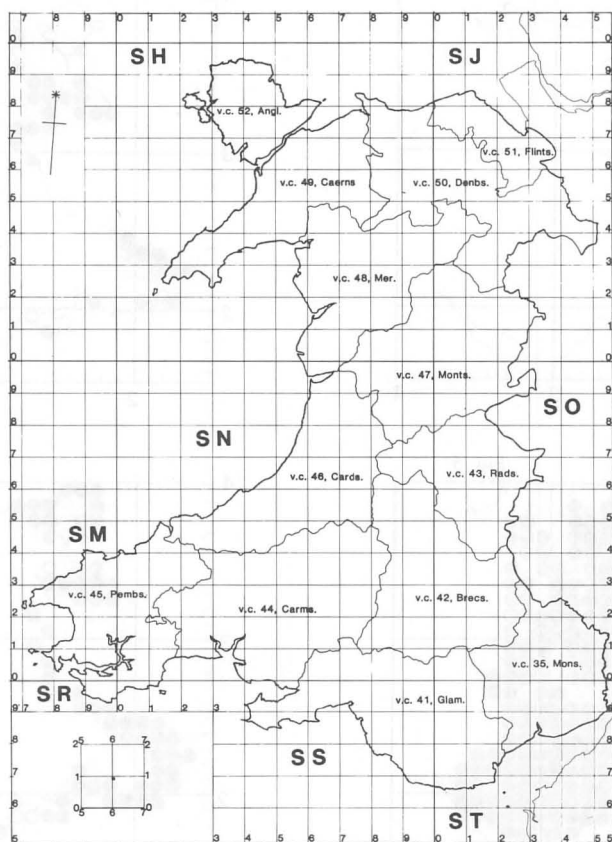
(Accepted August 1991)

APPENDIX: CHECKLIST OF WELSH PTERIDOPHYTES

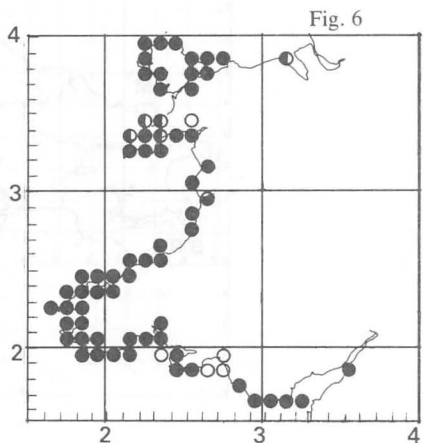
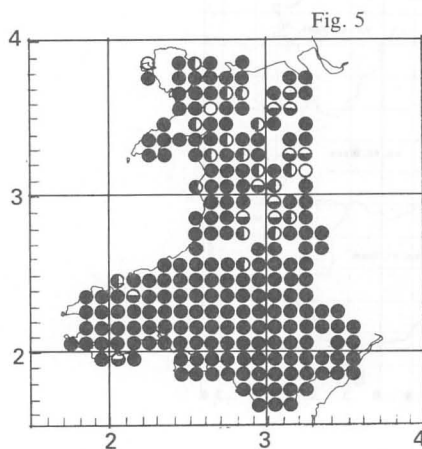
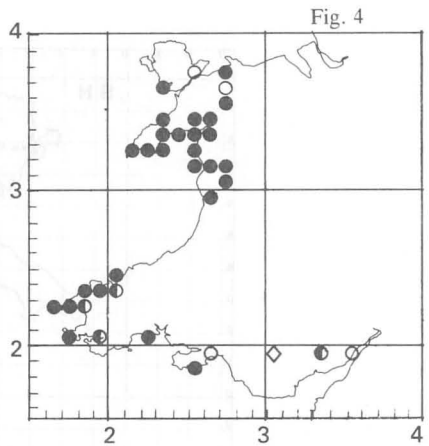
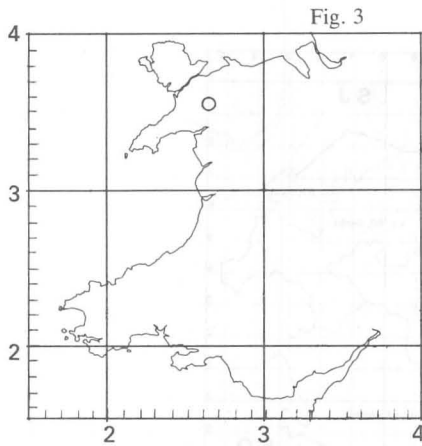
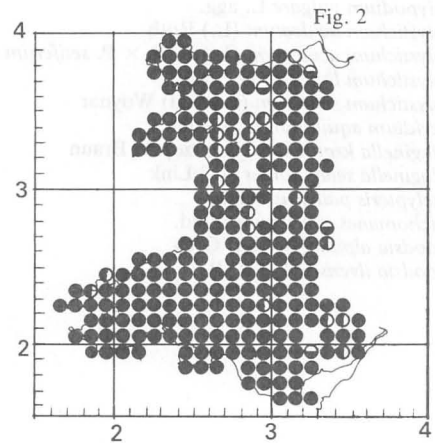
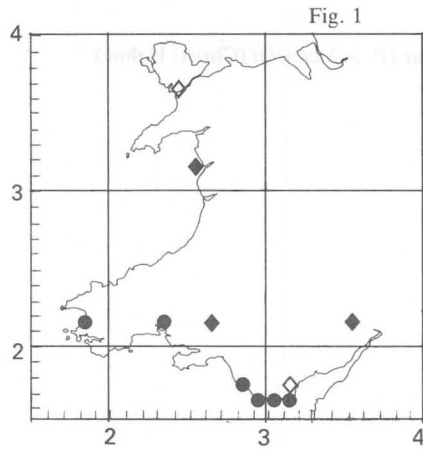
- Adiantum capillus-veneris* L.
Asplenium adiantum-nigrum L.
Asplenium adiantum-nigrum L. × *A. septentrionale* (L.) Hoffm. (*A. × contrei* Callé, Lovis & Reichst.)
Asplenium billotii F. W. Schultz
Asplenium ceterach L.
Asplenium marinum L.
Asplenium ruta-muraria L.
Asplenium scolopendrium L.
Asplenium septentrionale (L.) Hoffm.
Asplenium septentrionale (L.) Hoffm. subsp. *septentrionale* × *A. trichomanes* L. subsp. *trichomanes* (*A. × alternifolium* Wulfen nothosubsp. *alternifolium*)
Asplenium trichomanes L.
Asplenium trichomanes L. subsp. *pachyrachis* (Christ) Lovis & Reichst.
Asplenium trichomanes L. subsp. *pachyrachis* (Christ) Lovis & Reichst. × *A. trichomanes* L. subsp. *quadri-valens* D. E. Meyer emend. Lovis (*A. trichomanes* L. nothosubsp. *staufferi* Lovis & Reichst.)
Asplenium trichomanes L. subsp. *quadri-valens* D. E. Meyer emend. Lovis

- Asplenium trichomanes* L. subsp. *quadrivalens* D. E. Meyer emend. Lovis × *A. trichomanes* L. subsp. *trichomanes* (*A. trichomanes* L. nothosubsp. *lusaticum* (D. E. Meyer) Lawalrée)
Asplenium trichomanes L. subsp. *trichomanes*
Asplenium viride Hudson
Athyrium filix-femina (L.) Roth
Azolla filiculoides Lam.
Blechnum spicant (L.) Roth
Botrychium lunaria (L.) Swartz
Cryptogramma crista (L.) Hook.
Cyrtomium falcatum (L. f.) C. Presl
Cystopteris fragilis (L.) Bernh.
Diphasiastrum alpinum (L.) Holub
Dryopteris aemula (Aiton) Kuntze
Dryopteris affinis (Lowe) Fraser-Jenkins
Dryopteris affinis (Lowe) Fraser-Jenkins subsp. *affinis*
Dryopteris affinis (Lowe) Fraser-Jenkins subsp. *borreri* (Newman) Fraser-Jenkins
Dryopteris affinis (Lowe) Fraser-Jenkins subsp. *cambrensis* Fraser-Jenkins
Dryopteris affinis (Lowe) Fraser-Jenkins × *D. filix-mas* (L.) Schott (*D. × complexa* Fraser-Jenkins)
Dryopteris carthusiana (Vill.) H. P. Fuchs
Dryopteris carthusiana (Vill.) H. P. Fuchs × *D. dilatata* (Hoffm.) A. Gray (*D. × deweveri* (Jansen) Jansen & Wachter)
Dryopteris dilatata (Hoffm.) A. Gray
Dryopteris dilatata (Hoffm.) A. Gray × *D. expansa* (C. Presl) Fraser-Jenkins & Jermy (*D. × ambroseae* Fraser-Jenkins & Jermy)
Dryopteris expansa (C. Presl) Fraser-Jenkins & Jermy
Dryopteris filix-mas (L.) Schott
Dryopteris filix-mas (L.) Schott × *D. oreades* Fomin (*D. × mantoniae* Fraser-Jenkins & Corley)
Dryopteris oreades Fomin
Dryopteris submontana (Fraser-Jenkins & Jermy) Fraser-Jenkins
Equisetum arvense L.
Equisetum arvense L. × *E. fluviatile* L. (*E. × litorale* Kuhl. ex Rupr.)
Equisetum fluviatile L.
Equisetum hyemale L.
Equisetum palustre L.
Equisetum palustre L. × *E. telmateia* Ehrh. (*E. × font-queri* Rothm.)
Equisetum sylvaticum L.
Equisetum telmateia Ehrh.
Equisetum variegatum Schleicher ex Weber & Mohr
Gymnocarpium dryopteris (L.) Newman
Gymnocarpium robertianum (Hoffm.) Newman
Huperzia selago (L.) Bernh. ex Schrank & C. F. P. Mart.
Hymenophyllum tunbrigense (L.) Sm.
Hymenophyllum wilsonii Hook.
Isoetes echinospora Durieu
Isoetes lacustris L.
Lycopodiella inundata (L.) Holub
Lycopodium annotinum L.
Lycopodium clavatum L.
Matteuccia struthiopteris (L.) Tod.
Onoclea sensibilis L.
Ophioglossum azoricum C. Presl
Ophioglossum vulgatum L.
Oreopteris limbosperma (All.) Holub
Osmunda regalis L.
Phegopteris connectilis (Michx) Watt
Pilularia globulifera L.
Polypodium cambricum L.
Polypodium cambricum L. × *P. interjectum* Shivas (*P. × shivasiae* Rothm.)
Polypodium cambricum L. × *P. vulgare* L. (*P. × font-queri* Rothm.)
Polypodium interjectum Shivas
Polypodium interjectum Shivas × *P. vulgare* L. (*P. × mantoniae* Rothm.)
Polypodium vulgare L.

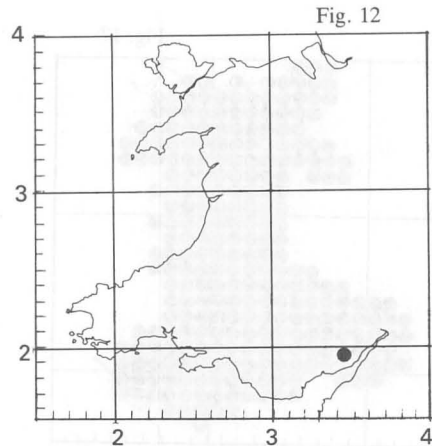
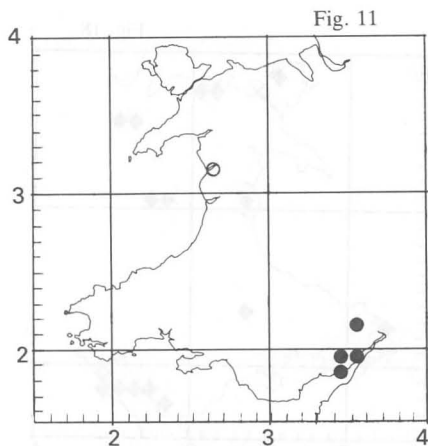
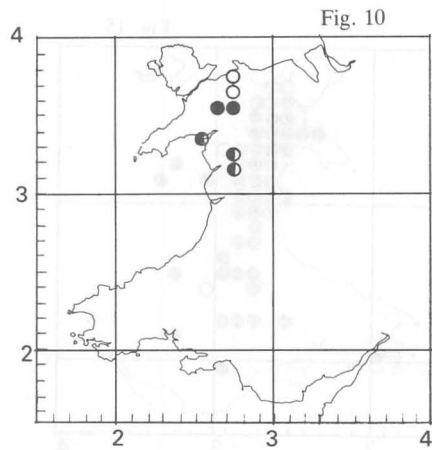
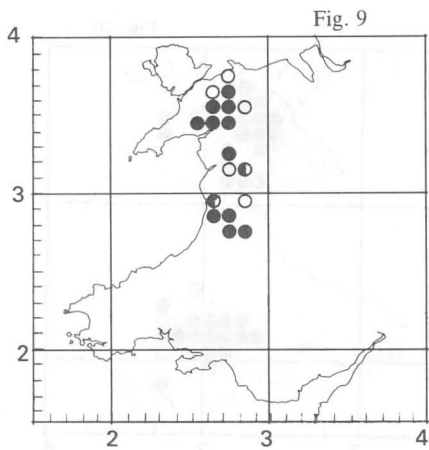
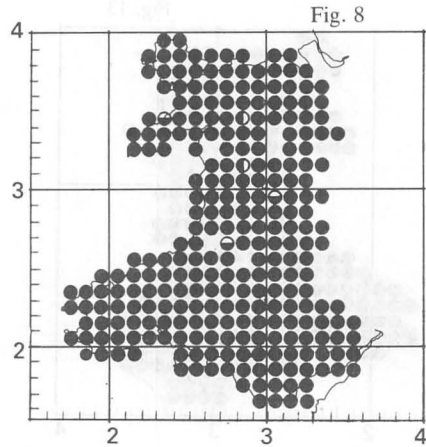
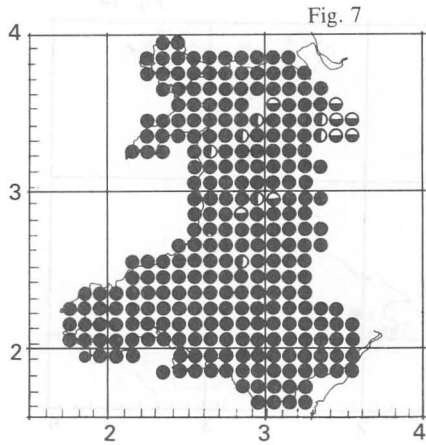
Polypodium vulgare L. agg.
Polystichum aculeatum (L.) Roth
Polystichum aculeatum (L.) Roth \times *P. setiferum* (Forskål) Woynar (*P. \times bicknellii* (Christ) Hahne)
Polystichum lonchitis (L.) Roth
Polystichum setiferum (Forskål) Woynar
Pteridium aquilinum (L.) Kuhn
Selaginella kraussiana (Kuntze) A. Braun
Selaginella selaginoides (L.) Link
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Trichomanes speciosum Willd.
Woodsia alpina (Bolton) Gray
Woodsia ilvensis (L.) R. Br.



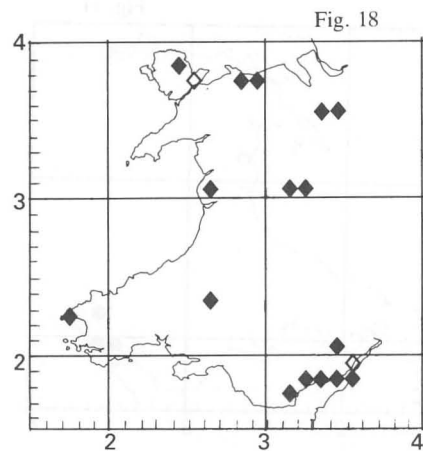
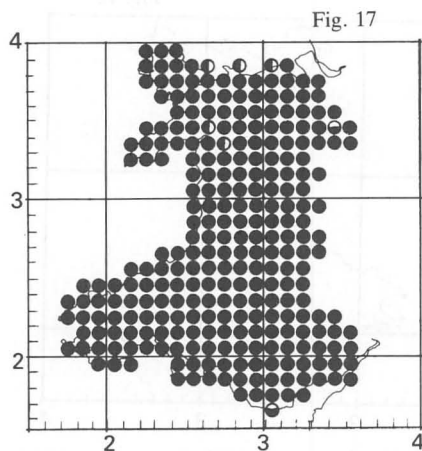
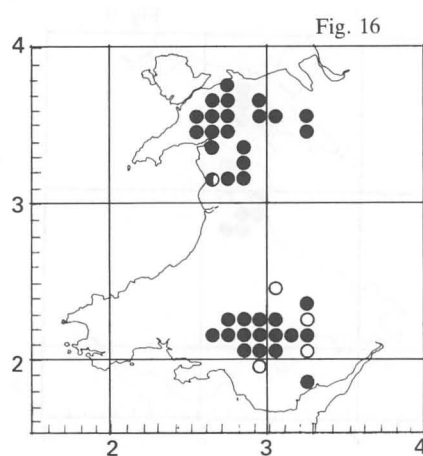
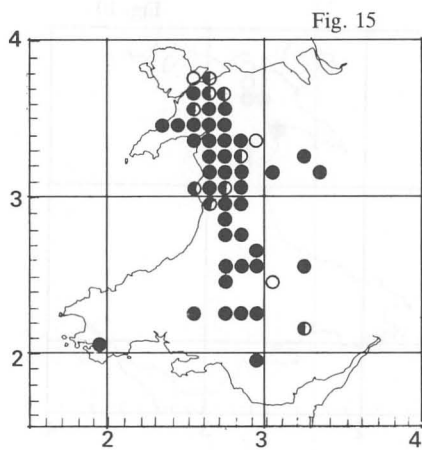
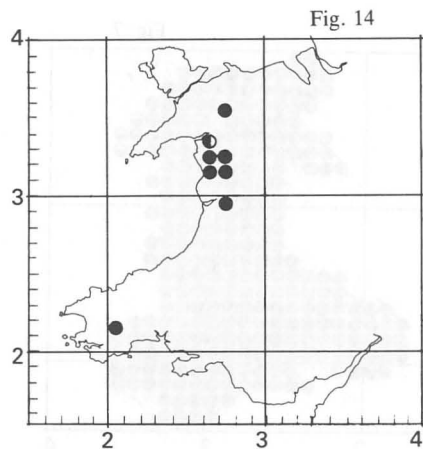
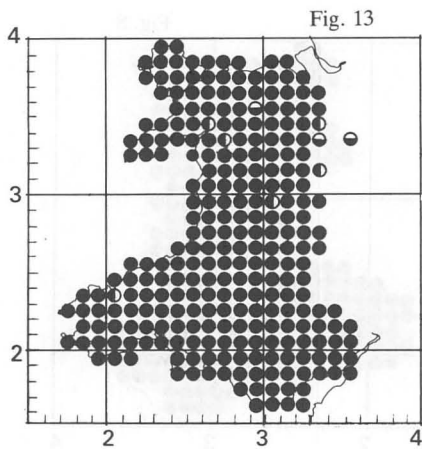
Map of Welsh vice-counties and 10-km squares.



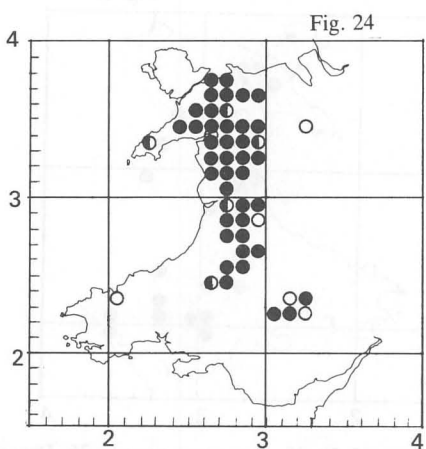
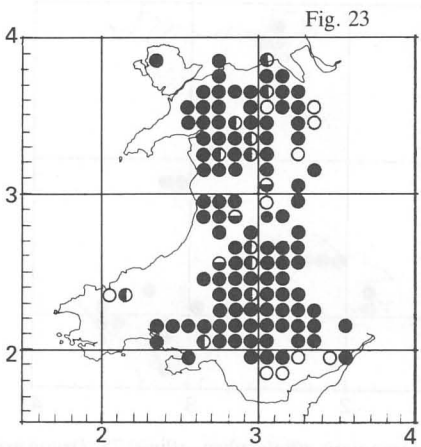
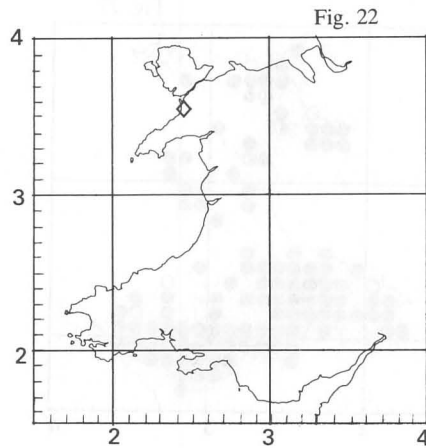
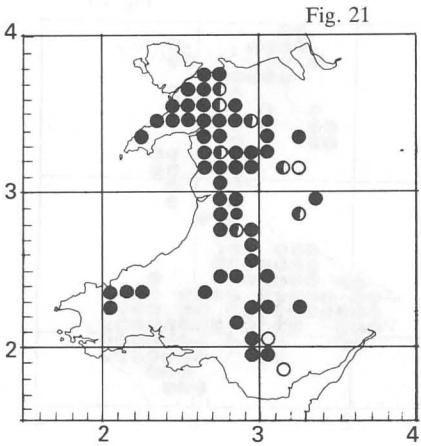
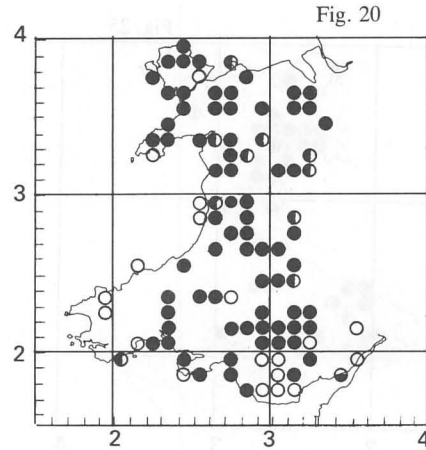
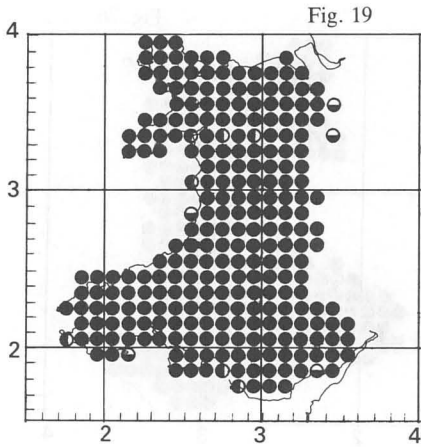
FIGURES 1-6: 1. *Adiantum capillus-veneris*; 2. *Asplenium adiantum-nigrum*; 3. *Asplenium adiantum-nigrum* \times *A. septentrionale* (*A. x contrei*); 4. *Asplenium billotii*; 5. *Asplenium ceterach*; 6. *Asplenium marinum*.



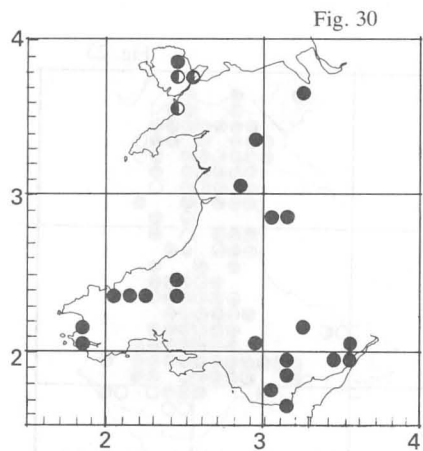
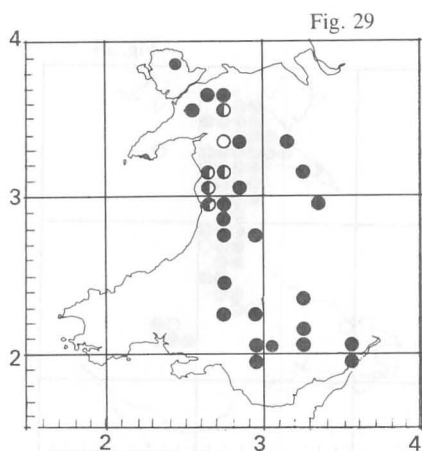
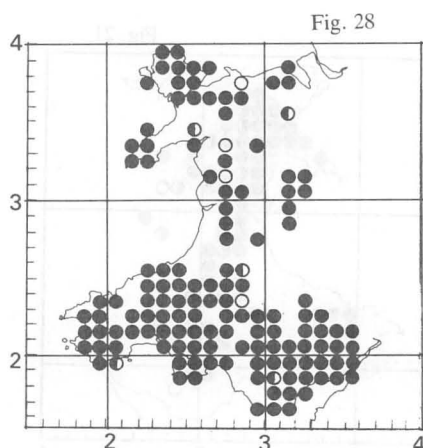
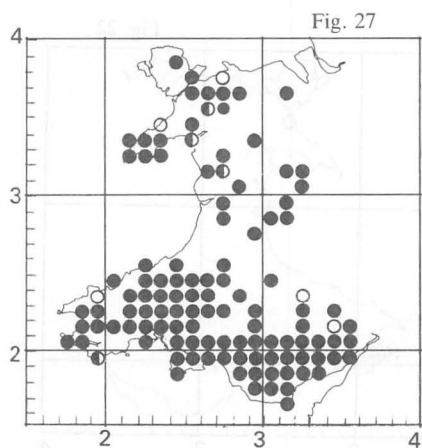
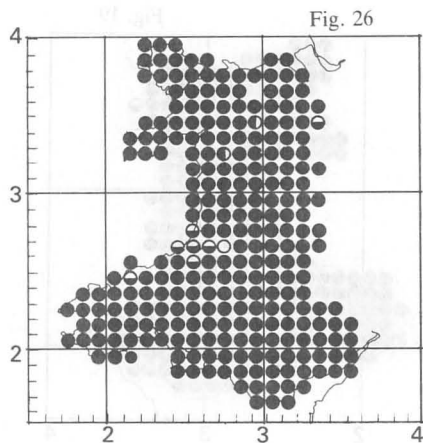
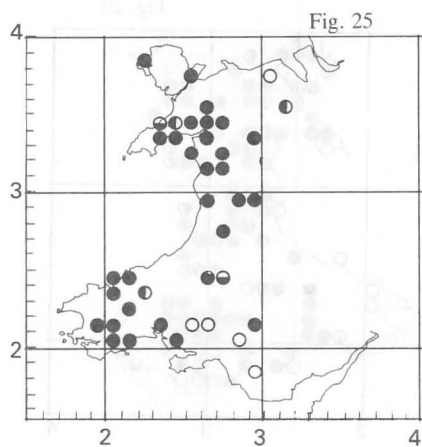
FIGURES 7-12: 7. *Asplenium ruta-muraria*; 8. *Asplenium scolopendrium*; 9. *Asplenium septentrionale*; 10. *Asplenium septentrionale* subsp. *septentrionale* \times *A. trichomanes* subsp. *trichomanes* (*A.* \times *alternifolium* nothosubsp. *alternifolium*); 11. *Asplenium trichomanes* subsp. *pachyrachis*; 12. *Asplenium trichomanes* subsp. *pachyrachis* \times *A. trichomanes* subsp. *quadrivalens* (*A. trichomanes* nothosubsp. *staufferi*).



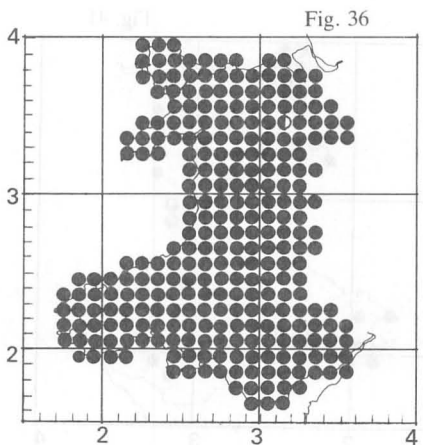
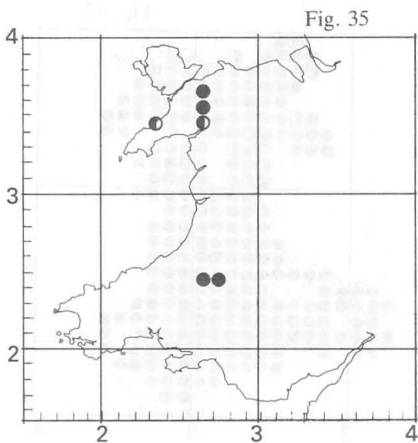
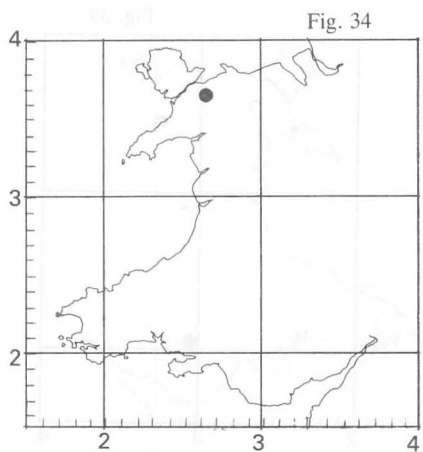
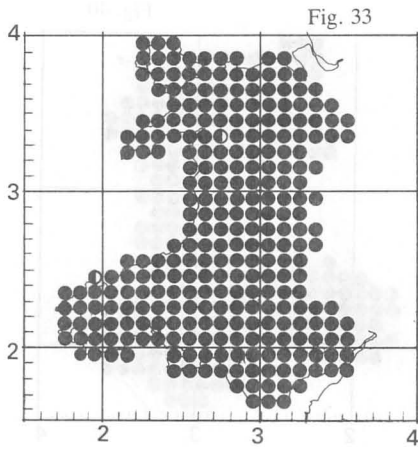
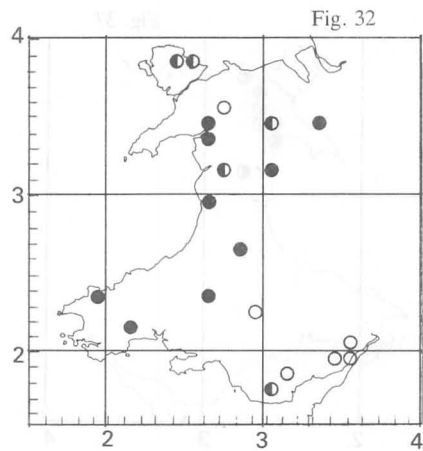
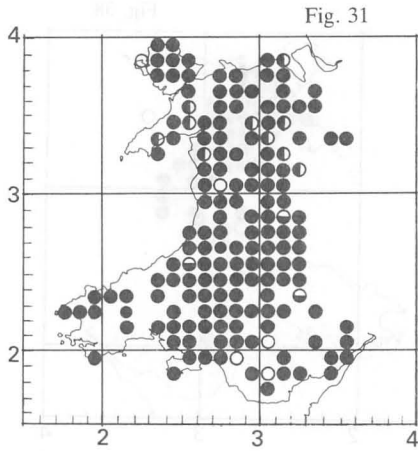
FIGURES 13–18: 13. *Asplenium trichomanes* subsp. *quadrivalens*; 14. *Asplenium trichomanes* subsp. *quadrivalens* × *A. trichomanes* subsp. *trichomanes* (*A. trichomanes* nothosubsp. *lusaticum*); 15. *Asplenium trichomanes* subsp. *trichomanes*; 16. *Asplenium viride*; 17. *Athyrium filix-femina*; 18. *Azolla filiculoides*.



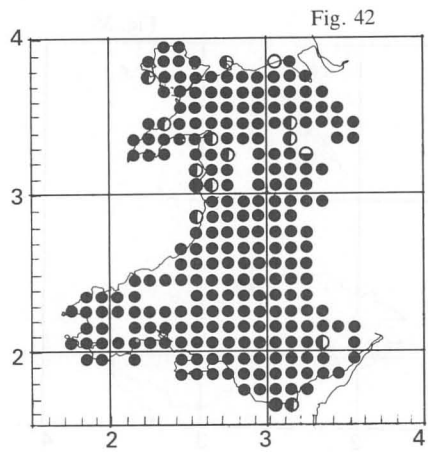
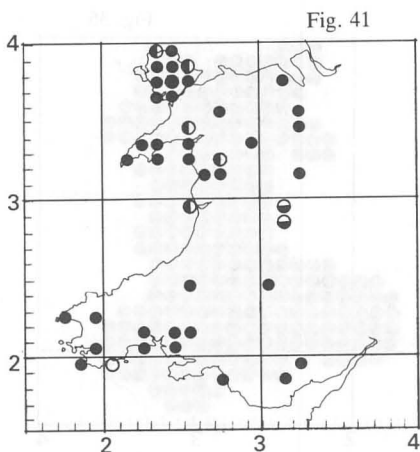
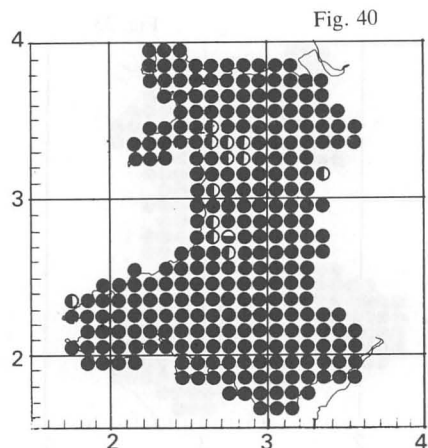
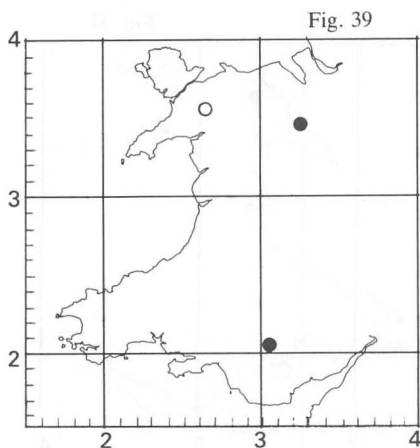
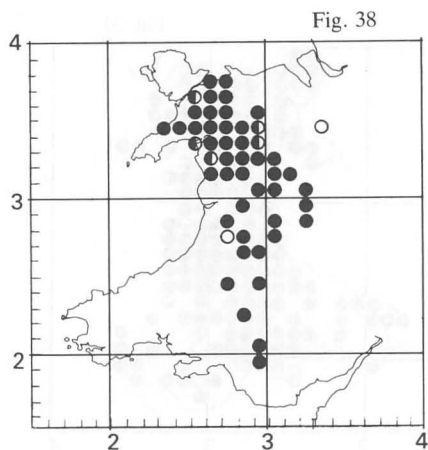
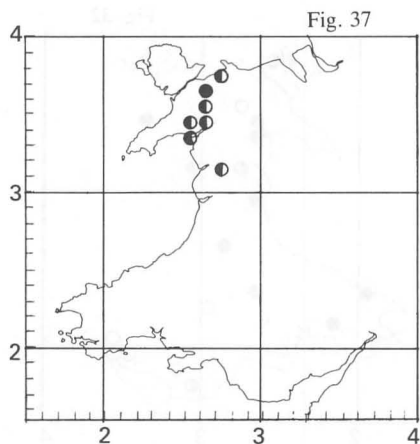
FIGURES 19–24: 19. *Blechnum spicant*; 20. *Botrychium lunaria*; 21. *Cryptogramma crispa*; 22. *Cyrtomium falcatum*; 23. *Cystopteris fragilis*; 24. *Diphasiastrum alpinum*.



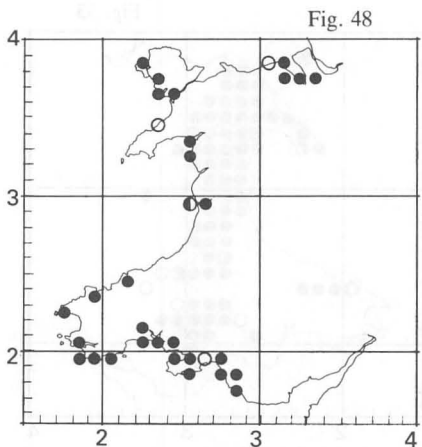
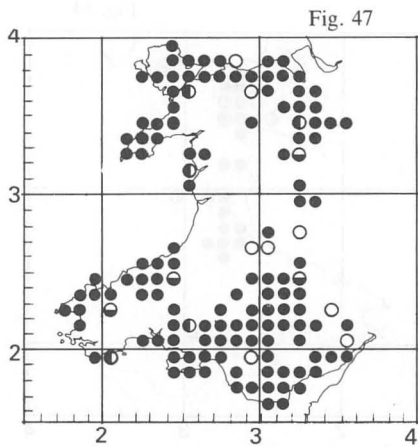
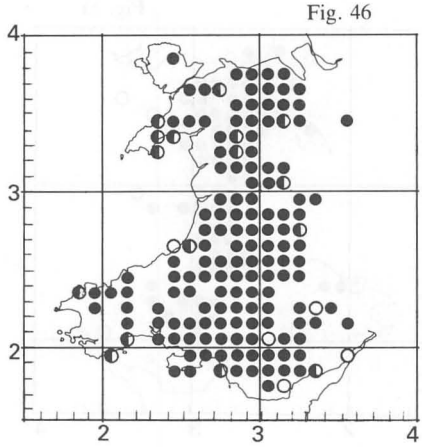
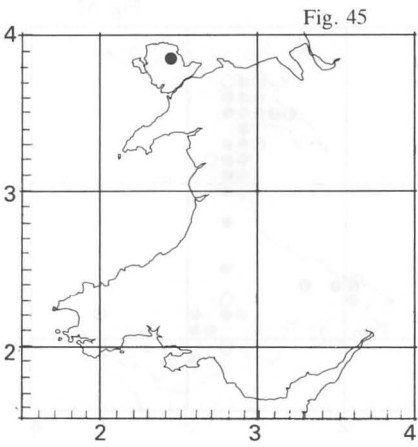
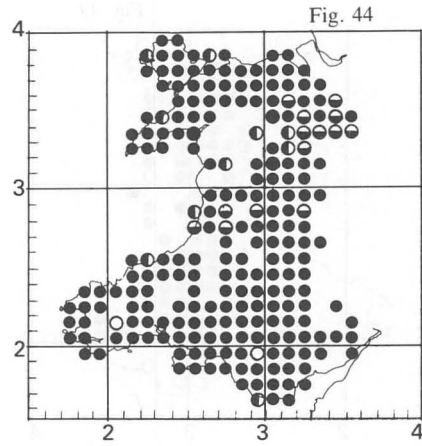
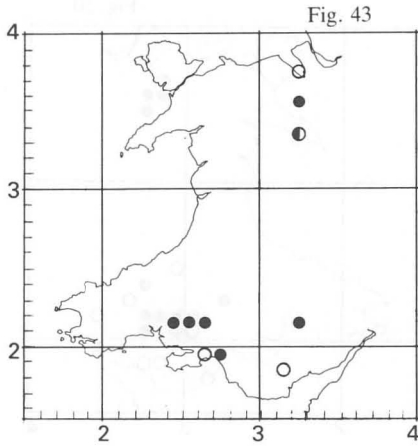
FIGURES 25–30: 25. *Dryopteris aemula*; 26. *Dryopteris affinis*; 27. *Dryopteris affinis* subsp. *affinis*; 28. *Dryopteris affinis* subsp. *borreri*; 29. *Dryopteris affinis* subsp. *cambrensis*; 30. *Dryopteris affinis* × *D. filix-mas* (*D. x complexa*).



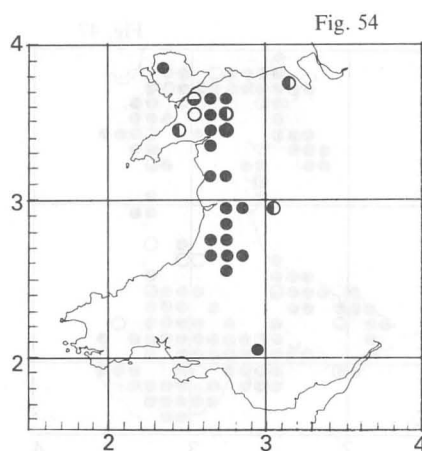
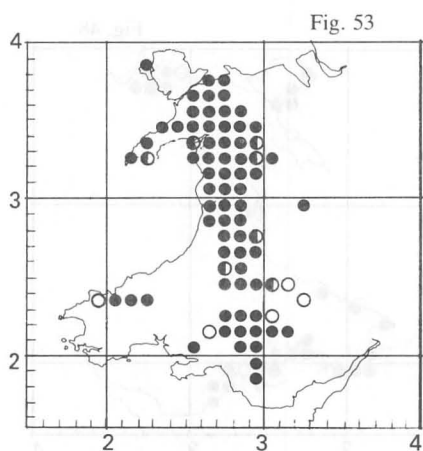
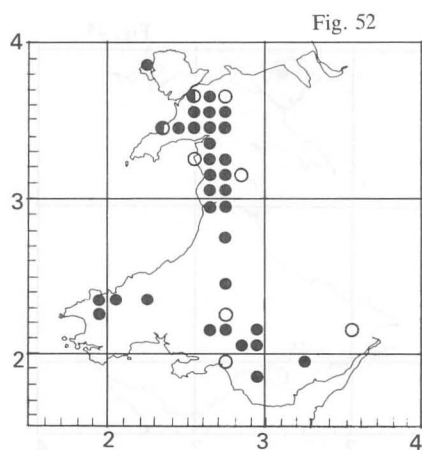
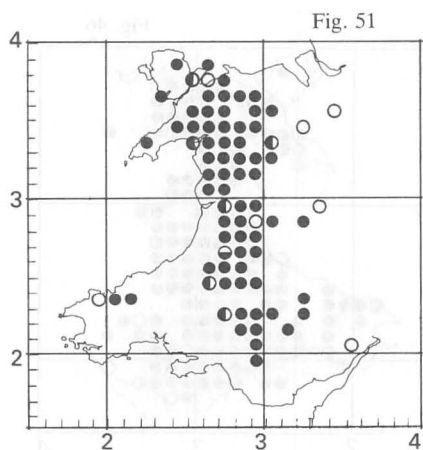
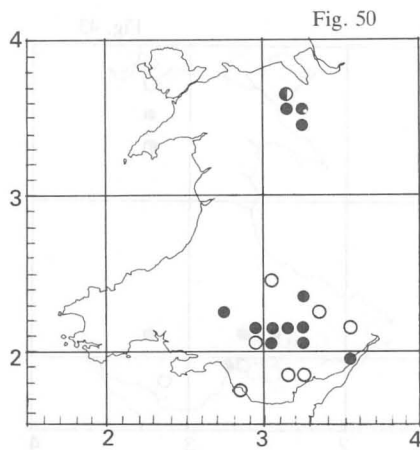
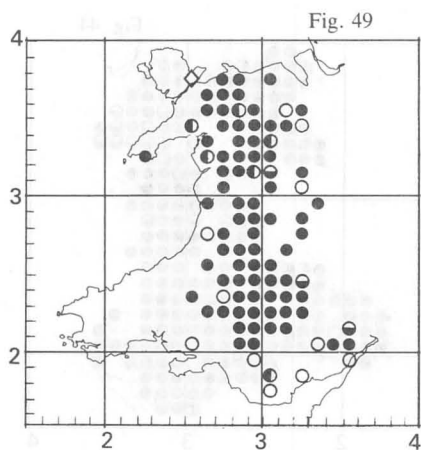
FIGURES 31–36: 31. *Dryopteris carthusiana*; 32. *Dryopteris carthusiana* × *D. dilatata* (*D.* × *deweveri*); 33. *Dryopteris dilatata*; 34. *Dryopteris dilatata* × *D. expansa* (*D.* × *ambroseae*); 35. *Dryopteris expansa*; 36. *Dryopteris filix-mas*.



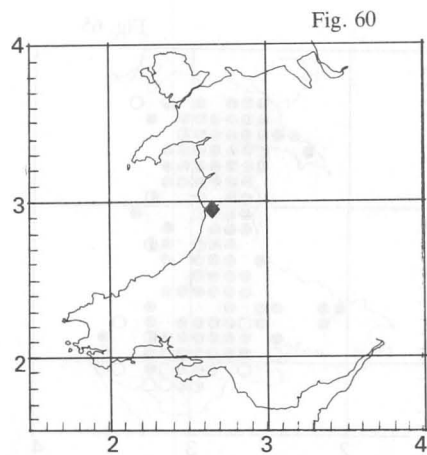
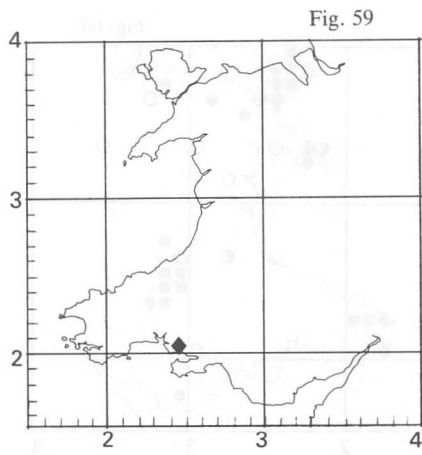
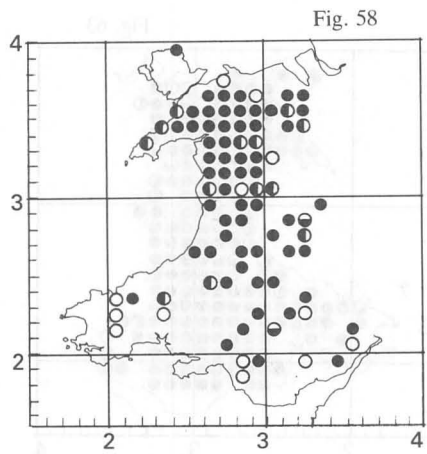
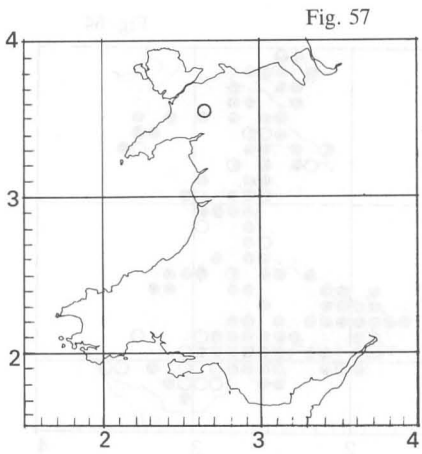
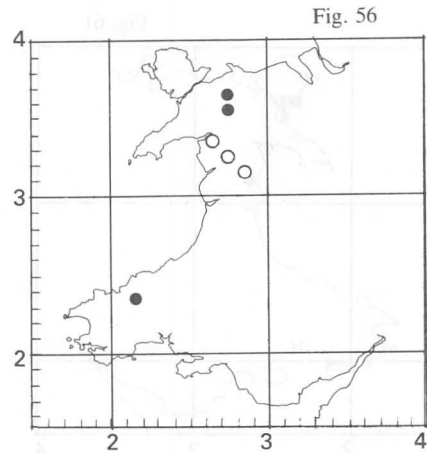
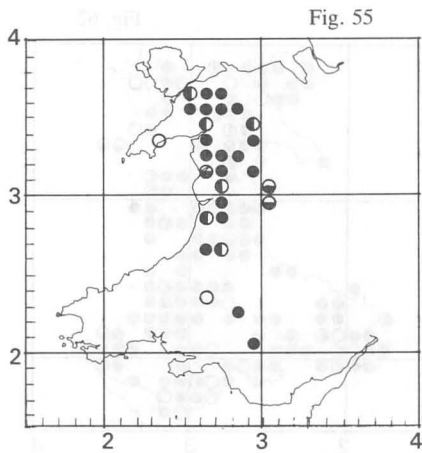
FIGURES 37-42: 37. *Dryopteris filix-mas* × *D. oreades* (*D. × mantoniae*); 38. *Dryopteris oreades*; 39. *Dryopteris submontana*; 40. *Equisetum arvense*; 41. *Equisetum arvense* × *E. fluviatile* (*E. × litorale*); 42. *Equisetum fluviatile*.



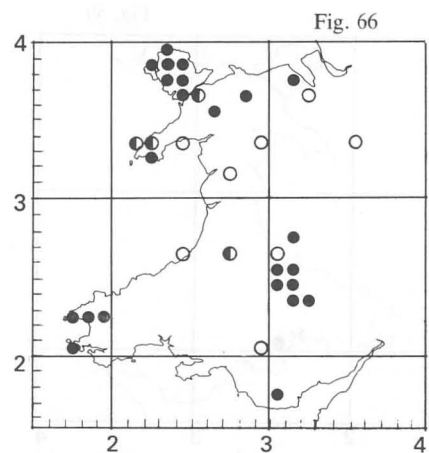
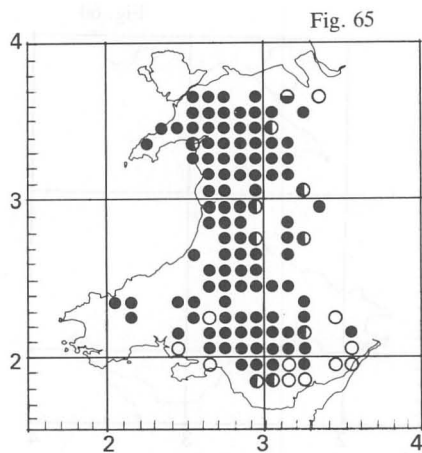
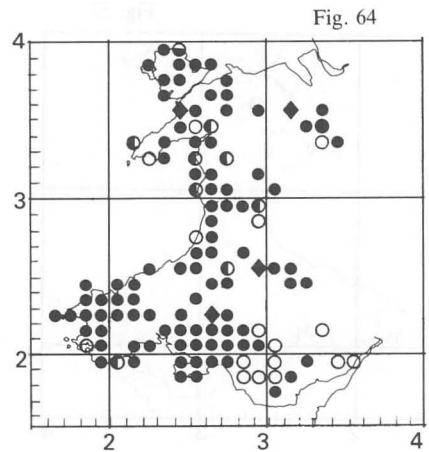
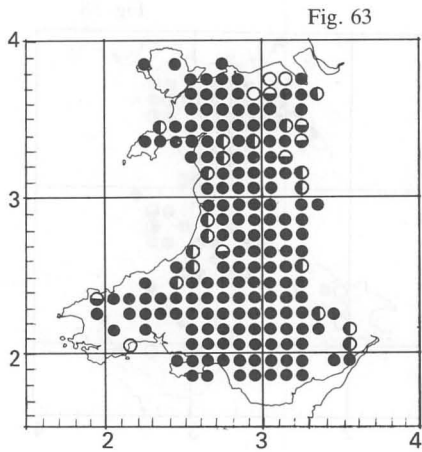
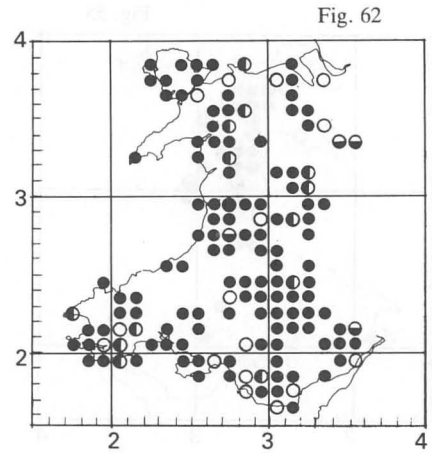
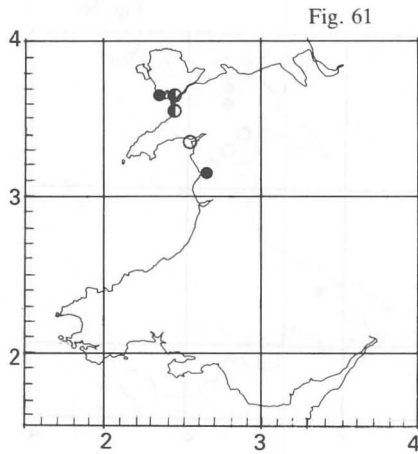
FIGURES 43-48: 43. *Equisetum hyemale*; 44. *Equisetum palustre*; 45. *Equisetum palustre* × *E. telmateia* (*E.* × *font-queri*); 46. *Equisetum sylvaticum*; 47. *Equisetum telmateia*; 48. *Equisetum variegatum*.



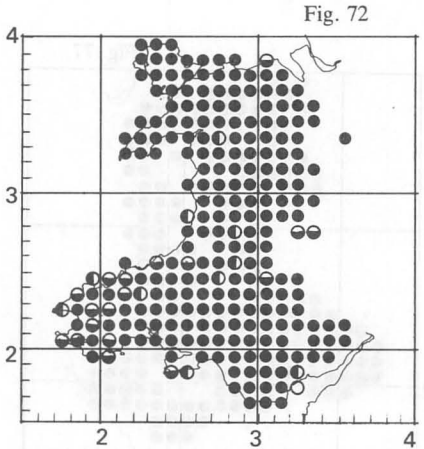
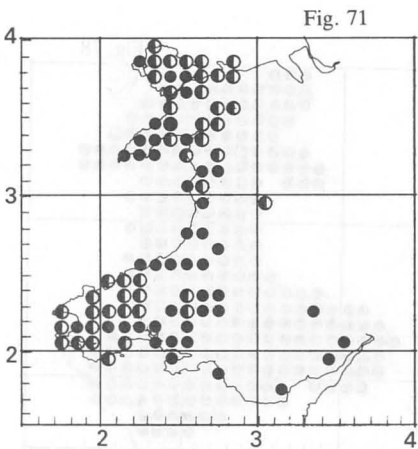
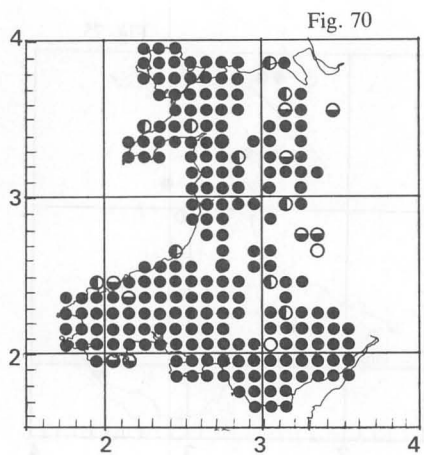
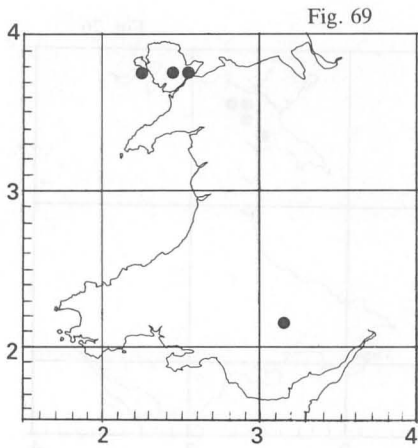
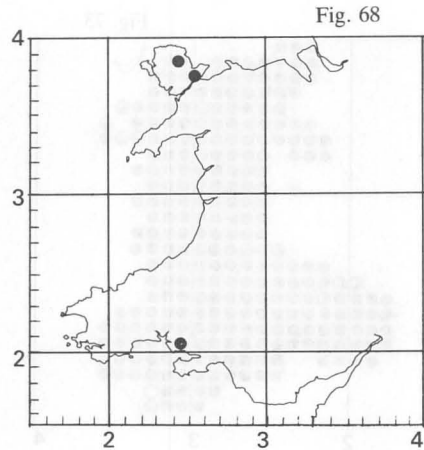
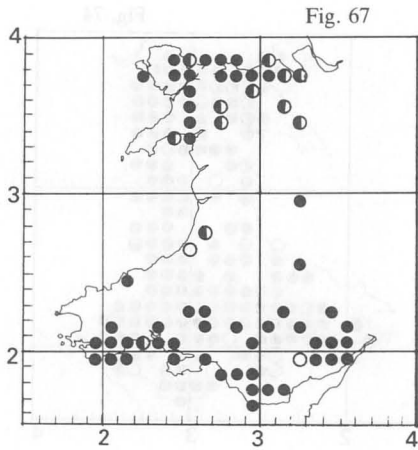
FIGURES 49-54: 49. *Gymnocarpium dryopteris*; 50. *Gymnocarpium robertianum*; 51. *Huperzia selago*; 52. *Hymenophyllum tunbrigense*; 53. *Hymenophyllum wilsonii*; 54. *Isoetes echinospora*.



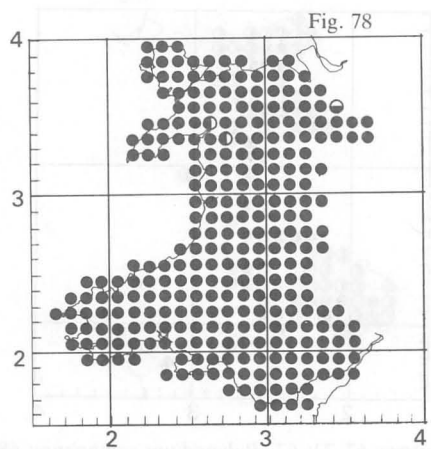
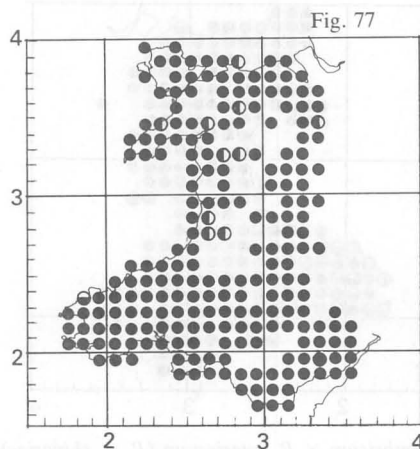
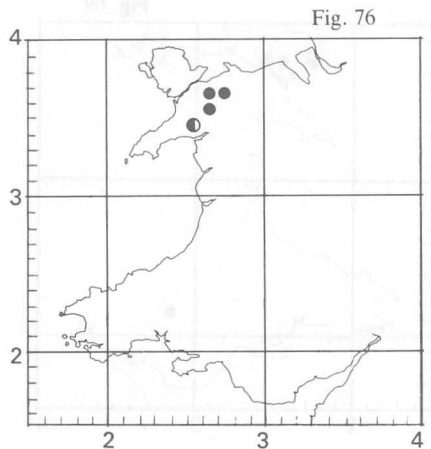
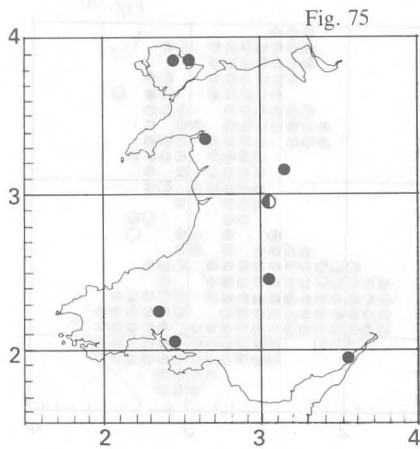
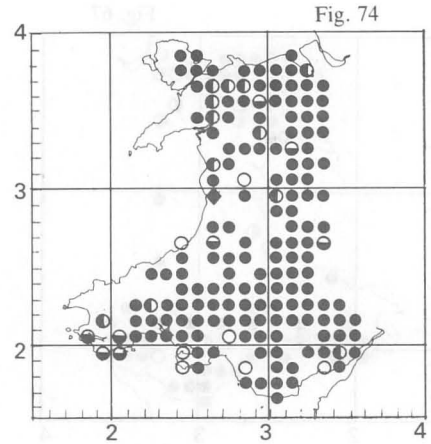
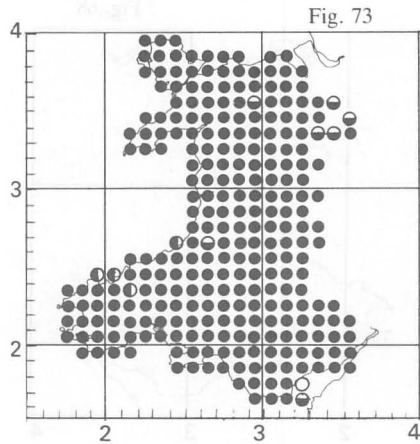
FIGURES 55–60: 55. *Isoetes lacustris*; 56. *Lycopodiella inundata*; 57. *Lycopodium annotinum*; 58. *Lycopodium clavatum*; 59. *Matteuccia struthiopteris*; 60. *Onoclea sensibilis*.



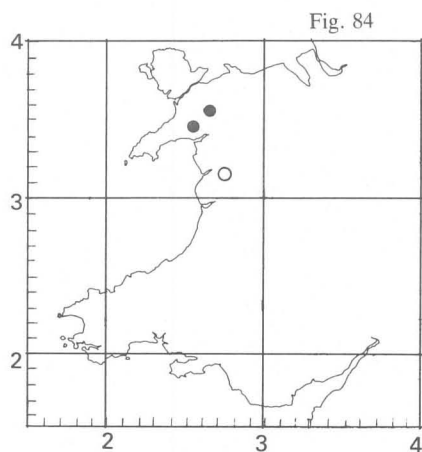
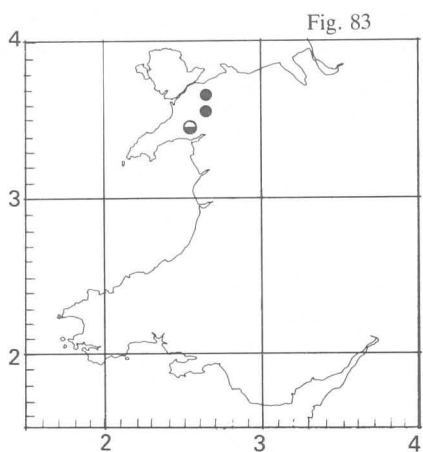
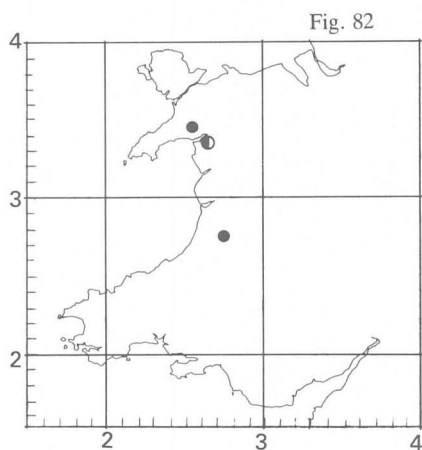
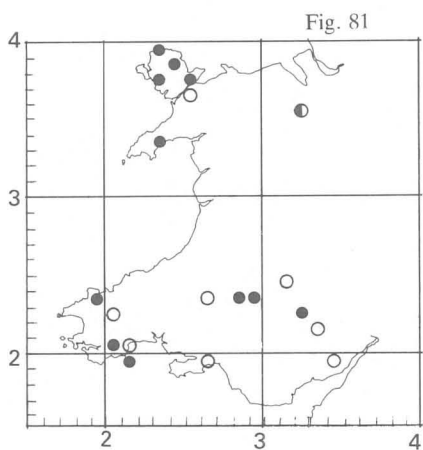
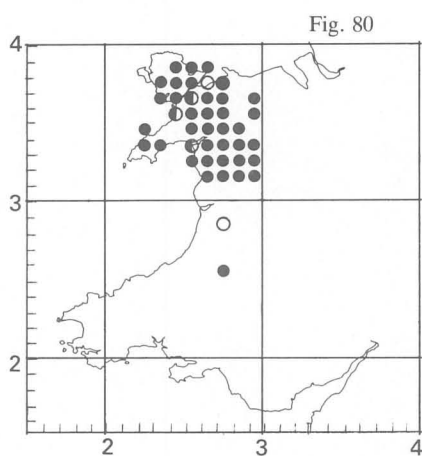
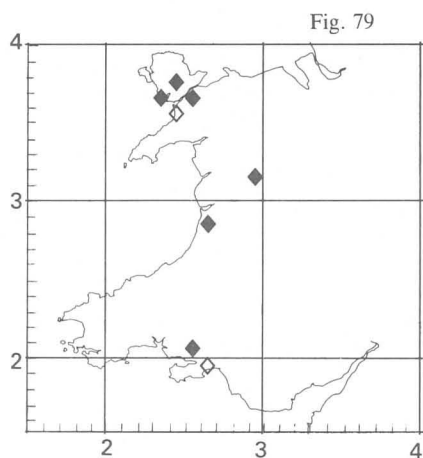
FIGURES 61–66: 61. *Ophioglossum azoricum*; 62. *Ophioglossum vulgatum*; 63. *Oreopteris limbosperma*; 64. *Osmunda regalis*; 65. *Phegopteris connectilis*; 66. *Pilularia globulifera*.



FIGURES 67-72: 67. *Polypodium cambricum*; 68. *Polypodium cambricum* \times *P. interjectum* (*P.* \times *shivasiae*); 69. *Polypodium cambricum* \times *P. vulgare* (*P.* \times *font-queri*); 70. *Polypodium interjectum*; 71. *Polypodium interjectum* \times *P. vulgare* (*P.* \times *mantoniae*); 72. *Polypodium vulgare*.



FIGURES 73-78: 73. *Polypodium vulgare* agg.; 74. *Polystichum aculeatum*; 75. *Polystichum aculeatum* × *P. setiferum* (*P. x bicknellii*); 76. *Polystichum lonchitis*; 77. *Polystichum setiferum*; 78. *Pteridium aquilinum*.



FIGURES 79-84: 79. *Selaginella kraussiana*; 80. *Selaginella selaginoides*; 81. *Thelypteris palustris*; 82. *Trichomanes speciosum*; 83. *Woodsia alpina*; 84. *Woodsia ilvensis*.