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**N** **Isoetes histrix**  Land Quillwort

Bory

A small, summer-deciduous perennial growing from a ‘corm’. It prefers skeletal acidic soils that are moist or flooded in winter but experience summer drought. A poor competitor, it is most frequent on pans of bare soil over south-facing serpentine rock outcrops, but also grows on erosion pans and footpaths. It also occurs in dune-slacks in Guernsey, Lowland.

**Trends** *I. histrix* was first detected in Guernsey in 1860 and only discovered in mainland Britain in 1917. The distribution of the species was considered stable at the 10km square scale by the end of the last century (Preston et al., 2002a). Detailed monitoring, however, has since revealed a c. 90% decline in total population size since an intensive survey was undertaken in 1982 (Pearman et al., 2014). Surveys in subsequent years have revealed the situation to be less severe, with large annual fluctuations in visible plants dependent on climate. A few sites have been lost due to a lack of grazing, to fire and to conversion to cultivation, but it has colonized areas from which turf has been stripped. Its overall 10km square range here at its northernmost global limit has remained stable.

**Biogeography** Mediterranean-Atlantic element.

**Ophioglossum vulgatum**  Adder’s-tongue

L.

A rhizomatous, deciduous fern found on mildly acidic to base-rich soils in open woodland, meadows and damp pastures, and on sand dunes, under bracken on heathlands, and on peat in regularly mown fen. 0–810 m (Great Dun Fell, Cumberland).

**Trends** *O. vulgatum* is an inconspicuous species which is best searched for in early spring, being easily overlooked later in the year. Although under-recording may have contributed to some apparent losses shown on the map, it has certainly been extirpated from many lowland sites due to the destruction or neglect of its principal habitats, though there are many new records across its range since 2000 due to fuller recording, most notably in Ireland and north-western Scotland.
**Ophioglossum azoricum**  
**Small Adder’s-tongue**

A small rhizomatous, deciduous fern of gently sloping coastal grasslands, cliff-tops, damp dune-slacks and sandy maritime heaths on both acidic and alkaline soils. Most sites are in frost-free situations near to and facing the sea, with some exceptions, as in South Somerset and in the New Forest (South Hampshire), where it occurs in shallow soils on old aerodromes, car parks, tracks and around pools. Generally lowland, but reaching 380 m at Coumshingaun Lough in the Comeragh Mountains (County Waterford).

**Trend**  
In the past some small plants of *O. vulgatum* have been misidentified as *O. azoricum*, but the morphological distinctions are now better known and molecular techniques have also helped clarify the identity of plants. As a consequence the species is much better recorded. Though diminutive, it has been refound in most areas from which it has been previously recorded.

**Biogeography**  
Suboceanic Boreo-temperate element.

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**Ophioglossum lusitanicum**  
**Least Adder’s-tongue**

A very small, rhizomatous, summer-deciduous fern, growing in open therophyte communities and parched acidic grassland on sea-cliffs and rock promontories. It prefers thin peaty soils, but is also found over shallow blown sand over acidic rocks. All sites are unshaded and exposed, but are warm and south- or south-west-facing. Lowland.

**Trends**  
*O. lusitanicum* was first discovered in Guernsey in 1853, but not found on the Isles of Scilly until 1950. In Guernsey, many sites have been lost to scrub encroachment by *Ulex europaeus* and other woody species owing to undergrazing.

**Biogeography**  
Mediterranean-Atlantic element; also in central Asia.

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**Key refs**  
**Botrychium lunaria** Moonwort

(L.) Sw.

A small perennial fern, often occurring singly or in small populations, which may show marked annual fluctuations. It prefers well-drained sites, usually with a high base-content, although it can occur on more acidic substrates. Habitats historically included unimproved meadows, pastures, and even open woodland, but now it is most frequent by upland tracksides and on grassy rock ledges. In the lowlands it is a plant of fixed sand dunes, lead-mine waste, slag heaps, quarry spoil and low grass-heath associated with roadsides and disused runways. 0–1,155 m (Ben Lawers, Mid Perthshire).

**Trends** *B. lunaria* was lost from many lowland sites before 1930, and this loss has continued, primarily due to grassland improvement, eutrophication and scrub invasion. There appear to have been some losses in upland areas, but the species can easily be overlooked and may therefore be somewhat under-recorded. Recent molecular studies indicate this to be a complex of many cryptic species, several of which are to be expected in our area. Of these and amongst the most morphologically distinct is the recently recognized *B. nordicum*, mapped here separately. Further work is needed to establish the identity and distribution of this and other novel segregates.

**Biogeography** Circumpolar Boreo-temperate element.

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**Botrychium nordicum** Nordic Moonwort

Stensvold & Farrar

A small perennial fern of disturbed grassy and rocky upland heath associated with ski-lifts, but it is likely to be more widely distributed in similar montane habitats to *B. lunaria*. Upland, to at least 755 m (Meall Odhar, South Aberdeenshire).

**Trends** A cryptic species, only reported in our area recently following molecular studies. Morphologically, *B. nordicum* is primarily distinguished from *B. lunaria* by the deeply incised pinnae margins, which are consistently present in the former but "usually not" in the latter (Stensvold & Farrar, 2017). In their original description of *B. nordicum*, Stensvold & Farrar (2017) also comment on the shorter length of the common stalk, i.e. the section of stem below the first pinnae (and point of divergence of the sporophore when fertile). The recent Scottish examples all have rather laxly arranged sporangia, although this character has not previously been noted as diagnostic. The *B. lunaria* aggregate has declined most severely in lowland areas, whereas this segregate appears to be exclusively upland. Morphologically similar plants have historically been collected from over 20 British and Irish vice-counties but these are yet to be confirmed as this taxon by molecular means.

**Biogeography** Native throughout the Boreal and Arctic, from Greenland, Iceland, and the Nordic region, reaching its southern limit in Scotland.

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**Key refs** Bangerter et al. (1978), Page (1997), Stroh et al. (2019).

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**Key refs** Stensvold & Farrar (2017).
**Equisetum hyemale** Rough Horsetail

A slow-growing, evergreen horsetail forming colonies of shoots from branching rhizomes. It prefers heavy soils derived from sand or clay which are permanently moist and have a high mineral and silica content. It is usually found in shaded open woodland beside streams and rivers, but also grows in base-rich moorland flushes and sand dunes. 0–920 m (Coire na Coichille, Westerness).

**Trends** Many new sites for *E. hyemale* have been discovered in recent decades, some perhaps of garden origin. Most losses occurred before 1930, probably due to drainage and an increase in grazing and trampling of riverbanks by livestock.

**Biogeography** Circumpolar Boreo-temperate element.

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**Key refs** Bangert et al. (1978), Page (1997).

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**Equisetum hyemale × variegatum = E. × trachyodon** Mackay’s Horsetail

A rhizomatous, evergreen hybrid of mostly base-rich habitats, growing in limestone flushes, on soil, shingle and rocks on stream sides, riverbanks and lake shores, on cliffs in riverside woodland, on banks and in hollows and slacks in coastal sand dunes, and in peaty turf in coastal machair. Populations are persistent, sterile, and spread by rooting stem and rhizome fragments. Though the range of the hybrid falls within the general overlap of the parent species, it may be found in the absence of one or both of them (e.g. Pearman & Preston, 2000). *E. × trachyodon* can appear strikingly different from either parent, but variation in *E. variegatum* can cause plants of this species to be confused with the hybrid. Lowland.

A spontaneous hybrid (native × native).

**Trends** The distribution of *E. × trachyodon* appears to be stable, and although much better known than when mapped by Perring & Sell (1968), it probably remains under-recorded. It is unclear whether losses are genuine or attributable to under-recording.

**Biogeography** Widespread in central and northern Europe, Greenland and North America.

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**Key refs** Pearman & Preston (2000), Stace et al. (2015).
Equisetum ramosissimum  
Branched Horsetail

An erect-sprawling, semi-evergreen or deciduous horsetail, found growing in rough grassland near the sea, on sand or clay soil, where it is long-persistent. Lowland.

**Trends**  *E. ramosissimum* was once regarded as possibly native (recorded at Hounslow Heath in 1705) but is now considered to have been introduced. In South Lincolnshire it was found in 1947 on a riverbank that was straightened between 1880 and 1887, where it is thought to be a ballast alien. In North Somerset it was not correctly identified until 1986, despite having been known at the site since 1963. It survives in both these two sites but may have been transient in Newport (Monmouthshire) where it was recorded once, in 2005.

**Biogeography** A Eurasian Southern-temperate species. Very widespread in warm-temperate parts of the world.

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Equisetum variegatum  
Variegated Horsetail

An evergreen, prostrate horsetail found in a wide variety of habitats, including dune-slacks, river shingle, upland flushes and stony loch-shores. More rarely it is also found in quarries and sand- and gravel-pits. It is a calcicole and a poor competitor; its sites are usually open and often winter-flooded. In Ireland a more vigorous, upright ecotype is found mostly on canal banks. 0–1,040 m (Ben Lawers, Mid Perthshire).

**Trends** The overall 10 km square distribution has increased slightly since the 1960s, especially in Ireland, presumably due to more systematic recording. However, there is also some evidence of local decline; upland sites are sensitive to over-stocking, whilst lowland populations have been lost due to drainage and sand dune development.

**Biogeography** Circumpolar Boreo-arctic Montane element.
**Equisetum fluviatile** Water Horsetail

A deciduous horsetail of a wide variety of aquatic and semi-aquatic habitats, from ditches and small ponds to large lakes and sheltered rivers. It tolerates a remarkable range of water and substrate pH, nutrient levels, substrate type and water depth, and is often a pioneer species in freshwater successions. 0–930 m (Breadalbanes, Mid Perthshire).

**Trends** Like many aquatic plants, this species is now much better recorded since the 1960s. Most of the losses in the southern and eastern lowlands of England have taken place since this time, and declines in these areas would appear to have continued into the 21st century, reflecting the loss of small wetlands and other suitable habitat.

**Biogeography** Circumpolar Boreo-temperate element.

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**Hy**

**Equisetum arvense × fluviatile = E. × litorale** Shore Horsetail

Kühlew. ex Rupr.

A vigorous, deciduous herb found in a wide range of habitats, often in the absence of one or both parents. It has been recorded from disturbed, moist soil in gravel-pits and quarries, road and railway cuttings, dune-slacks, eroding stream banks, ditches, moist, muddy or sandy ground or shingle at the edges of still and flowing waters, canal banks, flushes, fens, cut-over bogs, damp grassland, open willow scrub and the edges of moist woodland. The spores are completely abortive. Generally lowland, but with some recent records at higher altitudes (e.g. at c. 400 m near Hob Hay, Staffordshire).

A spontaneous hybrid (native × native).

**Trends** This is the most frequent Equisetum hybrid, though doubts about its hybrid nature lingered until the works of Manton (1950) and Hauke (1965).

It is much better recorded this century, though not consistently so, and the map shows much recorder bias. However, it appears to be genuinely more frequent in Ireland and western Britain.

**Biogeography** Widespread in the Boreal and Temperate regions of Europe (north to Iceland), Asia and North America.

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**Equisetum arvense** Field Horsetail

A deciduous horsetail of riverbanks, fixed dune grassland, sea-cliffs and montane flushes, but also frequent in anthropogenic habitats. Being long-lived, vigorous, resistant to herbicides and tolerant of drier conditions than other *Equisetum* species, it is now frequent on pavements, roadsides, railways, paths, soil banks and in highly disturbed habitats such as waste ground, quarries, gardens, allotments and arable land, where its spread is assisted by rhizome fragments. 0–1,010 m (Beinn Heasgarnich, Mid Perthshire).

**Trends** *E. arvense* is near-ubiquitous at the 10 km square scale and shows little change in distribution since the 1960s, except in Ireland and Scotland due to more systematic recording in recent decades.

**Biogeography** Circumpolar Wide-boreal element.

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**Equisetum pratense** Shady Horsetail

An evergreen horsetail, typically found on sloping sites where the substrate is derived from calcareous alluvial silts or sand, especially lightly wooded stream banks in the lower parts of upland valleys. It can also extend onto open moorland, and is found on grassy slopes beneath base-rich upland cliffs.

0–920 m (Garbh Choire, Angus).

**Trends** The considerable increase in records since the 1960s is due to fuller recording. Most populations are long-lived, but cone production is usually very poor, possibly because of climatic conditions. Although Page (1997) suggests that the species is in slow decline, it has been found in many new locations over the past two decades, most likely due to more systematic recording in upland regions.

**Biogeography** Circumpolar Boreal-montane element.
**Equisetum sylvaticum**  
**Wood Horsetail**  

A deciduous, colony-forming horsetail which generally grows on deep, mildly acid, often peaty soils that are kept permanently damp by flushing. It occurs on the lower slopes of mountain valleys, steep stream sides, wet ledges and open flushes, beside lakes and on the edges of drainage ditches. It also grows on wet road verges and railway embankments. 0–850 m (Breadalbaens, Mid Perthshire).

**Trends**  
The 10 km square distribution of *E. sylvaticum* appears to have been stable in upland areas since at least the 1960s, and is now much better known in Ireland due to more systematic recording. However, decline in the British lowlands, already apparent by the mid-20th century, has continued due to the drainage and improvement of wetland habitats. Very occasionally, robust individuals of *E. pratense* can have secondary branching, and so might be confused with either *E. sylvaticum* or the hybrid between the two.

**Biogeography**  
Circumpolar Boreo-temperate element.

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**Equisetum palustre**  
**Marsh Horsetail**  

A deciduous horsetail associated with marshes, damp pastures, ditches, dune-slacks, streams, rivers and mountain flushes. It tolerates a wide range of soil types and substrates, provided that they are permanently damp and adequately base-rich. 0–945 m (Meall nan Tarmachan, Mid Perthshire).

**Trends**  
The 10 km square distribution of this species has increased since the 1960s, presumably because of more systematic recording in many areas, especially Ireland. It has suffered some losses in south-eastern England due to drainage and agricultural improvement. It was mapped as 'all records' in the 1962 Atlas.

**Biogeography**  
Circumpolar Boreo-temperate element.
**Equisetum telmateia**  Great Horsetail

A robust, deciduous, colony-forming horsetail of base-rich clay soils in sites with spring-lines, permanent seepages and open flushes, especially in areas where porous rocks are interbedded with clays. It prefers open habitats and is particularly frequent on eroding sea- and river-cliffs, but also grows on roadsides and railway embankments. Lowland to 365 m in Fossdale (North-west Yorkshire).

**Trends**  This species has apparently become more frequent in inland parts of south-eastern England in the last 100 years (Kent, 1975) and elsewhere since the 1960s, presumably due to more systematic recording in many areas, especially Ireland. Localized losses have occurred due to drainage and improvement of wetlands.

**Biogeography**  European Southern-temperate element; also in western North America (*E. telmateia* subsp. *braunii*).
**Hymenophyllum tunbrigense**  Tunbridge Filmy-fern  
*(L.)* Sm.

A rhizomatous, perennial, mat-forming fern of very sheltered, often deeply shaded, humid habitats; these include acidic rock faces, humic banks and tree trunks, particularly in deep wooded stream valleys, and crevices on upland boulder scree. 0–760 m (Galtée Mountains, County Tipperary).

**Trends**  
The distribution of *H. tunbrigense* is now largely stable, due in part to fuller and more intensive searching, with the majority of losses having occurred before 1930, though a further fifth of sites in south-eastern England were lost by the end of the 20th century, largely through woodland loss and shading by *Rhododendron ponticum*. It is likely to survive in many of the sites in western Scotland where it has not been recorded this century.

**Biogeography**  
Oceanic Temperate element; also one site in North America.

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**Hymenophyllum wilsonii**  Wilson’s Filmy-fern  
Hook.

A rhizomatous perennial, forming dense colonies on a variety of substrates, including sheltered acidic or, rarely, mildly basic rocks, and trees in humid sites. It also occurs on damp upland cliffs, boulder scree and, rarely, old walls in hyper-humid areas. 0–1,005 m (Macgillycuddy’s Reeks, South Kerry).

**Trends**  
The distribution of *H. wilsonii* is largely stable, although the current map shows losses, particularly in upland areas of southern, central and eastern Scotland. At least some of this apparent decline is almost certainly due to under-recording, and it probably survives in many of the remoter 10 km squares where there are no records this century.

**Biogeography**  
Oceanic Boreo-temperate element; confined to the hyperoceanic zone of western Europe and Macaronesia.
**Trichomanes speciosum (gametophyte)** Killarney Fern (gametophyte)

Wild. The gametophyte of *T. speciosum* grows deep in clefts, crevices and natural rock hollows on a range of acidic to neutral rocks. Such sites are dark (less than 1% ambient light) and are often humid, being located on sea-cliffs, river-cliffs or stream-sides, or are kept damp through soil capillary action. 0–700 m (Mt. Brandon, South Kerry).

**Trends** Although first described from cultivated material in 1888, the gametophyte was overlooked in the wild until 1989, when it was identified in northern England (Rumsey et al., 1990). Subsequent fieldwork revealed an extensive, and still under-recorded, distribution (Rumsey et al., 1998).

Following the initial enthusiasm generated by the discovery, less attention has been devoted to the recording of this unique plant, reflected in the relative lack of records this century compared with the map produced for the 2002 *Atlas*. The range is likely to be essentially stable, although there is anecdotal evidence that recent climatic conditions may have favoured the production of sporophytes, perhaps to the detriment of gametophytic growth.

**Biogeography** Gametophytes occur throughout the European range of the sporophyte, but also extend eastwards to central Europe.

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**Trichomanes speciosum (sporophyte)** Killarney Fern (sporophyte)

Wild. A rhizomatous evergreen fern, with delicate but long-lived fronds, restricted to humid, winter-warm sites. The sporophyte occurs only in constantly damp, shaded localities, usually on acidic, but often base-flushed rocks, rarely on damp hemic banks, and exceptionally as an epiphyte. 0–420 m (Caernarvonshire).

**Trends** *T. speciosum* declined historically due to collecting, habitat disturbance and in response to extremes of climate, as occurred in the winter of 1962/3. Although one site has been lost since mapped in the 1960s (Perring & Walters, 1962) through collection, fieldwork since 1990 has revealed several new populations and over the past two decades recruitment of sporophytes has occurred at sites where previously only gametophytes existed. Climatic change with milder winters and increased rainfall has benefitted the plant in this regard. Due to its extreme rarity much secrecy surrounds many populations and at least one extant site in Cumbria is not mapped here. A variable species, with several cytotypes reported for our area which may represent cryptic taxa.

**Biogeography** Oceanic Temperate element; confined to Macaronesia, western Europe and northern Italy.
**Pilularia globulifera**  Pillwort

A small, rhizomatous fern growing on the edges of non-calcareous lakes, reservoirs, ponds or slow-flowing rivers, and sometimes in ditches in valley mires and on damp mine workings or as a submerged aquatic. It requires areas where competition is reduced by fluctuating water levels or disturbance. 0–491 m (Pool Hill, Radnorshire).

**Trends**  *P. globulifera* persists in those core areas to which it had largely retreated by 1950, having been eliminated from its wider range by habitat destruction, eutrophication and reduced disturbance. In the lowlands its strongholds are extensively grazed landscapes with surviving ponds. Though the species is inconspicuous, it has a high profile and is well recorded in its known range. It has been reintroduced to some former native sites (e.g. Rum, North Ebudes).

**Biogeography**  Suboceanic Temperate element; it is endemic to Europe and has declined throughout its range.

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**Azolla filiculoides**  Water Fern

A floating fern of canals, ditches, ponds and sheltered bays in lakes and rivers. It is most frequent in calcareous water, or near the sea. It has a symbiotic relationship with the nitrogen-fixing cyanobacterium *Anabaena azollae*. It reproduces vegetatively, often producing dense mats which reduce light penetration and result in lower dissolved oxygen levels and pH in the water below. Sporocarps are frequent and widespread; they are tolerant of desiccation and winter-cold and retain viability for some years. Generally lowland, but reaching 450 m above Rydal Water (Westmorland).

**Trends**  First recorded in Britain in 1883, this species spread rapidly in the second half of the 20th century. Its overall range in Britain has not changed substantially since 2000 though individual populations may come and go, or fluctuate greatly in numbers from year to year. In Ireland it is more widely recorded than it was before 2000 due to more systematic recording. It is widely cultivated and frequently discarded into the wild.

**Biogeography**  Native of western North and South America; widely naturalized in temperate and southern Europe and elsewhere.

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**Pteridium aquilinum**  
(Leichtlin) Kuhn

A large deciduous rhizomatous fern of moorland, hill pasture, open woodland, hedgerows and other habitats on acidic soils. It is most vigorous when growing on deep loam, sands or alluvium and is rare on base-rich soils. 0–670 m (Creag an Lochain, Mid Perthshire), and almost certainly higher elsewhere.

**Trends**  *P. aquilinum* increased markedly in the 20th century, apparently in response to more intensive sheep grazing and more frequent burning of heathland in the uplands. In the 1970s it was invading more than 10,000 hectares of agricultural land annually. This expansion is not apparent at the 10 km scale as the species was almost ubiquitous by the time of the 1962 Atlas. It is controlled using chemicals and cutting over large areas of northern Britain, although only repeated applications of the chemical asulam has so far proved effective due to its ability to reduce the vigour of rhizomes (Stewart *et al.*, 2005). However, the use of asulam has been restricted since 2012.

**Biogeography** Circumpolar Temperate element.

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**Cryptogramma crispa**  
Parsley Fern  
R.Br. ex Hook.

This small, deciduous, long-lived clump-forming fern is a strong calcifuge and is found in well-drained sites on relatively stable, steep scree slopes and on slate mine waste, where it is a pioneer species. It also occurs more rarely as small plants on cliff ledges and mortar-free dry-stone walls. From 30 m (Raasay, North Ebudes) to 1,330 m (Ben Nevis, Westerness).

**Trends** There is evidence for decline from the more lowland, southerly and drier extremes of the species’ British range, although a new site in Cornwall was found (and almost immediately lost) in 2020. Many losses, as in the South Pennines, took place before 1930, although its extirpation from Exmoor followed the 1976 drought. The only surviving population in southern England, on Dartmoor, is extremely small and vulnerable.
Anogramma leptophylla  
(\textit{L.}) \text{Link}

A small delicate fern found on moist but well-drained shady lane banks, especially where granite is used to support the bank. It prefers bare soil, often on vertical surfaces and where some erosion reduces competition. It is frequently associated with mats of thallose liverworts, typically \textit{Lunularia cruciata}. It is the only British fern with an annual sporophyte; its spores mature early (usually April) and plants die soon afterwards. Its prothallus, however, is perennial and may overwinter to produce new sporophytes the following year. Lowland.

**Trends**  
\textit{A. leptophylla} is confined to the Channel Islands (Guernsey, Jersey) where populations vary markedly in size from year to year. They are highly vulnerable to the scraping of lane banks by passing traffic and to over-enthusiastic hedgebank management, though population numbers have remained remarkably stable. After more than a century with only a single known site in Guernsey, a second population was discovered in 2016.

**Biogeography**  
Mediterranean-Atlantic element; widespread in Asia, Africa, Australasia, the Pacific Islands and South America.

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Adiantum capillus-veneris  
\textit{L.}

A semi-evergreen fern found in areas with an oceanic climate on wet, calcareous cliffs where its rhizomes are protected in crevices, or tufa encrustations; in the Aran Islands (West Donegal) and the Burren (County Clare) it grows in grikes in limestone pavement. Many inland records in sheltered warm sites, such as damp mortared walls, railway bridges and canal locks, are likely to have arisen from spores derived from cultivated plants. It is an outcrossing species, but most populations in Britain (the northernmost extremity of its range) show little or no genetic diversity. Lowland.

**Trends**  
In the 19th century native populations were jeopardized by collectors, with most native site losses before 1930. There have been few recent losses and very many gains, some close to natural sites, but most in sheltered urban habitats which are more likely to have derived from colonization from horticultural sources. Assigning status to any of these populations is problematic in the absence of genetic evidence but in general new colonies on man-made structures have been treated as introductions.

**Biogeography**  
Mediterranean-Atlantic element. Pantropical, widely distributed in Africa, central and eastern Asia, America and Oceania, extending into warm temperate regions.
**Pteris cretica**  Ribbon Fern

An evergreen or semi-evergreen shortly rhizomatous fern, found established on walls in areas with moist, largely frost-free micro-climates, so primarily in large urban or coastal areas, where it is found in basements, on outhouses, in culverts and wells. Reproduction is by spores, but populations are sometimes short-lived as a consequence of tidying operations and for climatic reasons. Lowland.

**Trends**  *P. cretica* was first cultivated in Britain in 1820 and was first recorded in the wild in 1950 (Chieveley, Berkshire). It is a very variable species, with many named cultivars commonly grown as houseplants. It was perhaps over-recorded historically for similar *Pteris* species such as *P. multifida*, although it is much better recorded now. New finds have been balanced by regular losses.

**Biogeography**  Widespread in tropical and warm-temperate regions of the Old World; extending north as a native to southern Europe.

**Gymnocarpium dryopteris**  Oak Fern

*(L.) Newman*

A gregarious, deciduous fern of rocky deciduous woodland and ravines, along stream banks, and on cliff ledges and stable block screes. It prefers moist but open, light-textured mineral soils with a high humus content, and tolerates a moderate range of pH. 0–1,007 m (Beinn Hearsgarnich, Mid Perthshire).

**Trend**  This species, which is susceptible to heavy grazing, has declined at the edges of its British range, where it has been lost from lowland woods even though the woods themselves often survive. Most of the losses occurred before 1950. It appeared but was soon lost in Surrey in the 2000s and has recently been discovered in Dorset. Curiously rare in Ireland, it was last recorded there in 1986.

**Biogeography**  Circumpolar Boreo-temperate element.

**Gymnocarpium robertianum**  Limestone Fern

(Hoffm.) Newman

A deciduous fern of cracks, fissures and scree in limestone rock, but also found in shallow grikes of limestone pavement, and, rarely, on chalk. It prefers warm, sunny exposures but can tolerate light shading. It has become established on rakes and buildings associated with lead mining and was known from walls and other masonry associated with railways and churchyards. Lowland to 585 m at Carreg yr Ogof (Carmarthenshire).

**Trends** The distribution of this species is essentially stable. Some sites have, however, been lost through competition with *Mercurialis perennis* and *Crataegus monogyna*, while quarrying and overgrazing have had detrimental effects on others. It has been lost from most if not all of its sites east of its 'natural' range where it was almost certainly a natural colonist, usually of built structures.

**Biogeography** Circumpolar Boreo-temperate element, with a disjunct distribution.

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**Cystopteris fragilis**  Brittle Bladder-fern

(L.) Bernh.

A small delicate fern of damp, shaded rock crevices, cliffs, cave entrances, ravines and mortared walls, always growing on a mineral-enriched substrate, and most frequent over limestone. A variable complex of taxa, represented in our area by tetraploid and hexaploid cytotypes, and their pentaploid hybrid where sympatric. The relationship of *C. alpina* and the rugose-spored forms here treated as *C. dickieana* in this polyploid complex remains to be fully resolved. 0–1,220 m (Breadalbane, Mid Perthshire).

**Trends** The distribution of *C. fragilis* in the uplands is stable. Some lowland sites, particularly those on old buildings, bridges, canal locks and railway platforms, have been lost since the 1960s through demolition or cleaning. Some earlier records in south-western England may relate to *C. diaphana*, which can only be separated microscopically.

**Biogeography** Circumpolar Wide-boreal element.
**Cystopteris diaphana**  Diaphanous Bladder-fern  
(Bory) Blasdell

A small, delicate, semi-evergreen and shortly rhizomatous fern of sheltered damp walls, dripping rock faces and rocky-loamy riverbanks, also persistent in and around Victorian ferneries and gardens. It was previously overlooked as *C. fragilis*, itself a polyploid complex of many critical taxa, from which it differs in its spore ornamentation, subtle morphological features and in its phenology and ecology. Lowland.

**Trends**  *C. diaphana* was first recorded as a wild plant scattered over a kilometre of riverbank in Cornwall in 2004 (Murphy & Rumsey, 2005), although it was long known but misidentified on a garden wall elsewhere in the county. A fragmentary herbarium specimen indicates its past presence with other Atlantic species in the Weald in the late 17th century (Rumsey, 2007b), providing some support to a claim for native status, although most extant populations are associated with built structures. Historical records of *C. fragilis* from similar Cornish localities to *C. diaphana*’s extant riverbank sites there and in County Cork also suggest it may be a hitherto overlooked native.

**Biogeography**  Widely distributed as a native, from the tropics, through Macaronesia, north on Atlantic coasts to Britain and Ireland.

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**Cystopteris alpina**  Alpine Bladder-fern  
(Lam.) Desv.

A small, delicate, deciduous fern of montane rock crevices, cliff faces and karstic limestones, previously established on a lowland wall. The altitudinal limit is unknown although it has been confirmed from between 400–500 m on Cronkley Scar (North-west Yorkshire).

**Trends**  The *C. fragilis* group represents a near-global polyploid complex which defies simple taxonomic treatment. Within this, hexaploid and octoploid plants referable to *C. alpina* are primarily distinguished by the position of their vein terminations. Plants of this species, previously referred to *C. regia*, more closely approach *C. fragilis* in their morphology and were known from an Essex wall for over 50 years in the 19th century, with similar plants (not mapped) reputed to have been collected in the Welsh mountains, but not recorded for over 90 years. More typical examples were restricted to a single site on Cronkley Scar in Upper Teesdale, where it was last recorded in 1911. More recently, plants showing similarities to Scandinavian examples referred to this species have been seen in the Orkneys and mainland Scotland, though their identity is still under investigation. Confusion has also previously been made with *C. fragilis* subsp. *huteri*, a glandular plant known only from Snowdon, Caernarvonshire.

**Biogeography**  An Arctic-montane species.
N

Cystopteris dickieana Dickie's Bladder-fern
R.Sim

A small delicate fern of rock crevices, shady ravines, cave entrances, under overhangs and rarely on walls and under stone bridges. It prefers moderately base-rich rocks. 0–420 m (Inshriach forest, Easternness).

Trends This species was originally described from sea caves south of Aberdeen in 1848, where it still occurs, but it is a predominantly montane plant in Britain. The species appears to be recognized primarily by its distinctive rugose spores, and material from the type locality is of an extreme foliose growth form. Plants elsewhere more typically resemble C. fragilis and have accordingly been much overlooked for it. British plants are tetraploid, but hexaploid examples are known elsewhere and as with the echinate-spored forms, rugose-spored plants worldwide may represent multiple taxa.

The C. fragilis group represents a near-global polyploid complex with taxa from diploid to octoploid level; it defies simple taxonomic treatment with polytopic origins at particular ploidies, reticulate evolution and uncertain genomic constituents. Further work is urgently needed but for now the taxonomic status of C. dickieana "remains uncertain and controversial" (Dyer et al., 2000).

Biogeography Rugose-spored plants are widely distributed throughout North America, the mountains of Asia, Europe, northern Africa and the Canaries.


F.J. Rumsey

N

Cystopteris montana Mountain Bladder-fern
(Lam.) Desv.

A deciduous fern of sheltered, humid, north- or east-facing limestone and mica-schist cliffs where there is periodic irrigation. It prefers dripping rock ledges, cliff bases, gullies and steep, unstable scree slopes. From 490 m on Ben Lui (Main Argyll) to 1,125 m on Aonach Beag (Westernness).

Trends Easily overlooked and sometimes growing in inaccessible sites, C. montana is probably present in most 10 km squares for which only pre-1987 records exist. It is susceptible to grazing, and had been lost from some sites before 1930 because of collecting, including the only English site, above Red Tarn on Helvellyn (Cumberland), where it was discovered by Bolton King in 1880.

Biogeography Circumpolar Boreal-montane element.


A.C. Jermy, T.D. Dines & F.J. Rumsey
Asplenium fontanum  
Smooth Rock-spleenwort  

(L.) Bernh.

A small, perennial, evergreen fern of sunny to sheltered limestone rock crevices elsewhere in Europe; in our area it was formerly found as a chance colonist on old walls, boulders and outcrops of a range of rock types, including sandstones and basalts. Lowland.

Trends  In Britain A. fontanum was possibly only a chance colonist resulting from long-distance spore dispersal from its native southern European range, or in some instances possibly from plants in cultivation. Doubt surrounds the provenance and precise localization of many of the specimens of this species in British herbaria. Some early literature reports resulted from misidentifications, but one of the earliest finds, from Buckinghamshire in 1775, is supported by a specimen in the Cambridge University Herbarium. It persisted for over 17 years at a site near Petersfield (Hampshire), where it was last collected in 1869. The most recent find, from a wall near Hawick (Roxburghshire) was made in 1923. The map shows records supported by specimens that have been critically determined.

Biogeography  Native of the Mediterranean region.


Asplenium scolopendrium  
Hart’s-tongue  

L.

An evergreen perennial fern of sheltered, humid, moist habitats, including rocky woodlands, streamsides and hedgebanks, grikes in limestone pavement, and on brickwork and walls, where it often grows in a stunted form. It avoids the most acidic substrates. 0–700 m (Great Dun Fell, Westmorland).

Trends  The range of this species has expanded since the 1960s, especially in eastern England and southern Scotland. Much of this increase is likely to have taken place in urban areas given increased habitat availability, the changing climate and reductions in airborne pollutants over recent decades.

Biogeography  European Temperate element. Related taxa of different ploidy, usually treated at subspecific level, are present in eastern Asia and North America.

Key refs  Bangerter et al. (1978), Page (1997).
**Asplenium adiantum-nigrum**  Black Spleenwort

An evergreen perennial fern which occurs on a wide range of well-drained, usually basic substrates, in lightly shaded habitats where there is little competition. These include cliffs and scree, quarries, lane banks and walls. Generally lowland, but reaching 770m on flushed rocks at Meall Coire Lochain (Westernness).

**Trends** The 10 km square distribution appears to be stable. It is a very variable species; plants from serpentine rocks in Scotland and western Ireland have previously been confused with the central European *A. cuneifolium*, a diploid which is parental to the tetraploid *A. adiantum-nigrum* and is maternal to these plants. These plants have also been referred to as *A. adiantum-nigrum* subsp. corunnense, described from Iberia, and *A. adiantum-nigrum* var. silesiacum, described from central Europe. These may be synonymous but investigation of their respective maternal parentage is ongoing. Morphologically similar plants from the serpentine rocks of Cornwall differ in having *A. onopteris* as their maternal parent, as do all other non-serpentine examples of the species.

**Biogeography** European Temperate element; also in central Asia and North America.

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**Asplenium onopteris**  Irish Spleenwort

An evergreen perennial fern of dry, warm, lightly shaded, usually basic, earthy banks and rock faces in open deciduous woodland, more rarely on damper maritime rocks and sea-cliffs. Lowland.

**Trends** The distribution of this species still requires detailed study. *A. adiantum-nigrum* (a polyploid derived in part from *A. onopteris*) and *A. onopteris* freely hybridize to produce the vigorous but sterile hybrid *A. × ticinense* which may persist in the absence of its rarer parent; hybrid populations, and extreme forms of *A. adiantum-nigrum*, are likely to have produced recording errors. A record, treated as an introduction from north Wales, may be just such an error. All Irish populations are small and threatened; historically, collection may have contributed to decline, and the upgrading of roads has resulted in the loss of some bankside sites.

Native in Ireland and a neophyte in Britain.

**Biogeography** Mediterranean-Atlantic element; it reaches its northern limit in Ireland where it is morphologically invariable, in contrast to the variation shown in the Mediterranean region.

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**Key refs** Bangerter *et al.* (1978).

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Asplenium obovatum  Lanceolate Spleenwort

A perennial, evergreen, calcifugous fern typically found in sheltered, shady crevices and ledges on maritime cliffs and on rock outcrops. It also occurs on well-drained, acidic, loamy lane banks and dry-stone walls. Most of its sites are near the sea, and the plant is not vigorous in its colder inland sites. Our plant is *A. obovatum* subsp. *billotii*, a tetraploid derived from the distinct Mediterranean diploid *A. obovatum* subsp. *oboovatum* and is probably best regarded as a distinct species, *A. billotii*. Lowland.

**Trends**  Its 10 km square distribution appears to be stable. Many of the losses of outlying sites are historical and it may to some extent be under-recorded in areas lacking recent records, such as in North Devon, but the lack of recent records in eastern Ireland may represent a genuine loss. Chance colonists on urban walls resulting from long-range spore dispersal occur rarely and often fail to persist.

**Biogeography**  Mediterranean-Atlantic element.

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Asplenium marinum  Sea Spleenwort

An evergreen perennial fern, predominantly found in cool, moist crevices and fissures in maritime cliffs, on a range of rocky substrates, and often within range of sea-spray. It occasionally grows on walls in coastal areas but, because of its requirement for a frost-free environment and its palatability to molluscs, it is only exceptionally found on rocks or masonry inland. Lowland.

**Trends**  Most of the British sites lacking a post-1970 record were lost before 1930, and the distribution of this species is currently stable. Since 2000 there have been a few discoveries on sheltered urban walls, although these have tended to be ephemeral.

**Biogeography**  Suboceanic Southern-temperate element. This species extends along the Atlantic seaboard from Morocco to south-western Norway.
**Asplenium trichomanes** Maidenhair Spleenwort

A variable, perennial, evergreen fern which grows in a range of rocky habitats, including cliffs, rock faces, screes, mine waste and, perhaps now most commonly, on walls. 0–870 m (Macgillycuddy’s Reeks, South Kerry).

**Trends** There has been a noticeable increase in the 10km square distribution of *A. trichomanes* since the 1960s, especially in eastern England, upland Scotland and in Ireland. This has been particularly evident in some urban areas, such as Greater London, although it is perhaps still under-recorded in these situations. This is a polyploid complex within which three ecologically and morphologically fairly distinct taxa (two tetraploid, one diploid) have been recognized within our area, all of which are mapped here separately. However, this taxonomic treatment perhaps oversimplifies a far more complex pattern of reticulate evolution. The taxonomic ranking of these entities as subspecies versus full species is contentious.

**Biogeography** Circumpolar Southern temperate element, with a disjunct distribution.

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**Asplenium trichomanes subsp. trichomanes**

A diploid, evergreen, perennial clump-forming fern, *A. trichomanes* subsp. *trichomanes* is restricted to acidic, siliceous substrates. It is found rooted into crevices in rock outcrops, and on screes, mine waste and dry-stone walls, particularly in oceanic upland areas. 0–540 m (Hartsop, Westmorland).

**Trends** This typically more delicate looking diploid taxon was known to Lovis (1955) and Kent (1965) but did not become widely known until mapped by Jermy *et al.* (1978). It has been much confused with, and is potentially still over-recorded for, forms of the nearly ubiquitous tetraploid subsp. *quadrivalens*. The distinctions are subtle and require microscopic confirmation and although recorders are more aware of it, which has led to recent finds at the southern extremes of range, there may be a reluctance by many to record other than at aggregate level. The apparent decline in Scotland is most likely a consequence of under-recording.

**Biogeography** Circumpolar Temperate element. Subsp. *trichomanes* is more frequent than subsp. *quadrivalens* in Scandinavia, but much rarer in the Mediterranean region.
**Asplenium trichomanes subsp. quadrivalens**

D.L.Mey.

This tetraploid segregate of *A. trichomanes* is found on mortared walls and calcareous rocks. It is replaced by the more montane diploid subsp. *trichomanes* only in the most acidic situations. When growing with the rarer subspecies, noticeably vigorous sterile hybrids may sometimes be found. A variable plant, inbreeding and with distinct morphological and ecological races, some similar to subsp. *pachyrachis*. Generally lowland, but reaching at least 730 m on Cross Fell (Cumberland), and 870 m on Macgillycuddy's Reeks (South Kerry).

**Trends**

Like subsp. *trichomanes*, this taxon was known to Lovis (1955) and Kent (1965) but did not become widely known until mapped by Jermy et al. (1978). As currently defined, this is the most variable and by far the most abundant and widespread of the *A. trichomanes* subspecies in Britain and Ireland. It is still under-recorded in many areas where recording is not to the subspecies level. The lectotype of *A. trichomanes* is of this taxon which will necessitate a change of name unless a proposal to conserve current usage is successful.

**Biogeography**

Circumpolar Southern-temperate element.

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**Asplenium trichomanes subsp. pachyrachis**

(Lobed Maidenhair Spleenwort)

(H.Christ) Lovis & Reichst.

A fern of perpendicular limestones, usually in shaded, sheltered, humid places, and often under overhangs. It is rarely found on sandstone rocks with basic inclusions and on old mortared walls, particularly of medieval castles. Generally lowland but with a single record at 420 m (Carlochy, Angus).

**Trends**

This tetraploid plant was known in Victorian times, but was only identified as the continental subsp. *pachyrachis* comparatively recently (Rickard, 1989). It is treated at specific rank, as *A. csikii*, by Vogel et al. (1999), although perhaps better called *A. harovii*, an earlier name for a distinctive member of this species complex which demonstrates the same growth form, and morphological distinctions which discriminate this from other tetraploid examples of the variable *A. trichomanes* complex. Though it appears to be genuinely rare and strangely absent from many apparently suitable areas, it is possibly still under-recorded. However, it is difficult to separate from similar polyploid lineages which also occur. Some populations on ruined medieval castles, such as at Knaresborough (Mid-west Yorkshire), are quite large, with 100s if not 1,000s of clumps on walls of varying aspects that have not been cleared of vegetation.

**Biogeography**

Widespread but scattered in Europe, centred on limestone massifs in southern Europe with rare occurrences farther north.
Asplenium viride  Green Spleenwort

An evergreen fern of moist, sheltered crevices in basic and ultrabasic rocks, the grikes of limestone pavements and very rarely also on mortared walls. It is occasionally a colonist of old metal mine workings. From sea level on the coasts of western Britain and Ireland to 1,000 m on Coire Cheap (Westerness).

Trends  There appears to have been a small overall decline throughout the British and Irish range, the causes of which are unclear and may simply reflect an element of under-recording. Because of its requirement for an environment which is cool and humid in summer (Page, 1997), its occasional occurrences in lowland central and eastern England have generally been short-lived, but it has persisted on a London Underground station wall for over 25 years. These occurrences, a consequence of long-distance spore dispersal, have been marked as non-native in earlier atlases with little justification.

Biogeography  Circumpolar Boreal-montane element, with a disjunct distribution.

Asplenium ruta-muraria  Wall-rue

A perennial, evergreen fern that occurs on limestone and other basic rocks, where it grows on steep, bare faces and in crevices; it is also found in hollowed clints in limestone pavement. In most lowland areas it is now equally, if not more abundant on mortared walls and other man-made structures. 0–625 m (Ingleborough, Mid-west Yorkshire).

Trends  A variable tetraploid inbreeding species. Historically, there was some decline in industrial areas through acidification (Page, 1997), but in recent years cleaner air has reversed this trend. Populations may be dynamic; losses occur through renovation of walls and the built environment, and this has its most marked influence on distribution in lowland agricultural areas where its habitat is scarcest.

Biogeography  Circumpolar Temperate element, with a disjunct distribution.
**Asplenium septentrionale**  Forked Spleenwort

An often long-lived, small, evergreen fern of well-drained, exposed, sunny, usually acidic rock faces, metalliferous mine spoil and unmortared stone walls. In Ireland, it grows on ultrabasic rocks. 0–535 m (Moel yr Ogof, Caernarvonshire), formerly to 715 m at Llyn y Cwn (Caernarvonshire).

**Trends**  This species has always been highly localized due to its exacting edaphic preferences. Although it is easily overlooked and potentially under-recorded, its distribution is now essentially stable on natural rock faces where its chief threats are scrub growth and encroachment. Historically, it was lost from a number of sites through collection, as on Exmoor (South Somerset), but the greatest continuing threats are through the tidying and restoration of old mining sites and walls. It can rapidly colonize mine spoil and the adjacent built environment, particularly where influenced by metalliferous substrates. Long distance spore dispersal has allowed colonization of walls far distant from known populations, as on the brickwork of an old bridge on Romney Marsh (East Kent). Such occurrences have previously been treated as non-native, but with little justification. The disjunct lowland populations are extremely small and vulnerable, but in the absence of detrimental management, long-persistent.

**Biogeography**  European Temperate element; also in central Asia and western North America.

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**Asplenium ceterach**  Rustyback

A perennial, calcicolous fern found on crags and cliffs of basic rocks, especially limestone, and also on limestone pavements and mortared walls. Generally lowland, reaching 580 m in High Cup Nick (Westmorland).

**Trends**  Historically, this species has benefited from the increase in available habitat created by the built environment. Its range has increased markedly since the 1960s, particularly in eastern Britain, but recent losses are also greater here, suggesting colonization which is not always successful. The species is distinctive and thus well recorded but its wall habitats are prone to renovation with the loss of small isolated populations.

**Biogeography**  Submediterranean-Subatlantic element; also in central Asia.
**Thelypteris palustris**  Marsh Fern

A perennial fern of open or recently wooded fen or open carr, where the soil is permanently wet and organic, but not too acidic. It is a characteristic component of *Phragmites australis–Cladium mariscus* fen, but also persists as vigorous colonies in alder- or willow-carr. Generally lowland, but formerly at 335 m (Braemar, South Aberdeenshire).

**Trends**  *T. palustris* declined in the 19th and 20th centuries due to drainage, but can be remarkably tenacious where natural succession has occurred, and has been refound in several of its stations after many decades. It remains well distributed, with strongholds in wetland landscapes such as the Norfolk Broads, New Forest and Somerset Levels, although away from these areas it does appear to be faring less well. A few new sites for the species have been discovered since 2000, most notably in Kent, Caernarvonshire and County Wexford.

**Biogeography**  Circumpolar Temperate element, with a disjunct distribution.

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**Phegopteris connectilis**  Beech Fern

(Michx.) Watt

A creeping, rhizomatous fern of ancient woodlands dominated by *Quercus petraea* on neutral to acidic soils, where it frequently occurs on deeper soils on shaded and humid gully sides where base-rich water percolates. It can also be found amongst boulders and on wet rock faces in the uplands where it is afforded protection from grazing. It is virtually absent from lowland regions of England, Wales and Ireland, 0–1,200 m (Observatory Ridge, Ben Nevis, Westerness).

**Trends**  The distribution of *P. connectilis* is stable, and with many new records on the southern and eastern margins of its Welsh range, and the margins of its Scottish range, since 2000.

**Biogeography**  Circumpolar Boreo-temperate element.
**Oreopteris limbosperma**  Lemon-scented Fern

A perennial fern of acidic, peaty or humus-rich soils in open woodland, along drainage ditches and stream sides, and on damp heathlands, upland grassland and damp rock ledges. It is especially associated with the edges of watercourses, including man-made ditches, and is therefore more frequent on poorly drained substrates. 0–1,233 m (summit of Aonach Beag, Wester Ross).

**Trends**  The distribution of this species in the uplands, where it can be locally abundant, is stable. Many of the losses in the lowlands occurred before 1930, caused especially by the destruction of heathland. This decline continues and remaining populations in south-eastern England are small and vulnerable. The factors responsible for losses are varied, but include changes to woodland management, drainage and eutrophication.

**Biogeography**  European Temperate element.

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**Woodsia alpina**  Alpine Woodsia

A diminutive semi-evergreen fern of steep bare faces of calcareous rocks, including pumice tuffs, basalts, mica- and hornblende schists, slates and limestones. Sites are very free-draining, if often quite wet, with little competition. From 391 m on Ben Hiesgarnich (Mid Perthshire) to 975 m on Ben Lawers (Mid Perthshire).

**Trends**  *W. alpina* was first reported from Snowdonia in 1790, and current populations are probably relics from more widespread populations in post-glacial times. It suffered a serious decline through collecting in the 19th century. New sites have been discovered since it was first mapped in the 1962 *Atlas*, and current populations appear to be relatively stable. Some apparent historical losses may be through misidentifications.

**Biogeography**  Circumpolar Boreo-arctic Montane element.
**Woodsia ilvensis** Oblong Woodsia  
(L.) R.Br.

A diminutive semi-evergreen fern of horizontal cracks and fissures in cliffs and crags, typically on more acidic tuffs, grits and shales. Sites are exposed and very free-draining, with little competition. There is little evidence for sexual reproduction and the plant is reliant on very local vegetative spread and great longevity for survival. From 365 m to 700 m (Cwm Idwal, Caernarvonshire), and possibly to 760 m (Cumberland).  

**Trends** Current populations of *W. ilvensis* are probably relics of a more widespread post-glacial distribution. It suffered serious declines due to collecting in the 19th century but now appears to be stable, if still extremely vulnerable. The total British population is of fewer than 200 individuals, with most sites supporting single figures and with little evidence of recruitment, despite conservation activities. Some older records (e.g. Cumberland) may be erroneous. Successful reintroductions have taken place at historical locations in Scotland and Upper Teesdale (Falcon Clints, Cronkley Scar).  

**Biogeography** Circumpolar Boreo-arctic Montane element.

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**Athyrium filix-femina** Lady-fern  
(L.) Roth

A deciduous fern that prefers moist but well-drained acidic soils, but can tolerate more basic substrates if these are overlain by mildly acidic layers. It is particularly frequent in deciduous woodland, especially on stream banks, and in moist, rocky habitats, but is also found in hedgerows, drainage ditches and in the uplands on damper cliff ledges and gullies. It is one of few species able to colonize metalliferous lead and tin mine deposits, but unlike other woodland species is rarely found on urban walls, where lack of moisture is a limitation. 0–1,005 m (Carnedd Llewelyn, Caernarvonshire).  

**Trends** There is little evidence for any recent change in the distribution of this widespread and common species. There have, historically, been some losses in eastern and central England through habitat loss and drainage.

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**Athyrium distentifolium**  Alpine Lady-fern

A deciduous fern of the higher Scottish mountains, growing in block screes and in shallow hollows where snow lies late into summer, gullies and more rarely on rock ledges. It prefers more stable, acidic block screes with a northerly or north-easterly aspect and some degree of soil accumulation. Found from 455 m in the Breadalbanes (Mid Perthshire) to 1,230 m on the north face of Ben Nevis (Westernness).

**Trends** Since the latter decades of the 20th century there is evidence for a decline in this species, probably through a combination of overgrazing and decreasing snow-lie as a consequence of climate change, as the decline has been most marked for the endemic late snow bed ecotype previously known as *A. flexile*. This decline is likely to be ongoing. Molecular studies have suggested that the plant is better reinstated in the monotypic genus *Pseudathyrium* as *P. alpestre*.

**Biogeography** Circumpolar Arctic-montane element, with a disjunct distribution.

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**Blechnum spicant**  Hard-fern

(L.) Roth

An evergreen calcifugous fern of damp peaty or loamy soils, often on ditchbanks, in deciduous and coniferous woodland and heathland. In suitably wet climates it extends onto open moorland, streamisdes and hedgerows. 0–1,065 m (Aonach Beag, Westernness), and reportedly to 1,185 m elsewhere in Scotland.

**Trends** Although still widespread and abundant over much of Britain and Ireland, this species declined through the latter part of the 20th century in central and eastern lowland England and central Ireland due to woodland clearance and the conversion of lowland heathland to improved pasture. It is now treated by many authors as *Struthiopteris spicant* (De Gasper et al., 2016).

**Biogeography** European Temperate element; also in northern Africa, western Asia and western North America.
**Blechnum cordatum** Greater Hard-fern

(Dess.) Hieron.

A large, evergreen fern with a shortly creeping rhizome, eventually forming extensive patches, found in hedgerows, on rocky roadsides, by streams and ditches, where it typically occurs as a garden outcast which may then be transported downstream through rhizome fragmentation. It also occurs as a garden relic. Reproduction is primarily by vegetative spread. Lowland.

**Trends** *B. cordatum* is now much more frequently grown in gardens and is widely available in garden centres, often under the name *B. chilense*. It is the most commonly cultivated of a complex of robust, small-trunk forming Austral taxa, often now separated in the genus *Parablechnum*. It was first recorded in the wild in our area from Clooney Loughs, Kenmare (South Kerry) in 1952, with a first British record from a malodorous ditch on St. Mary’s, Isles of Scilly, in 1953. Its increasing popularity and availability has seen it much more widely recorded as a casual garden outcast, with more frequent and persistent occurrences in the far southwest and along our Atlantic coasts.

**Biogeography** Native of southern South America.

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**Matteuccia struthiopteris** Ostrich Fern

(L.) Tod.

A large deciduous fern found in damp woodland, by streams and lakes, and in fen-carr under birches. It tolerates a range of soil pH, but prefers waterlogged clay substrates. It spreads through the production of stolons. Lowland.

**Trends** *M. struthiopteris* was introduced to cultivation in Britain in 1760 and is frequently grown for its distinctive shuttlecock shape. It has been known in the wild since 1948 (Lough Neagh, Antrim), and is increasing due to its popularity in water gardens. The number of recorded sites has more than doubled in the last two decades, but the majority are likely to be deliberate plantings in formal parkland or large gardens and there is limited evidence to suggest that it is spreading unaided; however, it spreads aggressively by runners once established.

**Biogeography** A Circumpolar Boreal-montane species; absent as a native from much of western Europe although it is considered to be native in a small area of north-eastern France where it is at the western extreme of its native Eurasian range (Prelli, 2001).
**Onoclea sensibilis**  
Sensitive Fern

A deciduous rhizomatous fern, found in wet woodland, marshy meadows and on lake and river margins. It spreads by rhizomes and by spores with some colonies established at a considerable distance from gardens. The common name comes from the sensitivity of its leaves to frost. Lowland.

**Trends**  
This species was in cultivation by 1699 and is very popular as a garden plant. It was first recorded in the wild in 1843 (Warrington, South Lancashire), and may be spreading given the marked increase in its 10 km square distribution since 2000, although this may partly reflect the more systematic recording of aliens. Although it is sensitive to frost, drought and full sun, it can be a quite aggressive spreader via its rhizomes where conditions are favourable.

**Biogeography**  
Native of eastern North America and eastern Asia.

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**Polystichum setiferum**  
Soft Shield-fern

A semi-evergreen fern of moderately base-rich habitats, but less strictly calcicolous than *P. aculeatum* with which it often grows. It occurs in shaded deciduous woodland, hedgerows, lane banks and sheltered stream-sides, and also in the peaty bottoms of grikes in limestone pavement. It grows on a wide range of soil types, from those derived from sands to clays, but prefers sloping or well-drained ground. Generally lowland, but reaching 480 m at Peraidd Fynydd (Cardiganshire) and 563 m (Trout Beck, Westmorland).

**Trends**  
This species has undergone a dramatic expansion in range northwards and eastwards since the 1960s, which has continued this century. Although this may in part be due to increased familiarity with this often overlooked species, it must reflect a genuine increase too, possibly as a result of milder winters farther north and east. As a widely cultivated plant, self-sowing from gardens probably accounts for some of the increase in records this century.

**Biogeography**  
Submediterranean-Subatlantic element.

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**Key refs**  

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This index covers taxa included in both Volume 1 and Volume 2 of this publication, as well as taxa that are included in the Online Plant Atlas (plantatlas2020.org) only: these are indicated as “online”. Volume 1 includes taxon accounts up to page 758 (the end of Rubiaceae) and Volume 2 covers taxon accounts from page 759 (Gentianaceae onwards). The page numbers for taxa included in Volume 1 are in bold type; those included in Volume 2 are in regular type. Scientific names for taxa that are the subject of an account in these volumes are in bold italics; vernacular names are in regular bold type. Taxa that are “online” only are included using non-bold type.

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