

## Three species of clubmoss (Lycopodiaceae) at a lowland station in Shropshire

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### ABSTRACT

The clubmosses *Huperzia selago* (L.) Bernh. ex Schrank & Mart., *Lycopodium clavatum* L., and *Diphasiastrum alpinum* (L.) Holub have recently been discovered on acidic clay spoil from the Carboniferous Lower Coal Measures at Stoneyhill, Telford, Shropshire, v.c. 40. *H. selago* and *L. clavatum* occur elsewhere in Shropshire but *D. alpinum* has not been reported in the county since 1726. Stoneyhill was open-cast for coal and clay and abandoned in the mid 1960s. Colonization by plants has occurred, with the clubmosses behaving as colonists in moss and lichen dominated communities. The possible origins of these three species in close association at a lowland site are discussed.

### INTRODUCTION AND OBSERVATIONS

Clubmosses (Lycopodiaceae) are found on heaths, moorlands and montane grasslands, and are usually associated with upland areas. The discovery in 1983/84 of *Huperzia selago*, (L.) Bernh. ex Schrank & Mart., *Lycopodium clavatum* L., and *Diphasiastrum alpinum* (L.) Holub at a lowland site at Stoneyhill, Telford, Shropshire, v.c. 40, is thus of great interest.

Stoneyhill (GR 33/666.061) lies to the west of Telford at around 170 m above sea level and has a history of mining. The underlying Carboniferous Lower Coal Measures strata are composed of thin bands of coal underlaid by fireclays with workable coals in the upper layers. There are also subordinate ironstones embedded in mudstones mixed with the clay strata. Coal was extracted from drift mines in the 1930s; subsequently the site was open-cast for both clay and coal from the mid 1950s until the site was abandoned in the mid 1960s. There has been no restoration of the site and natural regeneration has taken place on the spoil heaps.

Much of the site is bare ground (pH 4.5-5) with a thin mat of algae comprising a typical wet acid flora, mainly *Zygonium* sp. (presumably *Z. ericetorum*) with a small amount of *Hormidium* sp., *Mesotaenium* sp., and *Glindrocystis* sp. There is a good diversity of mosses (*Campylopus introflexus*, *Ceratodon purpureus*, *Dicranella heteromalla*, *Pohlia nutans*, *Polytrichum commune*, *P. formosum*) in association with lichens (*Cladonia floerkeana*, *C. furcata*, *C. impexa*, *C. squamosa*). *Agrostis capillaris* and *Hieracium* sp. are scattered over the site with *Holcus lanatus*, *Deschampsia flexuosa*, *Hypochaeris radicata* and *Calluna vulgaris*; *Ulex europaeus*, *Cytisus scoparius* and *Betula pendula* are present in localized areas.

*Huperzia selago* was discovered in late 1983 as two plants, one of which was apparently dead, on the northern side of a low bank of clay containing small pieces of coal up to 3 cm in size. Associated species included *Agrostis capillaris*, *Hypochaeris radicata* and *Holcus lanatus*, as well as mosses and

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lichens. The plants were uprooted by unknown persons in June 1984 and they were donated to the British Museum (Natural History) (BM), as transplantation was considered inadvisable (A. C. Jermy, pers. comm.).

*L. clavatum* and *D. alpinum* are both found on a north-west-facing (approximately 320°) low ridge of clay (pH 4.5) with ironstone nodules up to 10 cm in size. *D. alpinum* is present as at least 20 plants scattered over the southern end of the ridge, both on the slope and on the flat top. Smaller, younger plants outnumber larger, older plants. Some of the smaller plants have definitely developed from rhizomes; others are up to 1 m from the nearest larger clump and no rhizomes were observed. Several new plants, which are lighter green in colour than the older plants, were found in July 1986. At the foot of the slope, four clumps of *L. clavatum* are present, two of which intermingle with *D. alpinum* over an area of approximately 60 × 30 cm. The moss *Rhacomitrium lanuginosum*, more commonly associated with upland areas, is also present. Associated plants include *Agrostis capillaris*, *Holcus lanatus*, *Hypochaeris radicata*, *Lotus corniculatus*, *Leontodon autumnalis* and *Hieracium* sp. with the mosses *Campylopus introflexus*, *Ceratodon purpureus*, *Pohlia nutans* and *Cladonia* lichens.

A second bank of similar pH and soils, but much damper, has three patches of *L. clavatum* at the bottom of its northern face (aspect approximately 360°). One patch is extensive, covering approximately 75 × 90 cm, and sporing profusely in summer and autumn. At the northern end of the site, some 300–400 m from the above banks, a small number of plants of *D. alpinum* and one plant of *L. clavatum* were found growing on open ground but these were destroyed during site reclamation. The associated vegetation and pHs were similar to those described above.

#### TRANSLOCATION EXPERIMENTS

Attempts were made to move those plants which were to be affected by a derelict-land reclamation scheme. Three clumps of *D. alpinum* together with algal mat, mosses and lichens were moved as a turf approx 30 × 30 cm and 10–15 cm deep. They were planted on the top of the main ridge close to an existing patch of *D. alpinum*. One clump of *L. clavatum* was also moved to the foot of a ridge close to existing *L. clavatum* plants. The plants had to be moved during the dry summer of 1984 and, in spite of being regularly watered with water from an adjacent pool, only one of the plants, a clump of *D. alpinum*, survived.

One clump of *D. alpinum* and one of *L. clavatum* were also moved to Hartlebury Common Local Nature Reserve, Worcestershire. *L. clavatum* was found at this site up to the 1920s/1930s and *D. alpinum* was last recorded from the site in 1836. Unfortunately, the translocated *D. alpinum* was dug up by a dog or a rabbit. However, *L. clavatum* survives on a slope down to a small bog, growing on acid soil (D. Scott, pers. comm. 1986).

#### DISCUSSION

Nationally, the distribution of these three clubmosses reflects their association with the more mountainous areas of the north and west. Of the three, the distribution of *D. alpinum* is the most restricted, being found in northern and central Wales, the Lake District, the north of England, and Scotland (Jermy *et al.* 1978). Stoneyhill lies on the line between known *D. alpinum* sites in South Wales and Derbyshire which forms the south-eastern limit of its present distribution in Great Britain. Sinker *et al.* (1985) have described the present distribution of these three species in Shropshire. *H. selago* was formerly found on the ridges of the Stiperstones and the Long Mynd, the Stretton Hills, and Brown Clee in the Clee Hills; it is now recorded only from Titterstone Clee. *L. clavatum* is found on the Ercall Hill and the Stiperstones. *D. alpinum* was last recorded on the Stiperstones in 1726 and its discovery at Stoneyhill is thus particularly interesting.

The presence of an old specimen collected from a lowland site at Hartlebury Common, Worcestershire (in herb. Babington, CGE), determined by A. C. Jermy as *D. × issleri* (Rouy) Holub, stimulated Jermy and I. C. Trueman (pers. comm.) to consider the possibility of the Stoneyhill plants being this partially fertile hybrid (*D. alpinum* × *D. complanatum* (L.) Holub). After much study of the plants *in situ*, they agreed that they represented *D. alpinum*.

The Stoneyhill habitat shows similarities to montane grassland communities, notably the acid soils, low vegetation cover, and the exposed nature of the site. Colonization of the acid clay spoils at Stoneyhill has occurred since the open-cast site was abandoned in the mid-1960s. The clubmosses are part of the early successional stages together with mosses and lichens; the associated algal mat can be observed to form a crust in dry weather and may assist in retaining moisture. It is of particular relevance to note that these three species of clubmoss were formerly recorded from the moorlands and heaths of Derbyshire. Now only *L. clavatum* may be found in these habitats, whilst all three species are found in quarries and on tip-heaps of acid refractory sands on the Carboniferous limestone plateau, where they behave as occasional colonists of newly available and suitably moist and acid habitats (Clapham 1969). The presence of unusual plants on industrial sites which have been colonized by natural vegetation has been noted elsewhere (e.g. Greenwood & Gemmell 1978; Teagle 1978). The main area of interest at Stoneyhill has been retained as a nature reserve as part of a derelict-land reclamation scheme due to cooperation between Shropshire County Council and the Shropshire Trust for Nature Conservation.

The discovery of these three clubmosses in a very localized area raises questions as to how they may have arrived. The obvious explanation is that spores of *H. selago* or *L. clavatum* were carried either on the prevailing westerly winds, or possibly by birds (I. C. Trueman, pers. comm.) from the Ercall (4 km north-west of Stoneyhill), the Stiperstones (c. 30 km to the west) or the Cleve Hills (c. 30 km to the south). Spores of *D. alpinum* would have had to have been carried from north-western Wales, some 100 km away. A second theory is that these species have been present in the Telford area for many years and have migrated from one suitable site to another as pitmounds were created during the exploitation of the East Shropshire Coalfields. Earlier botanists who found these three species elsewhere in the County might well have overlooked their presence in the apparently unlikely conditions of the abandoned coal and clay tips which have been present in the Telford area for at least 250 years. It is noteworthy that the distribution of clubmosses at Stoneyhill suggests that there is much variation in the spoil, which is to be expected at an old open-cast site on Coal Measures strata. The possibility that other suitable sites in the Telford area might have clubmosses is being explored.

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