



The *Scapanietum asperae* in Wales

Sharon Pilkington explains how her recent fieldwork has extended the known range of this rare plant community

The ‘southern hepatic mat’ or *Scapanietum asperae* (Fig. 1) is an association of large leafy liverworts that grows alongside mosses and vascular plants on the chalk of southern England. Porley & Rose (2001) imply that it is found only in England, having searched for it unsuccessfully on chalk downs in France. It is considered to be a rare vegetation type both nationally and globally and is thought to have declined in quality and extent in England in recent decades.

The *Scapanietum asperae* is described as a ‘distinctive association of leafy liverworts and mosses of north-facing, grazed chalk grassland’. It is characterised by the presence of one or more of the liverworts *Frullania tamarisci*, *Porella arboris-*

vitae and *Scapania aspera* in a turf dominated by bryophytes. At least six other characteristic species, particularly *Hypnum cupressiforme* var. *lacunosum*, *Neckera crispa*, *Ctenidium molluscum*, *Dicranum scoparium* and *Pseudoscleropodium purum* should also be present.

Scope of the work

Wales lacks chalk and therefore the potential presence of the *Scapanietum asperae* has not been previously considered. Geologically, however, the principality is very diverse and includes some extensive outcrops of Carboniferous Limestone supporting species-rich calcareous grassland in districts including the Gower peninsula, Pembrokeshire, the Brecon Beacons,

Box 1 – Welsh sites where the *Scapanietum asperae* has been documented (with vice-county names)

Bryn Alyn SSSI, Denbighshire

Creigiau Rhiwledyn / Little Ormes Head SSSI, Caernarvonshire

Gower Coast: Rhosili to Port Eynon SSSI, Glamorgan

Llandulas Limestone and Gwrych Castle Wood SSSI, Denbighshire

Pen y Gogarth / Great Ormes Head SSSI, Caernarvonshire

Ruabon/Llantysilio Mountains and Minera SSSI (Creigiau Eglwyseg and Trevor Rocks), Denbighshire

Land west of Eryrys, Denbighshire

Other vegetation with the characteristics of *Scapanietum asperae* has also been anecdotally reported by NRW from Castlemartin Ranges in Pembrokeshire.

<Fig. 1. *Scapanietum asperae* at Great Ormes Head. All pictures by S. Pilkington.

Denbighshire and the Conwy coast.

Grassland surveys undertaken by Natural Resources Wales (NRW) in 2014 and 2016 revealed a number of stands of limestone grassland which appeared to have affinities to the *Scapanietum asperae*. Could the association also be present on the Welsh limestone as well as the English chalk?

In 2017, under contract to NRW, I surveyed five Sites of Special Scientific Interest (SSSI) on the Carboniferous Limestone of Denbighshire and the Conwy coast to determine the extent of any *Scapanietum asperae* and characterise its

ecology, as far as possible.

In each site, I searched for the *Scapanietum asperae* in herb-rich limestone grassland with an appropriately cool and humid aspect (typically with aspect facing north-east to north-west). I also sampled a number of quadrats in representative stands of the association at each site, recording the presence and approximate percentage cover of every bryophyte, lichen and vascular plant species.

Findings

All of the SSSIs supported the *Scapanietum*



Fig. 2. The cliff and ledge habitat of *Scapanietum asperae* at Great Ormes Head.



asperae to varying degrees (Box 1). At Great Ormes Head near Llandudno, extensive high-quality stands of the association were common on ledges around limestone exposures, limestone pavement and on cliff-tops at altitudes from 30 to 80 m AOD (Fig. 2).

All three Denbighshire SSSIs were inland and significantly higher than the coastal sites: here stands of the *Scapanietum asperae* were found between 280 m and 470 m AOD. In the highest stands, on the dramatic limestone cliffs of Creigiau Eglwyseg near Llangollen, the *Scapanietum asperae* preferred situations where some shelter was afforded from the wind by nearby rock exposures or topography (Fig. 3).

At nearby Trevor Rocks, the habitat of the association was distinct from any of the other sites. Above a disused limestone quarry, there are a number of small spoil tips colonised by

sparse secondary limestone grassland (Fig. 4). Liverwort-rich fragmentary stands of the *Scapanietum asperae* were found primarily on the northern and western faces of these tips.

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After consolidating the results of my quadrat sampling with NRW's datasets from Rhosili and Eryrys, fifteen species were found to have a strong fidelity with Welsh stands of *Scapanietum asperae* (Table 1).

Of the three signature liverworts that define the association in England, *Frullania tamarisci* is by far the most frequently encountered in Welsh stands. *Scapania aspera* and *Porella arboris-vitae* are generally – but not always – present in small amounts and in some stands all three liverworts occur together.

The association in Wales typically comprises

Fig. 3. The upland habitat of the *Scapanietum asperae* at Creigiau Eglwyseg.



a dense, springy turf with upwards of 15% cover of bryophytes. As well as the species listed above, other frequently occurring mosses include *Ditrichum gracile*, *Fissidens dubius*, *Hylocomium splendens*, *Pseudoscleropodium purum* and *Rhytidiadelphus triquetrus*. It occurs where close-grazed species-rich limestone grassland lies over thin soil and often in close juxtaposition with

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outcrops of limestone.

Aspect is a critical driver of the development of the *Scapanietum asperae* in Wales, as it is in England. Sites with north, north-easterly or north-westerly aspects generally have the best examples of the association. In some localities, for example on Great Ormes Head, poorly developed stands occur on west to south-west-facing slopes. Although *F. tamarisci* is often abundant in such stands, rendering them visually conspicuous, overall bryodiversity is always significantly lower than examples in cooler/moister situations and they do not fully meet the floristic criteria which define the association.

The proximity of the sea to some of the Welsh stands of *Scapanietum asperae* (especially on Great Ormes Head and Little Ormes Head) also introduces elements of maritime distinctiveness to the association. Characteristically maritime bryophytes include *Grimmia orbicularis*, *Pleurochaete squarrosa*, *Scorpiurium circinatum* and *Tortella nitida*. Equivalent vascular plant associates (in Wales at least) include *Cerastium diffusum* (Sea Mouse-ear), *Euphorbia portlandica* (Portland Spurge), *Helianthemum oelandicum* subsp. *incanum* (Hoary Rock-rose) and *Scilla verna* (Spring Squill).

Sub-montane examples of the association

▽ Table 1. Species preferential to Welsh *Scapanietum asperae*

Mosses and liverworts	Vascular plants
<i>Ctenidium molluscum</i>	<i>Briza media</i> (Quaking-grass)
<i>Dicranum scoparium</i>	<i>Carex flacca</i> (Glaucous Sedge)
<i>Frullania tamarisci</i>	<i>Festuca ovina</i> (Sheep's-fescue)
<i>Hypnum cupressiforme</i> var. <i>lacunosum</i>	<i>Festuca rubra</i> (Red Fescue)
<i>Neckera crispa</i>	<i>Koeleria macrantha</i> (Crested Hair-grass)
<i>Rhytidiadelphus squarrosus</i>	<i>Poterium sanguisorba</i> subsp. <i>sanguisorba</i> (Salad Burnet)
<i>Scapania aspera</i>	<i>Thymus polytrichus</i> (Wild Thyme)
<i>Tortella tortuosa</i>	



inland in Denbighshire characteristically support a suite of large distinctive lichens, including *Collema auriforme*, *Peltigera leucophlebia*, *P. membranacea* and *Squamarina cartilaginea*. They may also host a number of calcifuges alongside the typical calcicoles, perhaps as a result of soil leaching due to high rainfall. Among these are *Calluna vulgaris* (Heather), *Galium saxatile* (Heath Bedstraw), *Oxalis acetosella* (Wood Sorrel), *Polytrichastrum formosum*, *Ptilidium ciliare*, *Vaccinium myrtillus* (Bilberry) and *Veronica officinalis* (Heath Speedwell).

Grazing is critical in maintaining the short, species-rich turf in which the *Scapanietum asperae* is found. Four out of the five SSSIs that were surveyed in 2017 were well grazed by sheep and wild herbivores (rabbits and possibly deer). At these sites no major threats to the *Scapanietum asperae* were observed. However, part of the fifth SSSI - Llandulas Limestone and Gwrych Castle Wood SSSI - had suffered badly from a lack of grazing and consequently *Cotoneaster integrifolius* (Entire-leaved Cotoneaster) and *Ulex gallii*

(Western Gorse) were invading remaining areas of good limestone grassland. This is likely to have caused some loss and/or degradation of the *Scapanietum asperae*.

Comparison with English *Scapanietum asperae*

Floristically, the Welsh examples of the *Scapanietum asperae* that have been described so far are similar to the English ones cited by Porley & Rose (2001). They considered sites on the English chalk from Wiltshire south to Dorset, east to Sussex and as far north as Hertfordshire.

The *Scapanietum asperae* is strongly associated with species-rich, usually unimproved calcareous grassland vegetation communities of the kind considered to have very high conservation importance. Within the British National Vegetation Classification (NVC) (Rodwell 1992), English examples of the *Scapanietum asperae* are typically found in the *Festuca ovina*–*Avenula pratensis* grassland (CG2), the *Bromopsis erecta* grassland (CG3) and *Brachypodium*

<Fig. 4. The disused quarry at Trevor Rocks.

rupestre grassland (CG4). Lowland examples of the association in Wales occur in *Festuca ovina*–*Carlina vulgaris* grassland (CG1) and CG2 moving into *Festuca ovina*–*Agrostis capillaris*–*Thymus polytrichus* grassland (CG10) in the uplands.

The bryophytes that define the association in Wales are remarkably consistent with their English counterparts although biogeographical differences mean that some variation in floristic composition does occur, principally among the vascular species that define the different NVC communities. For example grasses such as *Bromopsis erecta* (Upright Brome) and *Brachypodium rupestre* (Tor-grass) are common in most English stands but are likely to be absent or rare in Wales. Other more local differences stem from a strong maritime influence on certain of the Welsh sites. Likewise, examples of the Welsh *Scapanietum asperae* at altitudes above 350 m differ from typical *Scapanietum asperae* anywhere else in lowland England or Wales in supporting a suite of species indicative of wet and cold conditions and leached ground.

There are also differences in the microhabitat supporting the association in England and Wales. Porley and Rose (2001) describe the favoured microhabitat of English examples of the *Scapanietum asperae* as sheep-made terracettes on steep slopes. Though most of the Welsh sites are grazed by sheep, the association does not appear to be especially associated with sheep-walk (where it exists) and instead favours shallow soils around and on limestone outcrops and pavement on cool, humid slopes.

Conclusions

It is clear that Welsh limestone grassland is a very important habitat for the *Scapanietum asperae*. Well-developed stands are an important

ecological feature of a number of Carboniferous Limestone sites in Wales and further studies may well demonstrate a much wider distribution of the association in the British Isles. In the last year, small stands of the association have been discovered by the author at two sites on Carboniferous Limestone in Somerset's Mendip Hills, Dolebury Warren SSSI and Friar's Oven SSSI. The Carboniferous Limestone of the Peak District lies at similar latitude to Denbighshire so could the association be present there too?

The association remains poorly understood by many ecologists, conservationists and land managers. Despite being a part of a rare and declining kind of grassland, the *Scapanietum asperae* lacks rare signature species and in upland Wales at least its differentiation from typical sub-montane liverwort-rich vegetation is not yet clear.

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References

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