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## Evaluating the *Scapanietum asperae* in Wales



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Vegetation Survey & Assessment Ltd

Report No 289

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We work to support Wales' economy by enabling the sustainable use of natural resources to support jobs and enterprise. We help businesses and developers to understand and consider environmental limits when they make important decisions.

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- Having a well resourced proactive programme of evidence work;
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## 1. Crynodeb Gweithredol

Cynhaliwyd gwerthusiad manwl o'r SoDdGA glaswelltir calchfaen gyda'r potensial i gefnogi'r *Scapanietum asperae* yng ngogledd Cymru yn dilyn darganfod enghreifftiau posibl o'r cysylltiad yn ystod arolygon llystyfiant gan fotanegwyr Cyfoeth Naturiol Cymru yng ngogledd a de Cymru. Fe wnaed arolwg o nifer o SoDdGAu ger Llandudno, Llangollen ac mewn mannau eraill yn Sir Ddinbych, gydag ymdrechion yn canolbwyntio ar laswelltir pori, ansawdd uchel heb ei drin ar lethrau a allfrigiad creigiog gydag arwedd oer a llaith.

Fe ganfuwyd cysylltiad ym mhob un o'n safleoedd a arolygwyd, gyda chlystyrau eang iawn/ neu lawn dwf yn cael eu cadarnhau yn SODdGA Penygogarth, SoDdGA Bryn Alyn, Creigiau Eglwyseg a Chreigiau Trefor (y ddau o fewn Mynyddoedd Llatysilio/Rhiwabon a SoDdGA Y Mwynglawdd) ac yn rhan o Galchfaen Llanddulas a SoDdGA Coedwig Castell Gwrych.

Mae nodweddion blodeueg y cysylltiad yng Nghymru yn dangos tebygrwydd rhyfeddol i enghreifftiau Saesneg oedd wedi cael eu cofnodi. Yn ogystal, cafwyd amrywiadau godreol ac arforol lleol diddorol yn rhai o'r clystyrau yng Nghymru, na welwyd unrhyw le arall, ac felly o bwysigrwydd cadwraethol arbennig.

Roedd y rhan fwyaf o'r clystyrau ar y safleoedd oedd wedi cael eu pori'n dda, mewn cyflwr rhagorol. Argymhellwyd y dylid ystyried yr holl enghreifftiau yng Nghymru i fod o bwysigrwydd mawr cenedlaethol o ran cadwraeth, gyda'r rhai cyfatebol yn Lloegr, o ystyried maint ac ansawdd dirywiol y clystyrau cofnodwyd o'r calchfaen yn Lloegr. Dylid ystyried gwneud gwaith pellach i nodi presenoldeb y *Scapanietum asperae* mewn mannau eraill yng Nghymru ac i flaenoriaethu ymdrechion i'w warchod yn y mannau lle mae'n dod i'r golwg.

## 2. Executive Summary

The *Scapanietum asperae* is a distinctive association of liverworts growing alongside mosses and vascular plants in calcareous grassland on the English chalk. It has never been formally recognised in Wales.

A detailed evaluation of limestone grassland SSSIs with potential to support the *Scapanietum asperae* in north Wales was undertaken following identification of possible examples of the association during vegetation surveys by NRW botanists in north and south Wales. A number of SSSIs near Llandudno, Llangollen and elsewhere in Denbighshire were surveyed, with effort focussing on grazed, high quality unimproved grassland on slopes or rock outcrops with a cool and moist aspect.

The association was found at all of the sites that were surveyed, with particularly extensive and/or well-developed stands confirmed at Great Ormes Head SSSI, Bryn Alyn SSSI, Creigiau Eglwyseg and Trevor Rocks (both within Ruabon / Llantysilio Mountains and Minera SSSI) and in part of Llanddulas Limestone and Gwrych Castle Wood SSSI.

Characterisation of the floristics of the Welsh association shows a remarkable similarity to documented English examples. Furthermore, some of the Welsh stands demonstrated interesting local maritime and sub-montane variations not seen anywhere else and therefore of particular conservation significance.

On well-grazed sites the majority of the stands were in excellent condition. Given the declining extent and quality of the stands documented from the English chalk it is recommended that all Welsh examples should be regarded as being of high national conservation importance, alongside their English counterparts. Further work should be considered to identify the presence of the *Scapanietum asperae* elsewhere in Wales and to prioritise efforts to conserve it where it does occur.

### 3. The *Scapanietum asperae*

The 'southern hepatic mat' or *Scapanietum asperae* is an association of large leafy liverworts that grows alongside mosses and vascular plants on the chalk of southern England (Porley and Rose 2001). It is thought to be a rare vegetation type both nationally and globally and has declined in quality and extent in England in recent decades.

Porley and Rose describe the *Scapanietum asperae* 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. To be referable to the *Scapanietum asperae* at least six characteristic species, particularly *Hypnum cupressiforme* var. *lacunosum*, *Neckera crispa*, *Ctenidium molluscum*, *Dicranum scoparium* and *Pseudoscleropodium purum* in addition to at least one of the liverworts, should be present. Other characteristic bryophytes of the association include *Calliergonella cuspidata*, *Fissidens dubius*, *Homalothecium lutescens*, *Rhytidiadelphus triquetrus*, *Ditrichum gracile* and *Tortella tortuosa*.

## 4. Evaluation of Welsh Limestone Grassland

### 4.1. Identification of Potential Habitat

No previous consideration of the potential presence of the *Scapanietum asperae* in Wales has taken place. However, the geology of the principality is very varied and includes some extensive outcrops of hard limestone in districts including the Gower peninsula, the Brecon Beacons, Denbighshire and the Conwy coast.

Vegetation surveys undertaken by NRW near Eryrys in Denbighshire in 2017 revealed a number of stands of calcareous grassland which had strong affinities to the *Scapanietum asperae*. Similar stands have been noted at Trevor Rocks near Llangollen and on the Gower (Rhossili) and Castlemartin limestone in south Wales although only the stands at Eryrys and Rhossili were sampled by quadrats covering bryophytes, lichens and vascular plants.

The presence of these stands suggested that the *Scapanietum asperae* might well be found elsewhere on the limestone of north Wales. NRW therefore identified a number of Sites of Special Scientific Interest (SSSI) of importance for their calcareous grassland including:

- Creigiau Eglwyseg (within Ruabon / Llantysilio Mountains and Minera SSSI) SJ2245 to SJ2347;
- Bryn Alyn SSSI SJ1959 to SJ2058;
- Llanddulas Limestone and Gwrych Castle Wood SSSI SH9076, SH9077, SH9176 and SH9177);
- Creigiau Rhiwledyn / Little Ormes Head SSSI SJ8182; and
- Pen y Gogarth / Great Ormes Head SSSI SJ7584 to SJ7783.

## 4.2. Field Survey

Within each SSSI, a search for stands of the *Scapanietum asperae* was made where species-rich limestone grassland occurred in places with a cool and humid aspect (typically on north to west-facing slopes).

Where examples were found, the extent of the association was mapped as accurately as possible and at least one 4m<sup>2</sup> quadrat (2m x 2m or 4m x 1m) was sampled to document its species, including all vascular plants, bryophytes and lichens. Equivalent quadrats were also sampled at Trevor Rocks, near Llangollen (within Ruabon / Llantysilio Mountains and Minera SSSI SJ2343) to characterise the stands previously seen and to establish the extent of the association there.

All fieldwork was completed from July 10<sup>th</sup> to 13<sup>th</sup> and July 31<sup>st</sup> to August 2<sup>nd</sup> 2017.

## 5. Confirmed Examples

Stands of the *Scapanietum asperae* were confirmed at all of the targeted localities, as documented below. Appendix 9.1 includes all of the tabulated quadrat data from these sites and from Trevor Rocks. Existing NRW data from Eryrys and Rhossili are also included.

### 5.1. Creigiau Eglwyseg

Numerous stands of *Scapanietum asperae* are closely associated with the long north to west-facing rock exposures at the upper edge of the limestone scarp and on the plateau nearby (Figure 1). These are the highest examples of the association found in the current study, occurring in quite exposed locations at altitudes between 330 and 470m AOD.

A notable floristic character of the highest stands is the presence of dwarf ericaceous shrubs (*Calluna vulgaris*, *Vaccinium myrtillus*) and other calcifuge or sub-montane species alongside typical calcicoles.

The most extensive and well-developed stands are found in short-grazed turf at the very top of the dramatic Eglwyseg cliffs and on soil ledges just below. None of the stands appears to be threatened in any way except by natural rock falls. More stands are likely to be present on ledges lower down the cliffs, which were not accessed for reasons of safety.

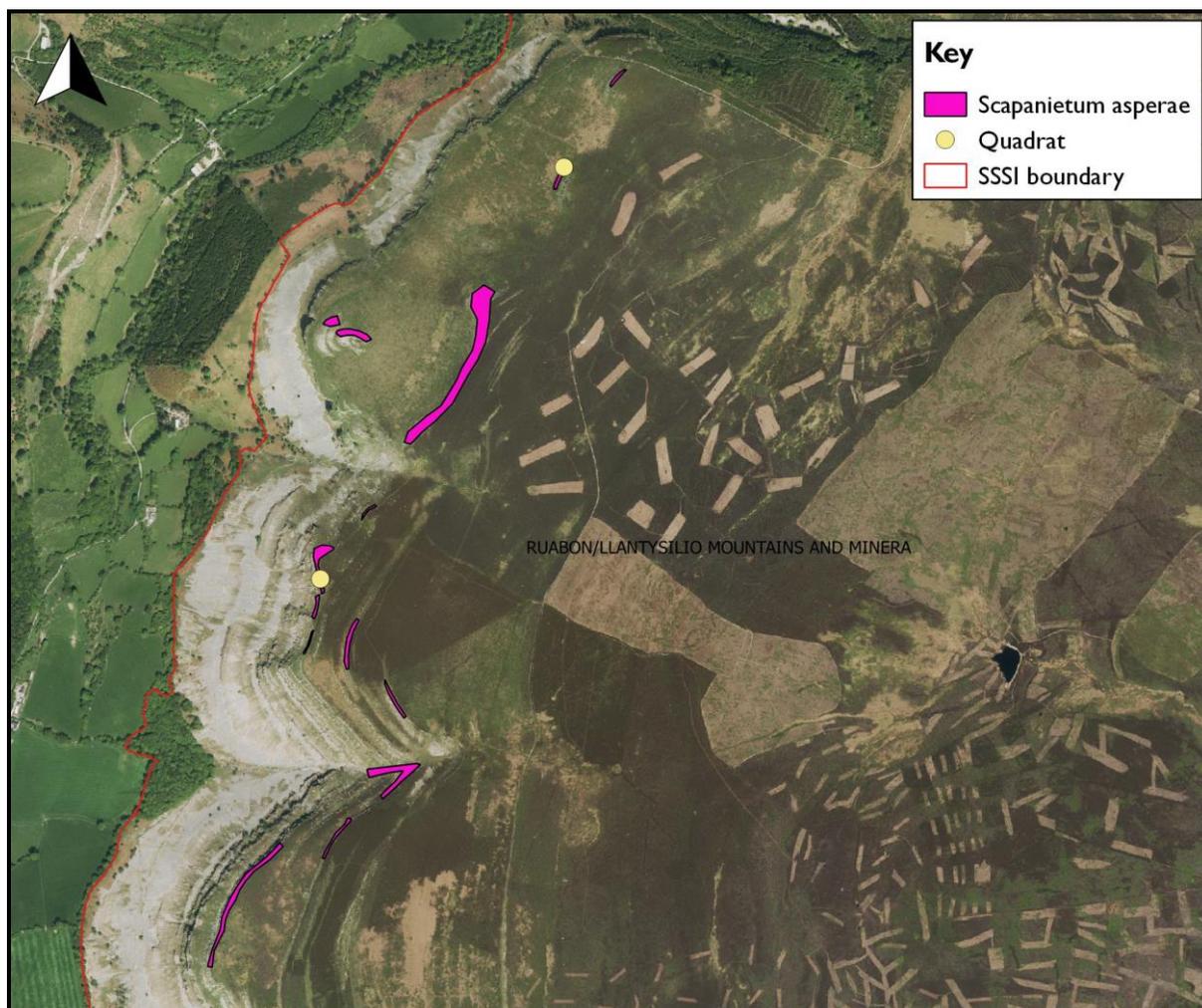


Figure 2. Extent on limestone scarp south of World's End

## 5.2. Trevor Rocks

The habitat of the *Scapanietum asperae* near a disused limestone quarry at Trevor Rocks is unusual in that it comprises secondary grassland developing on quarry tips rather than long-established semi-natural turf. The limestone bedrock dips gently to the north-east and the association is restricted to the northern and western faces of the tips (Figure 2). It also occurs patchily just north-west of the quarry in north-facing and sheltered limestone grassland. The altitude of these stands lies between 280 and 320m AOD.

Calcareous grassland developing over the tips supports a particularly liverwort-rich form of the *Scapanietum asperae*, with all three signature species growing together. Open vegetation on the tips and in the rocky limestone grassland nearby is tightly grazed by sheep. However, the two most westerly tips (at SJ 2335 4330) support mature *Ulex* scrub which is threatening the small remnants of the association found on them.



Figure 2. Extent of association near disused quarry, Trevor Rocks

### 5.3. Bryn Alyn

Bryn Alyn has extensive outcrops of north to west-facing limestone and numerous fragmentary stands of *Scapanietum asperae* occur in short, species-rich grassland around these (Figure 3). The SSSI is well-grazed by sheep and none of the stands was considered to be threatened in any way. They are typically associated with exposures between 300 and 400m AOD and best developed where topography affords some shelter from the most desiccating winds.

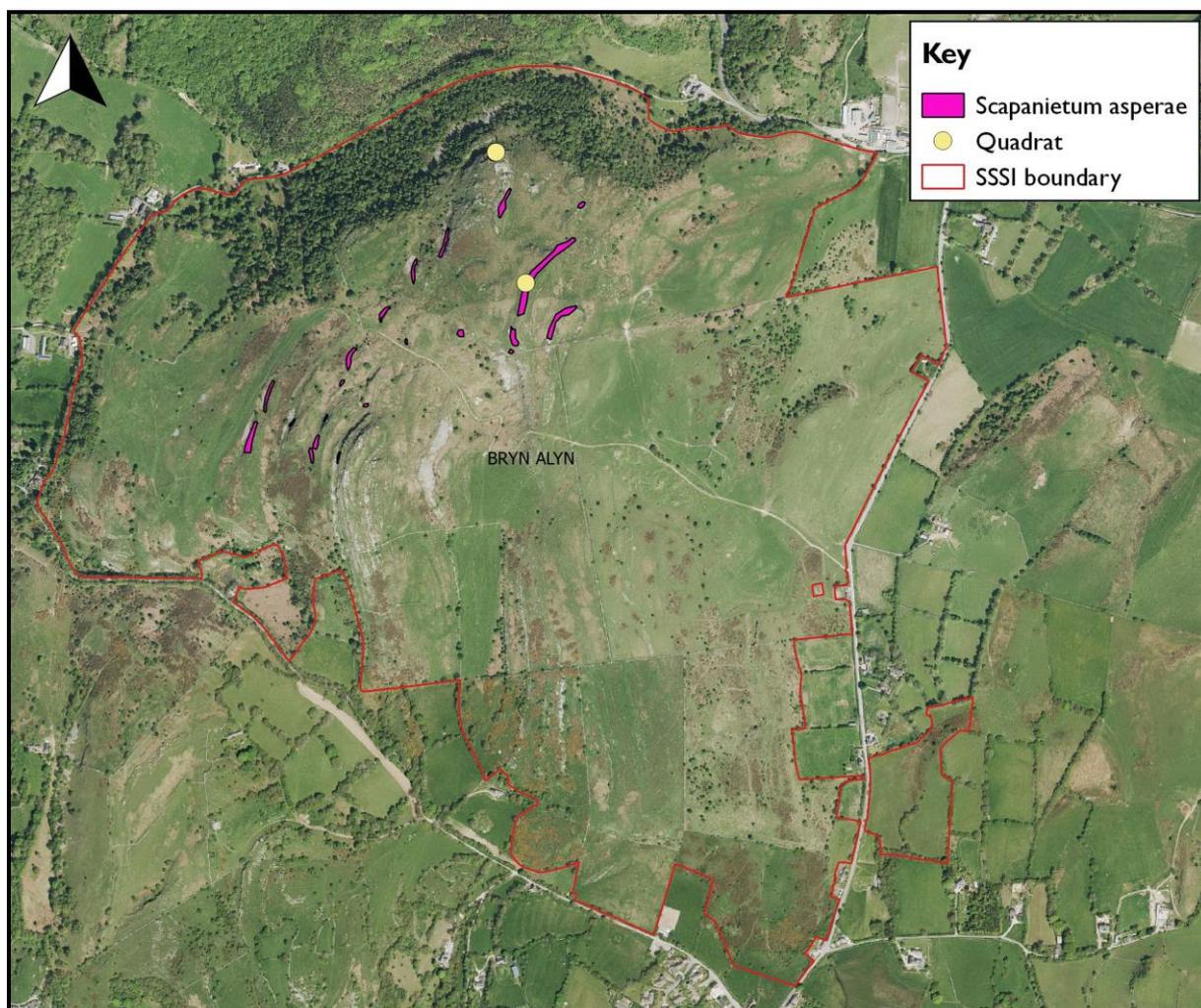


Figure 3. Extent of association at Bryn Alyn

#### 5.4. Llanddulas Limestone and Gwrych Castle Wood

Three separate hills form Llanddulas Limestone and Gwrych Castle Wood SSSI, with the village of Rhyd-y-foel nestled in a valley between them (Figure 4). Only the two eastern hills have significant tracts of rocky north to west-facing limestone grassland and stands of the *Scapanietum asperae* were found in some of these.

The best-developed of these is in species-rich grassland below Pen-y-corddyn-mawr hill fort at about 150m AOD. In some stands at this locality all three of the signature liverworts of the association are present in turf where bryophytes are hyper-abundant. This part of the SSSI is grazed by sheep but some of the stands are threatened by spreading *Cotoneaster integrifolius* and *Ulex gallii*.

Stands of *Scapanietum asperae* on the hill above Terfyn are more fragmentary and under immediate threat from the advance of *C. integrifolius*, which is rampant across much of this part of the SSSI. No evidence of any recent livestock grazing was apparent at the time of survey and currently open

habitats appear to be maintained by wild herbivores. The association occurs between 70 – 170m AOD.



Figure 4. Extent in Llanddulas Limestone and Gwrych Castle Wood SSSI

### 5.5. Little Ormes Head

Little Orme's Head (Figure 5) supports only a single small stand of the *Scapanietum asperae* extending several metres along a low, west-facing limestone outcrop in high quality tightly sheep-grazed grassland at about 100m AOD. Other examples might be present on the cliffs to the north but these were too precipitous to survey safely. No visible threats to the association were noted.

This stand is notable in supporting small populations of two nationally scarce mosses: *Bryum canariense* and *Grimmia orbicularis*.



Figure 5. Little Ormes Head

## 5.6. Great Ormes Head

Great Ormes Head supports extensive fragmented stands of the association in tightly grazed limestone grassland on ledges around north to west-facing limestone exposures and less frequently over limestone pavement and on cliff-tops. It occurs mainly between 80 and 150m AOD. However, other stands will certainly be found on cliff ledges below the road where there is suitable aspect; these were considered too precipitous to survey safely.

Many of these stands are small but rich in bryophyte species, often including all three signature liverworts and populations of notable species including *Pleurochaete squarrosa* and *Grimmia orbicularis*. *Scilla verna* and rarely, *Helianthemum oelandicum* are notable maritime vascular associates. None of the stands appears threatened in any way, apart from natural cliff falls.

A particularly good and extensive example of the *Scapanietum asperae* occurs in north-facing calcareous grassland over rocks on the eastern side of the peninsula near Pen-trwyn (Figure 6). Here *Frullania tamarisci* is particularly prominent, occurring in bryophyte-rich turf with the two other liverworts over many square metres (Figure 7). Evidence of considerable rabbit activity was also noted in the vicinity of the stand, which is at 30-40m AOD.



Figure 6. Great Ormes Head has extensive stands of *Scapanietum asperae*



Figure 7. Example of extensive *Scapanietum asperae* near Pen-trwyn

## 6. Characterisation of the Association in Wales

Data from 18 quadrats representing calcareous grassland supporting the *Scapanietum asperae* in different parts of Wales were brought together and are summarised in Appendix 9.1.

### 6.1. Floristic Overview

Species considered to have a strong fidelity with Welsh stands of *Scapanietum asperae* are those recorded in more than 75% of quadrats (14-18). Fifteen species (seven vascular plants and eight bryophytes) meet this criterion. *Thymus polytrichus* and *Dicranum scoparium* are the only species constant to all quadrats, with *Festuca ovina*, *Briza media*, *Festuca rubra*, *Carex flacca*, *Koeleria macrantha* and *Poterium sanguisorba* occurring in 75% or more. Among the bryophytes, *Tortella tortuosa*, *Frullania tamarisci*, *Hypnum cupressiforme* var. *lacunosum*, *Ctenidium molluscum*, *Neckera crispa*, *Rhytidiadelphus squarrosus* and *Scapania aspera* are all strongly preferential.

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 examples all three liverworts occur together.

Forms of the community differ greatly in cover of bryophytes but are mostly characterised by a dense, springy turf with upwards of 15% cover of bryophytes. As well as the species listed above, other frequently occurring mosses included *Hylocomium splendens*, *Fissidens dubius*, *Pseudoscleropodium purum*, *Ditrichum gracile* and *Rhytidiadelphus triquetrus*.

The proximity of the sea to some of the Welsh stands of *Scapanietum asperae* also introduces elements of maritime distinctiveness to the association. Examples include *Aira caryophyllea*, *Cerastium diffusum*, *Euphorbia portlandica*, *Helianthemum oelandicum*<sup>1</sup> and *Scilla verna* as well as *Grimmia orbicularis*, *Tortella nitida*, *Pleurochaete squarrosa* and *Scorpiurium circinatum*.

Sub-montane examples of the association e.g. at Bryn Alyn, Eryrys and especially Creigiau Eglwyseg characteristically support a suite of large distinctive lichens, including *Squamarina cartilaginea*, *Peltigera membranacea*, *P. leucophlebia* and *Collema auriforme*. They sometimes also host a number of calcifuge vascular plants and bryophytes juxtaposed with the typical calcicoles, perhaps as a result of soil leaching due to high levels of precipitation. Among these are *Veronica officinalis*, *Oxalis acetosella*, *Galium saxatile*, *Calluna vulgaris*, *Vaccinium myrtillus*, *Ptilidium ciliare* and *Polytrichastrum formosum*.

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<sup>1</sup> In Wales

## 6.2. Habitat

All stands of the *Scapanietum asperae* occur in unshaded, closely-grazed, herb-rich calcareous grassland in sloping situations with a westerly to north-easterly aspect. Some of these occur in exposed situations but at lower altitudes the best-developed examples are found where some shelter from strong winds is provided by nearby topography. A typical situation is on a ledge or rock outcrop on a slope sheltered by surrounding exposures or cliffs.

The presence of the *Scapanietum asperae* in a given site does not appear to depend on altitude and examples can be found from near sea level (Great Ormes Head and Rhossili) right up to 470m (Creigiau Eglwyseg). It is likely that the buffering effects of the sea on some of the coastal localities may play a major role in favouring the association at such low altitudes and in more exposed situations.

Typically the association occurs in a fragmentary pattern across a site, closely following outcropping of bands of limestone. Individual stands are often small, typically less than several metres in area and closely associated with areas of well-grazed limestone grassland occurring in shallow soils over limestone outcrops and on ledges of such outcrops, and in shallow crevices in limestone pavement. Exceptionally, it also occurs in secondary calcareous grassland developing over long-established tips of limestone quarry spoil (at Trevor Rocks).

Aspect is a critical driver of the development of the *Scapanietum asperae*. In some localities, for example on the Great Orme and at Bryn Alyn, poorly developed stands occur on west to south-west-facing slopes. Although *Frullania 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 (Porley & Rose, 2001).

Examples of the *Scapanietum asperae* from Rhossili and Eryrys are associated with CG1 *Festuca ovina* – *Carlina vulgaris* grassland, a highly restricted NVC community of coastal hard limestone sites. At Rhossili the association occurs in the *Festuca rubra* – *Scilla verna* sub-community (CG1f) whereas at Eryrys (which is more than 15km inland) it is found in the *Koeleria macrantha* sub-community (CG1e). Although full NVC evaluations were not undertaken at other localities as part of this study, analysis of individual quadrats indicates that the *Scapanietum asperae* at most of the other study sites occurs in grassland referable to CG2d *Festuca ovina* – *Avenula pratensis* grassland; *Dicranum scoparium* sub-community. At Creigiau Eglwyseg at least some stands are found in CG10a *Festuca ovina* - *Agrostis capillaris* – *Thymus polytrichus* grassland; *Trifolium repens*-*Luzula campestris* grassland, a characteristic calcareous grassland of sub-montane altitudes.

### 6.3. Management and Threats

Most sites are grazed by livestock of various kinds (sheep, cattle and goats were all seen) and it is evident that regular grazing plays a critical role in maintaining the association through suppression of coarse grasses and woody species.

In north Wales, the majority of stands of the *Scapanietum asperae* are in good condition and not under threat. However, serious invasion of parts of Llanddulas Limestone and Gwrych Castle Wood SSSI by *Cotoneaster integrifolius* and other scrub is an immediate threat for the future of the association there (Figure 8). Mature scrub on two of quarry tips at Trevor Rocks is a more minor threat to the *Scapanietum asperae* there. In both instances scrub control in the vicinity of the association should be an immediate priority.



Figure 8. *Scapanietum asperae* under threat from *Cotoneaster integrifolius* and *Ulex gallii* at Pen-y-corddyn-mawr (Rhyd-y-foel)

## 7. Comparison with English *Scapanietum asperae*

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

Both Welsh and English examples are restricted to high quality, grazed unimproved calcareous grassland with a cool and moist aspect, both in semi-natural situations and more rarely in disused quarries.

The bryophytes that define the association in Wales are remarkably consistent with their English counterparts although biogeographical differences mean that some differences in floristic composition do occur, primarily among the vascular species that define the different vegetation communities. For example grasses such as *Bromopsis erecta* and *Brachypodium rupestre* are represented in most English stands but are absent from the Welsh equivalents. The Welsh association is also characterised by the presence of certain large lichens typical of colder and wetter climates.

English examples of the *Scapanietum asperae* typically are found in the lowland calcareous grassland communities CG2, CG3 *Bromopsis erecta* grassland and CG4 *Brachypodium rupestre* grassland. All of these are very characteristic of chalk grassland in southern England. Lowland examples of the association in Wales occur in CG1 and CG2 moving into CG10 at the upland edge.

Other, local differences stem from the strong maritime influence on certain of the Welsh sites i.e. Great Ormes Head, Little Ormes Head and Llanddulas Limestone and Gwrych Castle Wood SSSI. Likewise, examples of the Welsh *Scapanietum asperae* at higher altitudes on Creigiau Eglwyseg differ from 'typical' *Scapanietum asperae* anywhere else in 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. Porley and Rose (2001) cite the favoured microhabitat of English examples of the *Scapanietum asperae* as sheep-made terracettes on steep slopes. Though many 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, wet slopes.

The current study indicates that certain of the Welsh sites support relatively extensive stands of the *Scapanietum asperae* and given the declining extent and quality of those in England they should therefore be considered to be of national importance for the association. Of particular note (in north Wales) are Great Orme's Head, Bryn Alyn and Creigiau Eglwyseg, where excellent examples of the association are closely associated with long outcrops of hard limestone.

## 8. References

Porley RD . & Rose F. 2001. The characterization and status of the southern hepatic mat, *Scapanietum asperae* Rose & Porley, on the English Chalk. *Journal of Bryology* 23, 195-204.



Site name	Great Orme's Head	Little Orme's Head	Rhyd y Foel	Rhyd y Foel	Bryn Alyn	Bryn Alyn	Creigiau Eglwyse g	Creigiau Eglwyse g	Trevor Rocks	Trevor Rocks	Rhossili	Eryrys	Freq						
Quadrat grid reference	SH7532 8391	SH8125 8221	SH9142 7657	SH9144 7789	SJ1997 5939	SJ2001 5917	SJ2234 4652	SJ2289 4743	SJ2339 4329	SJ2344 4325	SS40914 87064	SJ18945 58599	SJ19486 58357	SJ19348 58158	SJ18933 58477	SJ19022 58525	SJ18933 58477	SJ19022 58525	
Date	11/07/17	10/07/17	10/07/17	12/07/17	31/07/17	31/07/17	01/08/17	01/08/17	02/08/17	02/08/17	19/06/14	12/07/16	12/07/16	12/07/16	13/07/16	13/07/16	13/07/16	13/07/16	
Aspect	W	W	NW	NW	N	NW	NW	NW	N	NE	NE	NW	W	NW	NW	NW	NW	NW	
Asplenium trichomanes							1						1						2
Brachypodium sylvaticum	1									2									2
Cirsium vulgare					1					1									2
Cladonia symphycarpha																1		O	2
Danthonia decumbens	3										2								2
Deschampsia cespitosa								4										R	2
Orthotrichum anomalum								1					1						2
Oxalis acetosella					1			1											2
Pimpinella saxifraga					1		1												2
Plagiomnium affine									3			1							2
Poa humilis														1			R		2
Polytrichastrum formosum							1					1							2
Porella platyphylla		1	2																2
Ptilidium ciliare							3	4											2
Ranunculus bulbosus						2					2								2
Rhodobryum roseum														1			R		2
Scilla verna	1										3								2
Trifolium pratense	1	1																	2
Agrostis vinealis								2											1
Aira praecox							3												1
Asperula cynanchica											4								1
Betula sp. seedling												1							1
Blackstonia perfoliata				1															1
Brachythecium albicans	1																		1
Breutelia chrysocoma																	O		1
Bryum canariense		1																	1
Calluna vulgaris							4												1
Cardamine pratensis								2											1
Centaurium erythraea											2								1
Cerastium diffusum											2								1
Cotoneaster integrifolius				4															1
Didymodon rigidulus						2													1
Filipendula vulgaris	1																		1
Galium saxatile								1											1
Helianthemum oelandicum											2								1
Holcus lanatus												3							1
Hypochaeris radicata											3								1
Lolium perenne													1						1
Lophocolea bidentata											1								1
Medicago lupulina		2																	1
Orchis mascula												1							1
Orthotrichum cupulatum	1																		1
Peltigera neckeri													1						1
Plagiochila asplenioides					3														1
Pleurochaete squarrosa										2									1
Pleurozium schreberi							2												1
Poa pratensis										1									1
Quercus sp. Seedling																		R	1
Racomitrium lanuginosum						2													1
Teucrium scorodonia				3															1
Thalictrum minus					4														1
Trifolium scabrum											1								1
Vaccinium myrtillus								3											1
Weissia brachycarpa																		R	1
Xanthoria parietina													1						1
Number of species/sample	42	43	38	29	45	44	37	47	34	35	36	46	46	60	50	36	56	49	
Cover in each quadrat is recorded using DOMIN scale																			

## 9.2 Data Archive

Data outputs associated with this project are archived on server-based storage at Natural Resources Wales.

The data archive contains:

The final report in Microsoft Word and Adobe PDF formats.

Metadata for this project is publicly accessible through Natural Resources Wales' Library Catalogue <https://libcat.naturalresources.wales> (English Version) and <https://catllyfr.cyfoethnaturiol.cymru> (Welsh Version) by searching 'Dataset Titles'. The metadata is held as record no [NRW to insert this number]



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