Cyfoeth Naturiol Cymru
Natural Resources Wales

Grassland Fungi survey at Ciliau Farm 2025

Peter Roberts & Shelley Evans

Evidence Report No 988

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1. Crynodeb Gweithredol

Ystyrir bod glaswelltiroedd capiau cwyr Cymru ymhlith y gorau nid yn unig yn y DU ond ledled Ewrop ac mae llawer ymhlith y gorau yn y byd.

Dim ond yn y degawd diwethaf y mae ffyngau wedi cael eu cynnwys ar Restr Goch fyd-eang yr IUCN, ond mae dros 10% o'r rhai sydd bellach wedi'u hasesu fel rhai sydd dan fygythiad (35 o rywogaethau) yn gapiau cwyr ar laswelltir. Mae dros 90% o'r rhain yn bresennol yng Nghymru, sy'n rhoi cyfrifoldeb cadwraeth allweddol i Gymru i amddiffyn y ffyngau glaswelltir hyn sydd dan fygythiad yn fyd-eang. O ran cadwraeth, capiau cwyr yw pandas mawr y DU gyda'r un asesiad bygythiad gan yr IUCN, ond eu prif amddiffyniad yw'r system SoDdGA sy'n tanwasanaethu pob math o ffwng. Mae pob ffwng wedi'i dangynrychioli'n sylweddol mewn SoDdGAau yng Nghymru gyda dim ond 11 safle (1% o SoDdGAau) yn eu crybwyll fel nodwedd neu gasgliad a hysbyswyd. Nid oes yr un o'r rhain yn Sir Faesyfed.

Mae gwybodaeth am laswelltir capiau cwyr ar dir fferm yn y DU yn gymharol gyfyngedig. Ac eto oherwydd natur newidiol ffermio, mae'r glaswelltiroedd hyn ymhlith y rhai mwyaf agored i niwed yn sgil rheolaeth anffafriol, gan gynnwys ailhadu a thaenu gwrteithiau, yn ogystal â newidiadau dinistriol a pharhaol o ran defnydd tir o aredig ar gyfer caeau âr i gynlluniau creu coetiroedd.

Cofnododd arolwg 2025 yn Fferm Ciliau 45 o rywogaethau o ffwng glaswelltir, a fynegir fel sgôr CHEGD yn cynnwys 8 *Clavarioid*, 21 *Hygrocybe sensu lato*, 13 *Entoloma*, 0 *Geoglossaceae* a 3 *Dermoloma*, gan ddod â'i nodweddion cronnus sydd o ddiddordeb o ran glaswelltir capiau cwyr i C10 H23 E13 G1 D3 sy'n amlwg yn hafal i neu'n fwy na'r rhan fwyaf o drothwyon glaswelltir capiau cwyr a argymhellir gan JNCC o C7 H19 E15 G5 D3 ar gyfer dynodiad SoDdGA. Mae'r cyfanswm cronnus yn cynnwys chwe "rhywogaeth sy'n ddangosyddion o amrywiaeth uchel": Cap cwyr troed melyn *Cuphophyllus flavipes*, cap cwyr oren *Hygrocybe aurantiosplendens*, cap cwyr ffibraidd *H. intermedia*, cap cwyr rhuddgoch *H. punicea*, cap cwyr ysblennydd *H. splendidissima*, a'r cap cwyr pinc *Porpolomopsis calyptriformis*.

Yn ogystal, mae gan Fferm Ciliau un ar ddeg o rywogaethau wedi'u hasesu fel rhai sydd 'dan fygythiad' yn fyd-eang ar Restr Goch fyd-eang yr IUCN: Cap cwyr troed melyn *Cuphophyllus flavipes*, *Dermoloma magicum*, tagell binc bannog *Entoloma griseocyaneum*, Tagell binc blodiog *E. prunuloides*, cap cwyr oren *Hygrocybe aurantiosplendens*, cap cwyr ffibraidd *H. intermedia*, cap cwyr chwerw *H. mucronella*, cap cwyr rhuddgoch *H. punicea*, cap cwyr olewog *H. quieta*, cap cwyr ysblennydd *H. splendidissima*, a'r cap cwyr pinc *Porpolomopsis calyptriformis*.

Dylid ystyried Fferm Ciliau fel blaenoriaeth ar gyfer hysbysu fel SoDdGA oherwydd ei gapiau cwyr glaswelltir. Mae'n un o'r safleoedd glaswelltir capiau cwyr pwysicaf yn Sir Faesyfed ac mae angen ei amddiffyn ar frys fel SoDdGA rhag newidiadau niweidiol posibl yn ei reolaeth.

2. Executive Summary

The waxcap grasslands of Wales are considered to be amongst the best not only in the UK but across Europe and many are of world class status.

Fungi have only been included on the IUCN global Red List in the last decade, yet over 10% of those now assessed as threatened (35 species) are waxcap-grassland fungi. Over 90% of these occur in Wales which gives Wales key conservation responsibility to protect these globally threatened grassland fungi. In conservation terms waxcaps are the giant pandas of the UK with exactly the same IUCN threat assessment, yet their main protection is only through a SSSI system that is under-serving all fungi. All fungi are vastly under-represented in SSSIs in Wales with only a negligible 11 sites (1% of SSSIs) mentioning them as a notified feature or assemblage. None of these is in Radnorshire.

Knowledge of waxcap-grassland interest on farmland in the UK is relatively limited. Yet due to the changing nature of farming, these grasslands are among the most vulnerable to adverse management, including reseeding and the application of fertilisers, as well as destructive and irreversible land use changes from ploughing for arable fields to woodland creation schemes.

The 2025 survey at Ciliau Farm recorded 45 grassland fungus species, expressed as a CHEGD score comprising 8 *Clavarioid*, 21 *Hygrocybe sensu lato*, 13 *Entoloma*, 0 *Geoglossaceae* & 3 *Dermoloma*, bringing its cumulative waxcap-grassland interest to C10 H23 E13 G1 D3 which clearly equals or exceeds most of the recommended JNCC waxcap-grassland thresholds of C7 H19 E15 G5 D3 for SSSI designation. The cumulative total includes six “high diversity indicator species”: *Cuphophyllus flavipes* yellowfoot waxcap, *Hygrocybe aurantiosplendens* orange waxcap, *H. intermedia* fibrous waxcap, *H. punicea* crimson waxcap, *H. splendidissima* splendid waxcap, and *Porpolomopsis calyptriformis* pink waxcap.

In addition, Ciliau Farm has eleven species assessed as globally ‘vulnerable’ on the IUCN global Red List: *Cuphophyllus flavipes* yellowfoot waxcap, *Dermoloma magicum* black magic, *Entoloma griseocyaneum* felted pinkgill, *E. prunuloides* mealy pinkgill, *Hygrocybe aurantiosplendens* orange waxcap, *H. intermedia* fibrous waxcap, *H. mucronella* bitter waxcap, *H. punicea* crimson waxcap, *H. quieta* oily waxcap, *H. splendidissima* splendid waxcap, and *Porpolomopsis calyptriformis* pink waxcap.

Ciliau Farm should be considered as a priority for notification as a SSSI for its waxcap grassland fungi. It is one of the most important waxcap-grassland sites in Radnorshire and it urgently needs SSSI protection against potential adverse changes in its management.

Figure 1 Grassland fungi at Ciliau Farm

3. Introduction

3.1 Waxcap-grassland fungi background

Considerable conservation attention has been focused on waxcap-grassland fungi in the last 30 years since the launch of the British Mycological Society (BMS) waxcap-grassland survey (Rotheroe *et al.* 1996), not just in the UK but across Europe. Previously little to no attention had been given to this specialist group of fungi, but raised awareness and widespread research have now led to the inclusion of many species on red lists of threatened species, not only in countries throughout Europe but also on the International Union for Conservation of Nature (IUCN)'s global Red List (IUCN 2025).

The threat to these waxcap-grassland species is in part but not exclusively due to pressures on their unimproved grassland habitat, the extent of which has declined dramatically in Northern Europe (Veen *et al*. 2009). Waxcap-grassland fungi include species from a range of habitat-linked genera often referred to collectively as 'CHEGD' fungi. The name is taken from the first letters of each group. These are:

- Clavariaceae (club and coral fungi);
- *Hygrocybe* et al. (waxcaps - the most easily identified and therefore best-recorded group);
- *Entoloma* (pinkgills);
- Geoglossaceae, including Microglossum (earthtongues); and
- *Dermoloma* (crazed caps), including *Pseudotricholoma* (meadowcaps) and *Hodophilus*/*Camarophyllopsis* (fanvaults).

The total number of species from these CHEGD genera found at a site is frequently used as a comparative measure between sites and for conservation assessment purposes (Bosanquet *et al.* 2018). In the UK and across most of Europe these CHEGD species occur predominantly in nutrient-poor, semi-improved grasslands. These can range from large swathes of upland hill pasture and lowland commons to playing fields, churchyards, and domestic lawns provided they are nutrient-poor and sufficiently old. Typically these grasslands are undisturbed, though It has been suggested that some disturbance to the soil may in the long term be beneficial to waxcap fungi, giving rise to greater numbers of species (old quarrying sites, manmade reservoir banks, etc.), though this may take many decades to manifest itself (Griffith *et al.* 2013).

The waxcap grasslands of Wales are considered to be amongst the best not only in the UK but across Europe (Griffith *et al*. 2013) and many are potentially of world class status. The best site currently known in Wales is the upland Mynydd Epynt Ranges (Brecon vice-county) with a total of 98 CHEGD species (albeit in a very large sampling area totalling some 370 ha); it is not only the best site yet identified in the UK, but also in Europe and almost certainly globally (Evans & Roberts 2015).

Knowledge about the waxcap-grassland interest in non-arable (especially organic), livestock farmland like Ciliau Farm however is relatively restricted across Wales and the UK as it relies on the co-operation and ideally the proactive interest of the landowner. The 24-hectare Somerton Farm in Pembrokeshire is one of the best examples of well-surveyed, waxcap farmland in Wales (Bosanquet *et al.* 2007).

All high-interest waxcap-grassland at farmland sites is clearly, due to the nature of farming, extremely vulnerable to adverse changes in management (eg application of fertiliser or pesticide, ploughing, and changes in use from livestock to arable or forestry). This is especially so when changes of ownership take place, unless there is some legal protection such as SSSI listing.

3.2 Neutral MG5a grassland

MG5a grassland, such as that at Ciliau Farm, is a sub-community of ‘typical’ MG5 neutral grassland on soils with pH between 6.5 and 7.5 and it is estimated that MG5 grassland covers 1595 hectares in Wales (Jefferson *et al.* 2013).

The greatest diversity of waxcap species is thought to be found in such neutral grasslands (Griffith *et al.* 2002). A study of unimproved meadows in Germany showed that the majority of waxcap occurrences were on neutral soils, with most species extending into the slightly acidic range (pH 4.5 to 5.0) (Ruthsatz & Boertmann 2011).

A number of waxcap species are unlikely to be found at Ciliau Farm unless there are favourable microhabitats within the MG5a grassland. These include *Cuphophyllus colemannianus* toasted waxcap*, Hygrocybe calciphila* limestone waxcap, and *H. acutoconica* persistent waxcap, all of which prefer more basic soils, as well as *Gliophorus laetus* heath waxcap*, Hygrocybe helobia* garlic waxcap, *H. lepida* goblet waxcap, *H. miniata* vermilion waxcap, and *H. substrangulata* waisted waxcap, all of which prefer more acid soils (Boertmann 2010, Ruthsatz & Boertmann 2011).

4. Aims

A limited, exploratory survey of Ciliau Farm, an area comprising approximately 55 hectares of MG5a neutral grassland to the north of the Ciliau SSSI (notified for Lesser Horseshoe Bats) near Llanstephan in Radnorshire, was undertaken in 2021 (Woods 2021). This revealed its potential conservation interest for waxcap-grassland fungi. Only 16 of the 26 numbered fields on the farm were surveyed in 2021 and records were restricted to *Hygrocybe* sensu lato (18 species) and grassland Clavariaceae (5 species). The presence of three JNCC SSSI high diversity indicator species (*Hygrocybe aurantiosplendens* orange waxcap, *H. punicea* crimson waxcap, and *H. splendidissima* splendid waxcap) suggested the likelihood of a greater diversity of waxcap-grassland (CHEGD) species at the site (Bosanquet *et al.* 2018). To better assess its conservation value, a more complete survey was commissioned to include all 26 fields at Ciliau Farm and to record all CHEGD species present.

Key aims of the current survey were to:

- Visit Ciliau Farm on at least three occasions (but ideally more) during autumn 2025 to record the grassland fungi present on the site;
- Record all colonies of high diversity indicator species with at least 8-figure GPS accuracy and produce a grassland fungi species list for each field;
- Produce a report bringing together all the grassland fungi records and comparing them to the thresholds for SSSI selection.

5. Methodology

5.1 Method

Fruitbody surveys for waxcap-grasslands follow an intensive, methodical, walkover approach as recommended by the British Mycological Society waxcap-grassland survey (Rotheroe *et al.* 1996). This approach, which is particularly relevant to smaller areas of grassland such as lawns, recommends walking up and down in a ‘mowing’ fashion in as methodical a way as terrain allows, scanning visually for target species.

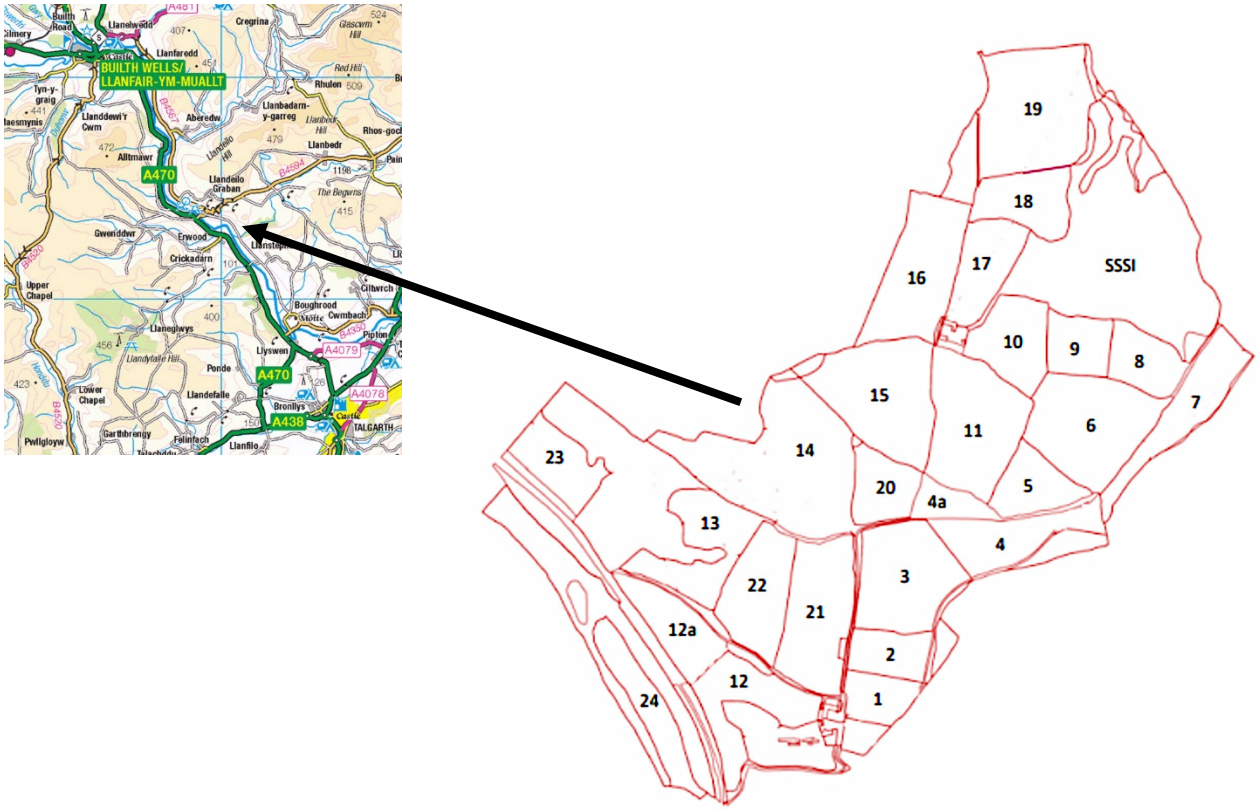
For large sites with steep or less easily accessible areas, such as many of the very steep fields at Ciliau Farm, a more flexible, broadly zig-zag approach is normally used (Evans & Roberts 2012). This approach, adopted at Ciliau Farm, enabled as much of the target area as possible to be surveyed and ensured surveyor effort was comparable both within this site and with other sites previously surveyed.
Field records were made on site for all fungi observed and collections were made for all species (the majority) requiring further lab-based microscopic identification using specialist literature. Descriptions were made on the day of collection for any groups such as *Entoloma* pinkgills where key diagnostic features may be ephemeral. Photographs of a number of species were taken and exact 8-figure OS grid references taken for all JNCC SSSI listed high diversity indicator species, as well as representative 8-figure references in each field for other CHEGD taxa.

Most species names in the report follow those used in the Royal Botanic Gardens, Kew's *Checklist of the British and Irish Basidiomycota* (Legon & Henrici 2005, plus subsequent updates to 2020). Some more recent names, together with names for species of the Ascomycota, follow those used by Index Fungorum (2026). English names for fungi, where available, follow those recommended by the British Mycological Society (2025).

All species have been databased in an electronic format. These records include data fields recommended as a minimum for best practice by the Fungal Records Database of Britain and Ireland (FRDBI 2026) managed by the British Mycological Society. Survey records are normally shared with the FRDBI which itself feeds data into the National Biodiversity Network (NBN 2026).

All the CHEGD fungi found in this survey and the fields in which they were recorded are listed in the Annex (Table 5), with species of conservation concern highlighted. In addition, all fungi recorded from the current survey at Ciliau Farm have been listed separately in an Excel spreadsheet. Field numbers follow (Figure 2).

Figure 2 Field numbers at Ciliau Farm (SO108432) and the farm's location in relation to Builth Wells. The SSSI field in the north-east is Rhos Garth-fawr SSSI.



5.2 Waxcap grassland assessments

5.2.1 Waxcap count

In the UK, waxcaps (species of *Hygrocybe* s.l.) are the best-known and best-recorded group amongst the CHEGD target taxa, being less difficult to identify than most other components. A simple unweighted cumulative count of waxcap species, as devised by Rald (1985) and adapted by Vesterholt *et al.* (1999), is therefore an easy and widely accessible method of comparing sites in terms of conservation importance especially when a full waxcap grassland survey of all groups has not been undertaken. See Table 1 below.

Table 1 Waxcap assessment of Rald (1985). as adapted by Vesterholt *et al.* (1999)

Conservation value	Single visit *Hygrocybe* count	Cumulative *Hygrocybe* count
Internationally important	15+	22+
Nationally important	11-14	17-21
Regionally important	6-10	9-16
Locally important	3-5	4-8
Of no importance	1-2	1-3

5.2.2 CHEGD count

The straightforward approach commonly used in the UK to summarise all the different groups of waxcap-grassland fungi is the CHEGD system (Evans 2003), an acronym for the various groups that comprise the assemblage, as noted above.

A total CHEGD count enables comparison and rankings between sites, though these can never be definitive as they will vary depending on different factors (eg type of grassland, size of the site, and recorder expertise).

For the purpose of this report, CHEGD numbers only include counts of species and not subspecies, varieties or forms. The sole exception is *Cuphophyllus pratensis* var. *pallidus* pale waxcap. This taxon has long been regarded as a distinct species (*C. berkeleyi*) by many mycologists, including the authors of this report, and its status as such has been confirmed following DNA sequence analysis at RBG Kew (Cannon 2012). The pale waxcap is also recognised by JNCC as part of the waxcap grassland assemblage (Bosanquet *et al.* 2018).

Recently described cryptic species, based on DNA sequencing, have not been added to the CHEGD count as distinct from their 'parent' species, but have been treated as part of an aggregate species to maintain stability and enable historic site comparisons (Bosanquet *et al.* 2018).

5.3 Conservation tools

5.3.1 Global Red List

Fungi have been very slow to attract any conservation attention compared with other organism groups and it is only in the last decade or so that the IUCN global Fungal Red List Initiative (IUCN 2026) has begun to add fungi to the IUCN global Red List (IUCN 2025). This is an ongoing process as mycologists make a start on the long and painstaking process of assessing an estimated 150,000 fungal species known to science worldwide.

Wales has a key role in conserving the world's biodiversity with its globally significant waxcap grassland CHEGD fungi. To date there are 331 species of non-lichenised fungi assessed as threatened globally (vulnerable, endangered, or critically endangered), over 10% of which are European CHEGD species (IUCN 2025; 2026). This highlights the serious conservation threat to this group of grassland fungi worldwide. Of these globally threatened fungi no less than 35 species are British CHEGD waxcap-grassland fungi (see Annex, table 6), nearly all of which occur in Wales.

5.3.2 UK Red List:

There is no recent comprehensive red list for non-lichenised fungi in Britain and none for Wales. The last one for Britain was published 20 years ago by the British Mycological Society (Evans *et al.* 2006) and can now only provide a limited tool for assessing conservation vulnerability of a species. There are however two more recent group-focussed red lists supported by molecular analysis, for Boletaceae (Ainsworth *et al*. 2013) and for Bankeraceae, Cantharellaceae, Geastraceae, etc. (Smith *et al.* 2016) and these should replace all species from the relevant groups listed in the 2006 Red List.

5.3.3 Wales Section 7 species:

In Wales there are five waxcap-grassland fungi amongst the 27 fungi listed on Section 7 of the Environment (Wales) Act 2016: *Clavaria zollingeri* violet coral, *Entoloma bloxamii* big blue pinkgill, *Geoglossum atropurpureum* dark purple earthtongue, *Hygrocybe spadicea* date waxcap,and *Microglossum olivaceum* olive earthtongue (Wales Biodiversity Partnership 2026).

5.3.4 SSSI protection:

In the absence of a current Red List covering waxcap grassland fungi in the UK or Wales the strongest protection these assemblages of threatened and globally scarce fungi have are as notified features within SSSIs.

The CHEGD JNCC thresholds for consideration of a site as a SSSI are**: C7 H19 E15 G5 D3** (Bosanquet *et al.* 2018). The guidelines include 16 species listed as high diversity indicators which, if present, suggest a site is likely to have high numbers of waxcap-grassland fungi (see Annex, Table 6).

Non-lichenised fungi of any kind are vastly under-represented in SSSIs in Wales with only six sites (0.6% of SSSIs) mentioning them as a notified feature and 11 sites (1%) mentioning them as an assemblage. None of these sites are in Radnorshire (Edwards & York 2025).

6. Constraints

Surveying and identifying the larger fungi in any area depends on the presence of sporocarps (fruitbodies) that are ephemeral and may not be produced each year. The majority of non-lichenised macrofungi produce fruitbodies in the autumn, from September to early November, if there is sufficient rainfall and warmth. The fruiting of most autumn species is terminated by a sudden drop in temperature or frost (Gange *et al*. 2018). Analysis has shown that successive surveys year on year will continue to add new species of macrofungi to a site list even after 20 years, albeit under the rule of diminishing returns (Tofts & Orton 1998). A three-year survey of the Mynydd Epynt Ranges in Breconshire increased the number of CHEGD species from 46 in the first year to 97 after the third year (Evans & Roberts 2015).

Any one year survey, such as the present survey at Ciliau Farm, only represents a minimum snapshot of the species actually present at a site. This is particularly so when CHEGD fruiting is suboptimal, as it was in 2025.

The autumn of 2025 continued dry after a prolonged summer drought in the area north of Bannau Brycheiniog and was not ideal for fruiting of grassland fungi. The nearest weather station (Talgarth) recorded summer rainfall levels substantially below average for July (-73%) and for August (-69%) (NRW 2026). When the summer drought ended in September, many parts of Wales recorded above average rainfall, but in the Ciliau Farm area rainfall remained below average in both September (-5%) and October (-18%) (NRW 2026). This collective deficit adversely affected CHEGD fruiting.

The main season for waxcap grassland fungi normally starts in mid-September. But in 2025 a preliminary visit to Ciliau on 3rd October revealed just a single waxcap grassland species (*Clavaria fragilis* white spindles) in one of the best fields for CHEGD fungi (Field 12). Although fruiting improved later in October, fruitbody numbers were often low, some species being represented by single specimens whilst the Geoglossaceae earthtongues were completely absent. This together with the negative impact of high sward height in some fields made searching more time-consuming and less productive.

It is normally recommended that waxcap grassland surveys be undertaken across three separate years to optimise meaningful results. Further surveys at Ciliau Farm would undoubtedly add to a more complete assessment of its waxcap grassland conservation interest and the presence of target species across different fields.

7. Results

7.1 Visits 2025

CIliau Farm was visited on a total of 17 separate occasions over several months with between two and six visits to each field (see Table 2). The first visit took place on 3rd October 2025 and the final one on 6th February 2026. The most productive visits for waxcap grassland fungi were between 14th October and 19th November inclusive, with only a single target species (*Cuphophyllus pratensis* meadow waxcap) found on 12th December and none in February.

The number of visits proposed in the survey specification aims (above) were increased in response to the below-par fruiting conditions in order to maximise recording. All 26 fields were visited on at least two occasions and the majority three or more times, with some up to six times. Those found least productive or in poor condition with very high

Table 2 Ciliau farm survey visits 2025-26

Field	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6
1	18/10	25/10	5/11	-	-	-
2	18/10	5/11	-	-	-	-
3	18/10	5/11	19/11	-	-	-
4	18/10	5/11	19/11	-	-	-
4a	18/10	5/11	19/11	-	-	-
5	22/10	5/11	-	-	-	-
6	18/10	27/10	5/11	-	-	-
7	18/10	5/11	-	-	-	-
8	22/10	5/11	-	-	-	-
9	22/10	5/11	13/11	-	-	-
10	8/10	22/10	13/11	-	-	-
11	14/10	17/10	27/10	8/11	-	-
12	3/10	14/10	25/10	6/11	16/11	12/12
12a	3/10	14/10	25/10	6/11	16/11	12/12
13	14/10	22/10	8/11	16/11	-	-
14	22/10	8/11	19/11	-	-	-
15	8/10	17/10	22/10	8/11	-	-
16	8/10	17/10	27/10	8/11	-	-
17	17/10	27/10	13/11	-	-	-
18	17/10	27/10	13/11	-	-	-
19	17/10	27/10	13/11	-	-	-
20	17/10	27/10	-	-	-	-
21	3/10	14/10	13/11	-	-	-
22	14/10	25/10	6/11	16/11	-	-
23	14/10	25/10	-	-	-	-
24	8/10	22/10	6/11	19/11	12/12	6/2
SSSI	13/11	-	-	-	-	-

sward levels were only visited twice (fields 2, 7, 8, 20, & 23). The remainder were visited four times (fields 11,13,15, & 16) or more. Three fields (12,12a & 24) which were easily accessible from the road were additionally visited on 12th December 2025 and 6th February 2026 in an effort to record any species believed to be present but not yet seen, specifically late-fruiting Geoglossaceae earthtongues.

8. 2025 Survey

8.1 CHEGD species

During the 2025 survey 127 species of non-lichenised macrofungi were recorded across the whole of Ciliau Farm, of which 45 species were waxcap-grassland (CHEGD) fungi.

On the basis of this 2025 survey, Ciliau Farm had a CHEGD score of **C8 H21 E13 G0 D3** which means it reached and exceeded the main eligibility threshold of 19 species of *Hygrocybe* sensu lato for consideration for SSSI notification. It additionally reached the suggested thresholds for *Clavariaceae* and *Dermoloma*.

Of these 21 waxcap species from the 2025 survey, four are listed as high diversity indicators suggesting a high overall grassland fungal diversity and reinforcing the need for SSSI assessment. These species were spread across the site and are*: Cuphophyllus flavipes* yellowfoot waxcap, *Hygrocybe aurantiosplendens* orange waxcap*, H. punicea* crimson waxcap, and *Porpolomopsis calyptriformis* pink waxcap. All of these are also listed as 'vulnerable' on the IUCN global Red List, as are a further five species found in 2025 at Ciliau Farm: *Hygrocybe mucronella* bitter waxcap, *H. quieta* oily waxcap, *Entoloma griseocyaneum* felted pinkgill, *E. prunuloides* mealy pinkgill, and *Dermoloma magicum* black magic. The UK has an international conservation responsibility for all nine of these species.

The most widely distributed waxcap species at Ciliau Farm in 2025 across the 26 fields were unsurprisingly: *Cuphophyllus virgineus* snowy waxcap, *C. pratensis* meadow waxcap, *Gliophorus psittacinus* parrot waxcap, *Hygrocybe chlorophana* golden waxcap, and *Hygrocybe conica* blackening waxcap. The most restricted species found in only one field were: *Cuphophyllus berkeleyi* pale waxcap (24), *Gliophorus laetus* heath waxcap (12), and *Hygrocybe mucronella* bitter waxcap (22). Those found in just two fields were *Gliophorus irrigatus* slimy waxcap (1 & 12) and *Hygrocybe glutinipes* glutinous waxcap (16 & 19), and in three fields *Cuphophyllus fornicatus* earthy waxcap (11,12a, & 22) and *Porpolomopsis calyptriformis* pink waxcap (9, 17, & 22).

Figure 3 Field 22, with *Porpolomopsis calyptriformis* pink waxcap

All the common and widely distributed waxcap species were recorded using a representative 8-figure grid reference, whilst where possible all the least distributed species were recorded with an exact 8-figure grid reference. These grid references are provided in the Excel spreadsheet of all the macrofungi records from 2025 which accompanies this report. All CHEGD species are additionally listed within this report together with the field numbers in which they were seen (see Annex, Table 5). Field numbers in brackets represent historic species records (2007 or 2021).

None of the waxcap-grassland species, even the common ones, were found fruiting in large quantities, but were at best patchy and dispersed. This is most likely attributable to the months of summer drought and lower than average rainfall in autumn 2025. In particular all the red species were very sparse and late in appearing. A single fruitbody of *Hygrocybe coccinea* scarlet waxcap was first seen on 22nd October with further records into November but with very few fruitbodies for such a normally prolific species. *Hygrocybe punicea* crimson waxcap first appeared on 25th October with additional records into November but again only in small numbers. *Hygrocybe splendidissima* splendid waxcap was not seen at all in 2025.

The five top-ranked fields at Ciliau Farm in 2025, based on their total CHEGD score, are: 1) field 22; 2) field 12; 3=) fields 12a and 13; and 5) field 14.

Figure 4 Field 14, with *Hygrocybe aurantiosplendens* orange waxcap

8.1.1 New county records

- *Entoloma sororpratulense*: DNA sequencing has recently shown that *Entoloma pratulense* meadow pinkgill comprises two European species: *E. pratulense* sensu stricto and *E. sororpratulense* (Noordeloos *et al.* 2022). The former has a Nordic-alpine distribution whilst the latter is more southerly. Morphologically, Ciliau specimens appear to represent *E. sororpratulense*, though this name has not yet been used in the UK. The old *E. pratulense* sensu lato is uncommon with just six sites on FRDBI (2026), four of which are in Wales. It is quite possible that all these older records represent *E. sororpratulense*. Under either name, this is a new species for Radnorshire.

- *Hodophilus subfoetens*: DNA sequencing has shown that *Hodophilus foetens* stinking fanvault, which has a pungent, napthalene smell, comprises at least five species in Europe (Adamčík *et al.* 2016). One of these species, *H. subfoetens*, is similar to *H. foetens*, but has fewer, more widely spaced gills. The species was partly based on a collection from the Blorenge, Monmouthshire, but the record has not yet been updated on FRDBI. There are eleven Welsh sites for the old *H. foetens* sensu lato (FRDBI 2026), but this is the first record for Radnorshire under either name.

8.1.2 Second county records

- *Dermoloma magicum* black magic: This species, assessed as 'vulnerable' on the IUCN global Red List, was seen fruiting in fields 12 and 12a (see Annex, Fig. 11). It has been suggested (Griffith *et al.* 2022) that it may be a very infrequently fruiting species. Certainly, at its first known site in Radnorshire (Glasbury) which is constantly monitored for its fungi, it was also recorded in 2025 but had only previously fruited in

2007. It is a distinctive, mealy-smelling, black-bruising *Dermoloma* species known from six sites in Wales (FRDBI 2026).

- *Entoloma atrocoeruleum* navy pinkgill is a small but distinctive, dark blue, grassland species known in Wales from some 26 sites, mostly in Pembrokeshire and the northwest (FRDBI 2026). The Ciliau collections represent a second location for Radnorshire, the species having previously been recorded only from Fynnon Gynydd Common.

8.1.3 Acid grassland microhabitat

All the waxcap species recorded at Ciliau are typical of neutral grasslands, with the exception of the acid-loving *Gliophorus laetus* heath waxcap found at a single site in Field 12 (also reported from this field in 2021). This collection site is a small area of grass and bracken downslope from a large stand of conifers, which may account for its acidity. *Gliophorus laetus* is otherwise a very common species in the acid uplands of Radnorshire.

8.2 Non-CHEGD species

The remaining species recorded in 2025 were non-target fungi, over 60% of which were grassland dwelling species (eg *Galerina, Mycena, Panaeolus*, etc.). Amongst these, three are of note:

- *Pseudolaccaria pachyphylla* is a rather non-descript, brownish, thick-gilled agaric recorded on FRDBI (2026) from just nine locations in the UK. The present authors have found it twice in Radnorshire with bracken, as was the Ciliau Farm collection (field 12), though it is not an obligate bracken associate. These three Radnorshire records are the only known sites for the species in Wales.

- *Tricholomopsis* cf *pteridicola* resembles the common UK species *Tricholomopsis rutilans* plums and custard which is a conspicuous plum-red and yellow agaric associated with conifers. A bracken associate, *Tricholomopsis pteridicola*, was described from Spain (Olariaga *et al.* 2015) supported by DNA sequencing. It has not yet been definitively recorded from the UK, but the present authors have encountered a *Tricholomopsis* species (not *T.rutilans*) with bracken on several occasions in Breconshire and Radnorshire and two such collections were made at Ciliau Farm (field 24, see Fig. 5). A similar specimen from Monmouthshire was recently sequenced and was referable to an unnamed *Tricholomopsis* taxon (J. Dunkelman, pers. comm.), so it is not clear whether the Ciliau Farm collections represent *T. pteridicola* or this as yet unnamed species.

Figure 5 *Tricholomopsis* cf *pteridicola* (field 24)

- *Contumyces rosellus* rosy navel is a small, pink agaric probably associated with mosses in grassland. Though morphologically distinctive, there were only two old records from Wales (FRDBI 2026) until recently, when the present authors encountered it in six sites in Radnorshire, typically late in the year. The Ciliau Farm collection (field 13) represents a seventh site, but whether *C. rosellus* is a Radnorshire speciality or simply overlooked elsewhere is unclear.

9. Historic records

A small number of additional CHEGD species were not recorded during the 2025 survey and have been collated and added to the cumulative assessment for CIliau Farm.

In July 2007 the authors of this report attended a 'Bioblitz' held at Cliiau Farm organized by the Local Records Centre. July is not a month best suited to recording macrofungi like waxcaps. However one speces, *Hygrocybe intermedia* fibrous waxcap, was recorded in field 12 (see Fig. 6). It is a species that can often appear at damper periods during the summer months, sometimes as early as June. *Hygrocybe intermedia* is assessed as 'vulnerable' on the IUCN global Red List and is also a JNCC SSSI high diversity indicator species.

The 2021 records for Ciliau Farm (Woods 2021) included three species not seen during the 2025 survey. They were: *Clavulinopsis umbrinella* beige coral (field 21), *Hygrocybe splendidissima* splendid waxcap (field 12), and at least one species of *Geoglossaceae* s.l. not identified beyond family level but confirming the presence of earthtongues on the farm (fields 12, 12a, and 21). *Hygrocybe splendidissima* is assessed as 'vulnerable' on the IUCN global Red List and is also a JNCC SSSI high diversity indicator species. Although carefully searched for, none of these species was seen in 2025.

Figure 6 Field 12, with *Hygrocybe intermedia* fibrous waxcap (2007)

10. Cumulative results

Combining all the above waxcap grassland results for Ciliau Farm gives it a total CHEGD value to date of **C10 H23 E13 G1 D3.** This easily exceeds the JNCC SSSI assessment threshold of 19 for *Hygrocybe et al*. confirming the need to consider the site for SSSI notification.

Six of these species are listed as high diversity indicators suggesting a site with high overall grassland diversity: *Cuphophyllus flavipes* yellowfoot waxcap, *Hygrocybe aurantiosplendens* orange waxcap, *H. intermedia* fibrous waxcap, *H. punicea* crimson waxcap, *H. splendidissima* splendid waxcap, and *Porpolomopsis calyptriformis* pink waxcap. This means nearly 25% of the waxcaps listed are high diversity indicator species.

A total of 11 species are assessed as 'vulnerable' on the IUCN global Red List. All of the above six species, plus *Dermoloma magicum* black magic, *Entoloma griseocyaneum* felted pinkgill, *E. prunuloides* mealy pinkgill, *Hygrocybe mucronella* bitter waxcap, and *H. quieta* oily waxcap. The UK has an international conservation responsibility for all of these, especially given Wales' position at the top of the global waxcap-grassland league.

A full breakdown of all the waxcap grassland species and their field distribution across Ciliau Farm, highlighting the above 11 global Red List species. is shown in the Annex (Table 5).

10.1 Absences

Species of earthtongues (*Geoglossum* and allies) were completely absent during the 2025 survey at CIliau Farm, although noted as present in fields 12, 12a, and 21 in the preliminary 2021 survey (Woods 2021). For comparison, local sites in Radnorshire where earthtongues are known to occur were visited on several occasions in 2025, but none was seen. Since earthtongues can fruit very late in the season, extra visits were made after frost in December and again in February 2026 following a local find of *Microglossum olivaceum* s.l. olive earthtongue on a nearby site (The Begwns). None was found fruiting at Ciliau in 2025 into early 2026.

10.2 Distribution of waxcap interest

Waxcap grassland interest is well distributed across the whole of Ciliau Farm which has a cumulative CHEGD total of 50. Based on its cumulative *Hygrocybe s.l.* numbers (Rald 1985; Vesterholt *et al.* 1999) Ciliau Farm is of international importance.

It is not always possible to adequately explain why some fields or areas of apparently similar habitat adjacent to one another appear to differ radically in their fruiting waxcap-grassland interest. Microhabitat factors affecting ecology and climate can often be of influence from one field to another.

Changes in CHEGD interest across the two years 2021 and 2025 can be seen in the two maps below (Fig. 7).

The best waxcap-grassland interest, with a relatively high cumulative CHEGD total of 20 or more, are fields 12, 12a, 13, 14, and 22. Both fields 12 and 22 rate as nationally important within Wales for their cumulative *Hygrocybe s.l.* numbers (Rald 1985; Vesterholt *et al.* 1999), while 12a, 13, and 14 qualify as regionally important.

A further eight fields achieved a medium cumulative CHEGD total of 10-19. These were fields 2, 3, 4, 9, 11, 16, 19, and 21 of which most (2, 3, 9, 11,19, & 21) also qualify as regionally important.

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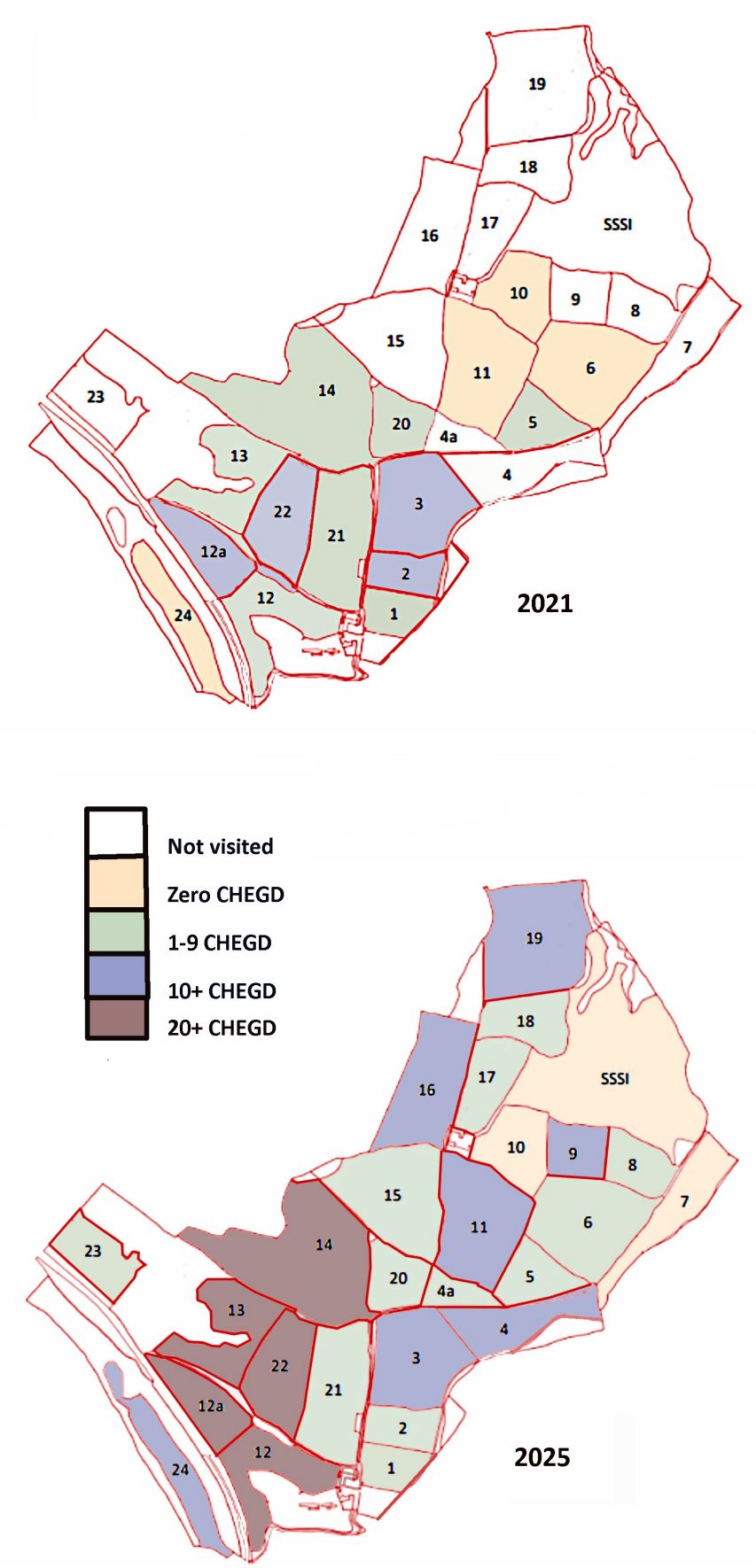
A further eight fields achieved a medium cumulative CHEGD total of 10-19. These were fields 2, 3, 4, 9, 11, 16, 19, and 21 of which most (2, 3, 9, 11,19, & 21) also qualify as regionally important.

Figure 7 CHEGD field totals 2021 and 2025



Those fields with a low cumulative CHEGD total of 6-10 are fields 1, 6, 17, 20, and 23. whilst those with an even lower cumulative CHEGD of 1-5 are fields 4a, 5, 8, and 18. Of these lower CHEGD fields, 4a, 8, 17, 18, and 23 were not recorded in the initial 2021 survey, and in 2025 all had high sward levels incompatible with good fruiting of waxcap-grassland fungi. Of the remaining low interest fields, 1, 6, 5, and 20, visited in both 2021 and 2025, also had sward which was less than ideal for waxcap interest in one or both years. Field 6 was well grazed in 2025 but was the most recently disturbed field, having been ploughed during the 1970's (Woods 2021), and was clearly still affected by this with only pockets of interest around the edges.

In 2025, fields 7 and 10 had zero CHEGD species. Field 7 includes an area of woodland and appeared largely uncut and ungrazed with high sward and substantial incursion of bracken. If cut or grazed it should have potential for waxcap interest. This is not the case, however, for field 10 which is on the edge of the Rhos Garth-fawr SSSI and is too wet, having similar vegetation to the SSSI, and is unlikely to be significant waxcap grassland habitat even if cut and grazed.

For details of each field and its waxcap total, conservation value (assessed following Rald 1985, as adapted by Vesterholt *et al.*1999), CHEGD score, and ranking, see Table 3 below.

The 2025 records strongly suggest that all these fields, even the poorest, have potentially greater waxcap-grassland interest than a limited one-year survey in a poor season could uncover.

Table 3 Waxcap (H) and CHEGD field totals (2007 to 2025); = signs indicate joint ranking position between two or more sites.

Field	Waxcaps 2007	Waxcaps 2021	Waxcaps 2025	Total	Conservation value	CHEGD	RANK
1	-	4	3	**6**	-	3:6:0:0:0	15
2	-	11	4	**11**	Regionally Important	0:11:1:0:1	11=
3	-	9	10	**12**	Regionally Important	5:12:1:0:0	6=
4	-	4	6	**6**	-	3:6:2:0:1	14
4a	-	-	2	**2**	-	1:2:1:0:0	20=
5	-	1	1	**1**	-	1:1:0:0:0	23
6	-	0	4	**4**	-	1:4:1:0:1	16=
7	-	-	0	**0**	-	0	-
8	-	-	1	**1**	-	0:1:0:0:0	24
9	-	-	10	**10**	Regionally Important	4:10:4:0:0	6=
10	-	-	0	**0**	-	0	-
11	-	0	10	**10**	Regionally Important	4:10:3:0:0	8=
12	1	4	15	**17**	Nationally Important	4:17:5:1:1	2=
12a	-	10	13	**14**	Regionally Important	5:14:6:1:2	2=
13	-	5	12	**13**	Regionally Important	6:13:5:0:1	4
14	-	3	12	**12**	Regionally Important	6:12:3:0:1	5
15	-	-	2	**2**	-	1:2:1:0:0	20=
16	-	-	8	**8**	-	3:8:4:0:1	10
17	-	-	4	**4**	-	1:4:2:0:0	16=
18	-	-	3	**3**	-	0:3:0:0:0	22
19	-	-	10	**10**	Regionally Important	3:10:3:0:1	8=
20	-	1	4	**4**	-	1:4:0:0:1	18
21	-	4	4	**6**	-	4:6:1:1:1	11=
22	-	9	17	**17**	Nationally Important	6:17:8:0:1	1
23	-	-	3	**3**	-	2:3:0:0:0	19
24	-	0	8	**8**	-	3:8:0:0:2	11=
Total	**-**	**-**	**-**	**23**	**Internationally Important**	**10:23:13:1:3**	**50**

10.3 Context in Radnorshire

Collating the available waxcap grassland records for Ciliau Farm with the 2025 survey gives a **total CHEGD score of 50** comprising **C10 H23 E13 G1 D3.**

Wales is acknowledged as having some of the best international waxcap-grasslands, notably the nearby Mynydd Epynt Ranges in VC42 Brecknock. It has 35 waxcap species and a total CHEGD score of at least 98 (Evans & Roberts 2015). It is however a vast, upland, largely acid grassland area of nearly 400 sheep-grazed hectares and as such is hardly comparable to Ciliau Farm with its 55 hectares of partly lowland, neutral grassland (about 50% of the fields are below 200 metres).

Comparatively few sites in the vice county of Radnorshire have been systematically surveyed for waxcaps and CHEGD fungi, most of the relevant records on FRDBI being derived from single or occasional, ad hoc visits to a wide variety of locations. At least six sites, however, have substantial records on FRDBI or have been the subject of targeted surveys of various duration.

Table 4 provides a list of these sites, their size, and total CHEGD values. It seems clear from this that Ciliau Farm is one of the most important sites for waxcap-grassland fungi in Radnorshire, especially given its comparatively small size. This emphasises the imminent need for Ciliau Farm to be evaluated for SSSI status.

Table 4 Ciliau Farm comparison with other Radnorshire sites

Site name	Ref.	Area (ha)	*Hygrocybe s.l.* total	CHEGD total
Ciliau Farm	**This report**	**55**	**23**	**50**
Maelienydd SSSI	Evans & Roberts (2012)	350	23	49
Coxhead Bank Common	Evans & Roberts (2012)	28	23	46
The Begwns NT	FRDBI (2026)	523	24	45
Gilfach Farm NR	Griffith *et al*. (2013)	84	22	43
Ffynnon Gynydd Common	FRDBI (2026)	22	17	42
Troed-rhiw-drain SSSI	Griffith *et al.* (2013)	20	18	33

11. Discussion

11.1 Management issues

Ciliau Farm is currently managed as a small-scale, organic beef farm. During the 2025 survey it had around 20-25 cattle on 55 hectares, so it is in large part under-grazed from a waxcap grassland perspective. The cattle tended to be located in two separate fields at any one time and moved around the farm intermittently. Some of the fields (notably field 9) had been mown for hay fodder in 2025, but others were neither grazed nor mown in the autumn of 2025 (notably 4a, 5, and 8).

Tall vegetation whether grass, bracken or encroaching scrub appears to inhibit fruiting of waxcap fungi possibly through eutrophication and/or microhabitat changes in light and moisture levels. Experimental plots with known CHEGD interest have been subjected to different mowing regimes. Results showed fruitbody species diversity and numbers were best when grass was cut to 3 cm, either continually or following a July haycut, whilst uncut plots had hardly any fruitbodies (Griffith *et al*. 2012).

Historic management at Ciliau Farm indicates that in the past there have been various levels of soil disturbance through arable cultivation and ploughing. This may well account for the poorest scoring fields. Many fields appear in tythe maps in arable production from the mid-19th century onwards. Field 24 was used for wheat in 1947, whilst field 21 was ploughed in the 1950s and field 6 in the 1970s (Woods 2021). All have cumulative CHEGD totals at or below 13, with the most recently ploughed only achieving a CHEGD total of 7. Further they demonstrate a timeline of slowly recovering waxcap totals (H) after ploughing: 1970s = 4H, 1950s = 6H, and 1947 = 8H.

It has also been suggested from vascular plant evidence that “fields 1, 7, 8, 10, and 23 plus the rhos might have escaped cultivation in the recent past” (Woods 2021), but the cumulative CHEGD totals for each of these fields is only 5 or below, with the exception of field 1 scoring 9. All are currently amongst the lowest-scoring fields at Ciliau Farm, so it seems rather more likely that all they have been in cultivation at some point in the past and are yet to recover. None of them has a cumulative waxcap total (H) above 3H and fields 7 and 10 have zero CHEGD interest. Vascular plant recovery and waxcap-grassland recovery may well follow very different timescales after a period of cultivation.

During the autumn of 2025 the highest scoring fields with CHEGD of 20 and over (fields 12, 12a, 13, 14, and 22) were also some of the most recently cattle-grazed fields with sward height varying in patches from 2 to 9 cm. However, a number of fields did not appear to have been grazed recently or at all in 2025 with only tractor mowing to keep bracken in check either in larger part (eg fields 4 and 16) or in strips around the periphery (eg fields 18 and 19), whilst some had been partially (field 15) or wholly (field 9) cut for hay. Others (including fields 2 and 3, which were in good condition in 2021) appeared recently uncut or ungrazed, with a sward height well above 10 cm in places and therefore unfavourable for CHEGD fruiting. Those with the highest sward included fields 4a, 8, 18, and 20. All the latter had CHEGD scores below 6, but if grazed or cut for hay before surveying would have had potentially much greater waxcap grassland fruiting interest (see Fig. 8).

There were no waxcap grassland species fruiting in 2025 in fields 7 (sward too high with invasive backen) and 10 (wet, unsuitable grassland bordering the existing SSSI wetland).

Sward height and lack of grazing or cutting clearly had an impact, albeit temporary, on CHEGD fruiting in 2025 at Ciliau Farm. There is evidence to suggest that areas of long grass and bracken that are undisturbed and retain intact mycelia of CHEGD fungi will produce fruitbodies again if cut, even after a period of several years in unfavourable condition (Griffith *et al.* 2012). So even the low scoring CHEGD fields at CIliau Farm have the potential for good waxcap grassland interest.

Figure 8 Unfavourable high sward in field 8

11.2 Additional CHEGD potential

Waxcap grassland data resulting from one extensive and one partial survey (as at Ciliau Farm) can only provide a minimum assessment of both the total species present and extent of fruiting across all fields.

There are a number of species absent from the total CHEGD list at Ciliau Farm which experience suggests might be expected to be present. These most notably include a range of *Geoglossum* species and other earthtongues (at least one species seen in 2021 but entirely absent in 2025), further species of *Entoloma* pinkgills (which typically fruit early in the season, but not in 2025's September drought), and potentially a few additional species of *Hygrocybe* s.l. waxcaps.

Conservation assessments in the UK and statutory protections are currently only made on the basis of fruitbody surveys. This enables data to be as accurate and comparable between different sites as possible. However environmental DNA (eDNA) from soil samples is a useful additional way of detecting potential waxcap grassland species at any time of year (Evans & Roberts 2022). Such techniques are still currently constrained by gaps in sampling (both in terms of habitat and substrates) and by incomplete databases of the reference sequences that enable identification to species.

The data require considerable interpretation and need confirmation by fruitbody presence. As noted by Griffith *et al.* (2019), eDNA sampling works best with *Hygrocybe s.l.* waxcaps (*Hygrocybe*, *Cuphophyllus*, *Gliophorus*, and *Porpolomopsis* species) as the genetic dataset for matching samples to species is more extensive and robust than for other CHEGD fungi.

Some limited eDNA samples have been taken at Ciliau Farm (fields 12,13, 21, and 22) as part of a wider ongoing analysis of various sites in Wales by Aberystwyth University (Gareth Griffith, pers. comm.). Early unpublished results from this confirm the likelihood of further CHEGD species including several Geoglossaceae earthtongues and includes the potential presence of one further 'high diversity indicator' (*Hygrocybe citrinovirens* citrine waxcap) also on the IUCN global Red List and potentially two further global Red List species (*Trichoglossum walteri* shortspored earthtongue and *Camarophyllopsis schulzeri* matt fanvault). Further fruitbody survey would be needed to confirm this.

11.3 Further survey

The results of the 2025 survey can only be regarded as a minimum account of those CHEGD species actually present at Ciliau Farm and further survey for more accurate assessment is both desirable and strongly recommended.

Any such further survey should be widened, as suggested by Woods (2021), to include an earlier visit, if weather conditions are suitable, any time from June or July onwards. Fields should ideally be either grazed or cut for hay some weeks preceding the survey and priority given to recording additional species and extent of interest in fields currently having a low CHEGD score.

11.4 Boundaries of waxcap- grassland interest

The extent of the waxcap-grassland interest at Ciliau Farm as a whole already exceeds JNCC guideline numbers for consideration of the site as a SSSI (Bosanquet *et al.* 2018). The number and variety of fruitbodies recorded can only be regarded as a minimum and not a reflection of subterranean mycelial extent across the fields. With improved grazing or cutting, even the lowest interest fields have waxcap-grassland potential and mycelial networks may well be more extensive across the site but simply not fruiting (Taylor *et al.* 2014).

There is a strong argument to be made when considering the potential SSSI boundary to incorporate the farm as a whole especially when survey has been limited in time and fruiting results hampered by less than ideal fruiting conditions as a result of dry weather and areas of high sward.

Fields at the lower end of cumulative CHEGD interest based on this survey are: fields 1, 6, 17, 20, and 23 (with CHEGD totals of 5-10), 4a, 5, 8, 15, and 18 (with CHEGD total under 5). As noted above, all had less than ideal sward length during the survey, with the exception of field 6 which is in recovery after ploughing in the 1970s and field 10 (zero CHEGD sp) whose habitat is more consistent with the existing wetland SSSI.

An integral inclusion of all fields in any SSSI is strongly recommended to buffer potential negative impacts on waxcap-grassland fungi from changes in management on any excluded fields, such as the use of chemical fertilisers or pesticides. Guidelines for best management practice are given in the Annex (Table 7).

11.5 Landscape-level issues

At the wider landscape level it is acknowledged that the majority of waxcap-grasslands are outside of SSSIs and under greatest threat from tree planting (Wilkins *et al*. 2025).

In Wales the government currently has a commitment to plant 180,000 ha of new tree cover by 2050, equivalent to planting at least 5000 ha per year (NRW 2023), extending the existing 308,000 ha of woodland in Wales by 58%. These ambitious targets can only be met by large-scale planting on farm and open land that is currently grazed and deemed of agriculturally poor quality, often in the uplands of Wales and often ideal waxcap habitat. Large-scale investment and habitat creation schemes have already come under scrutiny for buying up farms in Wales, many of them containing potentially rich habitats for waxcap-grassland fungi.

Awareness of these issues needs to be raised far more widely to ensure all waxcap-grassland habitat is identified and protected, so that its unwarranted destruction is avoided.

12. Conservation summary

The 2025 survey at Ciliau Farm brings its total waxcap-grassland interest to **C10 H23 E13 G1 D3** which clearly exceeds the recommended JNCC waxcap thresholds of C7 H19 E15 G5 D3 for SSSI designation (Bosanquet *et al.* 2018). Based on its cumulative *Hygrocybe et al.* numbers it is of international importance.

Ciliau Farm includes six high diversity indicator species *Cuphophyllus flavipes* yellowfoot waxcap*, Hygrocybe aurantiosplendens* orange waxcap, *H. intermedia* fibrous waxcap, *H. punicea* crimson waxcap, *H. splendidissima* splendid waxcap, *and Porpolomopsis calyptriformis* pink waxcap.

In addition, Ciliau Farm has eleven species assessed as globally ‘vulnerable’ on the IUCN global Red List (IUCN 2025; 2026): *Cuphophyllus flavipes* yellowfoot waxcap, *Dermoloma magicum* black magic, *Entoloma griseocyaneum* felted pinkgill, *E. prunuloides* mealy pinkgill, *Hygrocybe aurantiosplendens orange waxcap, H. intermedia fibrous waxcap, H. mucronella* bitter waxcap, *H. punicea* crimson waxcap, *H. quieta* oily waxcap, *H. splendidissima* splendid waxcap, *and Porpolomopsis calyptriformis* pink waxcap.

Wales holds over 10% of the world’s threatened fungal species, including more than 90% of all vulnerable and endangered waxcap-grassland species (IUCN 2025; 2026). This gives Wales an extraordinary responsibility to protect these globally Red Listed

waxcap-grassland fungi. Across the UK their main means of protection is SSSI designation for habitat including assemblages of waxcap-grassland fungi. But in Wales, their global stronghold, only 1% of SSSIs list waxcap-grassland fungi as a notified feature and none at all in Radnorshire.

The co-owner managing Ciliau Farm is of an age where he is now considering retiring. This puts the continuity of sympathetic, beneficial waxcap management in serious jeopardy. The future of this top-ranking, neutral MG5a grassland in Radnorshire needs securing urgently by notification as a SSSI, following JNCC guidelines for its waxcap-grassland interest.

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15. Appendices

15.1 Annex One: All target CHEGD fungi recorded at Ciliau Farm (2007-2025)

Table(s) 5 Records of CHEGD fungi by field; international Red List species are marked VU and High Diversity Indicator species are marked HDI

CLAVARIACEAE (10)	YEAR	FIELD NUMBERS
Clavaria falcata	2025	11+12a+22
Clavaria flavipes	2025	4+9+11+13+14+16
Clavaria fragilis	2025	3+4+4a+5+9+11+12+12a+13+14+15+16+17+21+22+24
Clavaria incarnata	2025	13+14+19+22
Clavulinopsis corniculate	2025	(3)+12a+13+14+21+22+23
Clavulinopsis helvola	2025	1+(3)+4+12+14+(21)+23
Clavulinopsis laeticolor	2025	1+3+6+9+11+12a+13+14+16+19+22+24
Clavulinopsis luteoalba	2025	1+9+(12)+13+22
Clavulinopsis umbrinella	2021	(21)
Ramariopsis robusta	2025	(3)+12+(12a)+(21)

HYGROCYBE s.l. (23)	YEAR	FIELD NUMBERS
Cuphophyllus berkeleyi	2025	24
***Cuphophyllus flavipes* VU HDI**	2025	9+12a+13+22
Cuphophyllus fornicatus	2025	(2)+(3)+11+12a+22
Cuphophyllus pratensis	2025	1+2+3+4+4a+9+11+12+12a+13+14+16+17+19+21+22+24
Cuphophyllus russocoriaceus	2025	12+12a+13+14+19+22+23+24
Cuphophyllus virgineus	2025	2+3+4+4a+5+6+9+11+12+12a+13+14+15+16+17+18+19+20+21+22+23+24
Gliophorus irrigatus	2025	1+12
Gliophorus laetus	2025	12
Gliophorus psittacinus	2025	(2)+3+4+6+9+11+12+12a+13+14+16+17+19+(21)+22+22+24
***Hygrocybe aurantiosplendens* VU HDI**	2025	(1)+(2)+3+12+12a+(13)+14+19+22
Hygrocybe ceracea	2025	(1)+(3)+9+11+12+13+14+16+20+(21)+22
Hygrocybe chlorophana	2025	1+(2)+3+4+6+11+12+12a+13+14+16+18+19+21+22+24
Hygrocybe coccinea	2025	2+3+4+9+11+12+12a+13+14+19+20+22
Hygrocybe conica	2025	2+3+4+6+11+12+12a+13+14+15+16+20+21+22+24
Hygrocybe glutinipes	2025	(1)+16+19
Hygrocybe insipida	2025	(2)+3+9+11+12+(12a)+13+18+19+22+24
***Hygrocybe intermedia* VU HDI**	2007	(12)
***Hygrocybe mucronella* VU**	2025	22
***Hygrocybe punicea* VU HDI**	2025	3+12+12a+13+14+22
***Hygrocybe quieta* VU**	2025	(2)+3+8+9+11+12a+14+16+17+19+22
Hygrocybe reidii	2025	(2)+9+12+12a+13+14+22
***Hygrocybe splendidissima* VU HDI**	2021	(12)
***Porpolomopsis calyptriformis* VU HDI**	2025	9+17+22

ENTOLOMA (13)	YEAR	FIELD NUMBERS
Entoloma atrocoeruleum	2025	14+19
Entoloma chalybeum	2025	22
Entoloma clandestinum	2025	11+12+12a+13+14+16+19+22
Entoloma conferendum	2025	17+22
Entoloma exile	2025	12a+13+16+22
***Entoloma griseocyaneum* VU**	2025	12+12a+16+22
Entoloma hebes	2025	13
Entoloma infula	2025	2+4+4a+6+9+11+12+12a+13+14+16+22
Entoloma poliopus	2025	13
***Entoloma prunuloides* VU**	2025	11+12+12a+22
Entoloma sericellum	2025	3+4+9+15
Entoloma sericeum	2025	9+12+12a+17+21+22
Entoloma sororpratulense	2025	9

GEOGLOSSACEAE (1)	YEAR	FIELD NUMBERS
(unidentified)	2021	(12)+(12a)+(21)

DERMOLOMA etc. (3)	YEAR	FIELD NUMBERS
Dermoloma cuneifolium	2025	2+4+6+(12a)+13+14+16+19+20+(21)+22+24
***Dermoloma magicum* VU**	2025	12+12a
Hodophilus subfoetens	2025	24

Key:

- All species of conservation importance are in bold text with their status included.
- Field numbers in brackets indicate species present in 2007 or 2021, but not seen in those fields in 2025.

15.2 Annex Two: IUCN global Red List of threatened waxcap-grassland fungi

Table 6 UK CHEGD fungi on IUCN global Red List
* = assessed but not yet published (IUCN 2026)

Scientific Name	English Name	IUCN threat category	JNCC SSSI High Diversity Indicators
Camarophyllopsis schulzeri	matt fanvault	VU	-
Clavaria zollingeri	violet coral	VU	-
Cuphophyllus canescens	felted waxcap	VU	HDI
Cuphophyllus colemannianus	toasted waxcap	VU	HDI
Cuphophyllus flavipes	yellow foot waxcap	VU	HDI
Cuphophyllus lacmus	grey waxcap	VU	HDI
Cuphophyllus lepidopus	scalyfoot waxcap	VU	-
Cuphophyllus radiatus	slender waxcap	VU	-
Dermoloma magicum*	black magic	VU	-
Entoloma bloxamii	big blue pinkgill	VU	-
Entoloma griseocyaneum	felted pinkgill	VU	-
Entoloma porphyrophaeum	lilac pinkgill	VU	-
Entoloma prunuloides	mealy pinkgill	VU	-
Entoloma queletii	flushed pinkgill	VU	-
Gliophorus europerplexus	butterscotch waxcap	VU	-
Gliophorus reginae	jubilee waxcap	VU	-
Gloioxanthomyces vitellinus	glistening waxcap	EN	-
Hygrocybe aurantiosplendens	orange waxcap	VU	HDI
Hygrocybe citrinovirens	citrine waxcap	VU	HDI
Hygrocybe intermedia	fibrous waxcap	VU	HDI
Hygrocybe lepida*	goblet waxcap	VU	-
Hygrocybe mucronella	bitter waxcap	VU	-
Hygrocybe punicea	crimson waxcap	VU	HDI
Hygrocybe quieta	oily waxcap	VU	-
Hygrocybe spadicea	date waxcap	VU	HDI
Hygrocybe splendidissima	splendid waxcap	VU	HDI
Hygrocybe subpapillata	papillate waxcap	VU	HDI
Hygrocybe turunda	singed waxcap	-	HDI
Microglossum atropurpureum	dark-purple earthtongue	VU	-
Neohygrocybe ingrata	dingy waxcap	VU	HDI
Neohygrocybe nitrata	nitrous waxcap	VU	HDI
Neohygrocybe ovina	blushing waxcap	VU	HDI
Porpolomopsis calyptriformis	pink waxcap	VU	HDI
Pseudotricholoma metapodium	mealy meadowcap	EN	-
Trichoglossum walteri	short-spored earthtongue	VU	-

15.3 Annex Three: Grassland management

Table 7 General guidelines for managing waxcap-grassland fungi

Principle	Justification	Management guidelines
Maintain sward and soil integrity	Waxcap-grassland fungi have evolved in long-term associations of grasses, mosses, and stable soil profiles	Avoid ploughing and extensive areas of digging and soil disturbance; avoid excessive compaction by heavy vehicles and machinery
Maintain low nutrient conditions	Waxcap-grassland fungi have evolved in nutrient-poor grasslands and are replaced by common nitrophilic fungi in nutrient-rich soils	Avoid fertilisers (other thandispersed dunging from grazing animals) and other chemicals such as pesticides and herbicides; avoid any run-off or spray drift from neighbouring fields; remove clippings if grass is mown
Maintain low sward	Waxcap-grassland fungi do not normally persist in long grass or rank herb growth	Maintain grazing, ideally by rabbits and sheep (heavy cattle may damage the sward), or mow to keep sward low (removing clippings)
Maintain open grassland	Waxcap-grassland fungi do not normally persist in areas of dense bracken growth, invasive scrub or woodland	Keep bracken levels low or patchy (without using herbicides); cut back gorse and other invasive scrub and ensure there is no woodland planting
Protect locations of rare fungi and fungal diversity hotspots	Many waxcap-grassland fungi are red-listed or legally protected	Ensure any such locations are identified by survey; minimize disturbance and maintain critical habitat elements
Monitor fungal populations	Several years of data collection are needed to assess fungal populations and detect trends in population stability for rare species or fungal communities	Include regular fungal monitoring (every 3-5 years) within long-term biodiversity monitoring programmes

15.4 Annex Four: Fields and grassland fungi of conservation interest at Ciliau Farm

Figure 9 Field 3, showing over-long sward in 2025, with *Hygrocybe punicea* crimson waxcap

Figure 10 Field 11, with *Entoloma prunuloides* mealy pinkgill

Figure 11 Field 12a, with *Dermoloma magicum* black magic

Figure 12 Field 13, with *Cuphophyllus flavipes* yellowfoot waxcap

Figure 13 Field 16, with *Entoloma griseocyaneum* felted pinkgill

Data Archive Appendix

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

The data archive contains:

[A] 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_DS161503

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