Galileo 03 Ltd.

Mynydd Ty-talwyn Energy Park - Environmental Statement Volume III

Appendix 10.2: Grassland Fungi Survey Report

Project Reference: 663870

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RSK Biocensus

Mynydd Ty-talwyn Energy Park

Grassland Fungi Survey

December 2024

Sturgess Ecology

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Cover photographs: Left: Meadow Waxcap (*Cuphophyllus pratensis*): Right: Scarlet Waxcap (*Hygrocybe coccinea*).

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1.0 Introduction

1.1.1 This report has been prepared by Sturgess Ecology on behalf of Galileo 03 Ltd (part of Galileo Empower UK Ltd) (hereinafter referred to as 'Galileo' or the 'Applicant'). In collaboration with RSK Biocensus who are conducting a series of ecological studies at Mynydd Ty-talwyn, Bridgend (approx. central grid reference SS 86327 86041). The surveys are being undertaken in advance of a proposed renewable energy project and are intended to inform the planning process and project design.

1.1.2 The current survey was limited to study areas that were initially selected by RSK Biocensus as being likely to support grassland fungi. The selection was based on the presence of short pasture grassland that appear to be largely free from recent agricultural improvement (such as ploughing or treatment with fertilisers or herbicides), because such grasslands often support important fungi populations[1]. The survey of the eastern area was not carried out due to an injury, and the subsequent discovery that most of the area had been ploughed and reseeded in 2010. The northern area was included as an alternative, following the observation of several waxcaps that were visible from the road during the first survey. The survey areas are indicated on an aerial photograph background in **Figure 1**.

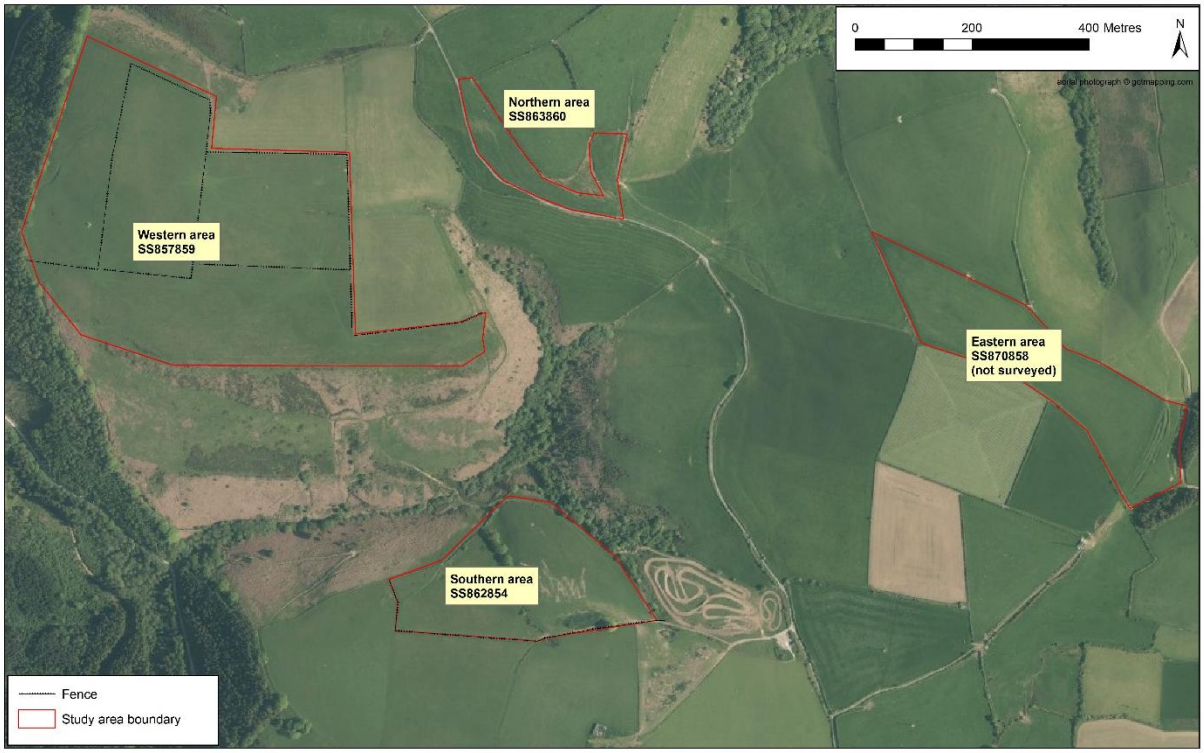

Figure 1. Location of Survey Areas

[1] Griffith GW, Gamarra JGP, Holden EM, Mitchel D, Graham A, Evans DA, Evans SE, Aron C, Noordeloos ME, Kirk PM, Smith SLN, Woods RG, Hale AD, Easton GL, Ratkowsky DA, Stevens DP, Halbwachs H (2013). The international conservation importance of Welsh 'waxcap' grasslands. Mycosphere 4(5), 969–984.

2.0 Survey Method

2.1.1 The survey was undertaken by a simple walk-over method during autumn 2024. A total of four survey visits were carried out between 19 September and 27 November, which was anticipated to be the likely peak season for fungi fruiting for that year. The wet summer of 2024 meant that fungi appeared a little earlier than usual. The final survey was delayed due to unusually hard frosts and snow in mid-November making conditions unfavourable. Visits were spread as evenly as possible through the survey period, aiming to avoid periods of frost or heavy rain. The fieldwork and identifications were undertaken by Dr Peter Sturgess CEnv MCIEEM, an ecologist experienced in grassland fungi survey, and already familiar with the habitats present at Mynydd Ty-talwyn.

2.1.2 The survey was limited to target groups that are generally recognised as being good indicators of nature conservation value for grassland fungi. These are often collectively referred to as CHEGD fungi (*Clavariaceae* = Clubs and corals, *Hygrophoraceae* = Waxcaps, *Entolomataceae* = Pinkgills, *Geoglossaceae* = Earthtongues, and *Dermoloma* and allied genera = Crazed-caps, Meadowcaps and Fan-vaults). In many cases specimens were collected to confirm species by microscopy. Specimens that were damaged or old were often impossible to name to species level.

2.1.3 The conventional survey used a walk-over sampling approach, crossing each site multiple times by a number of informal transects, targeting vegetation considered to be of highest potential value for grassland fungi. In particular, areas of unimproved and semi-improved short-grazed pasture. Areas of dense scrub, dense Bracken and damp, rush-dominated patches were generally screened out from the survey as they have much lower potential value for grassland fungi. The surveyor aimed to pass within approximately 20m of all suitable habitat within each area. The locations of fungi were recorded by hand onto an aerial photograph base plan. No attempt was made to count or map individual fungi fruiting bodies.

3.0 Survey Findings

3.1.1 The grassland fungi survey findings are summarised in **Tables 1 to 5**. These simply indicate whether a species was found on a particular survey date. The approximate locations of the fungi observations are shown on an aerial photograph background in **Figures 2 and 3** (these plans are quite detailed, but their main purpose is to highlight areas with clusters of fungi observations, rather than to accurately record the position of every fruiting body). Photographs of most of the fungi seen during the survey are included in **Annex 1**.

Table 1. Survey Findings: Clubs and Corals (Clavariaceae)

Species	Common name	19/9/24	10/10/24	30/10/24	27/11/24
Clavaria acuta	Pointed Club			x	
Clavaria flavipes	Straw Club		x	x	
Clavaria fragilis	White Spindles		x		
Clavaria fumosa	Smoky Spindles			x	
Clavaria messapica/ incarnata	'Pink Club'			x	
Clavulinopsis corniculata	Meadow Coral		x		
Clavulinopsis fusiformis	Golden Spindles	x	x	x	x
Clavulinopsis luteoalba	Apricot Club			x	
Clavulinopsis helvola	Yellow Club	x	x	x	
Clavulinopsis umbrinella	Beige Coral				x
Total Clavariaceae = 10 species		**2**	**5**	**7**	**2**

Table 2. Survey Findings: Waxcaps (Hygrophoraceae)

Species	Common name	19/9/24	10/10/24	30/10/24	27/11/24
Cuphophyllus flavipes	Yellowfoot Waxcap	x	x		
Cuphophyllus fornicatus	Earthy Waxcap			x	
Cuphophyllus pratensis	Meadow Waxcap	x	x	x	x
Cuphophyllus virgineus	Snowy Waxcap		x	x	x
Gliophorus laetus	Heath Waxcap		x	x	
Gliophorus irrigatus	Slimy Waxcap		x		
Gliophorus psittacinus	Parrot Waxcap	x	x	x	x
Hygrocybe cantharellus	Goblet Waxcap	x	x		
Hygrocybe ceracea	Butter Waxcap		x	x	
Hygrocybe chlorophana	Golden Waxcap	x	x	x	x
Hygrocybe citrinovirens	Citrine Waxcap		x	x	
Hygrocybe coccinea	Scarlet Waxcap			x	x
Hygrocybe conica	Blackening Waxcap		x		
Hygrocybe glutinipes	Glutinous Waxcap		x		
Hygrocybe helobia	Garlic Waxcap			x	
Hygrocybe insipida	Spangle Waxcap	x	x	x	
Hygrocybe intermedia	Fibrous Waxcap	x	x		
Hygrocybe quieta	Oily Waxcap	x	x	x	
Hygrocybe reidii	Honey Waxcap		x	x	
Hygrocybe splendidissima	Splendid Waxcap		x	x	x
Hygrocybe cf subpapillata	Papillate Waxcap	x			
Neohygrocybe ovina	Blushing Waxcap	x		x	
Porpolomopsis calyptriformis	Pink Waxcap		x	x	
Total Hygrophoraceae = 23 species		**10**	**18**	**16**	**6**

Table 3. Survey Findings: Pinkgills (Entolomataceae)

Species	Common name	19/9/24	10/10/24	30/10/24	27/11/24
Entoloma conferendum	Star Pinkgill	x	x	x	x
Entoloma hebes	Pimple Pinkgill		x		
Entoloma cf corvinum	Crow Pinkgill		x		
Entoloma cf poliopus	Brown-edge Pinkgill			x	
Entoloma prunuloides	Mealy Pinkgill	x			
Entoloma sp. (indeterminate)	Pinkgill	x	x	x	
Entoloma serrulatum	Blue-edge Pinkgill		x	x	
Total Entolomataceae = 7 species		**3**	**5**	**4**	**1**

Table 4. Survey Findings: Earthtongues (Geoglossaceae)

Species	Common name	19/9/24	10/10/24	30/10/24	27/11/24
Geoglossum fallax	Deceptive Earthtongue			x	x
Trichoglossum walteri	Short-spored Earthtongue		x	x	x
Total Geoglossaceae = 2 species		**0**	**1**	**2**	**2**

Table 5. Survey findings: Crazed Caps and Allies

Species	Common name	19/9/24	10/10/24	30/10/24	27/11/24
Dermoloma cuneifolium	Crazed Cap	x	x	x	
Camarophyllopsis schulzeri	Matt Fanvault	x			
Total crazed caps and allies = 2 species		**2**	**1**	**1**	**0**

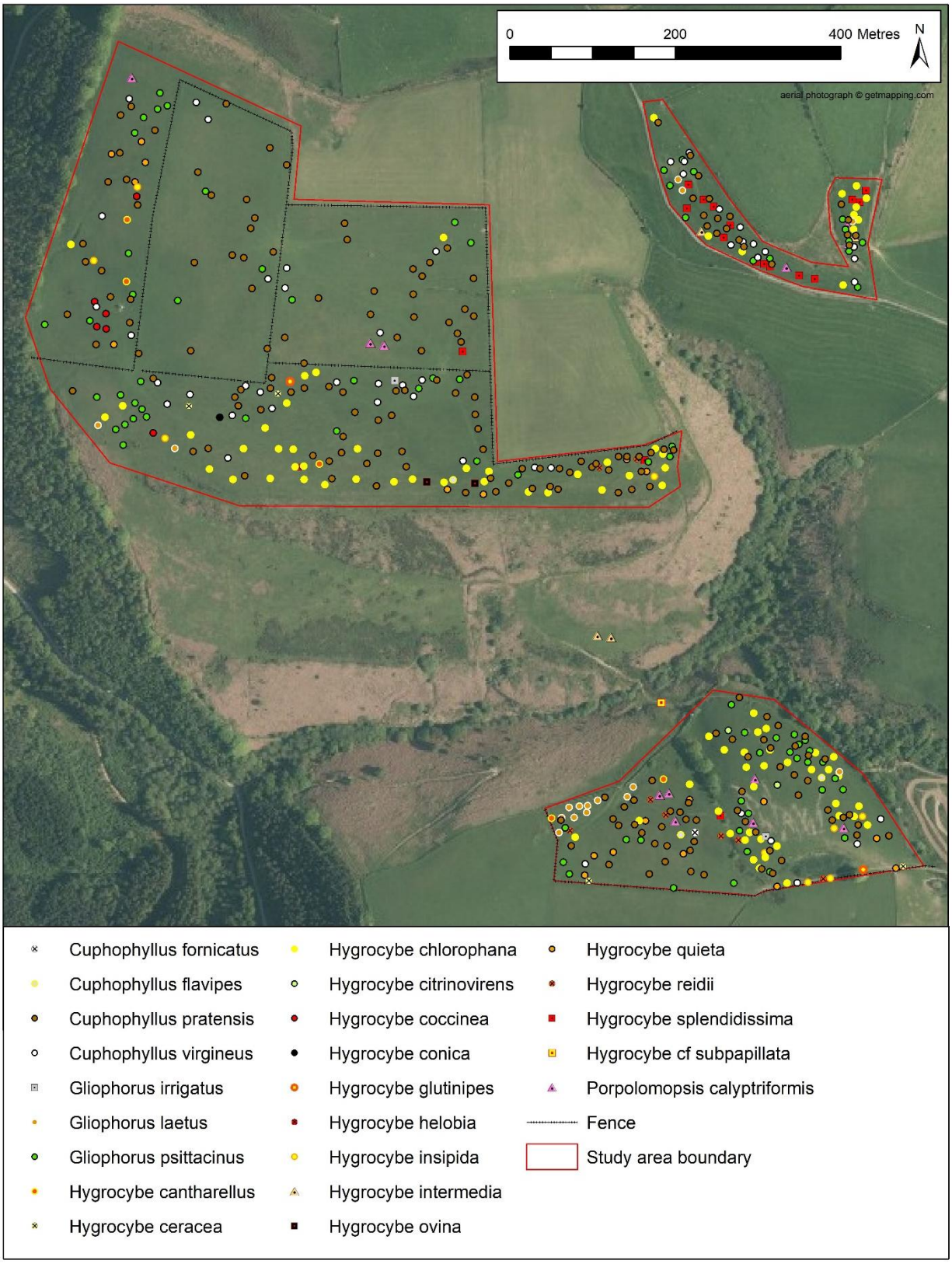

Figure 2. Summary of Waxcap Observations.

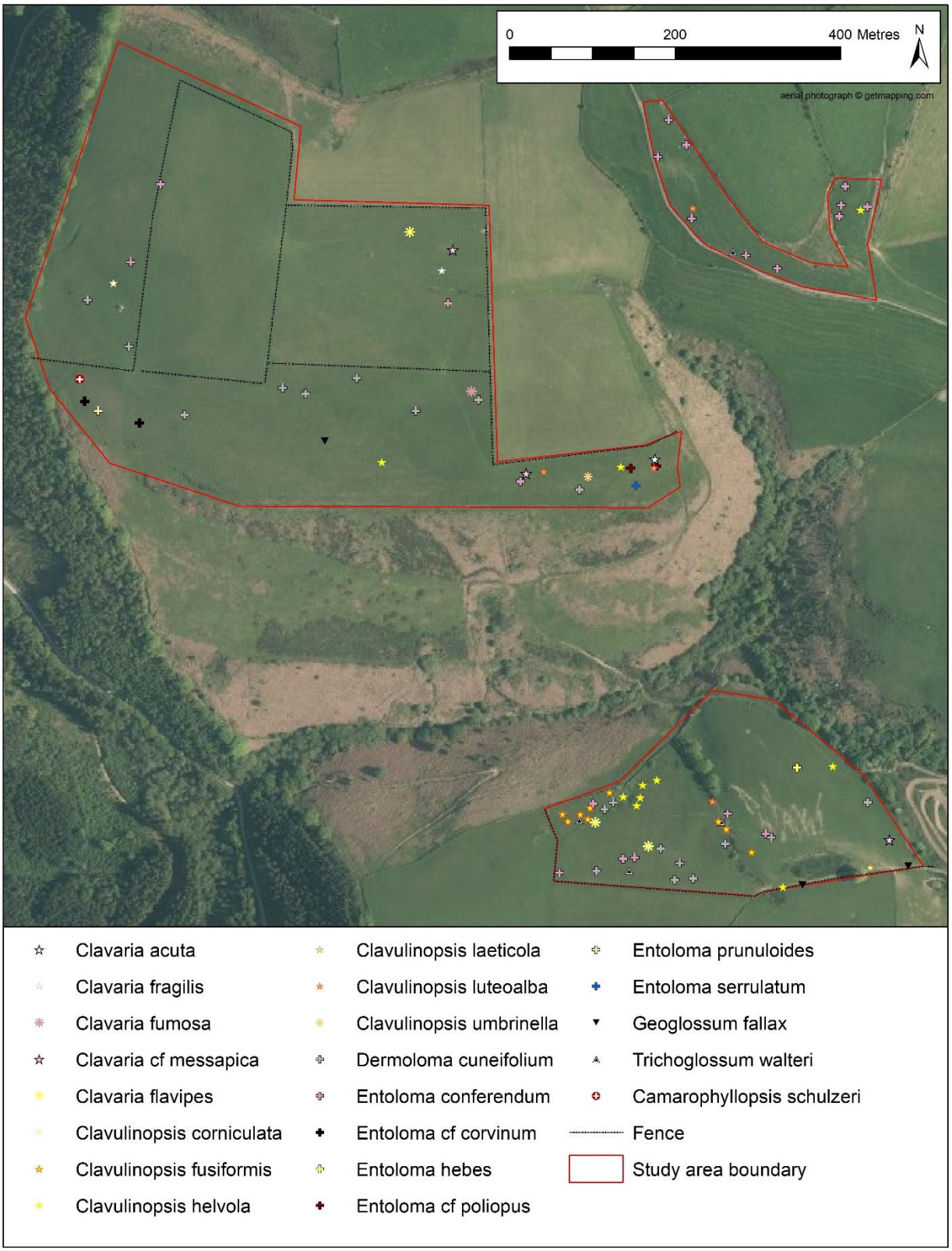

Figure 3. Summary of Non-waxcap Observations.

4.0 Limitations

4.1.1 The appearance of fungi can be very susceptible to weather conditions, and this means that some years are better than others for grassland fungi surveys. Prolonged drought and hard frosts can be especially problematic. Fortunately, the weather during 2024 was unusually wet, so there were no issues with drought. However, the damp, mild weather may have affected the fruiting of grassland fungi by providing ideal conditions for grass growth. Fungi tend to produce more fruiting bodies when grass is shorter (**Image 2**), so the results of a survey this year might potentially be poorer than a typical year when the grass would be shorter. The grassland on the south-facing slope of the western area was especially tall and tussocky (**Image 1**), and it is likely that there are more fungi here than were observed during the survey.

Image 1: ***Relatively few fungi were seen in the tall tussocky parts of the western area, almost certainly due to the density of the grass.***

Image 2: ***The highest density of grassland fungi was found in the southern fields, which had consistently short grass.***

4.1.2 The transect walking method used for the survey includes significant sampling bias, favouring larger and more easily seen species. It is likely that some smaller specimens would have been overlooked, especially given the very large area that had to be covered during the study. There is also an element of bias in the species seen later in the study, with some species being more frost-resistant than others. This probably explains the relatively high proportion of the relatively robust *Cuphophyllus pratensis* that were recorded during the November visits.

4.1.3 November can often be a peak time of year for observing grassland fungi. However, this year the occurrence of an unusually cold period with heavy frosts followed by snow delayed the timing of the final survey visit. Very few fungi were found on the 27 November 2024 survey. Observations of grassland fungi by the surveyor at lower-level sites during a similar period had not noted much of a reduction in numbers, but the additional altitude and exposure at Mynydd Ty-talwyn probably meant that the weather had a much more severe impact, effectively bringing the fungi fruiting season to an early close this year.

4.1.4 The fungi survey was modified after the first survey visit due to an injury to the surveyor (fortunately this occurred after most of the area had been covered). This resulted in a slight delay to the second survey and the substitution of the eastern area (which was not surveyed) by the northern area (which was surveyed for the three later visits). The change was fortuitous because the northern area proved to be a valuable site for fungi, while the eastern area was discontinued after most of it was found to have been subject to recent agricultural improvement and unlikely to support any fungi of nature conservation interest.

4.1.5 Unfortunately, it was not possible to identify every specimen, so in some cases fungi could only be identified to genus or named approximately. In a small number of cases species of potential high conservation value were sampled and have been sent for confirmation by DNA sequencing, but the results of this are not available at the time of writing.

4.1.6 The grassland fungi survey has confirmed that the parts of Mynydd Ty-talwyn that were included in the study support a good range of species. It is feasible that other parts of the wider area that were not initially short-listed for survey might also support concentrations of fungi (as was found in the northern area, which was not initially included). In particular, some of the grassland patches in the lower valley sides between the western and southern areas appear to have very high potential for grassland fungi (**Image 3**). It is understood that these were screened out from the current survey because they are not at risk from the proposed energy project.

Image 3: ***Likely ancient grassland in the lower valley sides between the southern and western areas is likely to have high value for grassland fungi. Note the presence of large ant-hills indicating lack of recent ploughing.***

4.1.7 Despite the limitation outlined above, it is considered that the survey effort is robust and sufficient to inform the assessment.

5.0 Assessment

5.1.1 It is important to recognise the limitations of a fungi survey based on just one season. The appearance of fungi can vary considerably from year to year, and it is likely that more species are present, and in different areas, than were seen this year. The observations from 2024 should therefore be regarded as a minimum representation of the fungi population. Despite this limitation, the grassland fungi survey has confirmed that Mynydd Ty-talwyn supports a good range of species and includes a number of species that are considered of high value for nature conservation. The surveys have been based on the most likely locations for fungi, as identified through the Phase 1 Survey undertaken, and has focused on those areas which were more likely to be directly affected by the construction/operation of the Proposed Development. As such this is not considered to be a limitation to this assessment.

5.1.2 The fungi assemblage at Mynydd Ty-talwyn is considered to be of importance for nature conservation in at least a county context. This is based on the criteria set out in Wildlife Sites Guidance Wales[2], which proposes that sites with 8 or more species of waxcaps would qualify. When taken as a whole, the area also easily exceeds the minimum 19 waxcap species required for consideration as a Site of Special Scientific Interest (SSSI)[3]. However, the distribution of the fungi is not uniform, and some parts are clearly of higher value than others.

5.1.3 The Wildlife Sites Guidance criteria based on the presence of rare species were based on a draft UK Red Data list from 2006, but this draft was not adopted so two more up to date approaches are also considered here, using the international Red Data list for fungi[4], and the presence of 'high diversity indicator species' for waxcaps from the SSSI selection guidelines. The latter have been chosen on grounds of their rarity/scarcity, strong association with ancient grassland sites, UK-wide distribution and international status. The species of special nature conservation value observed at Mynydd Ty-talwyn are listed in **Table 6**.

Table 6. Grassland Fungi Species of Special Nature Conservation Value

Species	Draft UK Red list (2006)	SSSI high diversity indicator waxcap species	IUCN Red Data list
Camarophyllopsis schulzeri			Vulnerable
Clavaria flavipes	Yes		
Clavaria messapica/ incarnata	Yes		
Cuphophyllus flavipes		Yes	
Hygrocybe citrinovirens		Yes	Vulnerable
Hygrocybe intermedia		Yes	
Hygrocybe splendidissima		Yes	Vulnerable
Hygrocybe subpapillata		Yes	
Neohygrocybe ovina		Yes	Vulnerable
Porpolomopsis calyptriformis	Yes	Yes	Vulnerable
Trichoglossum walteri	Yes		Vulnerable

5.1.4 When viewing the Site as a whole, there are some areas that are clearly of higher value than others. This survey suggests that the south- and west-facing slopes of the western area are of higher value for fungi than the more intensively managed north parts (despite the south

[2] Wales Biodiversity Partnership (2008). Wildlife Sites Guidance Wales: A Guide to Develop Local Wildlife Systems in Wales.
[3] Bosanquet, S.D.S., Ainsworth, A.M., Cooch, S.P., Genney, D.R, and Wilkins, T.C. (2018). Guidelines for the Selection of Biological SSSIs. Part 2: Detailed Guidelines for Habitats and Species Groups. Chapter 14 Non-lichenised Fungi. Joint Nature Conservation Committee, Peterborough.
[4] https://www.iucnredlist.org/

and west parts being more tussocky). It is feasible that the two northern fields may have been ploughed and reseeded more recently than the other parts (Image 4). These low diversity parts could possibly be regarded as having Local rather than County significance for nature conservation, but this should ideally be confirmed by further survey.

Image 4: ***The two fields on the highest part of Mynydd Ty-talwyn (western area) support a relatively low diversity of grassland fungi when compared with the other areas.***

5.1.5 The southern area supported a high density of grassland fungi through most of both fields. However, no grassland fungi were found within the part of the eastern one that had been used for topsoil storage or tracked over by heavy machinery (**Image 5**). The northern area supported grassland fungi through most of its area, with the only exception being a lower density of species near its northern edge, which appears to be wetter and subject to recent disturbance.

Image 5: ***Large pile of topsoil, mainly covered by Nettles, in the southern area. No grassland fungi were found here, or along the vehicle tracks leading east and west from it.***

6.0 Recommendations

Recommendations for Further Survey

6.1.1 No further surveys are considered necessary in areas where high value for fungi is already confirmed, or in any areas of potential value that would remain unaffected.

6.1.2 Surveys of fungi have many limitations due to their unpredictable appearance. If there are any design changed further surveys should be carried out to check any areas of potential value for grassland fungi that might be affected by the Proposed Development. Ideally field surveys should be conducted over several years to take weather variations into account.

6.1.3 If further surveys are planned, it is important to ensure that the grass within the survey area has been grazed short through the summer, to encourage the appearance of fungi.

6.1.4 If areas of potential high value for fungi cannot be surveyed (e.g. due to project timing/seasonal constraints), it may be worth undertaking DNA analysis of soil samples to investigate whether many fungi are present. This technique is not a full substitute for field surveys and has many limitations (e.g. very small samples can easily miss species on large sites) but it can still provide a useful initial assessment.

6.1.5 A few observations of fungi were made in the lower slopes of the southern valley during the first survey. However, the surveyor did not follow this survey route for the later visits (due to lack of phone signal in the event of a problem). There appeared to be some potentially very high-quality habitat for grassland fungi on the lower valley sides and these would be worthy of further survey.

Recommendations for Project Design

6.1.6 All areas of high diversity grassland fungi or supporting any of the species listed in **Table 6** should be completely avoided by the Proposed Development and maintained by grazing in the long term.

6.1.7 An approximation of the areas of highest value for grassland fungi is presented in **Figure 4.** (NB This is based on just one year of survey and the experience of the surveyor, taking account of features indicating likely high value, even where few fungi were seen due to relatively long grass).

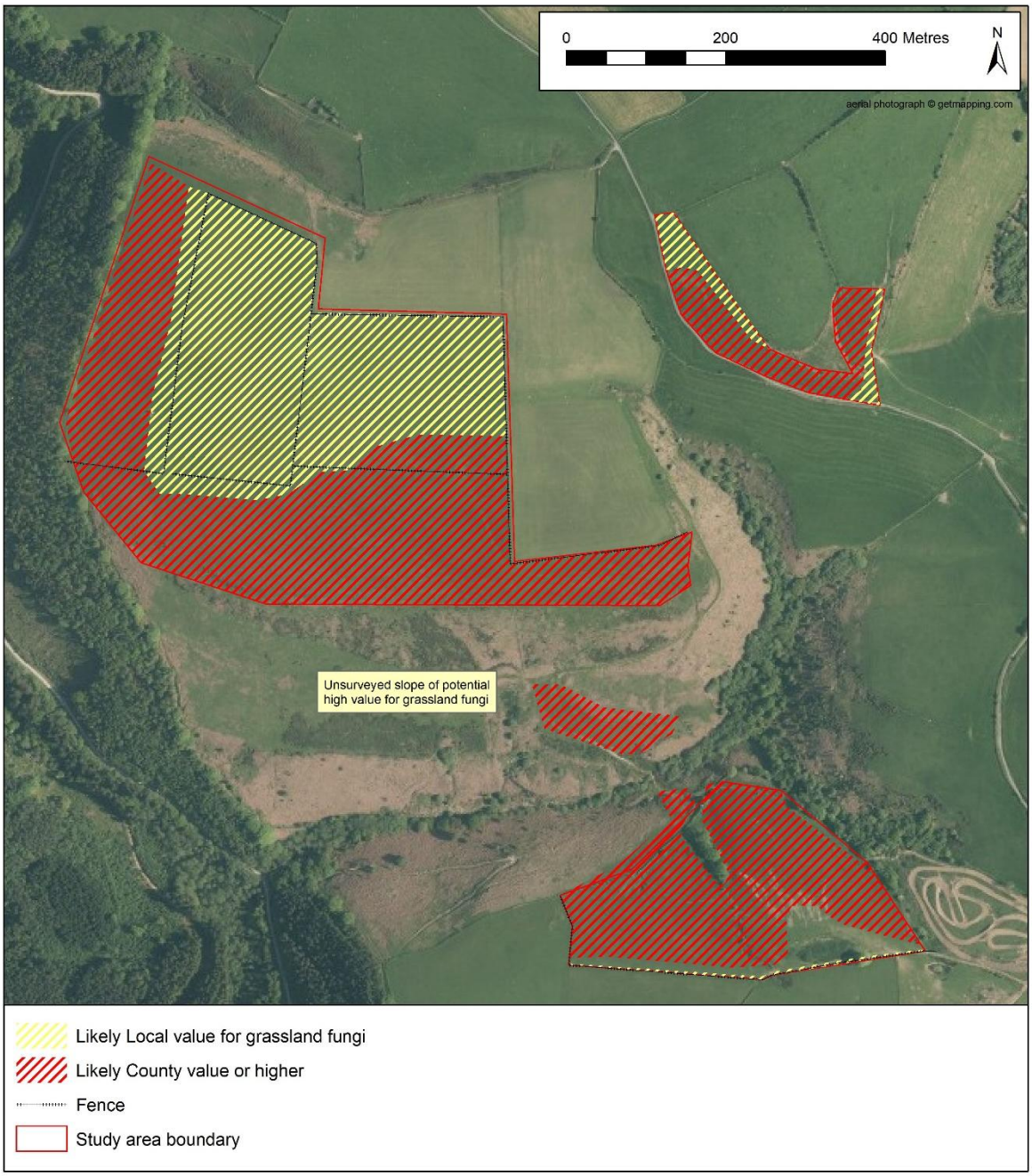

Figure 4. Summary of Likely Highest Value Fungi Habitat.

6.1.8 Grassland fungi are extremely vulnerable to ground disturbance, so even temporary construction access should be kept away from the high value areas for grassland fungi.

6.1.9 Developers often use tree-planting to off-set environmental impacts. However, tree-planting is very detrimental to grassland fungi and should not be considered as an option in this case.

6.1.10 If the developers are seeking opportunities for biodiversity benefit to off-set impacts elsewhere, there appears to be considerable potential to restore grassland habitat on the valley sides between the western and southern areas, which are currently becoming heavily encroached upon by Bracken and Gorse (**Image 6**). If undertaken carefully, clearance of this dense vegetation and restoration of grazing would be beneficial to grassland fungi, as well as flora and invertebrate diversity. Retaining patches of scrub and heath would minimise impacts on birds and reptiles. Similar grassland restoration could also be considered on slopes to the north of the western area, where Gorse is becoming dominant.

Image 6: ***The south-facing side of Mynydd Ty-talwyn is largely becoming overgrown by Bracken and Gorse, although a few patches of grassland are still present that support shorter grass and appear to have high value for grassland fungi and flora diversity. This could be a good opportunity for habitat restoration.***

Annex 1. Photographs from Site Survey

Most species seen during the survey were photographed. A small number have not been included; particularly the species that were not confirmed during the fieldwork and identified later by microscopy.

Clavaria acuta (Pointed Club).

Clavaria flavipes (Straw Club).

Clavaria fragilis (White Spindles).

Clavaria fumosa (Smoky Spindles).

Clavaria cf messapica (a pink club).

Clavulinopsis corniculata (Meadow Coral).

Clavulinopsis fusiformis (Golden Spindles).

Clavulinopsis helvola (Yellow Club).

Clavulinopsis umbrinella (Beige Coral). (An old, stunted specimen.)

Cuphophyllus flavipes (Yellowfoot Waxcap).

Cuphophyllus fornicatus (Earthy Waxcap).

Cuphophyllus pratensis (Meadow Waxcap).

Cuphophyllus virgineus (Snowy Waxcap).

Gliophorus laetus (Heath Waxcap).

Gliophorus irrigatus (Slimy Waxcap).

Gliophorus psittacinus (Parrot Waxcap).

Hygrocybe cantharellus (Goblet Waxcap).

Hygrocybe ceracea (Butter Waxcap).

Hygrocybe chlorophana (Golden Waxcap).

Hygrocybe citrinovirens (Citrine Waxcap).

Hygrocybe coccinea (Scarlet Waxcap).

Hygrocybe conica (Blackening Waxcap).

Hygrocybe glutinipes (Glutinous Waxcap).

Hygrocybe helobia (Garlic Waxcap).

Hygrocybe insipida (Spangle Waxcap).

Hygrocybe intermedia (Fibrous Waxcap).

Hygrocybe quieta (Oily Waxcap).

Hygrocybe reidii (Honey Waxcap).

Hygrocybe splendidissima (Splendid Waxcap).

Hygrocybe cf subpapillata (Papillate Waxcap). NB This was only found outside the southern study area. They were provisionally identified by microscopy, but the specimens were in poor condition. They are awaiting confirmation by DNA analysis.

Neohygrocybe ovina (Blushing Waxcap).

Porpolomopsis calyptriformis (Pink Waxcap).

Entoloma conferendum (Star Pinkgill).

Entoloma prunuloides (Mealy Pinkgill).

Entoloma serrulatum (Blue-edge Pinkgill).

Trichoglossum walteri (Short-spored Earth-tongue).

Dermoloma cuneifolium (Crazed Cap).

Camarophyllopsis schulzeri (Matt Fanvault).