



## Wylfa Newydd Project

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**Wylfa Newydd Project:  
A Grassland Fungi Survey of Key Habitats  
within the Wylfa Newydd Development Area**

**October – November 2017**



**Crimson Waxcaps, *Hygrocybe punicea* by Porth Wylfa, 10<sup>th</sup> October 2017**

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# **Wylfa Newydd Project: A Grassland Fungi Survey of Key Habitats within the Wylfa Newydd Development Area**



**Crimson Waxcap, *Hygrocybe punicea***

## **Executive Summary**

A mycological survey of grassland within the Wylfa Newydd Development Area (WNDA) was commissioned in autumn 2017 as part of the Environmental Impact Assessment (EIA) of the Wylfa Newydd Project. The specific aim of the survey effort was to determine the value of any grassland fungi assemblages present within the study area. The Grassland Fungi - the 'CHEGD' species are recognised as indicators of undisturbed, semi-improved or unimproved grassland and are now rare both in Britain and in Europe due to agricultural intensification. The survey work mainly concentrated on areas of grassland which had been identified as supporting grassland fungi from previous studies in 2012 and 2013, (Evans, 2013; Jacobs, 2017). These included coastal grassland, semi-improved inland fields and amenity grassland. This report details the methods and findings of three survey visits that were undertaken between October and early November 2017. Results are additionally discussed based on all survey results 2012 to 2017.

Three survey sites within the WNDA, (Coastal Grassland west of Porth Wylfa, Coastal Grassland east of Wylfa Head and Wylfa Head), were identified as of conservation value both for the total number of grassland fungi species recorded and for the value of the individual species as indicators of a quality habitat. *Hygrocybe punicea* an excellent indicator species of a quality, unimproved grassland was recorded on the three sites in addition to other good indicator species. Each of the three sites was found to support a sufficient number of *Hygrocybe* species to be ranked as of National Importance. Anglesey has relatively few sites which can support grassland fungi due to agricultural intensification and these high quality sites are worthy of conservation.

One further survey site, (The 'Outfall' area to the south of Wylfa Head), was found to be of Regional Importance and two sites, (Grassland to west and south-west of the Existing Power Station and Grassland along the entrance road to the Existing Power Station), were found to be of Local Importance from the 2017 survey. However, all three rank as of Regional Importance using the results of all survey effort 2012 to 2017. These three sites were considered to be of a lower conservation concern due to the small number of fruitbodies found, the lower value of the individual species and the limited areas where they were recorded.

Management recommendations are given to help conserve the grassland fungi populations identified in retained areas within the WNDA.

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## 1. Introduction

### 1.1 Overview

Jacobs UK Ltd (Jacobs) has been commissioned by Horizon to undertake a full ecological survey programme within the vicinity of the Wylfa Newydd Development Area (WNDA) including a Lower Plant Appraisal. This is part of the Environmental Impact Assessment (EIA) for the Wylfa Newydd project. This report summarises the methods and findings of a grassland fungi study between the 10<sup>th</sup> October and 10<sup>th</sup> November 2017 which was required as part of this programme. The grassland sites surveyed were identified from a baseline mycological study undertaken in 2013 by Jacobs, (Jacobs, 2017) and a survey in 2012, (Evans, 2013). Records collected during the 2012 and 2013 surveys are also included and discussed in this report. The study area - the WNDA including Wylfa Head is shown in Figure 1; the site areas surveyed in 2013 in Figure 2; the sites surveyed in 2017 in Figure 3.

### 1.2 Study Aims

The aim of the survey in 2017 was to identify any grassland fungi assemblages within the WNDA and to assess their conservation value. The majority of the areas of interest were semi-natural coastal grassland habitats which have probably had little agricultural intervention apart from grazing and had been identified as supporting grassland fungi from the previous survey effort. Most of the grassland further inland appears to be either agriculturally improved or has been disturbed by groundwork or archaeological excavations and is of limited mycological value.

### 1.3 Previous Survey Work

There have been two previous studies. A grassland fungi survey was commissioned by Arup in 2012, (Evans, 2013), concentrating on three site areas within the WNDA. Two of the sites were re-surveyed in 2017. A desktop study and survey was carried out in 2013, with additional records from 2016, (Jacobs, 2017), and this identified a number of grassland habitats within the WNDA as supporting grassland fungi. These were all re-surveyed during this study in 2017.

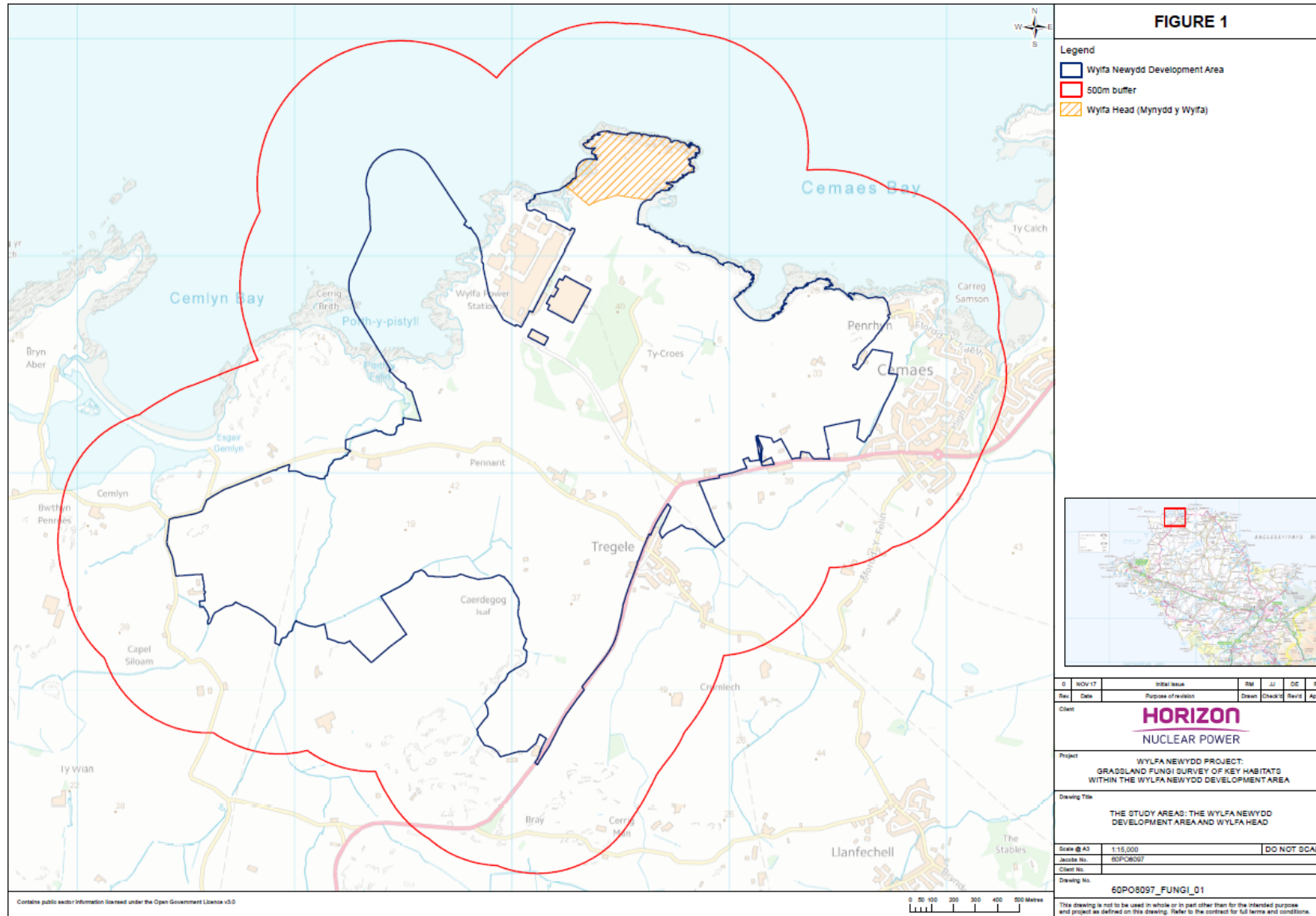
### 1.4 An Introduction to the Grassland Fungi: The 'CHEGD' species

The mycological surveys concentrated on the suite of Grassland Fungi, known as the 'CHEGD' species, which only thrive in undisturbed, semi-improved or unimproved grassland. This is typically fairly short, grazed or mown, well drained and often with a high moss content. This habitat and consequently the fungi it supports are now rare in much of lowland Britain as a result of agricultural intensification and both the habitat and fungi are of conservation concern, (Rotheroe, 1999). The **CHEGD** group comprises members of the genera *Hygrocybe* (Waxcaps) and *Entoloma* (Pinkgills) and the families Clavariaceae (Fairy Clubs) and Geoglossaceae (Earth Tongues). The **D** element includes the genera *Dermoloma*, *Porpoloma* and *Camarophyllopsis*. The CHEG profile was originally devised by Rotheroe, (2001) and he included *Porpoloma* and *Dermoloma*, now members of the D element, in with the *Hygrocybe* totals. This profile was adapted to the acronym CHEGD by Griffith *et al* (2006). The component groups are profiled in Appendix 1. The groups of fungi are unrelated but appear to have similar ecological requirements and are intolerant of agricultural improvement, fertilisers, ploughing, re-seeding, etc. They thrive in nutrient poor swards maintained by grazing or mowing and quickly disappear following any improvement and may not return for decades if ever, even if there is no further intervention. The colourful and charismatic *Hygrocybes*, called waxcaps because of the waxy texture of the fruiting bodies,

are the most visible component of the grassland fungi and have attracted the most attention. Good sites have become known as 'Waxcap Grasslands', (Rotheroe *et al*, 1996).



**Figure 1. The Study Areas: The Wylfa Newydd Development Area and Wylfa Head.**



## 1.5 Nomenclature of the Waxcaps (Hygrocybes)

Waxcap names used in this report follow those used by Boertmann, (1995, 2010), and as they appear in the British Mycological Society's FRDBI (Fungal Records Database of Britain and Ireland). Current leaflets including the Plantlife Identification Guide, (2014), also follow this nomenclature. However, following recent DNA analysis, the Hygrocybes have now been reclassified and several have been given new generic names, (Lodge *et al*, 2013). These are now shown in the Index Fungorum online database. The new names where applicable are given in Table 7 and in Appendix 2, along with the accepted English names, (Holden, 2003), for all the grassland fungi species recorded within the WNDA. Waxcaps are currently undergoing a revision based on DNA analysis and two new species of waxcap have already been identified, that were previously regarded as varieties of Parrot Waxcap *H. psittacina*, (Ainsworth, 2013). Similar work is currently looking at the fungi in the Blackening Waxcap *H. conica* complex using DNA analysis, (Cannon *et al*, 2013), and it may well be that further new species will be identified from their DNA profiles. This survey is thus, based on the current knowledge of the waxcaps.

## 1.6 Assessment of a Site

A grassland site can be assessed by a total count of the grassland fungi species recorded i.e. by its 'CHEGD' profile. The greater the number of CHEGD species present, the more important the grassland and this allows for a simple comparison between sites.

Other site evaluation methods use the number of Waxcap, *Hygrocybe* species recorded on single and/or multiple visits to classify the conservation value of a site on a geographic level. A site classification system was proposed by Rald, (1985) and was adapted by Vesterholt *et al*, (1999), Table 1, and the criteria are used in this report to evaluate each grassland area surveyed within the WNDA.

**Table 1. The site classification system of Rald, (1985), adapted by Vesterholt *et al*, (1999)**

Conservation Value	<i>Hygrocybe</i> spp. in one visit	Total no. of <i>Hygrocybe</i> spp.
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

Nitare (1988) also set out criteria for the Hygrocybes and included the other components of the CHEGD groups as well, in an attempt to assess the value of sites for all the grassland fungi that they support, Table 2. However, the former evaluation system of Rald using just the *Hygrocybe* component is more widely used.

**Table 2. The site classification system of Nitare (1988)**

Conservation Category	<i>Hygrocybe</i> spp. in one visit	<i>Entoloma</i> spp. in one visit	Clavariaceae spp. in one visit	Geoglossaceae spp. in one visit	<i>Dermoloma</i> spp. in one visit
Nationally important	11+	9+	6+	4+	2+
Regionally important	7-10	6-8	4-5	3	1
Local importance	5-6	4-5	3	2	
Of no importance	1-4	1-3	1-2	1	

Some species of grassland fungi however, are more tolerant of improvement than others, while there is a group of species that are only found on the best grasslands that have had the least or no improvement. McHugh *et al.*, (2001), ranked species of grassland fungi in to A, B and C classes with Class A species the very best indicators of quality grassland and they only occur where the land has perhaps had no disturbance for decades. Class B species are also reasonably good indicators but are not restricted to the best sites and are tolerant of some improvement while Class C species are the least valued as grassland quality indicators. These latter species e.g. *H. virginea* can tolerate low levels of fertiliser and they are the first *Hygrocybe* species to reappear if management practice is changed to a more natural grazing regime. Heavy fertiliser use, ploughing and re-seeding will however, result in a grassland devoid of any CHEGD fungi so the presence of any of these species is indicative of a less intensive management. This ranking system was modified by Evans and Aron, (2008) to include additional species and reflect the situation in north-west Wales and the experience and observations of the authors with respect to the relative values of the individual species; both for their rarity and as indicators of quality grasslands, Table 3. The ranking of individual species recorded can assist in assessing the value of a grassland habitat.

**Table 3. Indicator Classes of Grassland Fungi** (McHugh *et al* 2001; Evans & Aron 2008)

Class A	Class B	Class C
<i>Camarophylloopsis foetens</i>	<i>Clavaria fumosa</i>	<i>Clavaria acuta</i>
<i>Camarophylloopsis schulzeri</i>	<i>Clavaria straminea</i>	<i>Clavaria fragilis</i>
<i>Clavaria amoenoides</i>	<i>Clavulinopsis fusiformis</i>	<i>Clavulinopsis corniculata</i>
<i>Clavaria zollingeri</i>	<i>Clavulinopsis umbrinella</i>	<i>Clavulinopsis helvola</i>
<i>Entoloma anatinum</i>	<i>Entoloma chalybaeum</i>	<i>Clavulinopsis laeticolor</i>
<i>Entoloma asprellum</i>	<i>Entoloma clandestinum</i>	<i>Clavulinopsis luteoalba</i>
<i>Entoloma atrocoeruleum</i>	<i>Entoloma exile</i>	<i>Dermoloma cuneifolium</i>
<i>Entoloma bloxamii</i>	<i>Entoloma jubatum</i>	<i>Entoloma ortonii</i>
<i>Entoloma caesiocinctum</i>	<i>Entoloma porphyrophaeum</i>	<i>Entoloma conferendum</i>
<i>Entoloma corvinum</i>	<i>Entoloma serrulatum</i>	<i>Entoloma infula</i>
<i>Entoloma griseocyaneum</i>	<i>Geoglossum cookeianum</i>	<i>Entoloma papillatum</i>
<i>Entoloma lividocyanulum</i>	<i>Geoglossum glutinosum</i>	<i>Entoloma sericellum</i>
<i>Entoloma longistriatum</i>	<i>Geoglossum umbratile</i>	<i>Entoloma sericeum</i>
<i>Entoloma mutabilipes</i>	<i>Hygrocybe aurantiosplendens</i>	<i>Geoglossum fallax</i>
<i>Entoloma poliopus</i>	<i>Hygrocybe calyptriformis</i>	<i>Hygrocybe ceracea</i>
<i>Entoloma polito flavipes</i>	<i>Hygrocybe cantharellus</i>	<i>Hygrocybe chlorophana</i>
<i>Entoloma prunuloides</i>	<i>Hygrocybe conica</i> var. <i>conicoides</i>	<i>Hygrocybe coccinea</i>
<i>Entoloma corvinum</i>	<i>Hygrocybe flavipes</i>	<i>Hygrocybe conica</i> var. <i>conica</i>
<i>Entoloma formosum</i>	<i>Hygrocybe fornicata</i>	<i>Hygrocybe insipida</i>
<i>Entoloma longistriatum</i> var. <i>sarcitulum</i>	<i>Hygrocybe glutinipes</i>	<i>Hygrocybe irrigata</i>
	<i>Hygrocybe helobia</i>	<i>Hygrocybe pratensis</i>
<i>Entoloma mougeotii</i>	<i>Hygrocybe intermedia</i>	<i>Hygrocybe psittacina</i>
<i>Entoloma</i> sp. Section <i>Undati</i>	<i>Hygrocybe laeta</i>	<i>Hygrocybe quieta</i>
<i>Geoglossum atropurpureum</i>	<i>Hygrocybe marchii</i>	<i>Hygrocybe virginea</i>
<i>Hygrocybe citrinovirens</i>	<i>Hygrocybe miniata</i>	<i>Trichoglossum hirsutum</i>
<i>Hygrocybe colemanniana</i>	<i>Hygrocybe persistens</i>	
<i>Hygrocybe ingrata</i>	<i>Hygrocybe pratensis</i> var. <i>pallida</i>	
<i>Hygrocybe lacmus</i>	<i>Hygrocybe psittacina</i> var. <i>perplexa</i>	
<i>Hygrocybe nitrata</i>	<i>Hygrocybe reidii</i>	
<i>Hygrocybe ovina</i>	<i>Hygrocybe russocoriacea</i>	
<i>Hygrocybe punicea</i>	<i>Hygrocybe virginea</i> var. <i>ochraceopallida</i>	
<i>Hygrocybe spadicea</i>		
<i>Hygrocybe splendidissima</i>	<i>Hygrocybe vitellina</i>	
<i>Microglossum olivaceum</i>	<i>Ramariopsis kunzei</i>	
<i>Porpoloma metapodium</i>		

<i>Ramariopsis crocea</i>		
<i>Trichoglossum walteri</i>		

## 2. Methodology

### 2.1 Survey Dates

The survey was commissioned from early October 2017 with a total of three visits at one to three week intervals. The sites were visited on 10/10/2017, 30/10/2017 and 10/11/2017. It is generally assumed that the season for grassland fungi lasts from September to early/mid-November but this can vary considerably from year to year. Surveying following periods of rain and allowing at least a week between visits where possible will optimise the chance of recording any CHEGD species. Optimum fruiting of these fungi can be very weather dependent as they do not tolerate dry, windy or frosty weather very well and fruiting may be inhibited or any fungi present quickly desiccated or rotted. Individual members of the CHEGD suite may fruit at different times during the autumn season so a spread of dates should increase the number of species recorded. *Entoloma* species in particular and a few waxcap species like the Fibrous Waxcap, *Hygrocybe intermedia* tend to fruit early and may be absent later in the season, whilst a species like the Crimson Waxcap, *H. punicea* generally appears later. Due to the timing of the surveys in 2017 any early fruiting species may have been missed.

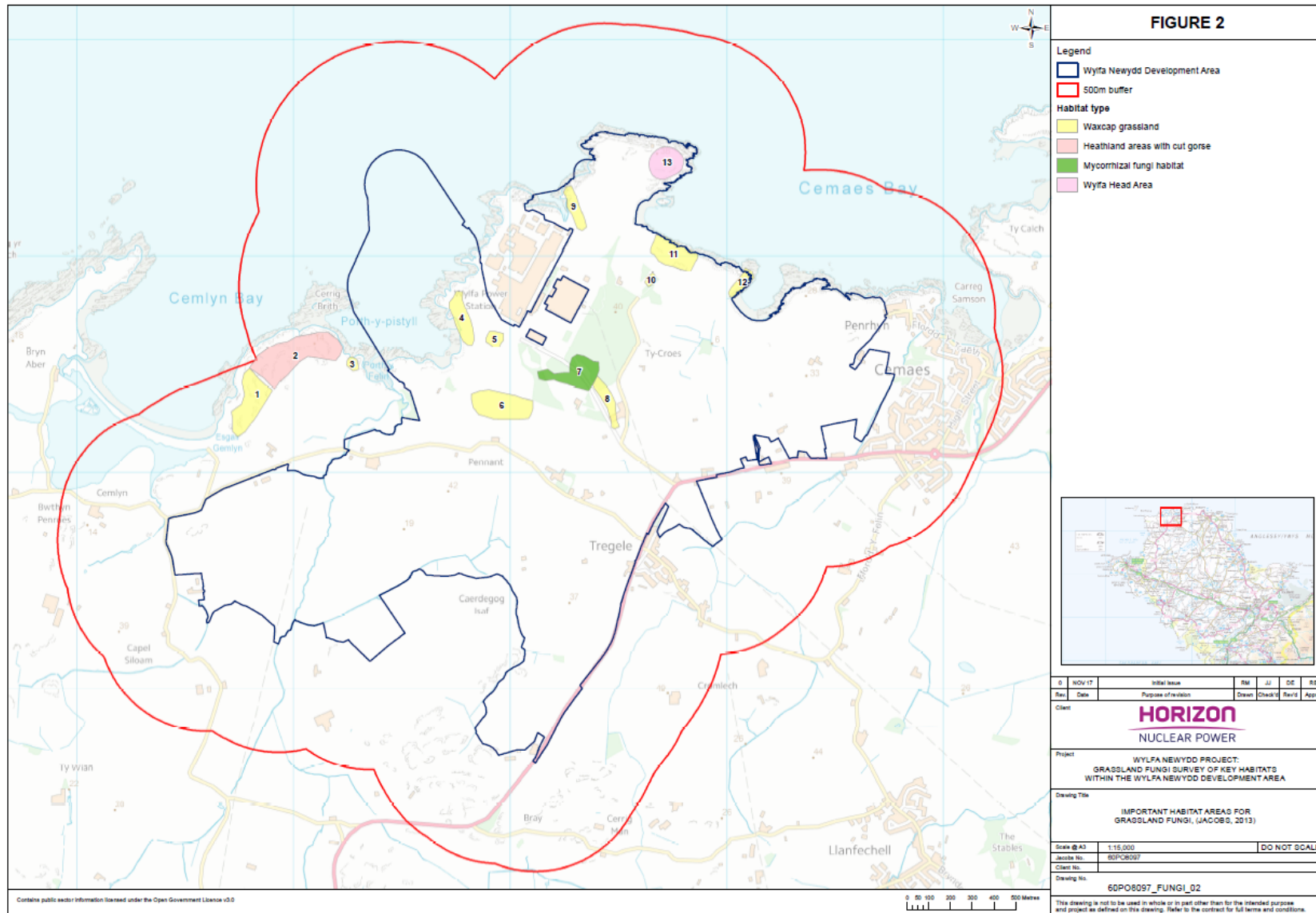
### 2.2 Survey Methodology

The selected site areas were surveyed on each visit by two experienced surveyors, with additional help from a Jacobs ecologist. A total of approximately seven hours were spent between the survey areas on each occasion. The aim was to look at all of each site area but with more recording effort concentrated on areas of suitable habitat. These are typically areas of open, fairly short, stock-grazed, grassland, including short coastal grassland. Areas of rank or matted and longer vegetation, largely due to less grazing pressure, are usually less suitable and these areas were only looked at briefly. Surveying consisted of walking slowly over survey areas to visually locate any CHEGD species. Many of these were identified directly in the field by an experienced mycologist, using their macroscopic features alone. In general no count was made of an individual species but relative abundance was noted. Any specimens requiring identification or confirmation were collected in partitioned and numbered plastic boxes. These were later identified or confirmed using keys and/or microscopic features of spores or cellular structures using a light microscope up to 1,000x magnification.

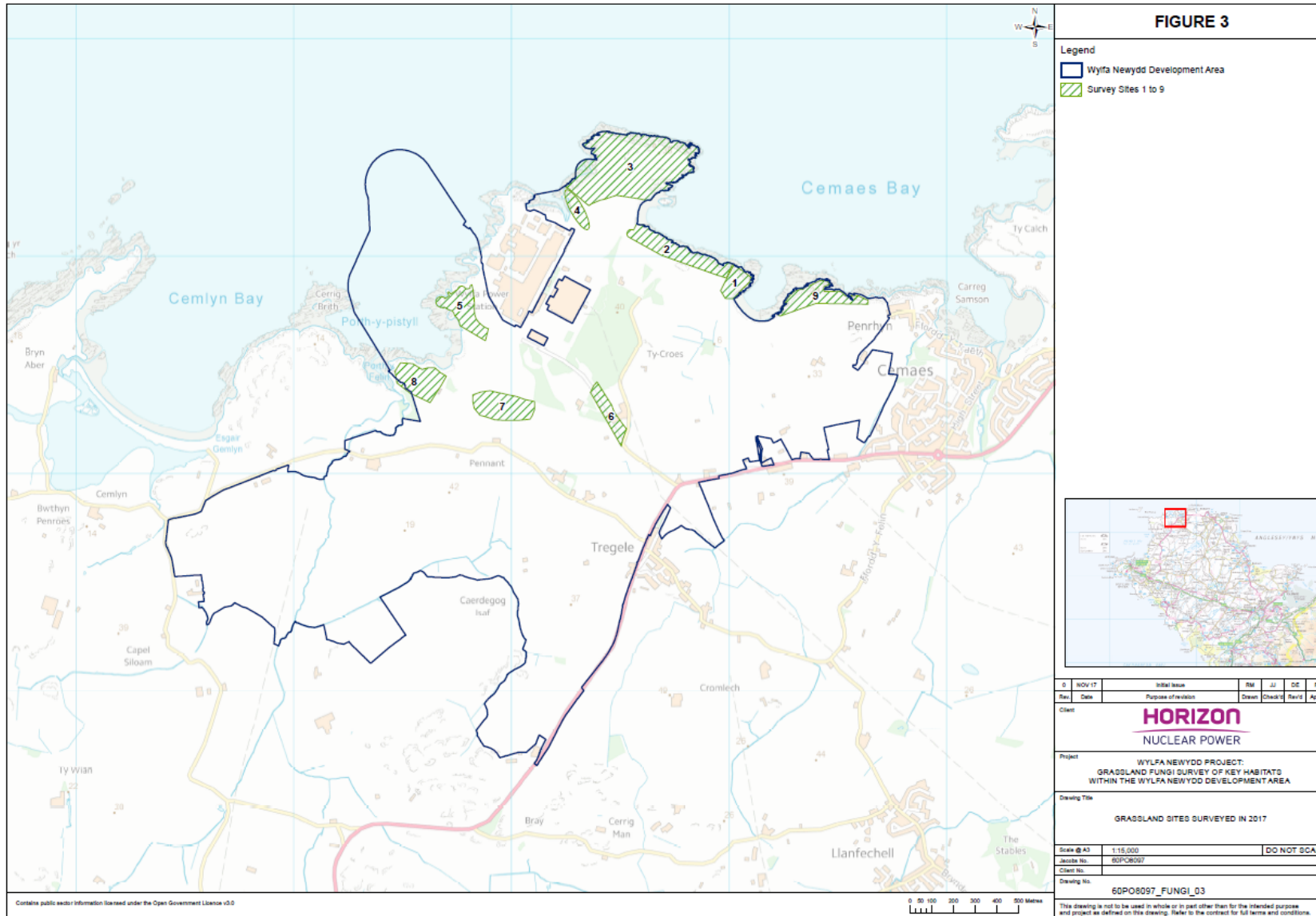
Identification references used included Boertmann, (2010); Noordeloos, (1992, 2010); Vesterholt, (2002); Knudsen *et al*, 2008; Spooner, (2005).

OS grid references were taken with a GPS to enable relocation of sites and the richest areas for fungi and detailed 10 figure grid references were taken of any significant species, Table 4 and Appendix 3. Photographs of some representative and significant species were taken as a record and for illustration purposes and representative photographs were taken of the sites. General observations were made including sward length, vegetation cover and management.

Figure 2. Important Habitat Areas for Grassland Fungi, (Jacobs, 2017).



**Figure 3. Grassland Survey Sites surveyed in 2017.**





### 2.3 Site Area Descriptions: Survey Sites 1 to 9.

Location of survey sites is shown in Figure 3 and an average OS grid reference for each site in Table 4.



Site 1: Rocky Slopes above Porth Wylfa



Site 1: Grassland 'Valley' and Slopes

#### Grassland Survey Site 1.

Coastal Grassland west of Porth Wylfa - This site area was identified in 2013 as being rich for grassland fungi, (Jacobs, 2017, habitat area 12, Figure 2) and consists of grass and gorse covered rocky slopes immediately to the west of Porth Wylfa and a grassland 'valley'. The vegetation here was mainly fairly short, around 10-20cms. The grassland appeared unimproved and in the 'valley' was a mixed, fairly herb-rich sward with *Trifolium pratense*, *Lotus corniculata*, *Centaurea nigra* and *Rumex acetosa* with *Agrostis* and *Festuca* grasses. The most productive areas for grassland fungi were the slopes above Porth Wylfa.



Site 2: Coastal Grassland



Site 2: Coastal Grassland and Slopes

#### Grassland Survey Site 2.

Coastal grassland to the east of Wylfa Head - This is defined as the coastal strip running west from Site 1 and includes the coastal grassland SE of Wylfa Head, (Jacobs, 2017, habitat area 11, Figure 2). This area of semi-natural coastal grassland through which the coastal path also runs is considered as a single site in this survey. The vegetation here was typical of coastal grassland, *Agrostis*, *Festuca*, *Plantago* etc. and grassland fungi were found all along the length of the coast and inland to approximately 20 (30) metres. Further inland the grassland was herb-rich with *Rumex acetosa*, *Hypochaeris*, *Ranunculus*, *Trifolium*, *Heracleum*, *Lolium* and *Agrostis* and was lush, indicating that it could have been improved to some extent e.g. with fertiliser input or previous disturbance; this area was mainly very poor for grassland

fungi. The coastal grassland is managed by sheep grazing and sheep would normally have access to the whole area although there was some temporary fencing in place at the time of the survey. There was no stock present throughout the survey period and the whole area had not been grazed recently, thus herbage length was not optimum for grassland fungi making recording difficult in places. Other adjacent inland areas had been disturbed for archaeological investigations or machinery movement and were unsuitable.



Site 3: North-eastern Slopes



Site 3: Under-grazed Grassland

### Grassland Survey Site 3.

Wylfa Head - The headland lies to the north of the WNDA, to the north-east of the existing Wylfa Power Station. It is presently a Local Nature Reserve and the Anglesey Coastal Path passes through it. Wylfa Head is an open, exposed coastal site with a mixture of semi-natural acid grassland, shorter coastal grassland and heath. There is some evidence of possible agricultural improvement in the southern half, but previous management is not known. The most productive areas for grassland fungi on Wylfa Head were the elevated areas to the east and north-east of the headland. Herbage length here was shorter despite a lack of grazing. Much of the south-eastern part of the headland, to the sides of the main track, and the central part were very under-grazed with long matted, thick vegetation including *Agrostis*, *Festuca*, *Plantago lanceolata*, *Rumex acetosa* and some bracken and were thus unsuitable at present for recording grassland fungi. Herbage length was over 30cms. in places. Grazing however, was reinstated on Wylfa Head just prior to the final survey on 10<sup>th</sup> November. The coastline around the north of the headland and immediately inland also supported a range of species. Wylfa Head was surveyed in 2012, (Evans, 2013), and a few species were noted in 2016, (Jacobs, 2017, habitat area A (13), Figure 2).



Site 4: Coastal Grassland, Seaward of Fence



Site 4: Inland of Fence



#### Grassland Survey Site 4.

The 'Outfall' area to the south of Wylfa Head - A small coastal site of thin soil and very short grass and coastal vegetation to the south of Wylfa Head and immediately north-east of the Existing Power Station, (Jacobs, 2017, habitat area 9, Figure 2). The coast is fenced off at this point from the headland and both the seaward and inland sides of the fence were surveyed.



Site 5: Rocky Mound



Site 5: Long, Ungrazed Vegetation

#### Grassland Survey Site 5.

Grassland to west and south-west of the Existing Power Station - This site was surveyed in 2013 (Jacobs, 2017, habitat areas 4 and 5, Figure 2), and in 2012, (Evans, 2013, Station West, Porth y Gwartheg). The survey site lies to the west of the Existing Power Station and is separated from the station site by a stone wall. The majority of the site is currently unsuitable for grassland fungi with long (over 20-30 cms.), tussocky, rank vegetation, including the grasses *Agrostis*, *Dactylis*, *Festuca*, *Molinia* and *Lolium* along with herbs *Plantago* ssp., *Rumex* ssp., *Centaurea*, *Senecio jacobaea* and *Cirsium* ssp. The only areas supporting a few grassland fungi were a couple of small rocky mounds with very short vegetation. Part of the survey site has had previous disturbance during the construction of the Existing Power Station but the coastal grassland is probably undisturbed. This survey site appeared to have had no grazing for some time and due to the herbage length a proper assessment was difficult.



Site 6: Entrance Road Verges and Banks

#### Grassland Survey Site 6.

By Existing Power Station Entrance Road - This site included the verges and associated banks along the entrance road, (Jacobs 2017, habitat area 8, Figure 2), and the amenity area of grassland to the south of the Reception block was also surveyed. The grassland here is

similarly managed. All grassed areas are kept very short by regular mowing and are presumed to be improved or semi-improved and to have been probably disturbed in the past during construction of the entrance roads etc.

### **Grassland Survey Site 7.**

Field with rocky outcrop SW of Station - This site was surveyed in 2013, (Jacobs, 2017, habitat area 6, Figure 2). The fields here appeared improved and there was additional disturbance from groundworks and movement of machinery.



**Site 7: Improved and Disturbed Fields**



**Site 8: Field adjacent to Cestyll Garden**

### **Grassland Survey Site 8.**

Fields to the east and adjacent to Cestyll Garden - These fields appeared to have had some improvement. There was no stock on the fields at the time of the surveys and they were considered under-grazed with vegetation at over 20cms. making surveying for grassland fungi difficult. The site was surveyed on the 10/10 and 10/11 and had not been surveyed in a previous study.

### **Grassland Survey Site 9.**

Coastal Grassland on Park Lodge Estate - This is an area of coastal grassland at the eastern end of the WNDA where the grassland appears unimproved or semi-improved and could therefore, possibly support grassland fungi. However, the vegetation was very long and rank due to a lack of grazing and no grassland fungi were found. This survey site was only visited on the 30/10 and had not been surveyed in any previous study.

## **3. Results.**

### **3.1 General**

Grassland fungi were recorded on all three survey visits, with the survey visits of 10/10 and 30/10 being the most productive. The combined results of the three surveys for each survey site are shown in Table 7 and a summary of their CHEGD profiles in Table 4. Full results for individual survey sites are shown in Tables 8 to 13.

A total of 42 species of grassland fungi, the CHEGD species, were recorded between the grassland habitats of the WNDA. This comprised 7 Clavarioids, 17 Hygrocybes, 13 Entolomas, 3 Geoglossums, 1 *Dermoloma* and 1 *Camarophylloopsis*, (C7, H17, E13, G3, D2). All species recorded are briefly described, including where they were recorded during the surveys and a note on their National Status in Appendix 2.

The Grassland Survey Sites 1, 2 and 3 were identified as having rich assemblages of the grassland fungi. Sites 4, 5 and 6 had lower numbers and sites 7, 8 and 9 were negative.



**Table 4. A Summary of Grassland Survey Sites surveyed in 2017, their location and CHEGD profile**

Grassland Survey Site	Location	Average OS Grid Reference	CHEGD* Profile
1	Coastal Grassland, W of Porth Wylfa	SH360938	C5,H16,E10,G1,D0
2	Coastal Grassland, E of Wylfa Head	SH358940	C5,H16,E10,G1,D0
3	Wylfa Head (rich area for fungi)	SH357944	C6,H15,E10,G1,D2
4	'Outfall' area, S of Wylfa Head	SH352942	C1,H7,E2,G1,D1
5	Grassland to S and W of Existing Power Station	SH346934	C0,H8,E2,G0,D0
6	Grassland along entrance road to Existing Power Station	SH354932	C1,H4,E0,G0,D1
7	Field and rocky outcrop SW of Existing Power Station	SH349937	C0,H0,E0,G0,D0
8	Fields adjacent to and E of Cestyll  Garden	SH345933	C0,H0,E0,G0,D0
9	Coastal Grassland on Park Lodge Estate	SH344938	C0,H0,E0,G0,D0

\*CHEGD Key: C = Clavariaceae, H = *Hygrocybe*, E = *Entoloma*, G = Geoglossaceae, D = *Dermoloma*

### 3.2 Results for Individual Survey Sites



Heath Waxcap, *Hygrocybe laeta*



Honey Waxcap, *Hygrocybe reidii*

#### Grassland Survey Site 1. (Table 8, Figure 4).

This relatively small site supported a good range of the CHEGD species including 16 species of *Hygrocybe*, with 13 recorded on a single visit on 10/10. Most significant was the presence of the Class A Crimson Waxcap, *Hygrocybe punicea* recorded on each visit with two groups of over 20 and 60 individuals seen on the steeper banks to the west of Porth Wylfa on the 30/10. The location of these populations is shown in Appendix 3 and Figure 4. Some species of *Hygrocybe* can tolerate a small amount of disturbance and low levels of fertiliser, but a few including this species are completely intolerant of any improvement and will quickly disappear following application of fertiliser, ground disturbance or similar. They are thus regarded as excellent indicators of high quality unimproved or semi-improved grasslands. The uncommon Goblet Waxcap, *Hygrocybe cantharellus* was recorded in low numbers on each visit including an unusual yellow form of this normally red coloured species. The small red, scurfy capped Vermillion Waxcap, *Hygrocybe miniata* was recorded on the 30/10 and was only recorded on this site, but it has been recorded previously on Site 3, (Evans, 2013). These two species along with the Honey Waxcap, *H. reidii*, Heath Waxcap, *H. laeta* and Cedarwood Waxcap, *H. russocoriacea* all recorded on Site 1 are regarded as medium, Class B indicator species. 10 species of *Entoloma* were recorded including *E. asprellum*, *E. formosum* and *E. prunuloides* which are also regarded as Class A indicator species of a

quality habitat. Several groups of the attractive Golden Spindles, *Clavulinopsis fusiformis*, a Class B indicator species were present on the banks.



Goblet Waxcap, *Hygrocybe cantharellus*



Golden Spindles, *Clavulinopsis fusiformis*

### Grassland Survey Site 2. (Table 9)

Grassland fungi were recorded intermittently along the whole length of the coastal grassland of Site 2. Most of the fungal interest was in the first 20 metres from the coastline with few species and individuals recorded further inland. The coastal grassland appeared unimproved or semi-improved and was mainly undisturbed, whereas further inland there had been more disturbance including machinery movement and archaeological workings. Only a few individuals of common species more tolerant of some improvement or disturbance were recorded outside the first 20 metres including Snowy Waxcap, *H. virginea* and Meadow Waxcap, *H. pratensis*. A total of 32 species were recorded along the coastal strip over the three survey visits, (C5, H16, E10, G1, D0). This included 16 *Hygrocybe* species with 15 on a single visit on 30/10. The Class A indicator species *H. punicea* was recorded towards the western end of the site on the slopes above the coastline, with a group of 10 individuals seen on 30/10. Locations of the populations are shown in Appendix 3 and Figure 4. A group of the attractive Ivory Coral, *Ramariopsis kunzei* was recorded nearby on the 10/11. This is considered to be a very good indicator species. Other species of note include *Entoloma asprellum*, a Class A indicator species of *Entoloma* and groups of *C. fusiformis*. A single fruitbody of the Class B indicator species Yellow Foot Waxcap, *H. flavipes* was recorded on a grassy bank on the second visit. This species and *R. kunzei* were only recorded on Site 2.



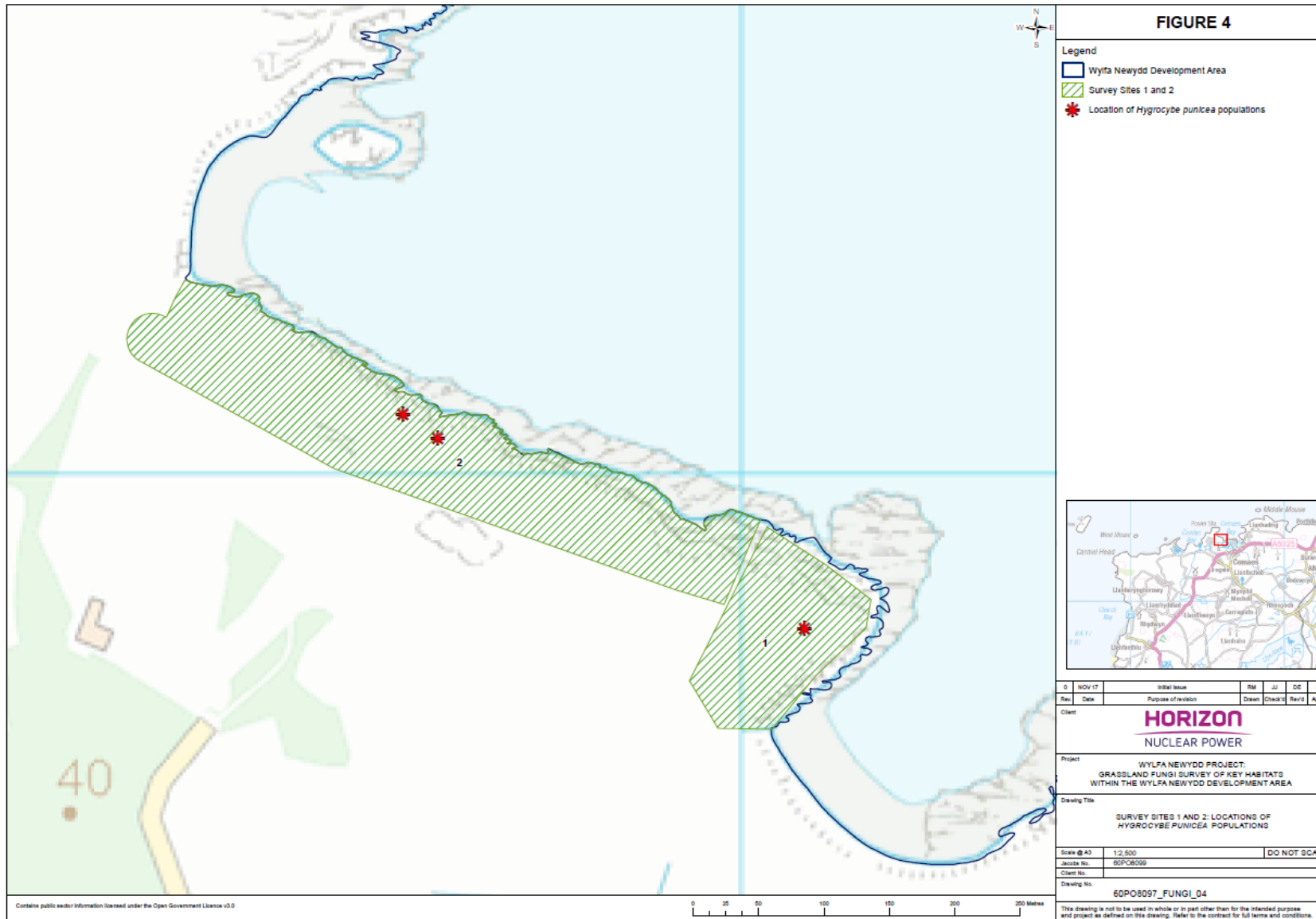
Golden Waxcap, *Hygrocybe chlorophana*



Ivory Coral, *Ramariopsis kunzei* (Site 2)



Figure 4. Survey Sites 1 and 2: Locations of *Hygrocybe punicea* populations.



### Grassland Survey Site 3. (Table 10)

Wylfa Head had not been recently grazed prior to the surveys, making surveying and locating fungi more difficult. (Sheep were reinstated just prior to the final survey). The richest areas for grassland fungi were the eastern and north-eastern sides of the headland and to a lesser extent the coastal fringes and a total of 34 CHEGD species were recorded over the three visits, (C6, H15, E10, G1, D2). A total of 15 species of *Hygrocybe* were found with a maximum of 14 on a single visit on 30/10. The *Hygrocybes* included the typical heathland species; Scarlet Waxcap, *H. coccinea*; Golden Waxcap, *H. chlorophana*; Heath Waxcap, *H. laeta*; Butter Waxcap, *H. ceracea*; and Parrot Waxcap, *H. psittacina*. These were all fairly widespread on the eastern and northern sides of the headland. The majority of these are not considered to be indicators of the highest quality grassland. The strong smelling Cedarwood Waxcap, *H. russocoriacea* which favours shorter coastal grassland, was found in patches all-round the coastal headland and is considered to be a medium indicator species. The Class A Crimson Waxcap, *H. punicea* was recorded on the north-eastern slopes on the 2<sup>nd</sup> and 3<sup>rd</sup> survey visits. Three groups were noted including one of over 20 individuals on the 30/10. The locations of these populations are shown in Figure 5 and Appendix 3. This species often appears later in the season and although not uncommon it is an excellent indicator species of a quality grassland. Other species of note recorded on the north-eastern slopes include the uncommon Matt Fanvault, *Camarophyllopsis schulzeri* and the Pinkgills *Entoloma anatinum*, and *E. formosum*, all regarded as Class A indicator species. Three Class B *Entolomas* were also recorded including Sepia Pinkgill *E. jubatum*. Several groups of the Class B Golden Spindles *Clavulinopsis fusiformis*, were seen growing on the steep north-eastern slopes. The richest part of the Wylfa headland for grassland fungi is shown in Figure 5.



Cedarwood Waxcap, *Hygrocybe russocoriacea*



Parrot Waxcap, *Hygrocybe psittacina*



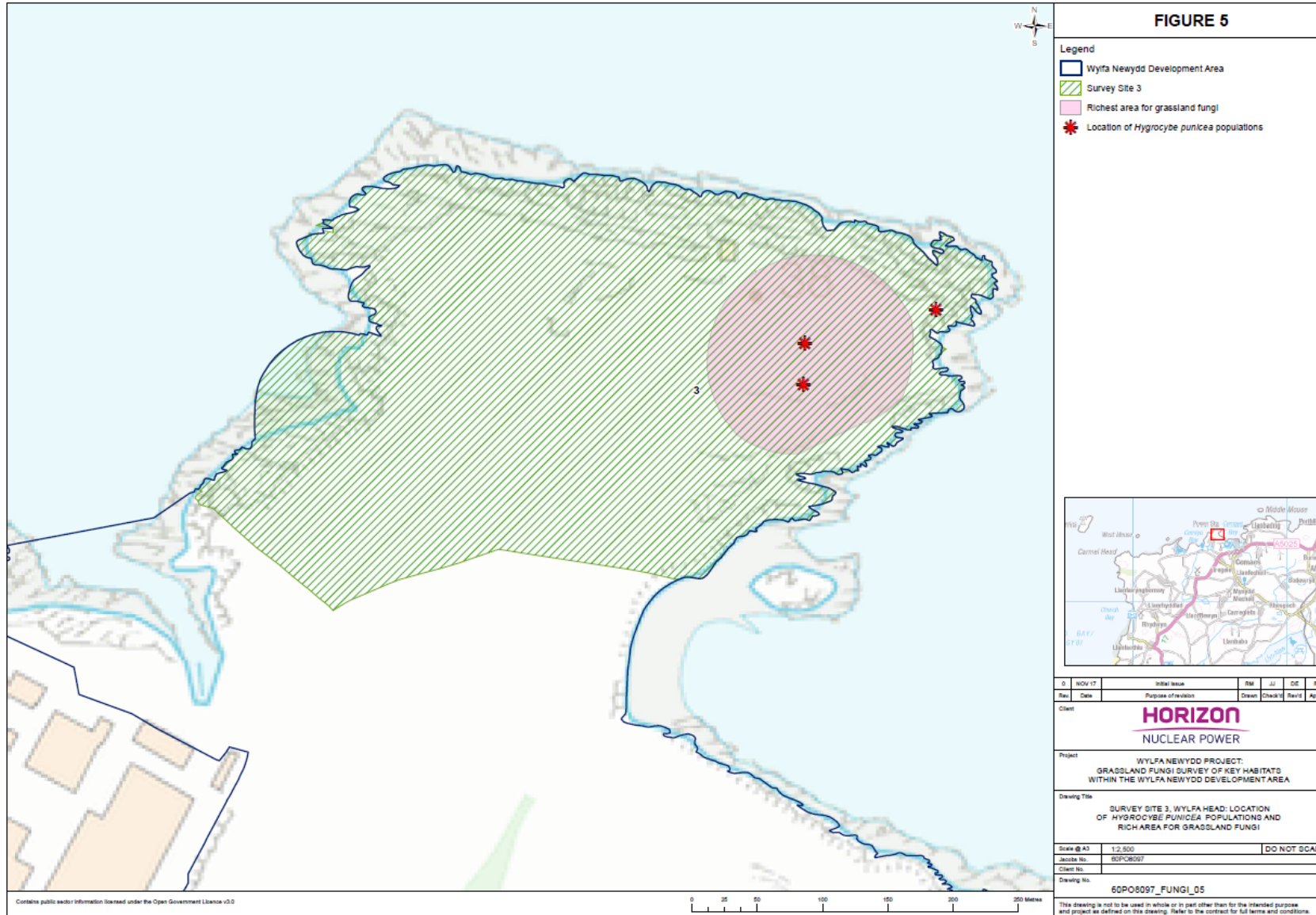
Sepia Pinkgill, *Entoloma jubatum* (Sites 1 and 3)



Matt Fanvault, *Camarophyllopsis schulzeri* (Site 3)



**Figure 5. Survey Site 3, Wylfa Head: Location of *Hygrocybe punicea* populations and rich area for Grassland Fungi.**



#### Grassland Survey Site 4. (Table 11)

This site was relatively poor in terms of numbers of individuals and the range of species present. 12 species of grassland fungi were recorded, (C1, H7, E2, G1, D1), with seven *Hygrocybe* species and a maximum of six on a single visit on 10/10. Most fungal records were based on either a single individual or very few fruitbodies, although there were larger groups of the Cedarwood Waxcap, *H. russocoriacea* which seems to favour the very short, exposed, coastal grassland as occurs at this point. All grassland fungi species recorded were fairly common species and no species of particular note was found.

#### Grassland Survey Site 5. (Table 12)

This site had not been recently grazed and herbage length was greater than 20-30cms. in parts and very tussocky making surveying difficult. A couple of small rocky mounds where the soil was thin and the vegetation length was shorter proved the most productive, however, very few individuals were found and most records are based on a single fruitbody. The coastal grassland was similarly very long and only a single Meadow Waxcap was found on the northern edge. A total of eight *Hygrocybe* species were recorded with five on a single visit on 30/10. The only additional species recorded were two common Entolomas, (C0, H8, E2, G0, D0).



Meadow Coral, *Clavulinopsis corniculata*



Meadow Waxcap, *Hygrocybe pratensis*

#### Grassland Survey Site 6. (Table 13)

The entrance road verges and banks were surveyed on the 2<sup>nd</sup> and 3<sup>rd</sup> visits. The grass length on the verges was very short and they appeared to have been cut recently. No grassland fungi species were found apart from a few Meadow Coral, *Clavulinopsis corniculata* and a Meadow Waxcap, *H. pratensis* was reported on a bank, (pers. comm. D. Harries). The amenity grassed areas around the main buildings supported a few very common species; Snowy Waxcap, *H. virginea*; Butter Waxcap, *H. ceracea*; Blackening Waxcap, *H. conica*; and Crazy Cap, *Dermoloma cuneifolium*. A total of six species were recorded, (C1, H4, E0, G0, D1).

#### Grassland Survey Sites 7, 8 and 9.

These sites all proved negative for grassland fungi during this survey. The grassland of Site 7 appeared improved to some extent and had additionally had some disturbance from vehicular movement and groundworks. The fields of Site 8 also appeared lush and somewhat improved and had not been grazed or cut recently. The coastal grassland of Site 9 could have some potential to support grassland fungi and appeared unimproved or semi-natural, however, an absence of grazing for a considerable period resulting in long, rank vegetation made a proper assessment impossible.





Scarlet Waxcap, *Hygrocybe coccinea*



Slimy Waxcap, *Hygrocybe irrigata*

#### 4. Discussion

This survey effort in 2017 has identified three site areas which support grassland fungi assemblages of conservation value, both in the total number of species recorded and in the value of some of the individual species as indicators of a quality grassland habitat. These are Grassland Survey Sites 1, 2 and 3. No individual fungal species recorded on any site within the WNDAs has an elevated conservation status i.e. on the IUCN Red List of threatened species, the RDL of threatened British Fungi, UK BAP priority species or Section 7 of the Environment Act (Wales) 2016. However, Survey Sites 1, 2 and 3 all support the Class A Crimson Waxcap, *H. punicea*, indicative of quality, unimproved or semi-natural grasslands in addition to Class A *Entoloma* species, a Class A Clavarioid on Site 2 and a Class A *Camarophyllopsis* spp. on Site 3. *H. punicea* in particular is known to occur exclusively on grasslands where many other *Hygrocybe* species occur and which are most likely to have a very long continuity as grassland without disturbance, (Boertmann, 2010).



Site 1 bank with *Hygrocybe punicea*



Crimson Waxcap, *Hygrocybe punicea*

The *Hygrocybe* species are the most prominent and usually the most abundant component of the suite of grassland fungi and a count is often sufficient to evaluate a site. The System of Rald and Vesterholt *et al* (Table 1), can be used as a guideline to rate the conservation value of a site based on the number of *Hygrocybe* species recorded on a single or over several visits. Using these criteria Survey Sites 1, 2 and 3 rank as probably of National Importance, Table 5. (The threshold for National Importance is regarded as 17 *Hygrocybe* species and 11 on a single visit). It is suggested that accumulated species counts should be over at least three years, (not necessarily consecutive) to ascertain the full value of a site. The grassland fungi exist in the soil as mycelia, i.e. masses of branching, thread-like hyphae and at present there

is no cost effective method available to assess and identify the fungal mycelia present in a grassland and we have to rely on the visible presence of fruiting bodies to record a species, (Griffith *et al*, 2004; Griffith *et al*, 2011). Fruiting body production can be sporadic and they may not be produced every year or may persist for only a few days, thus it can be predicted that further species of *Hygrocybe* and of the other groups may be present on all three sites and could be recorded in future seasons.

**Table 5. Evaluation of Grassland Survey Sites in 2017 for their Waxcap Conservation Value**

Grassland Survey Site	<i>Hygrocybe</i> spp. in one visit	Total no. of <i>Hygrocybe</i> spp.	Conservation Value
1	13	16	Nationally important
2	15	16	Nationally important
3	14	15	Nationally important
4	6	7	Regionally Important
5	5	8	Locally important
6	2	4	Locally important

In addition to the surveys in 2017 there are some data from previous survey effort for Sites 1 and 2, (Jacobs, 2017), and for Site 3, (Evans, 2013; Jacobs, 2017). All the survey results for Sites 1, 2 and 3 are shown in Tables 14 - 16 and the evaluation of the sites using the combined number of *Hygrocybes* recorded is shown in Table 6. The number of *Hygrocybe* species for Sites 1 and 2 is unchanged; the number for Site 3 is increased to 17 reinforcing its Nationally Important conservation value.

**Table 6. Evaluation of Grassland Survey Sites for their Waxcap Conservation Value combined results of Surveys in 2012, 2013 (2016) and 2017**

Grassland Survey Site	<i>Hygrocybe</i> spp. in one visit	Total no. of <i>Hygrocybe</i> spp.	Conservation Value
1	13	16	Nationally important
2	15	16	Nationally important
3	14	17	Nationally important
4	6	7	Regionally Important
5	10	11	Regionally Important
6	7	8	Regionally Important

All three sites have additional good populations of both Clavarioid species and *Entoloma* species summarised in Table 4. Using the ranking system of Nitare in Table 2, Site 1, (CHEGD profile: C5, H16, E10, G1,D0), ranks of National Importance for its *Entolomas* and Regionally Important for its Clavarioids; Site 2, (CHEGD profile: C5,H16,E10,G1,D0), ranks

of National Importance for its Clavarioids and Site 3, (CHEGD profile: C6,H15,E10,G1,D2), ranks Nationally Important for its Entolomas and Clavarioids.

The JNCC suggested threshold values for selection of sites as SSSI candidates is currently 12 species of *Hygrocybe* on a single visit and 18 on multiple visits, (Genney *et al*, 2009).

Thresholds for the other groups are also suggested and can be used in addition to the *Hygrocybe* count. (These are: Clavariaceae 5, *Entoloma* 12, Geoglossaceae 3, *Dermoloma* 2). The three survey sites would therefore not meet these criteria at present.

Other sites surveyed within the WNTDA were of lower conservation value.

Survey Site 4 had seven species of *Hygrocybe* recorded with six on a single visit and using the criteria of Rald and Vesterholt it ranks as of Regional Importance, Table 5. However, most species were represented by a single or very few individuals indicating small populations and most are common, Class C indicator species plus one Class B species, *H. russocoriacea*. All species with the exception of the common Hairy Earthtongue, *Trichoglossum hirsutum* were recorded at other locations on the Wylfa headland. No additional species were recorded in 2013, (Jacobs, 2017), Table 17.

Survey Site 5 had eight *Hygrocybe* species with five on a single visit ranking it of Local Importance from the 2017 survey, Table 5. This site was generally rated as of low value with most species recorded limited to two small rocky areas with shorter grass and all records were made from single individuals. No Class A indicator species were recorded and the majority of species found were lower value Class C species suggesting a site of only low to moderate value. The site was known to have been disturbed historically during the building of the Existing Power Station and this would explain the lack of high value indicator species. Species of lower value are the first species to return to sites and it is suggested that species like *H. virginea*, *H. conica* and a few others may appear in fields abandoned for about 10 years, (Bruun & Ernæs, 1993). Conversely Class A species like *H. punicea* once lost will probably never return. Site 5 had not been grazed recently and the long, rank, tussocky vegetation made surveying difficult so it was impossible to make a full assessment of the site area or its potential in 2017. Site 5 was also surveyed in 2012, (Evans, 2013) and in 2013, (Jacobs, 2017) and results from all surveys are shown in Table 18. 10 species of *Hygrocybe* were recorded in 2012 bringing the cumulative total from all surveys to 11 species with a maximum of 10 on 27/10/12 elevating its conservation value to of Regional Importance according to Rald & Vesterholt, Table 6. However, due to the very minimal extent of the suitable habitat present on the site and the value of the individual species this site is assessed as of low conservation concern based on the findings of the surveys to date. It is possible that some of the undisturbed coastal grassland might be a suitable habitat for some grassland fungi but this was impossible to determine due to lack of grazing.

Survey Site 6 had a very small number of grassland fungi species present on the two survey visits and these were of low quality value, typical of a semi-improved or slightly improved grassland and a fairly common finding on road verges. However, the verges had been recently mown at the time of the surveys which may have influenced the survey findings. With four *Hygrocybe* species recorded the site area ranks as of Local Importance using the Rald and Vesterholt system, Table 5. This site was also surveyed in 2013, (Jacobs, 2017) when seven species of *Hygrocybe* and the Class B Clavarioid Smoky Spindles, *Clavaria fumosa* were recorded. All results are shown in Table 19 and with a combined total of eight *Hygrocybe* species the site is elevated to of Regional Importance, Table 6. This site is considered of limited value with only lower value species present but should be conserved if possible and further species may be recorded in the future.

Survey Sites 7, 8 and 9 all proved negative for fungi during this survey. Site 7 appeared to be improved grassland and had been additionally disturbed by machinery movement in parts. The survey in 2013, (Jacobs, 2017, habitat area 6), identified three species *C. corniculata*, *H. conica* and *H. coccinea*. These three species are of low indicator value and were only present

on a rocky outcrop and not within the main grassland. This site area is considered of very low value due to the improved nature of the grassland.

Similarly, Survey Site 8 appeared to be improved and of limited value for grassland fungi. It can be expected that a few lower value species of *Hygrocybe* like *H. virginea* or *H. pratensis* might occur within such grassland but it would not support the higher value indicator species like *H. punicea*.

Survey Site 9 was difficult to assess due to the lack of grazing for a considerable period and the resultant long and rank coastal vegetation. The coastal grassland appeared unimproved and therefore, could potentially support some grassland fungi species.

It should be noted that the majority of grasslands on Anglesey are agriculturally improved and thus devoid of grassland fungi. The CHEGD species are mainly confined to a few coastal sites, dune grassland, churchyards and gardens where the grassland remains unimproved. It is therefore important to conserve any significant grassland sites identified on Anglesey wherever possible. All retained sites within the WNDA should be managed sympathetically to retain their grassland fungi populations, see recommendations.

## 5. Summary and Conclusions

The aim of this mycological study was to determine the value of any grassland fungi assemblages present within the WNDA. These data have been requested as part of an Environmental Impact Assessment (EIA) for the Wylfa Newydd Project. This group of grassland fungi also known as the 'CHEGD' species only occur in unimproved or semi-improved grasslands which are now much rarer due to agricultural intensification, both on a British and European basis. The grassland sites surveyed were identified as having potential during previous survey effort in 2013, (Jacobs, 2017), and in 2012, (Evans, 2013).

Three sites within the WNDA have been identified as having a conservation value both for the number of species present and for the value of some individual species as indicators of a quality grassland habitat. Sites 1, 2 and 3 all rank as of National Importance for their *Hygrocybe* component alone and additionally contain a good number of *Entoloma* species and Clavarioids.

Anglesey is farmed fairly intensively and there are few places that have escaped the use of fertilisers, ploughing, re-seeding etc. Grassland fungi are now only found on land that has largely escaped improvement and on Anglesey these are typically areas of coastal grassland, dune systems, churchyards, cemeteries and gardens. They are absent from most of the farmland on the island. The mainland of Gwynedd has a greater number of good grassland fungi sites mainly due to extensive areas of upland and marginal grassland. It is important therefore that sites on Anglesey where these fungi still thrive should be conserved whenever possible.

Sites 4, 5 and 6 all had lower number of grassland fungi species present and these were mainly species of low indicator value. These sites are considered of lower conservation concern. However, with the combined results of all survey effort 2012 to 2017 all three rank as of Regional Importance for their *Hygrocybe* content.

Sites 7, 8 and 9 were negative for grassland fungi and are considered to be of negligible fungal value based on these results. Site 9 could potentially support grassland fungi but could not be assessed properly due to the length of the vegetation.

## 6. Recommendations

### 6.1 General Recommendations for the Conservation of Grassland Fungi

- Avoid the use of any fertilisers, lime or added manures. These alter the nutrient levels in the soil and soil chemistry and will result in the loss of grassland fungi species. Waxcap pastures should rely only on natural fertilisation by grazing animals.

- Sheep grazing is thought to be the best way to graze a waxcap pasture, with the aim of achieving a close cropped, short sward of around 5 to 10 cm. maximum. This can be monitored by measuring the grass height and if needed the stocking rates and thus the grazing pressure adjusted accordingly to get the optimum sward length on a site.
- Avoid poaching of the ground especially during wet periods and during the winter as it can damage the fungal mycelium in the soil. Poaching can be a problem especially around gateways and feeding stations.
- Ideally supplementary feeding should be avoided. It may result in localised enrichment of the soil around the troughs and encourage poaching in these areas. If supplementary feeding must be used, position the troughs in areas which are known to be poorer for grassland fungi.
- Avoid any field operations like ploughing or harrowing, including chain harrows which can damage the grass, moss layers and fungal mycelium in the soil. Invasive weeds like creeping and spear thistles and nettles should be controlled only by cutting or pulling.
- Avoid compaction of the soil by heavy vehicles and any action which might affect the soil structure and the drainage of the field. Compaction can be especially damaging during wet weather. Aim to use lighter vehicles for any field operations that must be under-taken.
- Continue monitoring of a site in future years, this will obtain a more complete picture of the fungal diversity within a site and monitor the success of management practices.
- Relocation of Fungal Mycelium: there is no evidence to date to show that translocation of turves containing grassland fungal mycelium is a viable method of mitigation against the loss of a grassland fungi population. It should be assumed therefore, that this is not an option and important habitats retained and conserved in situ where-ever possible.

## **6.2 Specific Recommendations for Retained Areas in the WNDA**

All retained sites, with the exception of Site 6 which is regularly mown, would benefit from more sheep grazing to achieve a shorter sward length. This would additionally benefit invertebrates and indirectly the local chough population.

For management and conservation purposes Survey Sites 1 and 2 could be considered as one continuous site between Porth Wylfa and the coastline west of Wylfa Head. Most of the fungi recorded were present within the 20 - 30 metre coastal strip and very few species or individuals were recorded further inland where the grassland was either improved or had been disturbed. Wherever possible at least this 20 - 30 metre width should remain undisturbed from any development with an additional buffer zone if practical. It is recommended that grazing by sheep should be reinstated or continued to obtain a shorter sward of less than 20cms. The grassland here should remain free of fertiliser and movement of heavy machinery over the ground restricted where possible to avoid damage to fungal mycelium in the soil by physical damage or compaction. It is recognised that this coastal area may also be subject to significant footfall in the future and use of the coastal path should be encouraged, rather than trampling over the whole area.

Survey Site 3, Wylfa Head lies to the north of the WNDA and is a Local Nature Reserve with open access to the public and is part of the Anglesey coastal path route. It should not be affected to the same extent by the Wylfa Newydd project. Recommendations include sheep grazing of the headland to obtain a shorter sward throughout, with cutting of longer or rank herbage by machinery if necessary, and to restrict any use of fertiliser. The areas of greatest conservation value are the east and north-eastern sides of the headland and the coastal fringe. Areas to the south of the headland were poor for fungi and appeared somewhat improved.



Survey Site 6, the entrance verges and amenity grassland: The species recorded here were of low value but continued management by regular mowing and avoidance of fertilisers should ensure their continued presence.

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## 8. References and Further Information

Ainsworth, A. M., Cannon, P. F., & Dentinger, B. T., (2013). DNA barcoding and morphological studies reveal two new species of waxcap mushrooms (Hygrophoraceae) in Britain. *MycKeys* 7: 45-62 (09 Sep 2013).

Aron, C. A., (2005). *Fungi of Northwest Wales*. Self-published.

BMS: Fungal Record Database for Britain & Ireland.

<http://www.fieldmycology.net/frdbi/frdbi.asp>

Boertmann, D., (1995). *The Genus Hygrocybe, 1<sup>st</sup> edition. Fungi of Northern Europe, vol. 1.* Danish Mycological Society.

Boertmann, D., (2010). *The Genus Hygrocybe, 2<sup>nd</sup> revised edition. Fungi of Northern Europe, vol. 1.* Danish Mycological Society.

Bruun, H. H. & Ernæs, R., (1993). *Naturtypen overdrew, vegetationen og densforudsætninger*. Botanisk Institut, Kobenhavns Universitet, Kobenhaven.

Cannon, P. F., Dentinger, B. T. M., Ainsworth, A. M. & Griffith, G.W., (2013). *Systematics, barcoding, and ecology of fungi from waxcap grasslands in England and Wales*. Defra Final Project Report (WC0787).

Evans D. A. (2013). *Wylfa B Terrestrial Ecological Survey: Fungi. October – November 2012*. Arup commissioned survey on behalf of Horizon Nuclear Power (Wylfa) Ltd.

Evans, D. A. & Aron, C. E., (2008). *Survey of Unimproved and Semi-improved Sites for Grassland Fungi in Arfon*, 2007 Gwynedd County Council report.

Evans, S., Henrici, A., & Ing, B., (2006). *Preliminary Assessment the Red Data List of Threatened British Fungi*. BMS (JNCC).

Genney, D. R., A. D. Hale, R. G. Woods & M. Wright, (2009). *Guidelines for selection of biological SSSIs Rationale Operational approach and criteria. Detailed guidelines for habitats and species groups. Chapter 18: Grassland fungi*. JNCC.

<http://jncc.defra.gov.uk/page-2303>.

Griffith, G. W., Bratton, J., Easton, G., (2004). Charismatic megafungi- the conservation of waxcap grasslands. *British Wildlife* 16: 31-43.

Griffith, G. W., Holden, L., Mitchel, D., Evans, D. A., Aron, C., Evans, S., & Graham, A., (2006). *Mycological survey of selected semi-natural grasslands in Wales, 2003-5*.

Countryside Council for Wales Report No 743.

Holden, E., (2003). *Recommended English Names for Fungi in the UK*. Plantlife.

Index Fungorum. <http://www.indexfungorum.org/>

- Jacobs, (2017). *A Baseline Assessment of the Fungi of Key Habitats within the Wylfa NPS Site*. Consultancy report on behalf of Horizon Nuclear Power (Wylfa) Ltd. Ref. W202.01-S5-PAC-REP-00018.
- Knudsen, H. (Editor) & Vesterholt, J. (Editor), (2008). *Funga Nordica: Agaricoid, Boletoid, Clavarioid, Cyphelloid and Gastroid Genera*. Nordsvamp.
- Legon, N. W. & Henrici, A., (2005). *Checklist of the British and Irish Basidiomycota*. Royal Botanic Gardens, Kew.
- Lodge, D. J. *et al*, (2013). Molecular phylogeny, morphology, pigment chemistry and ecology in Hygrophoraceae (Agaricales). *Fungal Diversity* 64: 1-99.
- Marren, P., (1998). Fungal Flowers: the waxcaps and their World. *British Wildlife* 9 164-172.
- McHugh, R., Mitchel, D., Wright, M., Anderson, R., (2001). The Fungi of Irish Grasslands and their value for Nature Conservation. *Biology and Environment: Proceedings of the Royal Irish Academy* 101B: 225-243.
- Noordeloos, M. E., (1992). *Fungi Europaei, Volume 5: Entoloma s.l.* Editrice Giovanna Biella.
- Noordeloos, M. E., (2004). *Fungi Europaei, Volume 5A: Entoloma s.l. Supplemento*. Edizioni Candusso.
- Plantlife, (2014). *Waxcaps and grassland fungi: A guide to identification and management*. ISBN 978-1-907141-97-3.
- Rotheroe, M., (1999). *Mycological survey of selected semi-natural grasslands in Carmarthenshire*. CCW contract science report no.340.
- Rotheroe, M., (2001). A preliminary survey of waxcap grassland indicator species in South Wales. In: D. Moore, M., M. Nauta, S. E. Evans and M. Rotheroe (eds.) *Fungal Conservation: Issues and Solutions*, Cambridge University Press, Cambridge, U.K., pp. 120-135.
- Rotheroe, M., Newton, A., Evans, S., & Feehan, J., (1996). Waxcap-grassland Survey. *The Mycologist* 10: 23-25.
- Spooner, B. M., (2005). *British Geoglossaceae: Checklist and Provisional Key*.
- Vesterholt, J., Boertmann, D., & Tranberg, H. (1999). Et usaedvanlig godt ar for overdrevssvampe. *Svampe*, 40, pp. 36-44.
- Vesterholt, J., (2002). Fungi Non Delineati 21: *Contribution to the Knowledge of Species of Entoloma Subgenus Leptonia*. Libreria Mycoflora.

**Table 7. All CHEGD Species Recorded within the Wylfa Newydd Development Area in 2017. Latin and English Names and Grassland Survey Site where recorded.**

Latin Name	New Latin Name (Hygrocybes)	English Name	Survey Site
<b>Clavariaceae</b>		<b>Fairy Clubs</b>	
<i>Clavaria fragilis</i>		White Spindles	3
<i>Clavulinopsis corniculata</i>		Meadow Coral	1,2,3,4,6
<i>Clavulinopsis fusiformis</i>		Golden Spindles	1,2,3
<i>Clavulinopsis helvola</i>		Yellow Club	1,2,3
<i>Clavulinopsis laeticolor</i>		Handsome Club	1,2,3
<i>Clavulinopsis luteoalba</i>		Apricot Club	1,2,3
<i>Ramariopsis kunzei</i>		White Coral	2
<b>Hygrocybe spp.</b>	<b>Hygrocybe spp.</b>	<b>Waxcaps</b>	
<i>Hygrocybe cantharellus</i>	<i>Hygrocybe cantharellus</i>	Goblet Waxcap	1,2,3,5
<i>Hygrocybe ceracea</i>	<i>Hygrocybe ceracea</i>	Butter Waxcap	1,2,3,4,5,6
<i>Hygrocybe chlorophana</i>	<i>Hygrocybe chlorophana</i>	Golden Waxcap	1,2,3
<i>Hygrocybe coccinea</i>	<i>Hygrocybe coccinea</i>	Scarlet Waxcap	1,2,3,5
<i>Hygrocybe conica</i> var. <i>conica</i>	<i>Hygrocybe conica</i>	Blackening Waxcap	1,2,3,4,5,6
<i>Hygrocybe flavipes</i>	<i>Cuphophyllus flavipes</i>	Yellow Foot Waxcap	2
<i>Hygrocybe insipida</i>	<i>Hygrocybe insipida</i>	Spangle Waxcap	1,2,3,4
<i>Hygrocybe irrigata</i>	<i>Gliophorus irrigatus</i>	Slimy Waxcap	1,2,3
<i>Hygrocybe laeta</i>	<i>Gliophorus laetus</i>	Heath Waxcap	1,2,3
<i>Hygrocybe miniata</i>	<i>Hygrocybe miniata</i>	Vermilion Waxcap	1
<i>Hygrocybe pratensis</i>	<i>Cuphophyllus pratensis</i>	Meadow Waxcap	1,2,3,4,5,6
<i>Hygrocybe psittacina</i>	<i>Gliophorus psittacinus</i>	Parrot Waxcap	1,2,3,4,5
<i>Hygrocybe punicea</i>	<i>Hygrocybe punicea</i>	Crimson Waxcap	1,2,3
<i>Hygrocybe quieta</i>	<i>Hygrocybe quieta</i>	Oily Waxcap	1,2,3
<i>Hygrocybe reidii</i>	<i>Hygrocybe reidii</i>	Honey Waxcap	1,2,3,5
<i>Hygrocybe russocoriacea</i>	<i>Cuphophyllus russocoreaceus</i>	Cedarwood Waxcap	1,2,3,4
<i>Hygrocybe virginea</i>	<i>Cuphophyllus virgineus</i>	Snowy Waxcap	1,2,3,4,5,6
<b>Entoloma spp.</b>		<b>Pinkgills</b>	
<i>Entoloma anatinum</i>		A Pinkgill	3
<i>Entoloma asprellum</i>		A Pinkgill	1,2,3
<i>Entoloma chalybaeum</i>		Indigo Pinkgill	1
<i>Entoloma clandestinum</i>		A Pinkgill	3
<i>Entoloma conferendum</i>		Star Pinkgill	1,2,3,4,5
<i>Entoloma formosum</i>		A Pinkgill	1,3
<i>Entoloma infula</i>		A Pinkgill	1,3
<i>Entoloma jubatum</i>		Sepia Pinkgill	1,3
<i>Entoloma papillatum</i>		Papillate Pinkgill	1,2,3,4,5
<i>Entoloma prunuloides</i>		Mealy Pinkgill	1
<i>Entoloma sericeum</i>		Silky Pinkgill	3
<i>Entoloma serrulatum</i>		Blue Edge Pinkgill	1,2,3
<i>Entoloma</i> sp. ( <i>Nolanea</i> gp.)		A Pinkgill	1
<b>Geoglossaceae</b>		<b>Earthtongues</b>	
<i>Geoglossum fallax</i>		An Earthtongue	2,3
<i>Geoglossum glutinosum</i>		Glutinous Earthtongue	1
<i>Trichoglossum hirsutum</i>		Hairy Earthtongue	4
<b>Dermoloma spp.</b>			
<i>Dermoloma cuneifolium</i>		Crazed Cap	2,3,4,6
<b>Camarophyllopsis spp.</b>			
<i>Camarophyllopsis schulzeri</i>		Matt Fanvault	3



**Table 8. Grassland Survey Site 1: CHEGD species recorded by date in 2017.**

<b>CHEGD SPECIES</b> <b>Latin Name</b>	<b>English Name</b>	<b>Indicator</b> <b>Class</b>	<b>Visit 1</b> <b>10/10/2017</b>	<b>Visit 2</b> <b>30/10/2017</b>	<b>Visit 3</b> <b>10/11/2017</b>
<b>Clavariaceae</b>	<b>Fairy Clubs</b>				
<i>Clavulinopsis corniculata</i>	Meadow Coral	<b>C</b>	<b>X</b>		
<i>Clavulinopsis fusiformis</i>	Golden Spindles	<b>B</b>	<b>X</b>		<b>X</b>
<i>Clavulinopsis helvola</i>	Yellow Club	<b>C</b>	<b>X</b>		
<i>Clavulinopsis laeticolor</i>	Handsome Club	<b>C</b>		<b>X</b>	
<i>Clavulinopsis luteoalba</i>	Apricot Club	<b>C</b>	<b>X</b>		<b>X</b>
<b>Hygrocybe spp.</b>	<b>Waxcaps</b>				
<i>Hygrocybe cantharellus</i>	Goblet Waxcap	<b>B</b>	<b>X</b>	<b>X</b>	<b>X</b>
<i>Hygrocybe ceracea</i>	Butter Waxcap	<b>C</b>	<b>X</b>		
<i>Hygrocybe chlorophana</i>	Golden Waxcap	<b>C</b>	<b>X</b>	<b>X</b>	<b>X</b>
<i>Hygrocybe coccinea</i>	Scarlet Waxcap	<b>C</b>	<b>X</b>	<b>X</b>	<b>X</b>
<i>Hygrocybe conica</i> var. <i>conica</i>	Blackening Waxcap	<b>C</b>	<b>X</b>	<b>X</b>	<b>X</b>
<i>Hygrocybe insipida</i>	Spangle Waxcap	<b>C</b>	<b>X</b>		
<i>Hygrocybe irrigata</i>	Slimy Waxcap	<b>C</b>	<b>X</b>	<b>X</b>	
<i>Hygrocybe laeta</i>	Heath Waxcap	<b>B</b>		<b>X</b>	
<i>Hygrocybe miniata</i>	Vermilion Waxcap	<b>B</b>		<b>X</b>	
<i>Hygrocybe pratensis</i>	Meadow Waxcap	<b>C</b>	<b>X</b>	<b>X</b>	<b>X</b>
<i>Hygrocybe psittacina</i>	Parrot Waxcap	<b>C</b>	<b>X</b>	<b>X</b>	
<i>Hygrocybe punicea</i>	Crimson Waxcap	<b>A</b>	<b>X</b>	<b>X</b>	<b>X</b>
<i>Hygrocybe quieta</i>	Oily Waxcap	<b>C</b>		<b>X</b>	
<i>Hygrocybe reidii</i>	Honey Waxcap	<b>B</b>	<b>X</b>	<b>X</b>	<b>X</b>
<i>Hygrocybe russocoriacea</i>	Cedarwood Waxcap	<b>B</b>	<b>X</b>		
<i>Hygrocybe virginea</i>	Snowy Waxcap	<b>C</b>	<b>X</b>		<b>X</b>
<b>Entoloma spp.</b>	<b>Pinkgills</b>				
<i>Entoloma asprellum</i>	A Pinkgill	<b>A</b>	<b>X</b>		
<i>Entoloma chalybaeum</i>	Indigo Pinkgill	<b>B</b>		<b>X</b>	
<i>Entoloma conferendum</i>	Star Pinkgill	<b>C</b>	<b>X</b>	<b>X</b>	
<i>Entoloma formosum</i>	A Pinkgill	<b>A</b>	<b>X</b>		
<i>Entoloma infula</i>	A Pinkgill	<b>C</b>	<b>X</b>		
<i>Entoloma jubatum</i>	Sepia Pinkgill	<b>B</b>		<b>X</b>	
<i>Entoloma papillatum</i>	Papillate Pinkgill	<b>C</b>	<b>X</b>	<b>X</b>	
<i>Entoloma prunuloides</i>	Mealy Pinkgill	<b>A</b>			<b>X</b>
<i>Entoloma serrulatum</i>	Blue Edge Pinkgill	<b>B</b>	<b>X</b>		
<i>Entoloma</i> sp. ( <i>Nolanea</i> gp.)	A Pinkgill	<b>C</b>	<b>X</b>		
<b>Geoglossaceae</b>	<b>Earthtongues</b>				
<i>Geoglossum glutinosum</i>	Glutinous Earthtongue	<b>B</b>		<b>X</b>	

**CHEGD score: C5, H16, E10, G1, D0 = 32 species**

**16 *Hygrocybe* spp. recorded over three visits, a maximum of 13 on a single visit, (10/10/17)**

**Table 9. Grassland Survey Site 2: CHEGD species recorded by date in 2017.**

<b>CHEGD SPECIES</b> <b>Latin Name</b>	<b>English Name</b>	<b>Indicator</b> <b>Class</b>	<b>Visit 1</b> <b>10/10/2017</b>	<b>Visit 2</b> <b>30/10/2017</b>	<b>Visit 3</b> <b>10/11/2017</b>
<b>Clavariaceae</b>	<b>Fairy Clubs</b>				
<i>Clavulinopsis corniculata</i>	Meadow Coral	<b>C</b>	<b>X</b>	<b>X</b>	<b>X</b>
<i>Clavulinopsis fusiformis</i>	Golden Spindles	<b>B</b>		<b>X</b>	
<i>Clavulinopsis helvola</i>	Yellow Club	<b>C</b>	<b>X</b>		
<i>Clavulinopsis laeticolor</i>	Handsome Club	<b>C</b>		<b>X</b>	<b>X</b>
<i>Clavulinopsis luteoalba</i>	Apricot Club	<b>C</b>		<b>X</b>	<b>X</b>
<i>Ramariopsis kunzei</i>	Ivory Coral	<b>A</b>			<b>X</b>
<b>Hygrocybe spp.</b>	<b>Waxcaps</b>				
<i>Hygrocybe cantharellus</i>	Goblet Waxcap	<b>B</b>	<b>X</b>	<b>X</b>	<b>X</b>
<i>Hygrocybe ceracea</i>	Butter Waxcap	<b>C</b>	<b>X</b>	<b>X</b>	<b>X</b>
<i>Hygrocybe chlorophana</i>	Golden Waxcap	<b>C</b>	<b>X</b>	<b>X</b>	<b>X</b>
<i>Hygrocybe coccinea</i>	Scarlet Waxcap	<b>C</b>	<b>X</b>	<b>X</b>	<b>X</b>
<i>Hygrocybe conica</i> var. <i>conica</i>	Blackening Waxcap	<b>C</b>	<b>X</b>		<b>X</b>
<i>Hygrocybe flavipes</i>	Yellow Foot Waxcap	<b>B</b>		<b>X</b>	
<i>Hygrocybe insipida</i>	Spangle Waxcap	<b>C</b>		<b>X</b>	
<i>Hygrocybe irrigata</i>	Slimy Waxcap	<b>C</b>		<b>X</b>	<b>X</b>
<i>Hygrocybe laeta</i>	Heath Waxcap	<b>B</b>		<b>X</b>	<b>X</b>
<i>Hygrocybe pratensis</i>	Meadow Waxcap	<b>C</b>	<b>X</b>	<b>X</b>	<b>X</b>
<i>Hygrocybe psittacina</i>	Parrot Waxcap	<b>C</b>	<b>X</b>	<b>X</b>	
<i>Hygrocybe punicea</i>	Crimson Waxcap	<b>A</b>	<b>X</b>	<b>X</b>	<b>X</b>
<i>Hygrocybe quieta</i>	Oily Waxcap	<b>C</b>	<b>X</b>	<b>X</b>	<b>X</b>
<i>Hygrocybe reidii</i>	Honey Waxcap	<b>B</b>	<b>X</b>	<b>X</b>	
<i>Hygrocybe russocoriacea</i>	Cedarwood Waxcap	<b>B</b>	<b>X</b>	<b>X</b>	
<i>Hygrocybe virginea</i>	Snowy Waxcap	<b>C</b>	<b>X</b>	<b>X</b>	
<b>Entoloma spp.</b>	<b>Pinkgills</b>				
<i>Entoloma asprellum</i>	A Pinkgill	<b>A</b>		<b>X</b>	
<i>Entoloma conferendum</i>	Star Pinkgill	<b>C</b>	<b>X</b>	<b>X</b>	
<i>Entoloma papillatum</i>	Papillate Pinkgill	<b>C</b>	<b>X</b>		
<i>Entoloma serrulatum</i>	Blue Edge Pinkgill	<b>B</b>	<b>X</b>		
<b>Geoglossaceae</b>	<b>Earthtongues</b>				
<i>Geoglossum fallax</i>	An Earthtongue	<b>C</b>		<b>X</b>	
<b>Dermoloma ssp.</b>					
<i>Dermoloma cuneifolium</i>	Crazed Cap	<b>C</b>	<b>X</b>		<b>X</b>

**CHEGD score: C6, H16, E4, G1, D1 = 28 species**

**16 *Hygrocybe* spp. recorded over three visits, a maximum of 15 on a single visit, (30/10/17)**

**Table 10. Grassland Survey Site 3: CHEGD species recorded by date in 2017.**

<b>CHEGD SPECIES</b> Latin Name	English Name	Indicator Class	Visit 1 10/10/2017	Visit 2 30/10/2017	Visit 3 10/11/2017
<b>Clavariaceae</b>	<b>Fairy Clubs</b>				
<i>Clavaria fragilis</i>	White Spindles	C	X		
<i>Clavulinopsis corniculata</i>	Meadow Coral	C	X	X	X
<i>Clavulinopsis fusiformis</i>	Golden Spindles	B		X	X
<i>Clavulinopsis helvola</i>	Yellow Club	C	X	X	X
<i>Clavulinopsis laeticolor</i>	Handsome Club	C			X
<i>Clavulinopsis luteoalba</i>	Apricot Club	C	X	X	X
<b>Hygrocybe spp.</b>	<b>Waxcaps</b>				
<i>Hygrocybe cantharellus</i>	Goblet Waxcap	B		X	X
<i>Hygrocybe ceracea</i>	Butter Waxcap	C	X	X	X
<i>Hygrocybe chlorophana</i>	Golden Waxcap	C	X	X	X
<i>Hygrocybe coccinea</i>	Scarlet Waxcap	C	X	X	X
<i>Hygrocybe conica</i> var. <i>conica</i>	Blackening Waxcap	C	X	X	
<i>Hygrocybe insipida</i>	Spangle Waxcap	C	X		
<i>Hygrocybe irrigata</i>	Slimy Waxcap	C	X	X	X
<i>Hygrocybe laeta</i>	Heath Waxcap	B	X	X	X
<i>Hygrocybe pratensis</i>	Meadow Waxcap	C	X	X	X
<i>Hygrocybe psittacina</i>	Parrot Waxcap	C	X	X	X
<i>Hygrocybe punicea</i>	Crimson Waxcap	A		X	X
<i>Hygrocybe quieta</i>	Oily Waxcap	C	X	X	X
<i>Hygrocybe reidii</i>	Honey Waxcap	B	X	X	X
<i>Hygrocybe russocoriacea</i>	Cedarwood Waxcap	B		X	X
<i>Hygrocybe virginea</i>	Snowy Waxcap	C	X	X	
<b>Entoloma spp.</b>	<b>Pinkgills</b>				
<i>Entoloma anatinum</i>	A Pinkgill	A	X		
<i>Entoloma asprellum</i>	A Pinkgill	A		X	
<i>Entoloma clandestinum</i>	A Pinkgill	B	X		
<i>Entoloma conferendum</i>	Star Pinkgill	C	X	X	X
<i>Entoloma formosum</i>	A Pinkgill	A	X		
<i>Entoloma infula</i>	A Pinkgill	C	X	X	X
<i>Entoloma jubatum</i>	Sepia Pinkgill	B		X	
<i>Entoloma papillatum</i>	Papillate Pinkgill	C			X
<i>Entoloma sericeum</i>	Silky Pinkgill	C	X	X	
<i>Entoloma serrulatum</i>	Blue Edge Pinkgill	B	X		
<b>Geoglossaceae</b>	<b>Earthtongues</b>				
<i>Geoglossum fallax</i>	An Earthtongue	C		X	
<b>Dermoloma ssp.</b>	<b>Crazed Caps</b>			X	
<i>Dermoloma cuneifolium</i>	Crazed Cap	C	X		
<b>Camarophyllopsis spp.</b>					
<i>Camarophyllopsis schulzeri</i>	Matt Fanvault	A	X	X	

**CHEGD score: C6, H15, E10, G1, D2 = 34 species**

15 *Hygrocybe* spp. recorded over three visits, a maximum of 14 on a single visit, (30/10/17)

Table 11. Grassland Survey Site 4: CHEGD species recorded by date in 2017.

CHEGD SPECIES Latin Name	English Name	Indicator Species	Visit 1 10/10/2017	Visit 2 30/10/2017	Visit 3 10/11/2017
<b>Clavariaceae</b>	<b>Fairy Clubs</b>				
<i>Clavulinopsis corniculata</i>	Meadow Coral	C	X		
<b>Hygrocybe spp.</b>	<b>Waxcaps</b>				
<i>Hygrocybe ceracea</i>	Butter Waxcap	C	X		
<i>Hygrocybe conica</i> var. <i>conica</i>	Blackening Waxcap	C	X	X	
<i>Hygrocybe insipida</i>	Spangle Waxcap	C	X		
<i>Hygrocybe pratensis</i>	Meadow Waxcap	C	X	X	X
<i>Hygrocybe psittacina</i>	Parrot Waxcap	C	X	X	
<i>Hygrocybe russocoriacea</i>	Cedarwood Waxcap	B	X	X	X
<i>Hygrocybe virginea</i>	Snowy Waxcap	C		X	
<b>Entoloma spp.</b>	<b>Pinkgills</b>				
<i>Entoloma conferendum</i>	Star Pinkgill	C	X		
<i>Entoloma papillatum</i>	Papillate Pinkgill	C	X	X	
<b>Geoglossaceae</b>	<b>Earthtongues</b>				
<i>Trichoglossum hirsutum</i>	Hairy Earthtongue	C	X		
<b>Dermoloma spp.</b>	<b>Crazed Caps</b>				
<i>Dermoloma cuneifolium</i>	Crazed Cap	C	X		

CHEGD score: C1, H7, E2, G1, D1 = 12 species

7 *Hygrocybe* spp. recorded over three visits, a maximum of six on a single visit, (10/10/17)

Table 12. Grassland Survey Site 5: CHEGD species recorded by date in 2017.

CHEGD SPECIES Latin Name	English Name	Indicator Species	Visit 1 10/10/2017	Visit 2 30/10/2017	Visit 3 10/11/2017
<b>Hygrocybe spp.</b>	<b>Waxcaps</b>				
<i>Hygrocybe cantharellus</i>	Goblet Waxcap	B	X		
<i>Hygrocybe ceracea</i>	Butter Waxcap	C		X	
<i>Hygrocybe coccinea</i>	Scarlet waxcap	C			X
<i>Hygrocybe conica</i> var. <i>conica</i>	Blackening Waxcap	C		X	X
<i>Hygrocybe pratensis</i>	Meadow Waxcap	C	X	X	
<i>Hygrocybe psittacina</i>	Parrot Waxcap	C		X	
<i>Hygrocybe reidii</i>	Honey Waxcap	B		X	
<i>Hygrocybe virginea</i>	Snowy Waxcap	C	X		
<b>Entoloma spp.</b>	<b>Pinkgills</b>				

<i>Entoloma conferendum</i>	Star Pinkgill	C	X		X
<i>Entoloma papillatum</i>	Papillate Pinkgill	C		X	X

**CHEGD score: C0, H8, E2, G0, D0 = 10 species**

**8 *Hygrocybe* spp. recorded over three visits, a maximum of five on a single visit, (30/10/17)**

**Table 13. Grassland Survey Site 6: CHEGD species recorded by date in 2017.**

<b>CHEGD SPECIES</b> Latin Name	English Name	Indicator Class	Visit 2 30/10/2017	Visit 3 10/11/2017
<b>Clavariaceae</b>				
<i>Clavulinopsis corniculata</i>	Meadow Coral	C	X	
<b><i>Hygrocybe</i> spp.</b>	<b>Waxcaps</b>			
<i>Hygrocybe ceracea</i>	Butter Waxcap	C		X
<i>Hygrocybe conica</i> var. <i>conica</i>	Blackening Waxcap	C		X
<i>Hygrocybe pratensis</i>	Meadow Waxcap	C	X	
<i>Hygrocybe virginea</i>	Snowy Waxcap	C	X	
<b><i>Dermoloma</i> ssp.</b>				
<i>Dermoloma cuneifolium</i>	Crazed Cap	C		X

**CHEGD score: C1, H4, E0, G0, D1 = species**

**Four *Hygrocybe* spp. recorded over two visits, a maximum of two on a single visit**

**Table 14. Grassland Survey Site 1: All Results for Surveys in 2013, (Jacobs, 2017) and in 2017.**

<b>CHEGD SPECIES Latin Name</b>	<b>Survey Results 27/11/2013, (Jacobs, 2017, habitat area 12)</b>	<b>Combined Results of three survey visits, 2017</b>
<b>Clavariaceae</b>		
<i>Clavulinopsis corniculata</i>	X	X
<i>Clavulinopsis fusiformis</i>		X
<i>Clavulinopsis helvola</i>		X
<i>Clavulinopsis laeticolor</i>		X
<i>Clavulinopsis luteoalba</i>		X
<b>Hygrocybe spp.</b>		
<i>Hygrocybe cantharellus</i>	X	X
<i>Hygrocybe ceracea</i>	X	X
<i>Hygrocybe chlorophana</i>		X
<i>Hygrocybe coccinea</i>	X	X
<i>Hygrocybe conica</i> var. <i>conica</i>	X	X
<i>Hygrocybe insipida</i>		X
<i>Hygrocybe irrigata</i>		X
<i>Hygrocybe laeta</i>		X
<i>Hygrocybe miniata</i>		X
<i>Hygrocybe pratensis</i>	X	X
<i>Hygrocybe psittacina</i>	X	X
<i>Hygrocybe punicea</i>	X	X
<i>Hygrocybe quieta</i>		X
<i>Hygrocybe reidii</i>		X
<i>Hygrocybe russocoriacea</i>		X
<i>Hygrocybe virginea</i>	X	X
<b>Entoloma spp.</b>		
<i>Entoloma asprellum</i>		X
<i>Entoloma chalybaeum</i>		X
<i>Entoloma conferendum</i>		X
<i>Entoloma formosum</i>		X
<i>Entoloma infula</i>		X
<i>Entoloma jubatum</i>		X
<i>Entoloma papillatum</i>		X
<i>Entoloma prunuloides</i>		X
<i>Entoloma serrulatum</i>		X
<i>Entoloma</i> sp. ( <i>Nolanea</i> gp.)		X
<b>Geoglossaceae</b>		
<i>Geoglossum glutinosum</i>		X

**CHEGD score 2013: C1, H8, G0, D0 = nine species**

**CHEGD score 2017: C5, H16, E10, G1, D0 = 32 species**

**Combined CHEGD score all surveys: C5, H16, E10, G1, D0 = 32 species**

**16 *Hygrocybe* spp. recorded over all surveys, a maximum of 13 on a single visit, (10/10/17)**

**Table 15. Grassland Survey Site 2: All Results for Surveys in 2013, (Jacobs, 2017) and in 2017.**

<b>CHEGD SPECIES Latin Name</b>	<b>Survey Results 27/11/2013, (Jacobs, 2017, habitat area 11)</b>	<b>Combined Results of three survey visits, 2017</b>
<b>Clavariaceae</b>		
<i>Clavulinopsis corniculata</i>		<b>X</b>
<i>Clavulinopsis fusiformis</i>		<b>X</b>
<i>Clavulinopsis helvola</i>		<b>X</b>
<i>Clavulinopsis laeticolor</i>		<b>X</b>
<i>Clavulinopsis luteoalba</i>		<b>X</b>
<i>Ramariopsis kunzei</i>		<b>X</b>
<b>Hygrocybe spp.</b>		
<i>Hygrocybe cantharellus</i>		<b>X</b>
<i>Hygrocybe ceracea</i>		<b>X</b>
<i>Hygrocybe chlorophana</i>		<b>X</b>
<i>Hygrocybe coccinea</i>		<b>X</b>
<i>Hygrocybe conica</i> var. <i>conica</i>		<b>X</b>
<i>Hygrocybe flavipes</i>		<b>X</b>
<i>Hygrocybe insipida</i>	<b>X</b>	<b>X</b>
<i>Hygrocybe irrigata</i>		<b>X</b>
<i>Hygrocybe laeta</i>		<b>X</b>
<i>Hygrocybe pratensis</i>	<b>X</b>	<b>X</b>
<i>Hygrocybe psittacina</i>	<b>X</b>	<b>X</b>
<i>Hygrocybe punicea</i>		<b>X</b>
<i>Hygrocybe quieta</i>		<b>X</b>
<i>Hygrocybe reidii</i>		<b>X</b>
<i>Hygrocybe russocoriacea</i>		<b>X</b>
<i>Hygrocybe virginea</i>	<b>X</b>	<b>X</b>
<b>Entoloma spp.</b>		
<i>Entoloma asprellum</i>		<b>X</b>
<i>Entoloma conferendum</i>		<b>X</b>
<i>Entoloma papillatum</i>		<b>X</b>
<i>Entoloma serrulatum</i>		<b>X</b>
<b>Geoglossaceae</b>		
<i>Geoglossum fallax</i>		<b>X</b>
<b>Dermoloma ssp.</b>		
<i>Dermoloma cuneifolium</i>		<b>X</b>

**CHEGD score 2013: C0, H4, E0, G0, D0 = four species**

**CHEGD score 2017: C6, H16, E4, G1, D1 = 28 species**

**Combined CHEGD score all surveys: C6, H16, E4, G1, D1 = 28 species**

**16 *Hygrocybe* spp. recorded over all surveys, a maximum of 15 on a single visit, (30/10/17)**

**Table 16. Grassland Survey Site 3: All Results for Surveys in 2012, (Evans, 2013), 2016, (Jacobs, 2017) and in 2017.**

<b>CHEGD SPECIES Latin Name</b>	<b>Combined Results of three survey visits, 2012, (Evans, 2013)</b>	<b>Survey Results 18/11/2016, (Jacobs, 2017, habitat area A)</b>	<b>Combined Results of three survey visits, 2017</b>
<b>Clavariaceae</b>			
<i>Clavaria fragilis</i>			X
<i>Clavulinopsis corniculata</i>	X		X
<i>Clavulinopsis fusiformis</i>	X		X
<i>Clavulinopsis helvola</i>	X	X	X
<i>Clavulinopsis laeticolor</i>	X		X
<i>Clavulinopsis luteoalba</i>	X		X
<b>Hygrocybe spp.</b>			
<i>Hygrocybe cantharellus</i>			X
<i>Hygrocybe ceracea</i>	X		X
<i>Hygrocybe chlorophana</i>	X		X
<i>Hygrocybe coccinea</i>	X		X
<i>Hygrocybe conica</i>	X		X
<i>Hygrocybe insipida</i>	X		X
<i>Hygrocybe irrigata</i>			X
<i>Hygrocybe laeta</i>	X		X
<i>Hygrocybe miniata</i>	X		
<i>Hygrocybe mucronella</i>		X	
<i>Hygrocybe pratensis</i>	X	X	X
<i>Hygrocybe psittacina</i>	X	X	X
<i>Hygrocybe punicea</i>	X	X	X
<i>Hygrocybe quieta</i>	X		X
<i>Hygrocybe reidii</i>	X	X	X
<i>Hygrocybe russocoriacea</i>	X		X
<i>Hygrocybe virginea</i>	X		X
<b>Entoloma spp.</b>			
<i>Entoloma anatinum</i>			X
<i>Entoloma asprellum</i>			X
<i>Entoloma clandestinum</i>			X
<i>Entoloma conferendum</i>	X		X
<i>Entoloma formosum</i>			X
<i>Entoloma infula</i>			X
<i>Entoloma jubatum</i>			X
<i>Entoloma papillatum</i>			X
<i>Entoloma sericeum</i>			X
<i>Entoloma serrulatum</i>			X
<b>Geoglossaceae</b>			
<i>Geoglossum fallax</i>	X		X



CHEGD SPECIES Latin Name	Combined Results of three survey visits, 2012, (Evans, 2013)	Survey Results 18/11/2016, (Jacobs, 2017, habitat area A)	Combined Results of three survey visits, 2017
<i>Dermoloma</i> spp.			
<i>Dermoloma cuneifolium</i>	X		X
<i>Camarophyllopsis</i> spp.			
<i>Camarophyllopsis schulzeri</i>	X		X

CHEGD score 2012: C5, H14, E1, G1, D2 = 23 species

CHEGD score 2016: C1, H5, E0, G0, D0 = six species

CHEGD score 2017: C6, H15, E10, G1, D2 = 34 species

Combined CHEGD score all surveys: C6, H17, E10, G1, D2 = 36 species

17 *Hygrocybe* spp. recorded over all surveys, a maximum of 14 on a single visit, (30/10/17)

Table 17. Grassland Survey Site 4: All Results for Surveys in 2013, (Jacobs, 2017) and in 2017.

CHEGD SPECIES Latin Name	Survey Results 28/11/13 & 18/11/16, (Jacobs, 2017, habitat area 9)	Combined Results of three survey visits, 2017
<b>Clavariaceae</b>		
<i>Clavulinopsis corniculata</i>		X
<b><i>Hygrocybe</i> spp.</b>		
<i>Hygrocybe ceracea</i>		X
<i>Hygrocybe conica</i> var. <i>conica</i>	X	X
<i>Hygrocybe insipida</i>		X
<i>Hygrocybe pratensis</i>	X	X
<i>Hygrocybe psittacina</i>		X
<i>Hygrocybe russocoriacea</i>	X	X
<i>Hygrocybe virginea</i>		X
<b><i>Entoloma</i> spp.</b>		
<i>Entoloma conferendum</i>		X
<i>Entoloma papillatum</i>		X
<b>Geoglossaceae</b>		
<i>Trichoglossum hirsutum</i>		X
<b><i>Dermoloma</i> spp.</b>		
<i>Dermoloma cuneifolium</i>		X

CHEGD score 2013/2016: C0, H3, E0, G0, D0 = three species

CHEGD score 2017: C1, H7, E2, G1, D1 = 12 species

Combined CHEGD score for all surveys = C1, H7, E2, G1, D1 = 12 species

7 *Hygrocybe* spp. recorded over all surveys, a maximum of six on a single visit, (10/10/17)

**Table 18. Grassland Survey Site 5: All Results for Surveys in 2012, (Evans, 2013), 2013, (Jacobs, 2017) and in 2017.**

<b>CHEGD SPECIES Latin Name</b>	<b>Combined Results of three survey visits, 2012, (Evans, 2013)</b>	<b>Survey Results 28/11/2013, (Jacobs, 2017, habitat areas 4 and 5)</b>	<b>Combined Results of three survey visits, 2017</b>
<b>Clavariaceae</b>			
<i>Clavulinopsis corniculata</i>	X	X	
<i>Clavulinopsis laeticolor</i>	X		
<i>Clavulinopsis luteoalba</i>	X		
<b>Hygrocybe spp.</b>			
<i>Hygrocybe cantharellus</i>			X
<i>Hygrocybe ceracea</i>	X		X
<i>Hygrocybe chlorophana</i>	X		
<i>Hygrocybe coccinea</i>	X	X	X
<i>Hygrocybe conica</i> var. <i>conica</i>	X	X	X
<i>Hygrocybe insipida</i>	X		
<i>Hygrocybe pratensis</i>	X	X	X
<i>Hygrocybe psittacina</i>	X		X
<i>Hygrocybe reidii</i>	X		X
<i>Hygrocybe russocoriacea</i>	X	X	
<i>Hygrocybe virginea</i>	X	X	X
<b>Entoloma spp.</b>			
<i>Entoloma conferendum</i>	X		X
<i>Entoloma papillatum</i>	X		X
<b>Geoglossaceae</b>			
<i>Geoglossum fallax</i>	X		
<i>Geoglossum glutinosum</i>	X		

**CHEGD score 2012: C3, H10, E2, G2, D0 = 17 species**

**CHEGD score 2013: C1, H5, E0, G0, D0 = six species**

**CHEGD score 2017: C0, H8, E2, G0, D0 = 10 species**

**Combined CHEGD score all surveys: C3, H11, E2, G2, D0 = 18 species**

**11 *Hygrocybe* spp. recorded over all surveys, a maximum of 10 on a single visit, (27/10/12)**

**Table 19. Grassland Survey Site 6: All Results for Surveys in 2013, (Jacobs, 2017) and in 2017.**

<b>CHEGD SPECIES Latin Name</b>	<b>Survey Results 28/11/2013, (Jacobs, 2017, habitat area 8)</b>	<b>Combined Results of two survey visits, 2017</b>
<b>Clavariaceae</b>		
<i>Clavaria fumosa</i>	X	
<i>Clavulinopsis corniculata</i>		X
<b><i>Hygrocybe</i> spp.</b>		
<i>Hygrocybe ceracea</i>		X
<i>Hygrocybe chlorophana</i>	X	
<i>Hygrocybe coccinea</i>	X	
<i>Hygrocybe conica</i> var. <i>conica</i>	X	X
<i>Hygrocybe pratensis</i>	X	X
<i>Hygrocybe psittacina</i>	X	
<i>Hygrocybe virginea</i>	X	X
<i>Hygrocybe quieta</i>	X	
<b><i>Dermoloma</i> spp.</b>		
<i>Dermoloma cuneifolium</i>		X

**CHEGD score 2013: C1, H7, E0, G0, D0 = eight species**

**CHEGD score 2017: C1, H4, E0, G0, D1 = six species**

**Combined CHEGD score for all surveys = C2, H8, E0, G0, D1**

**Eight *Hygrocybe* spp. recorded over all surveys, a maximum of seven on a single visit, (28/11/13)**

## **Appendix 1. Profiles of the CHEGD groups of Grassland Fungi**

### **Clavarioids (Fairy Clubs)**

This is a diverse group of fungi including the genera *Clavaria*, *Clavulinopsis* and also *Ramariopsis*. Some species are simple club or spindle-shaped structures e.g. *Clavulinopsis helvola*, Yellow Club. They may grow singly or in dense groups as in *Clavulinopsis fusiformis*, Golden Spindles. Other species are branched and appear more coral-like, e.g. *Clavulinopsis corniculata*, Meadow Coral and *Ramariopsis kunzei*, Ivory Coral. They are often a brightly coloured component of the CHEGD suite along with the Hygrocybes, with bright yellow, orange and purple members. Some species require microscopic examination of the spores for positive identification.

### **Hygrocybes (Waxcaps)**

These are the most visible component of the CHEGD suite. They are simple cap and stem fungi and have no ring on the stem. Many species are brightly coloured and therefore conspicuous in the grassland and they can be found in a wide range of colours including yellow, orange and red. They have been referred to as 'Fungal Flowers', (Marren 1998). Other Waxcaps are duller in colour and include species coloured in shades of grey, brown and white. They have a waxy texture to the flesh from which they derive their common name and characteristic thick, well-spaced, waxy lamellae or gills on the underside of the cap. The texture of the cap and stipe surface varies between species and ranges from dry to viscid and forms one of the diagnostic features used in separating species. A novel feature is the distinct smell of some species e.g. garlic in *Hygrocybe helobia* and cedarwood or Russian leather in *Hygrocybe russocoriacea*, Cedarwood Waxcap. The majority of species appear in late autumn with peaks in October and early November but this can be very weather dependent with a dry period inhibiting or delaying fruiting and heavy frosts preventing fruiting. A few species fruit early e.g. *Hygrocybe intermedia*, Fibrous Waxcap and this can be found in some seasons in July, while *Hygrocybe punicea*, Crimson Waxcap, tends to be a late season Waxcap.

The majority of the Waxcaps can be identified in the field by an experienced surveyor. Nomenclature of the Waxcaps is from Boertmann, (2010).

### **Entolomas (Pinkgills)**

The Entolomas are cap and stem fungi and derive their common name from the pink coloured spores, which turn the gills pink as the spores ripen. The spores are characteristically angular in appearance under the microscope. They occur in a range of mainly dull colours, especially shades of brown but there are members showing bluish and purple tints. Many of this group appear early in the season and may not be present at the peak of the Waxcap fruiting, especially as they tend to be more sensitive to cold weather etc. With few exceptions they usually require microscopic examination to confirm their identity.

### **Geoglossums (Earthtongues)**

Earthtongues are classified as Ascomycetes, (Spore Shooters) and thereby differ from all the other CHEGD species which belong to the Basidiomycetes, (Spore Droppers). The two commonest genera are *Trichoglossum* and *Geoglossum* and they are usually brown or almost

## **Profiles of the CHEGD groups of Grassland Fungi**

black in colour. The much less common *Microglossum olivaceum* can be green, olive or brown. They have upright tongue-shaped fruiting bodies and may have a well-defined fertile head. Some species are dry while others have a viscid surface and in the genus *Trichoglossum* there are tiny setae, hair like structures on the stipe and fertile head visible with a hand lens,

Earthtongues tend to fruit later in the season and may not appear until November. They usually require microscopic examination to determine or confirm the species.

### **Dermolomas (Crazed Caps)**

These are simple cap and stem fungi with dry caps and dull colours. They often have a strong mealy or damp flour smell. The commonest species is *Dermoloma cuneifolium*, Crazed Cap, and other species are only rarely encountered.

Other genera included with the Dermolomas are *Porpoloma* and *Camarophylloopsis*, (Fanvaults).

*Porpoloma* is represented by *Porpoloma metapodium*, Mealy Meadowcap, a dull brown, mealy smelling cap and stem fungus with a reddening flesh on cutting. It is an uncommon species.

*Camarophylloopsis* species are found occasionally especially *Camarophylloopsis schulzeri*. They are brownish in colour with decurrent gills.

## **Appendix 2. Profiles of the CHEGD species recorded and their site locations within the Wylfa Newydd Development Area**

Notes on National status from Legon, & Henrici, (2005). Distribution in NW Wales up to 2005 is available in Aron, (2005).

*Camarophyllopsis schulzeri* A Fanvault (Class A)

**National status:** 'Rarely reported'.

This appears to be the commonest of the *Camarophyllopsis* species, although up until 2005 there was only one north-west Wales record of this species. It has since been recorded on several sites in Gwynedd, both upland and lowland and is mainly found in the better sites. Survey Site 3.

*Clavaria fragilis* White Spindles (Class C)

**National status:** 'Common'.

This is a simple, unbranched, white fairy club and often occurs in small groups. It is a common species in a variety of upland and lowland grasslands and can tolerate some improvement. Survey Site 3.

*Clavaria fumosa*, Smoky Spindles (Class B)

**National status:** 'Common'.

This large pale-brown, unbranched Clavarioid often grows in dense clumps. It occurs widely in both upland and lowland grasslands, but is usually confined to the less improved grasslands. Recorded on Survey Site 6 in 2013.

*Clavulinopsis corniculata* Meadow Coral (Class C)

**National status:** 'Very common'.

This is a yellow branching species and is very common in grasslands and can tolerate some improvement. It can sometimes be easy to overlook as it occurs low down in the turf. It is widespread in both upland and lowland grasslands. Survey Sites 1,2,3,4,6.

*Clavulinopsis fusiformis* Golden Spindles (Class B)

**National status:** 'Common and widespread'.

This is regarded as a nationally common species but in Gwynedd and Anglesey it occurs predominantly in upland pastures and on coastal areas. The simple yellow clubs are larger and taller than other yellow Clavarioids and it usually occurs in dense clumps. Survey Sites 1,2,3.

*Clavulinopsis helvola* Yellow Club (Class C)

**National status:** 'Very common'.

The most abundant of the grassland Clavarioids and can be found in lawns and pastures. However, this species closely resembles *C. laeticolor*, Handsome Club with which it may be confused. *C. laeticolor* can be separated by the smooth as opposed to warty spores. Survey Sites 1,2,3.

*Clavulinopsis laeticolor* Handsome Club (Class C)

**National status:** 'Occasional but widespread'.

This species is very similar to *C. helvola* but is sometimes more orange in colour and also the spores are different. It is found in a wide range of grassland habitats. Survey Sites 1,2,3.

*Clavulinopsis luteoalba* Apricot Club (Class C)

**National status:** 'Common and widespread'.

This Clavarioid is usually more of an apricot colour than the other yellow species, as well as having different spores. Although it is very widespread it is probably less ubiquitous and tolerant of improvement than *C. helvola*. Survey Sites 1,2,3.

*Dermoloma cuneifolium* Crazy Cap (Class C)

**National status:** 'Occasional but widespread and may be locally common'.

This fungus has a dry cap which is often finely cracked, hence the common name. It is found in a wide range of grassland habitats and is tolerant of some improvement. Survey Sites 2,3,4,6.

*Entoloma anatinum* A Pinkgill (Class A)

**National status:** 'Uncertain'.

This attractive *Entoloma* is distinctive in having marked purplish tones when young, although these fade with age. It is quite robust compared with other species from the *Leptonia* group. Most collections have been found in short, unimproved turf and it can be regarded as a good indicator species. Survey Site 3.

*Entoloma asprellum* A Pinkgill (Class A)

**National status:** 'Rarely reported but apparently widespread'.

*Entoloma asprellum* has a brownish cap, devoid of blue tones, and a bluish stipe when young. It often has a coconut smell which helps to separate it from other, similar species. Where it occurs there are diverse assemblages of grassland fungi and it appears to be a good indicator species. Survey Sites 1,2,3.

*Entoloma chalybaeum*, Indigo Pinkgill (Class B)

**National status:** 'Occasional but widespread'.

This species has an attractive bluish-black cap and also bluish lamellae when young. It is one of the commoner Leptonias and is tolerant of some grassland improvement although it would never be found in intensive pastures. Survey Site 1.

*Entoloma clandestinum* A Pinkgill (Class B)

**National status:** 'Rarely reported, mostly from Scotland'.

This brown *Entoloma* is similar to *E. papillatum* but has a darker cap and lamellae. It has a scattered distribution in unimproved and semi-improved pastures. Survey Site 3.

*Entoloma conferendum* Star Pinkgill (Class C)

**National status:** 'Very common and widespread'.

This very common brown *Entoloma* is found in many grassland habitats from mountain pastures to garden lawns and it is often abundant. *E. conferendum* is probably more tolerant of improvement than any other grassland *Entoloma*. It can be separated from similar brown *Entolomas* by the star-shaped spores. Survey Sites 1,2,3,4,5.

*Entoloma formosum* A Pinkgill (Class A)

**National status:** 'Uncommonly reported but apparently widespread'.

This attractive *Entoloma* has a finely scaly yellow- or orange-brown cap. It is characteristic of dry grasslands, heaths, upland grasslands and has also been found in dune slacks on Anglesey. It can be regarded as a good indicator species. Survey Sites 1,3.

*Entoloma infula* A Pinkgill (Class C)

**National status:** 'Uncommonly reported but apparently widespread'.

A brown *Entoloma* species which is often papillate, (with a nipple). Similar to *E. papillatum* but paler and has a tough, cartilaginous stem. It is widespread in both lowland and upland grasslands and is tolerant of some improvement. Survey Sites 1,3.

*Entoloma jubatum* Sepia Pinkgill (Class B)

**National status:** 'Occasional but widespread'.

*E. jubatum* is closely related to *E. porphyrophaeum* but is smaller and darker and without purplish tones. It has been recorded from grassland habitats ranging from churchyards to heathy upland pastures. Survey Sites 1,3

*Entoloma papillatum* Papillate Pinkgill (Class C)

**National status:** 'Frequent and widespread'.

This brown *Entoloma* has a domed cap and is often papillate, (having a small pimple at the apex of the cap). *E. papillatum* is widespread in both upland and lowland grasslands and is tolerant of some improvement. Survey Sites 1,2,3,4,5.

*Entoloma prunuloides* Meal Pinkgill (Class A)

**National status:** 'Occasional but widespread'.

This is a medium-sized, pale *Entoloma* with a mealy smell. It occurs in unimproved grasslands, mostly in the more lowland sites and can be regarded as a good indicator species. Survey Site 1.

*Entoloma sericeum* Silky Pinkgill (Class C)

**National status:** 'Common and widespread'.

This is a brown species often having a rather flattened cap with a silky sheen and has a mealy smell. It occurs in both upland and lowland grasslands and is tolerant of improvement. Survey Site 3.

*Entoloma serrulatum*, Blue Edge Pinkgill (Class B)

**National status:** 'Common in Scotland, widespread elsewhere'.

This species has a dark, blackish, usually depressed cap and whitish or pale blue gills with a dark-blue edging. It is found in both upland and lowland grasslands, mostly on the better sites. Survey Sites 1,2,3.

*Geoglossum fallax* An Earthtongue (Class C)

**National status:** 'Frequent and widespread'.

When immature this dry species is a brownish colour, and blackens with age. It has a dry, squamulose stipe. It is the commonest of the Earthtongues and is tolerant of some improvement. Their dull colour and small size makes Earthtongues fairly easy to miss. Survey Sites 2,3.

*Geoglossum glutinosum* Glutinous Earthtongue (Class B)

**National status:** 'Occasional, especially in upland grasslands'.

This is a viscid species with a smooth, viscid stipe, easily recognised in the field. It is characteristic of acidic, upland pastures. Survey Site 1.

*Hygrocybe cantharellus* Goblet Waxcap (Class B)

**National status:** 'Occasional but widespread'.



This is a characteristic Waxcap of upland pastures, with its orange, scurfy cap and markedly decurrent gills. It grows in heathy pastures, sometimes in *Sphagnum* but also occurs in lowland grasslands and may be tolerant of some slight improvement. Survey Sites 1,2,3,5.

*Hygrocybe ceracea* Butter Waxcap (Class C)

**National status:** 'Common and widespread'.

This yellow or yellow-orange Waxcap is very common in grasslands. In doubtful cases it can be separated from other yellow species by the broad gill attachment and the shorter cells of the gill trama. Survey Sites 1,2,3,4,5,6.

*Hygrocybe chlorophana* Golden Waxcap (Class C)

**National status:** 'Common and widespread'.

A bright or lemon yellow, rather viscid species, with paler, narrowly attached gills. It is found in all kinds of grasslands and is tolerant of some improvement. Survey Sites 1,2,3.

*Hygrocybe coccinea* Scarlet Waxcap (Class C)

**National status:** 'Common and widespread'.

This bright-red Waxcap is found in all kinds of grasslands. *H. punicea*, Crimson Waxcap is usually a darker red, more robust, and with a markedly fibrous stipe and the much less common *H. splendidissima*, Splendid Waxcap, has a drier cap, different reddish tones, and a marked smell of honey on drying. Survey Sites 1,2,3,5.

*Hygrocybe conica* var. *conica* Blackening Waxcap (Class C)

**National status:** 'Common and widespread'.

This very common blackening Waxcap occurs in all kinds of grasslands. It is difficult to confuse with any other species. It is tolerant of some improvement. Survey Sites 1,2,3,4,5,6.

*Hygrocybe flavipes*, Yellow-foot Waxcap (Class B) New name: *Cuphophyllus flavipes*

**National status:** 'Occasional but widespread'.

This species has a lilac-grey, greasy cap, decurrent gills and paler stipe. One distinguishing feature is the yellow stipe base. It is widespread in both upland and lowland grasslands and tolerant of some improvement. Survey Site 2.

*Hygrocybe insipida* Spangle Waxcap (Class C)

**National status:** 'Common and widespread'.

This small, lubricous orange-yellow species is widespread in all kinds of grasslands and is tolerant of some improvement. Characteristic features are the moist stipe when fresh, and a red apex to the stipe which helps to separate it from *H. ceracea* which can look similar, although this feature is not always present. Survey Sites 1,2,3,4.

*Hygrocybe irrigata* Slimy Waxcap (Class C)

**National status:** 'Occasional but widespread'.

This is an unmistakable, very viscid, grey-brown species. It is widespread in both upland and lowland grasslands and is tolerant of some improvement. Survey Sites 1,2,3.

*Hygrocybe laeta* Heath Waxcap (Class B). New name: *Gliophorus laetus*

**National status:** 'Occasional but widespread'.

This viscid *Hygrocybe* is characteristic of heathy habitats and is widespread in upland grasslands, often close to bracken. It is also found in lowland situations if the grassland is

suitably acidic and well drained. It has decurrent gills and a distinctive burnt rubber or rubbery smell. Survey Sites 1,2,3.

*Hygrocybe miniata* Vermilion Waxcap (Class B)

**National status:** 'Occasional but widespread'.

This species is similar to another small red Waxcap, *H. helobia*, Garlic Waxcap, and can occur in the same habitat although it is not confined to acid soils. *H. helobia* differs in having a garlic smell and decurrent gills. *H. miniata* has a dry, scurfy cap. Survey Site 1.

*Hygrocybe mucronella*, Bitter Waxcap (Class B)

**National status:** 'Occasional but widespread'

This is a fairly small red Waxcap, smaller than the common red Scarlet Waxcap, *H. coccinea*. *H. mucronella* is unique in the bitter taste of its cap surface detected by touching the cap with the tip of the tongue. It is widespread but only occasionally recorded and is usually present in singles or low numbers. Recorded on Survey Site 3 in 2016.

*Hygrocybe pratensis* Meadow Waxcap (Class C). New name: *Cuphophyllus pratensis*

**National status:** 'Common and widespread'.

This is a dry-capped, orangey species with decurrent gills and is common in both upland and lowland grasslands and is tolerant of some improvement. Survey Sites 1,2,3,4,5,6.

*Hygrocybe psittacina* Parrot Waxcap (Class C). New name: *Gliophorus psittacinus*

**National status:** 'Common and widespread'.

This is a very viscid and variable species and is typically green, yellow, or a mixture of these colours but pink and other colours are not uncommon, although there is generally some green on the underside. This is one of the most tolerant of all the Waxcaps to eutrophication and will occur in improved pastures that are fertilised at low rates. Survey Sites 1,2,3,4,5.

*Hygrocybe punicea* Crimson Waxcap (Class A)

**National status:** 'Occasional but widespread'.

A distinctive and robust Waxcap with a smooth, dark-red cap and fibrous stipe. It is a widespread species in NW Wales but can be regarded as a very good indicator species and is not tolerant of improvement. It is only found on the best grassland sites and sites where it is absent are of generally poorer quality. Survey Sites 1,2,3. Grid references for populations are shown in Appendix 3.

*Hygrocybe quieta* Oily Waxcap (Class C)

**National status:** 'Common and widespread'.

A yellow-capped, greasy Waxcap with orange gills and a distinct oily smell, especially when rubbed or crushed. It is found in both upland and lowland grasslands and is tolerant of some improvement. Survey Sites 1,2,3.

*Hygrocybe reidii* Honey Waxcap (Class B)

**National status:** 'Common and widespread'.

This orange, dry-capped Waxcap favours well drained turf and can be found commonly in both upland and lowland grasslands, however it is not found in the more eutrophic pastures and can be regarded as a reasonably good indicator species. Survey Sites 1,2,3,5.

*Hygrocybe russocoriacea* Cedarwood Waxcap (Class B). New name: *Cuphophyllus russocoreaceus*

**National status:** ‘Common to occasional and widespread’.

This is a small, buff-white to yellowish-white Waxcap favouring well-drained, short turf. It is close to the common Snowy Waxcap, *H. virginea* but is readily separated by the aromatic smell described as cedarwood or Russian leather. In Gwynedd it appears to be more widespread in the upland pastures and in coastal grasslands. It does not occur where there has been much improvement. Survey Sites 1,2,3,4.

*Hygrocybe virginea* Snowy Waxcap (Class C). New name: *Cuphophyllus virgineus*

**National status:** ‘Common and widespread’.

As with *H. psittacina* this Waxcap has distinct nitrophile tendencies and will occur in recently fertilised pastures. Although it occurs commonly in unimproved pastures as well it can be scarce in some of the best sites for grassland fungi. Survey Sites 1,2,3,4,5,6.

*Ramariopsis kunzei* White Coral (Class A) *Ramariopsis kunzei*, Ivory Coral (Class B)

**National status:** ‘Occasional but widespread’.

This is an attractive, white branched, coral-like Clavarioid species, distinguished microscopically from superficially similar species by its small, rough spores. It occurs occasionally in both upland and lowland sites but is rarely very common. Survey Site 2.

*Trichoglossum hirsutum* Hairy Earthtongue (Class C)

**National status:** ‘Widespread and common’.

*Trichoglossum* is a genus of Earthtongue characterised by the presence of tiny bristles (setae) which are visible under a hand lens. *Trichoglossum hirsutum* occurs in both upland and lowland grasslands and is tolerant of some improvement. In general, earthtongues tend to appear late in the season. Survey Site 4.

### Appendix 3. Survey Site location and OS Grid References for *Hygrocybe punicea* populations

Site	OS Grid Reference	Notes
1	SH36086 93884	80 fruitbodies 30/10/17
	SH36060 93865	
	SH35980 93938	
2	SH35804 94027	10 fruitbodies 30/10/17
	SH35720 94065	
	SH35700 94425	
3	SH35705 94425	
	SH35707 94442	20 fruitbodies 30/10/17
	SH35800 94437	