Waxcap Survey Work 2024

Report to the Cairngorms National Park Authority (CNPA)



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November 2024
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MAIN FINDINGS

- Rynettin compartment 3 is producing many of the same species recorded by Orton (1982-2002) but, when compared with adjacent fields that have remained in continuous grazing, the number of genets is considerably reduced (18 compared with 129 in the slightly larger compartment 1). *Entoloma* and Clavariaceae species, previously diverse in compartment 3, have barely fruited since the new management began.
- Rynettin Compartment 1 is worthy of consideration as an SSSI, following JNCC thresholds and high richness indicator species (Bosanquet et al 2019) with a total of 20 *Hygrocybe* species (Table 4).
- Three sites at RSPB were surveyed to provide baseline information to inform grassland restoration work.
- Of the 11 listed grassland sites in Strathspey (2024), four sites - Balnacraig, Croftronan, Glen Banchor and Tomachrocar are of current interest as waxcap grasslands (Table 1). None of the sites reached JNCC thresholds for consideration as SSSI.
- The best sites visited during this survey had average sward heights of 10 or 11cm, close to the recommended heights of 3 – 8cm.
- Seven sites additional to the contract list were informally visited; two of these would be worth a more formal visit as they are already good waxcap sites (Appendices. 1 and 6). Consideration could be given to liaising with the land managers about the potential for waxcaps for several of the other sites.
- It is suggested that there is a need for a wider survey of potentially good waxcap sites in Scotland to give more robust information for site ranking. Such a survey could be used to train up potential fungal surveyors for the future.

INTRODUCTION

Objectives

- Re-survey of Rynettin grassland compartments
- Survey of RSPB Abernethy grassland restoration sites
- Undertake surveys of listed grassland sites in Strathspey

There is a general background and general methodology section at the front of the report but, for ease of reference, and given the amount of information relating to the various sites, this report has been divided into three sections as indicated by the objectives listed above. Each section will contain the related information under the headings ‘Management History’, ‘Results’ and ‘Discussion’.

Information gathered for earlier reports has been brought together where appropriate, so as to be easily accessible in this 2024 report.

GENERAL BACKGROUND

The community of fungi that have specialised in long established, low input short sward grasslands (managed by either grazing or mowing) are recognised as being excellent indicators of the conservation value of this habitat (Spooner & Roberts 2005). This community of fungi includes members of the groups Clavariaceae (fairy clubs), *Hygrocybe* (waxcaps), *Entoloma* (pinkgills), Geoglossaceae (earth tongues), *Dermoloma* (crazed caps), *Porpoloma* (meadowcaps) and *Cuphophyllus* (fanvaults). For ease these are often collectively referred to as CHEGD species and their supporting habitat as 'waxcap grassland'.

It is widely accepted that waxcap grasslands, as a habitat, are threatened across Northern Europe by a mixture of human activities. These include agricultural improvements (primarily ploughing, reseeding and fertilising), and management changes, including housing or other development schemes or reversion to a woodland situation, either by natural regeneration or planting schemes. Bosanquet et al (2018) in the JNCC guidelines for biological SSSIs, state the following:

"*Sites rich in grassland fungi are scarce and threatened on a world scale, and the extent of this habitat in northern Europe has declined dramatically (Veen et al., 2009). Relative to these losses, Britain retains a high number of species-rich waxcap grasslands (Newton et al., 2003; Evans, 2004; Griffith et al. 2013), for which we clearly have an international responsibility*."

Criteria for the assessment of waxcap grasslands are discussed in 'General Methodology' below.

Waxcaps are included in the current Cairngorms Nature Action Plan 2019 – 2024. (https://cairngorms.co.uk/wp-content/uploads/2019/02/CairngormsNatureAction19_24PlanFinal.pdf page 31). The recommendations arising from this report are entirely in keeping with Cairngorms Nature Action Plan's aim to 'deliver focused action to improve the conservation status of threatened and declining species'.

A note on the functional mode of CHEGD species

Ainsworth et al (2013) suggest that:
"*Waxcaps are regarded as nitrogen-sensitive organisms because fruiting is inhibited by applications of nitrogenous fertilizers (Arnolds 1989). However, their below-ground ecology, in particular their nutritional mode(s), remains unclear despite recent attention by several researchers. Indirect evidence from carbon and nitrogen stable isotope ratios suggests that at least some taxa are biotrophic (Seitzman et al. 2011).*"

More recently, Halbwachs et al (2018) suggests that although waxcaps are generally referred to as saprotrophs, there are now several lines of research indicating that they are biotrophic. Waxcap fungi have been shown to colonise the root hairs of grassland plants, their DNA has been detected in plant tissues and in addition, their fruiting is inhibited by killing associated vegetation with herbicide.

They go on however, to suggest that the nutritional mode may not be a straightforward mycorrhizal relationship but better described, given the current lack of understanding, as endophytic. They indicate that N (nitrogen) acquisition or processing differs from other fungi and suggest that N may possibly be derived from acquisition of N via soil fauna high in the food chain.

Further research is still required to establish the nutritional mode of these fungi and this incomplete understanding of their ecology makes definitive management recommendations more difficult.

GENERAL METHODOLOGY

A total of 17 sites, listed in Table 1, were visited for this survey including three Rynettin Compartments, the RSPB recovering grassland sites (providing baseline data), known as Auchtergannach, Inchtomach and Rynerrick and 11 other sites in Strathspey where, with the exception of Tomachrochar, the sites were previously unsurveyed for CHEGD species.

Appendix 2 (presented as a separate word file) contains the site maps (apart from Rynettin which appears in the main report as Fig. 1)

Sites are numbered as follows:

- Site numbers in brackets refer to numbers generated in the 2006/7 botanical survey of inbye fields in Badenoch and Strathspey, instigated by the CNPA and undertaken by Brendan O'Hanrahan.
- Holden (2010), Holden (2018) produced two reports based on visits to sites from the inbye survey, in which sites were numbered 1 to 35. Only one site (Tomachrochar) was visited in 2010, 2018 and 2024. This site retains the number 25.
- Sites not visited before 2024, have been numbered 36 on. These numbers appear on the Excel spreadsheet tabs.
- The informally visited additional sites have not been numbered.

Ten of the 17 sites visited during the 2024 survey were generated by the inbye survey (nine not previously surveyed for CHEGD species). Other sites were included on recommendation (RSPB Abernethy, Stewart Taylor and Liz Holden).

Initial contact was made with landowners / managers by the CNPA (Rebecca Watts pers. comm.), or directly by the surveyor in the case of Glen Banchor. Site maps were also provided by the CNPA. A number of additional sites of potential interest were briefly investigated by the surveyor with the intention of flagging up future sites of survey interest. No contact was made with the land owners / managers. A full set of results is listed in an Excel spreadsheet –Appendix 1 (presented as a separate document) for reference. Two of the larger sites (Glan Banchor and Tomachrocar) were recorded in the field with sub sites as shown in the Excel spreadsheet – sub site records from 2024 have also been consolidated into single sites. Rynettin, Inchtomach and Tomachrochar also have historical records which have been shown as appropriate.

The single site visits took place during September and October of 2024 (Table 1). Visits were made after early frosts in the area and this may go some way to explaining the lack of *Entoloma* species at sites – *Entoloma* fruiting seems to be vulnerable to frost.

Suitable habitat at each site was walked using a 'mowing transect' through the areas of vegetation that supported fruiting waxcaps, with a similar methodology applied to all sites so that the survey time was roughly proportional to the area of suitable habitat. The patchy nature of fruiting makes the use of random plots or transects less useful than the above approach.

Table 1*: Site information and date of visits 2024*

Site name (numbers in brackets refer to botanical inbye survey)	**Site number**	**Approx site centroid**	**Date visited**	**CHEGD Totals 2024**
Abernethy Auchtergannach	36	NJ003156	Sept 27 2024	4
Abernethy Rynerrick	37	NJ001149	Sept 27 2024	3
Abernethy Inchtomach	38	NJ024153	Sept 27 2024	0
Rynettin cmpt 1	39	NJ011144	Sept 17 2024: Oct 16 2024	19
Rynettin cmpt 2	40	NJ012146	Oct 16 2024	11
Rynettin cmpt 3	41	NJ014143	Oct 16 2024	7
Lyngarrie (1330)	42	NJ025168	Sept 27 2024	7
Balnacraig (3101)	43	NH824035	Oct 23 2024	10
Croftronan (2112)	44	NH964195	Oct 24 2024	12
Duthill (2077)	45	NH929250	Oct 24 2024	4
Duthill (2075)	46	NH928251	Oct 24 2024	3
Flowerfield (373)	47	NH938163	Oct 5 2024	8
Glen Banchor	48	NN678996	Oct 17 2024	14
Hill of Lethendry (2110)	49	NJ086270	Oct 10 2024	2
Rynaballoch (2070)	50	NJ108287	Oct 10 2024	1
Tolvah (1309)	51	NN844996	Oct 23 2024	0
Tomachrochar (448)	25	NH983209	Oct 5 2024	16

The first genet of each CHEGD species at each site was recorded using a handheld GPS. Collections were recorded assuming that 10m distances would approximate to an individual genet (Dahlberg & Mueller 2011). There has been no specific research into the extent of grassland genets, but the consistent application of this criterion gives a useful insight into site diversity.

Other than for the request to survey the non-grassland areas at Inchtomach, no grassland species other than CHEGD are presented in this report. Other species, include dung fungi and known saprotrophs that function differently to CHEGD e.g. *Galerina*, *Mycena*, *Cystoderma, Stropharia, Panaeolus*, were present in the grasslands but not recorded.

Twelve sward heights were taken from each site (Appendix 3). These measurements are intended for general guidance only but generally the lower sward heights indicate a more open sward which waxcaps can fruit in, if the site is unimproved. Appendix 3 shows that although a low sward height does not

necessarily mean a good CHEGD count, the best sites in this survey had average sward heights of 10 or 11 cm. Griffith et al (2011) suggest that the optimum height for waxcap fruiting is between 3 and 8cm.

Earlier species records have been included in the site species lists (Tables 4 - 6 and 8 - 22) where available. Most historical records were generated for Rynettin Compartment 3 and Inchtomach by Peter Orton (UK fungal expert) made during the first two weeks of September, most years 1982 – 2002. Management information for Rynettin and Inchtomach has been given by S. Taylor (pers. comm.). Management information for Rynerrick and Auchtergannach has been supplied by the RSPB (C. Tilbury pers. comm.). Management information for other sites is not currently available.

All records will be passed onto the Fungal Records Database of Britain and Ireland (FRDBI) managed by the British Mycological Society (BMS). Data from the FRDBI is forwarded onto the National Biodiversity Network (NBN) Gateway.

***Criteria for assessment of the value of waxcap grasslands*:**

When assessing the quality of waxcap grasslands, the genus *Hygrocybe* is the most useful of the CHEG fungi as it includes many brightly coloured and distinctive species. Despite this, there are relatively few people, compared with botanists or ornithologists, who are skilled enough to determine them. Fungi are also more difficult to monitor as current identification methodology relies solely on the presence of fruit bodies, which are short lived and not regularly or reliably produced by the underground 'body' of the fungus, the mycelium.

It should be noted that recent work by Lodge et al (2014) has now divided the genus *Hygrocybe* into *Chromosera*, *Cuphophyllus*, *Gliophorus*, *Gloioxanthomyces*, *Hygrocybe*, *Neohygrocybe* and *Porpolomopsis* (Appendix 5), but for pragmatic reasons when assessing a site with the JNCC guidelines (Bosanquet et al 2018), all species within the new genera are counted as *Hygrocybe*. To help with this, a field 'CHEGD' has been included, in tables as appropriate, with 'c', 'h', 'e', 'g', 'd' against the genus names.

Table 2: *JNCC CHEGD species thresholds (Bosanquet et al. 2018) for waxcap grassland sites*

Clavariaceae (Corals and fairy clubs)	***Hygrocybe* (Waxcaps)**	***Entoloma* (Pinkgills)**	**Geoglossaceae (Earthtongues)**	***Dermoloma* (Crazed Caps) *Pseudotricholoma* (*Porpoloma* Meadow Caps) *Camarophyllopsis* (Fanvaults)**
7	19	15	5	3

In addition to the thresholds given in Table 2, the JNCC 2018 guidelines recommend consideration of the conservation 'value' of the species recorded to prioritise sites for further survey before consideration of notification as a SSSI. Table 3 shows the high richness indicator species recommended in this publication. Site lists with species from Table 3 should be referred for expert opinion to establish whether further survey is required.

It is difficult to be sure how important a site is in a Scottish context when so many potential sites remain unsurveyed. This could be a problem when trying to persuade a land manager of the value in restoring land set aside for tree regeneration, previously known to be good for CHEGD species, by reintroducing targeted grazing or cutting. It would be interesting to set up a project to contact farmers / estates through land agents and other means to try and establish where they have old grassland with minimal fertilization, with a view to following up in the field. This would be much easier if there was some financial incentive that this could be coupled with. It is appreciated that this would be a big project but, if taken forward, it could double as an apprenticeship for a small group of surveyors who would then be in a position to continue fungal work.

Table 3*: High richness indicator waxcap species (Bosanquet et al 2018)*

Hygrocybe aurantiosplendens	*Hygrocybe (Cuphophyllus) lacmus*
Hygrocybe (Porpolomopsis) calyptriformis	*Hygrocybe (Neohygrocybe) nitrata*
Hygrocybe (Cuphophyllus) canescens	*Hygrocybe (Neohygrocybe) ovina*
Hygrocybe citrinovirens	*Hygrocybe punicea*
Hygrocybe (Cuphophyllus) colemanniana	*Hygrocybe spadicea*
Hygrocybe flavipes	*Hygrocybe splendidissima*
Hygrocybe ingrata	*Hygrocybe subpapillata*
Hygrocybe intermedia	*Hygrocybe turunda*

Boertmann (2010) also suggests that *H. punicea* (Crimson Waxcap) is likely to be found in grasslands that have a very long continuity of sympathetic management suitable for waxcaps.

Waxcaps are highlighted in the Cairngorms Nature Action Plan 2019-2024 (Anon 2019) as priority species, with aims relating to waxcaps stated as follows:

- provide advice and support to land managers at existing sites
- recruit, train and support Plantlife Flora Guardians to monitor existing populations
- develop citizen science survey projects

Partners for the delivery of these aims are listed as Plantlife, SNH and CNPA. This survey is entirely compatible with these aims.

In the species lists for sites, the column headed IUCN refers to species listed on the IUCN Red List of threatened Species https://iucn.org/resources/conservation-tool/iucn-red-list-threatened-species .

IUCN species have been mostly assessed at a global scale, giving an indication of the importance of Scottish waxcap grasslands. JNCC indicators (*Hygrocybe* only) refer to species listed in Table 3 above.

RYNETTIN GRASSLAND COMPARTMENTS

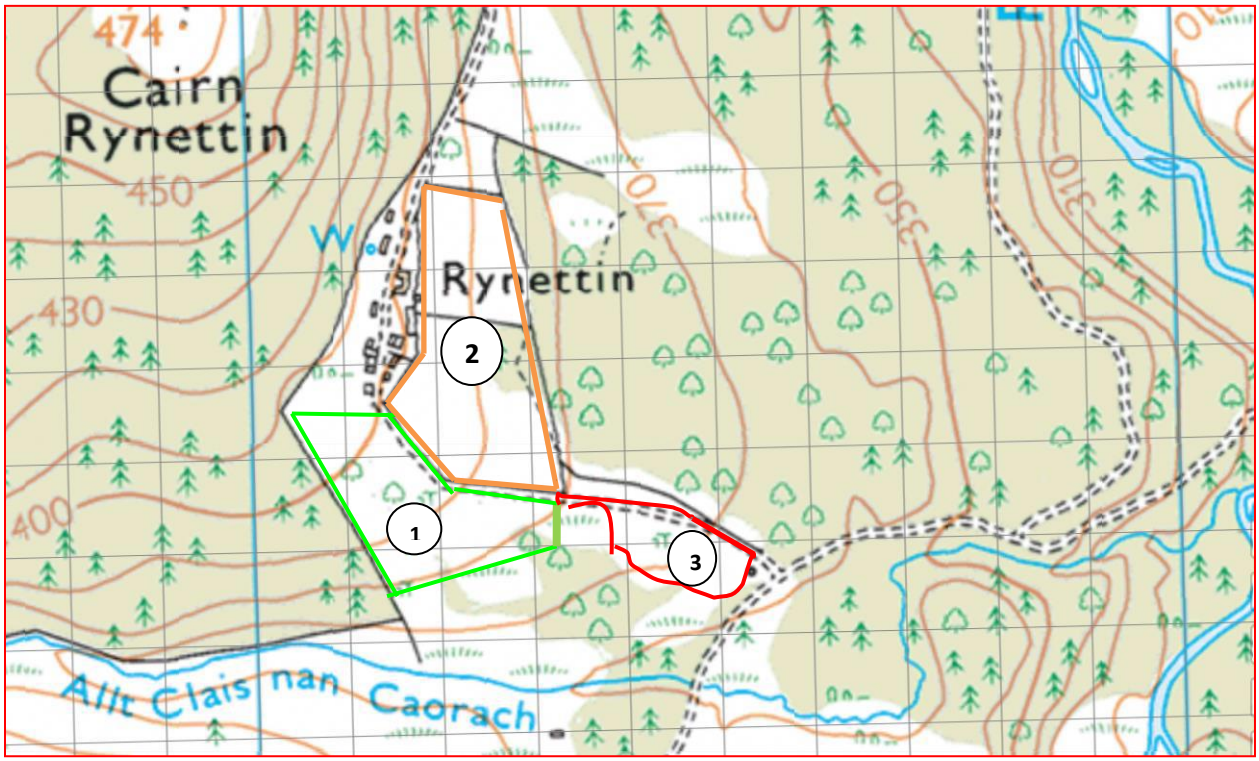
BACKGROUND

This site consists of three fields (Fig.1), two owned by the Naylor family and regularly grazed by sheep and cattle (compartment 1 - unimproved and compartment 2 - mostly improved) and a third owned by RSPB (compartment 3) which was left ungrazed for 30 years and only recently cut and grazed again (see below). Records prior to the removal of grazing suggest that compartment 3 was, historically, rich waxcap grassland. This situation provides the opportunity to observe what happens when the management of a site previously good for waxcaps but ungrazed for a long period, reverts to a low input, grazing regime.

METHODOLOGY

Compartment 1 was visited twice in 2024. The first visit (September 17) was made by a small group of students from Aigas Field Centre. The teaching nature of this first visit did not enable detailed grid references to be made but all records were from Compartment 1 and included two *Entoloma* species (*Entoloma atrocoeruleum* and *E. porphyrophaeum*) and two waxcap species (*Hygrocybe cantharellus* and *Hygrocybe ingrata*) not recorded during the second visit (October 16). The second visit was made by the surveyor and accompanied by R. Watts (CNPA); all three compartments were surveyed.

Fig.1: *Map delineating the Rynettin compartments 1 / 2 / 3*



RYNETTIN COMPARTMENT 1 Site Number 39

Average sward height 2024, 11 cm.

Total number of CHEGD genets – 127

Management History

Retained by one of the previous owners of Abernethy Forest (Christopher Naylor), this area of grassland falls out with the management of the RSPB and is currently worked by a local grazier. As an area of semi-improved grassland, it has not been ploughed and reseeded in recent memory although it may have received low levels of fertilization.

The field slopes down from west to east and the lower part is more botanically rich with field gentian recorded (S. Taylor pers. comm.). Bracken and juniper are both present in the field (Holden 2019) but currently any expansion seems to be kept in check by the grazing level.

Given the proximity to compartment 3, this field provides a very useful comparison and also a potential source of fungal inoculum in the form of spores or mycelial debris. It continues to provide an excellent diversity and richness of fruiting waxcaps, and in 2022 and 2024, they were fruiting in profusion.

Results

Table 4: *Total number of CHEG species in Rynettin Compartment 1 2018 - 2024*

Scientific name	CHEG	Common name	Year recorded	IUCN	JNCC indicator
Clavulinopsis corniculata	c	Meadow Coral	2019 2024		
C total	**1**				
Cuphophyllus fornicatus	h	Earthy Waxcap	2024		
Cuphophyllus pratensis	h	Meadow Waxcap	2018 2019 2022 2024		
Cuphophyllus russocoriaceus	h	Cedarwood Waxcap	20192024		
Cuphophyllus virgineus	h	Snowy Waxcap	2018 2019 2022 2024		
Gliophorus irrigatus	h	Slimy Waxcap	2024		
Gliophorus laetus	h	Heath Waxcap	2018 2019		
Gliophorus psittacinus	h	Parrot Waxcap	2018 2019 2022 2024		
Hygrocybe cantharellus	h	Goblet Waxcap	2024		
Hygrocybe ceracea	h	Butter Waxcap	2018 2019 2022 2024		
Hygrocybe chlorophana	h	Golden Waxcap	2018 2019 2022 2024		
Hygrocybe coccinea	h	Scarlet Waxcap	2019 2022 2024		
Hygrocybe conica	h	Blackening Waxcap	2019 2022 2024		
Hygrocybe glutinipes	h	Glutinous Waxcap	2019		
Hygrocybe insipida	h	Spangle Waxcap	2019 2022		
Hygrocybe punicea	h	Crimson Waxcap	2018 2019 2022 2024	VU	yes
Hygrocybe quieta	h	Oily Waxcap	2022 2024	VU	
Hygrocybe reidii	h	Honey Waxcap	2019 2022 2024		
Hygrocybe splendidissima	h	Splendid Waxcap	2019 2022	VU	yes
Neohygrocybe ingrata	h	Dingy Waxcap	2019 2024	VU	yes
Porpolomopsis calytpriformis	h	Pink or Ballerina Waxcap	2022	VU	yes
H total	**20**				
Entoloma atrocoeruleum	e	Navy Pinkgill	2022 2024		
Entoloma clandestinum	e	Clandestine Pinkgill	2022		
Entoloma conferendum	e	Star pinkgill	2019 2024		
Entoloma exile	e	Glaucous Pinkgill	2022		
Entoloma cf madidum	e	One of the Big Blue Pinkgills	2019	VU	
Entoloma nigroviolaceum	e	Blackish Pinkgill	2022		
Entoloma ochreoprunuloides f. hyacinthinum	e	One of the Big Blue Pinkgills	2022	VU	
Entoloma porphyrophaeum	e	Lilac Pinkgill	2024	VU	
Entoloma prunuloides	e	Mealy Pinkgill	2022	VU	
Entoloma sericellum	e	Cream Pinkgill	2022		
E total	**10**				
CHEGD scores 1 20 10 0 0					

Species recorded in Compartment 1 are given in Table 4. Records from 2018 were generated by Stewart Taylor (pers. comm..), records from 2019 – 2024 were made during survey field visits (Holden 2019, 2022 and 2024).

Discussion

The almost complete absence of Clavariaceae, Geoglossacea, *Dermoloma*, *Porpoloma* and *Camarophyllopsis* / *Hodophilus* in such a rich site for waxcaps, is consistent throughout the years surveyed. They may well be present, just not fruiting and current research is unable to offer any explanation for this. Table 4 also demonstrates the importance of several visits to get a good feel for the richness of a site, with several species only found during one of the visits. Compartment 1 is certainly a site worthy of consideration as an SSSI with one more than the JNCC threshold for waxcaps (Table 2) and four species considered to be high richness indicators (Table 3) – *Hygrocybe ingrata, H. punicea*, *H. splendidissima* and *Porpolomopsis calyptriformis*.

Current management should be encouraged with more grazing to shorten and open up the sward. This will enable the fungal richness and diversity or the site to continue.

RYNETTIN COMPARTMENT 2. Site Number 40

Management History

Retained by one of the previous owners of Abernethy Forest (Christopher Naylor), this area of grassland falls out with the management of the RSPB and is currently worked by a local grazier. The two fields are fenced and are known to have been ploughed, reseeded and fertilised about fifteen years ago. The far north corner, delineated by an old and indistinct field boundary, was not ploughed and reseeded although it may have received some fertilisation. The majority of CHEG species were recorded in this corner with a few found along the very edge of the fields where the management impacts will have been less severe.

There is also evidence of earlier cultivation in the form of field clearance stone piles in this area (Fig. 8) and it is likely that these fields were ploughed and cultivated when the croft was actively farmed.

Results

Average sward height 2024, 13 cm.

Total number of CHEGD genets – 34

Table 5 lists the species recorded in Compartment 2. Records have been generated from surveys by Holden (2019) and the current survey (2024). As reported in Holden (2019), 2024 records were all from the north end of the compartment and field edges. The north end is of particular importance and with the species known to be present, could be an important source of inoculum should there be no further improvement to the fields. *Hygrocybe punicea* and *Neohygrocybe nitrata* are both indicators of high richness (Table 3). *Clavulinopsis umbrinella* is not commonly recorded in Scotland.

Table 5: *Total number of CHEG species in Rynettin Compartment 2 2019 - 2024*

Scientific name	CHEG	Common name	Years recorded	IUCN	JNCC Indicator
Clavulinopsis umbrinella	c	Beige Coral	2019 2024		
C total	**1**				
Cuphophyllus fornicatus	h	Earthy Waxcap	2024		
Cuphophyllus pratensis	h	Meadow Waxcap	2019 2024		
Cuphophyllus russocoriaceaus	h	Cedarwood Waxcap	2019 2024		
Cuphophyllus virgineus	h	Snowy Waxcap	2019 2024		
Gliophorus irrigatus	h	Slimy Waxcap	2019		
Gliophorus laetus	h	Heath Waxcap	2024		
Gliophorus psittacinus	h	Parrot Waxcap	2019 2024		
Hygrocybe chlorophana	h	Golden Waxcap	2019 2024		
Hygrocybe coccinea	h	Scarlet Waxcap	2019 2024		
Hygrocybe conica	h	Blackening Waxcap	2019		
Hygrocybe insipida	h	Spangle Waxcap	2019		
Hygrocybe punicea	h	Crimson Waxcap	2019 2024	VU	yes
Neohygrocybe nitrata	h	Nitrous Waxcap	2024	VU	yes
H total	**13**				
CHEGD 1 13 0 0 0					

Discussion

Current management should be encouraged with more grazing to shorten and open up the sward. If no further intensive agricultural improvements are undertaken, it is likely that compartment 2 will begin to recover its fungal richness and diversity. The fungi at the northern end could act as a source of inoculum.

RYNETTIN COMPARTMENT 3 RSPB. Site Number 41

Management history

Since 1982, this area has been part of the RSPB managed Abernethy Forest. Compartment 3 was however, surveyed by Peter Orton during some of the years between 1982 and 2003. The grassland involved during that period was much like the current state of compartment 1 but was allowed to revert to bracken and scrub when grazing was removed in the late 1980s. This was the result of the reduction in deer numbers, mainly big groups of wintering red deer, to enable tree regeneration. By the mid 1990s the grass was already tall and few further waxcap records were made (S. Taylor pers. comm.).

A project was suggested (Taylor 2019) to try and revert the field to short sward grassland and see whether the waxcaps were still functioning below ground as mycelia and just not fruiting in the rank sward. Holden (2019) followed up on this paper and management recommendations were made, to cut

and remove the bracken and scrub, fence the site and allow grazing to occur over winter, spring and summer.

As outlined in Taylor (2021), a stock fence was installed in March 2020 and bracken was cut with a heavy duty robocutter with the cut being finely mulched and left in situ but not removed within the fenced area. The bracken was cut again in July 2021.

In 2022 the RSPB field was cut in early June using a tractor and cutter and then again 18 August just after the cattle (20) had grazed for one week in early August.

The compartment has received rather limited grazing in 2023 / 2024 by cattle and remains tussocky in places with an average sward height of 18cm (Appendix 3) well out with Griffiths recommendations (Griffiths et al 2011) i.e. 3 – 8cm. The bracken has however, been largely removed.

Results

Av. Sward height 20024, 18cmTotal number of CHEGD genets - 18

Formal recording of waxcap grassland species in compartment 3 (RSPB) has now been undertaken by Liz Holden 2019, 2022 and 2024 and informal recording by Stewart Taylor in 2018, 2019, 2021 and 2 visits in 2022. Data from these surveys is presented in Table 6 alongside the older (1982-2002) Orton records.

Table 6: *Rynettin RSPB field compartment 3– records of CHEGD grassland fungi (PO is Peter Orton; ST is Stewart Taylor: LH is Liz Holden). RW is Rebecca Watts – the single species in 2023 was identified by photograph only, included for its significance. 1 = present.*

CHEG Species name	English name	1982 – 2002 (PO)	2018 (ST)	2019 (LH / ST)	2021 (ST)	2022 (LH / ST)	2023 (RW) *	2024 (LH)	IUCN	JNCC indicator
Clavaria fragilis	White Spindles	1								
Clavaria fumosa	Smoky Spindles	1								
Clavaria zollingeri	Violet Coral	1						1	VU	
Clavulinopsis fusiformis	Golden Spindles	1			1					
Clavulinopsis helvola	Yellow Club					1				
Clavulinopsis umbrinella	Beige Club	1								
C Totals		**5**			**1**	**1**		**1**		
Cuphophyllus lacmus	Grey Waxcap	1			1				VU	
Cuphophyllus pratensis	Meadow Waxcap	1	1	1	1			1		
Gliophorus irrigatus	Slimy Waxcap	1		1						
Gliophorus laetus	Heath Waxcap				1			1		
Gliophorus psittacinus	Parrot Waxcap	1	1	1		1				
Hygrocybe acutoconica	Persistent Waxcap				1					
Hygrocybe cantharellus	Goblet Waxcap	1								
Hygrocybe cerecea	Butter Waxcap					1				
Hygrocybe chlorophana	Golden Waxcap	1	1	1	1	1		1		
Hygrocybe coccinea	Scarlet Waxcap	1			1	1		1		
Hygrocybe intermedia	Fibrous Waxcap	1							VU	yes
Hygrocybe punicea	Crimson Waxcap	1	1	1	1	1		1	VU	yes
Hygrocybe quieta	Oily Waxcap	1				1		1	VU	
Hygrocybe reidii	Honey Waxcap	1		1	1					
Hygrocybe splendidissima	Splendid Waxcap			1	1				VU	yes
Hygrocybe virginea var. ochraceopallida	Snowy Waxcap	1								
Neohygrocybe nitrata	Nitrous Waxcap	1					1		VU	yes

Porpolomopsis calyptriformis	Pink or Ballerina Waxcap	1			1	1			VU	yes
H Totals		**14**	**4**	**7**	**10**	**7**	**1**	**6**		
Entoloma anatinum	Dark Pinkgill	1								
Entoloma atrocoeruleum	Navy Pinkgill	1								
Entoloma chalybaeum var. lazulinum	Indigo Pinkgill	1								
Entoloma conferendum	Star Pinkgill	1		1						
Entoloma exile	Glaucous Pinkgill	1								
Entoloma formosum	Pretty Pinkgill	1								
Entoloma griseocyaneum	Felted Pinkgill	1							VU	
Entoloma huijsmanii	Violaceous Tint Pinkgill	1								
Entoloma lucidum	Shining Pinkgill	1								
Entoloma nigroviolaceum	Blackish Pinkgill	1								
Entoloma papillatum	Papillate Pinkgill	1								
Entoloma querquedula	Navyedge Pinkgill	1								
Entoloma sericellum	Cream Pinkgill	1								
Entoloma sodale	Friendly Pinkgill	1								
Entoloma xanthochroum	Brownedge Pinkgill	1								
E Totals		**15**	**0**	**1**	**0**	**0**	**0**	**0**		
CHEGD 6 18 15 0 0										

Of the 18 waxcap species recorded 1982 – 2024, since site recovery, four are new to the compartment (*Gliophorus laetus*, *Hygrocybe acutoconica*, *H. cerecea, H. splendidissima*) and three have not yet been re-found (*Cuphophyllus virgineus* var. *ochraceopallida*, *Hygrocybe cantharellus*, *H. intermedia*). This could just be down to the vagaries of fruiting; the overall richness of species is similar but see 'Discussion' below for significant differences. With no breakdown by year of the 1982 – 2002 records, it is not completely clear whether the low numbers of waxcap species recorded annually, since site recovery, is significant.

Discussion

Notable differences since grassland recovery began:

- Whilst there is no record of the number of genets recorded 1982-2002, comparisons between the number of genets in compartments 1 and 3, both in 2022 and 2024 do show a dramatic difference (Table 7).

  Table 7*: Difference in the number of waxcap genets recorded in compartments 1 and 3*

Compartment	**Number of genets 2022**	**Number of genets 2024 (Oct only)**
1 (Naylor)	137	127
3 (RSPB)	20	18

- The disappearance of *Entoloma* from compartment 3 is very noticeable. There is only one record of the very common *Entoloma conferendum* in 2019. The early records would have suggested a close look at the site for SSSI status on the basis of the *Entolomas* reaching the JNCC threshold of 15.

- Orton recorded 5 Clavarioid species of which only 3 have been re-recorded as single genets. One of these, *Clavaria zollingeri,* an uncommon species of grassland, was re-recorded for the first time in 2024.

Seven waxcap species were recorded here in 2024, the most frequent was *Hygrocybe punicea* (7 genets), a species thought to indicate good diversity in a waxcap community. Of particular interest was *Clavaria zollingeri* (Violet Coral) another indicator of good diversity and also recorded in the field by Peter Orton. The exact location of the Orton record is not known so it is not possible to do more than speculate about any connection but its presence might well suggest some mycelial continuity below ground.

It might be suggested that the overall waxcap richness has remained intact below ground, despite the lack of grazing, but that conditions are still not suitable for regular fruiting although it could equally be that there are just a few individual genets that remained in the otherwise unsuitable conditions.

The long period of a tall, dense sward has clearly had an impact on the fruiting behavior, and very probably the below ground structures of CHEGD fungi. Without more understanding of how these fungi are functioning, it is not possible to be absolutely sure what is happening below ground. Soil samples taken across both fields for DNA analysis might help in understanding the distribution but was out with the scope of this survey.

RSPB ABERNETHY GRASSLAND RESTORATION SITES: Baseline Surveys of Auchtergannach, Rynerrick and Inchtomach

AUCHTERGANNACH Site Number 36

Management History

This site was crofted until late 19th century – grassland was improved with lime. Grazed by sheep and some cattle until late 20th century.

Konik ponies were temporarily grazing this site following the flooding of Insh Marshes in 2022 (M. Butler pers. comm.). Their presence has left the site particularly rich in dung fungi and both reduced and opened up the sward. A north facing bank was the most herb rich area and *Hygrocybe cerecea* was fruiting here (NJ00391567). The rest of the field is tussocky and not particularly herb rich. An area of bracken is present in the south of the field.

Results

Average sward height 2024, 18 cm.

Total number of CHEGD genets - 4

This baseline survey found very few CHEGD species (Table 8), and those found were not of particular conservation interest. *Hygrocybe coccinea* was fruiting in a shorter sward in the north west corner of the field (NJ00261561). *Gliophorus laetus* was fruiting at NJ00421565. All three species were represented by single genets.

Table 8: *CHEGD species present at Auchtergannach 2024*

Scientific name	CHEG	Common name	Year	IUCN	JNCC indicator
Gliophorus laetus	h	Heath Waxcap	2024		
Hygrocybe cerecea	h	Butter Waxcap	2024		
Hygrocybe coccinea	h	Scarlet Waxcap	2024		
H total	**3**				
Entoloma conferendum	e	Star Pinkgill	2024		
E total	**1**				
CHEGD 0 3 1 0 0					

Discussion

Further grazing and lack of ploughing or the application of fertilizers should assist with this site becoming of more mycological interest.

RYNERRICK Site Number 37

Management History

The site was crofted until late 19th century – grassland was improved with lime and ploughed. Grazed with sheep and some cattle until late 20th century, as well as by deer up to present.

This site was characterized throughout by deep plough lines and a very tall and dense sward. Occasional herbs were found in the sward with pine and heather colonizing in places.

The presence of the ruins of the farms, Wester and Easter Rynerrick, suggest that the land would have been farmed historically.

Results

Average sward height 2024, 32 cm.

Total number of CHEGD genets - 3

This baseline survey found very few CHEGD species (Table 9), and those found were not of particular conservation interest. A shorter, more herb rich sward was found around ruins (Easter Rynerrick) in the south of the site, the only location for *Gliophorus laetus* and *Hygrocybe coccinea* (NJ00001427). A single fruitbody of *Cuphophyllus virgineus* was found on the eastern edge at NJ00211469.

Table 9: *CHEGD species present at Rynerrick 2024*

Scientific name	CHEG	Common name	Year	IUCN	JNCC indicator
Cuphophyllus virgineus	h	Snowy Waxcap	2024		
Gliophorus laetus	h	Heath Waxcap	2024		
Hygrocybe coccinea	h	Scarlet Waxcap	2024		
H total	**3**				
CHEGD 0 3 0 0 0					

Discussion

Further grazing and lack of ploughing or the application of fertilizers should assist with this site becoming of more mycological interest.

INCHTOMACH grassland Site Number 38

Management History

Holden (2019) states that the site has not been grazed by significant deer numbers since the late 1980s. It had also been grazed by free ranging cattle until 1988. Grazing since then has been minimal and in 2019, the vegetation is described as rank.

The sward height was relatively low on this site but grazing by cattle has only recently been re-introduced. It is hoped that further grazing will improve the grassland for waxcaps as well as knocking back the bracken that is present on the edge of the grassland here.

Results

Average sward height 2024, 10 cm.

Total number of CHEGD genets - 0

Recording undertaken in Abernethy Forest by Peter Orton, between 1982 and 2002, included visits to Inchtomach. Although the scores from that time do not pass any JNCC thresholds (CHEGD score 6 15 3 0 0), it should be noted that *H. punicea* and *Neohygrocybe nitrata* are both listed as high diversity indicators (Table 10). The lack of grazing since the late 1980s is reflected in the low species richness and

diversity in both 2019, with a CHEGD score of 2 3 0 0 0 and 2024 when no CHEGD species were recorded.

Table 10*: CHEGD species list for Inchtomach1982 - 2024*

CHEG Species name	CHEG	English name	1982 - 2003	2019	2024	IUCN	JNCC indicator
Clavaria acuta	c	Pointed Club	1	0	0		
Clavaria fumosa	c	Smoky Spindles	1	0	0		
Clavulinopsis corniculata	c	Meadow Coral	1	0	0		
Clavulinopsis helvola	c	Yellow Club	1	1	0		
Clavulinopsis laeticolor	c	Handsome Club	1	0	0		
Clavulinopsis luteoalba	c	Apricot Club	1	1	0		
C totals	**6**		**6**	**2**	**0**		
Cuphophyllus fornicatus	h	Earthy Waxcap	1	0	0		
Cuphophyllus pratensis	h	Meadow Waxcap	1	1	0		
Cuphophyllus virginea var. ochraceopallida	h	Snowy Waxcap	1	0	0		
Gliophorus irrigata	h	Slimy Waxcap	1	0	0		
Gliophorus psittacina	h	Parrot Waxcap	1	0	0		
Hygrocybe chlorophana	h	Golden Waxcap	1	0	0		
Hygrocybe coccinea	h	Scarlet Waxcap		1	0		
Hygrocybe conica	h	Blackening Waxcap	1	0	0		
Hygrocybe glutinipes	h	Glutinous Waxcap	1	0	0		
Hygrocybe insipida	h	Spangle Waxcap	1	0	0		
Hygrocybe laeta	h	Heath Waxcap	1	0	0		
Hygrocybe marchii	h		1	0	0		
Hygrocybe miniata	h	Vermillion Waxcap	1	0	0		
Neohygrocybe nitrata	h	Nitrous Waxcap	1	0	0	VU	yes
Hygrocybe punicea	h	Crimson Waxcap	1	0	0	VU	yes
Hygrocybe reidii	h	Honey Waxcap	1	1	0		
H totals	**16**		**15**	**2**	**0**		
Entoloma jubatum	e	Sepia Pinkgill	1	0	0		
Entoloma lucidum	e		1	0	0		
Entoloma sericellum	e	Cream Pinkgill	1	0	0		
E totals	**3**		**3**	**0**	**0**		
CHEGD 6 16 3 0 0	25		24	4	0		

Mention should be made of the profusion of small ascomycete disc fungi growing on the cow dung present. These were mostly the common *Coprobia granulata* and *Ascobolus furfuraceus*.

Discussion

The steep bank, facing the wetter area, supports a mosaic of mossy grass and heath and it was surprising not to find any waxcaps here at all. Recent changes in management do not appear to have yet had any significant impact on CHEGD species. It is interesting to note a very similar pattern in the lack of fruiting of *Entoloma* and Clavarioid fungi to that of Rynettin compartment 3. Possibly they are less tolerant of a deep sward and thatch; it will be interesting to see what further monitoring records.

Further grazing and lack of ploughing or the application of fertilizers should assist with this site becoming of more mycological interest.

INCHTOMACH: areas other than grassland

Bog woodland – the south end of the area delineated on the Inchtomach map provided for the purposes of this survey is an area of wet ground dominated by bryophytes (*Sphagnum* and *Polytrichum*), and some areas of slightly raised ground where heath and young trees are creating areas of bog woodland. In general very wet areas have a specialized mycota able to cope with the challenges provided by this habitat. Examples of these fungi that were found at the site are *Hypholoma laeticolor* and *Galerina hypnorum* - this latter with a wider habitat range than bog but present amongst *Sphagnum* here.

The drier areas of bog woodland supported mycorrhizal species growing with the pine trees here (Table 11).

Table 11: *Fungal species list for the bog woodland at Inchtomach 2024*

Scientific name	**Common name**	**Growing with**	**Grid ref**	**Functional mode**	**IUCN**
Lactarius rufus	Rufous Milkcap	Pinus sylvestris	NJ02291446	mycorrhizal	
Suillus variegatus	Velvet Bolete	Pinus sylvestris	NJ02291446	mycorrhizal	
Cortinarius cinnamomeus	Cinnamon Webcap	Pinus sylvestris	NJ02271451	mycorrhizal	
Galerina hypnorum	Moss Bell	Sphagnum sp	NJ02241452	saprotroph	
Hypholoma laeticolor	Bright Brownie	Sphagnum sp	NJ02241453	saprotroph	

Strip of mature pine along the riverside - was not fruiting at all during this visit.

Heath and regenerating pine – to the north of the site is a large area of heath and regenerating woodland. Overall it is much drier than the southern end. Table 12 gives the species recorded in this area, all with regenerating *Pinus sylvestris*.

Table 12: *Fungal species list for the heath at the northern end of Inchtomach*

Scientific name	Common name	Growing with	Grid ref	Functional mode	IUCN
Cortinarius cf caninus	Canine Webcap	Pinus sylvestris	NJ02291477	mycorrhizal	
Russula vesca	The Flirt	Pinus sylvestris	NJ02291478	mycorrhizal	
Chroogomphus rutilus	Copper Spike	Pinus sylvestris	NJ02261479	mycorrhizal	
Laccaria laccata	Deceiver	Pinus sylvestris	NJ02181492	mycorrhizal	
Tricholoma imbricatum	Matt Knight	Pinus sylvestris	NJ02161479	mycorrhizal	
Russula emetica	Sickener	Pinus sylvestris	NJ02141497	mycorrhizal	
Suillus luteus	Slippery Jack	Pinus sylvestris	NJ02141501	mycorrhizal	
Suillus variegatus	Velvet Bolete	Pinus sylvestris	NJ02151506	mycorrhizal	
Galerina ampullaceocystis	Flasked Bell	Pine needles	NJ02141496	saprotroph	

Although no CHEGD species were recorded in them, there are small areas of relatively dry, short, herb rich sward adjacent to the river at NJ02101523 and NJ02211536. There were some ruined structures at the former location. The sward at both locations had a well developed thatch and grazing would improve the structure of this sward.

SURVEYS OF LISTED GRASSLAND SITES IN STRATHSPEY

LYNGARRIE (1330) Site Number 42

Management History

No historical management information is available although it was reported that the banks were very fungi rich in 2006 during the CNPA inbye botanical survey. There were no obvious banks seen during the 2024 survey and it is not clear whether the fungi were mycorrhizal with surrounding trees but it is obvious that the bulk of the field has been significantly improved relatively recently. At some point in the current year, the improved part of the field has been cut and the cuttings left in situ. On the date of the visit, the field was being grazed by sheep.

The south east corner of the field remains unimproved although the sheep present have access to this as well as the improved field.

Results

Average sward height 2024 of unimproved part of the field, 24 cm.

Total number of CHEGD genets - 13

The improved field, with an average sward height of 7cm, supported no fruiting CHEGD species.

The south east corner, despite the longer average sward height (24cm), produced 5 waxcaps and two *Entoloma* (Table 13). The low number of genets is probably a reflection of the sward height; none of the species were JNCC indicators.

Table 13: *CHEGD species present at Lyngarrie (1330) 2024*

Scientific name	CHEG	Common name	Year	IUCN	JNCC indicator
Cuphophyllus pratensis	h	Meadow Waxcap	2024		
Cuphophyllus virgineus	h	Snowy Waxcap	2024		
Hygrocybe cerecea	h	Butter Waxcap	2024		
Hygrocybe chlorophana	h	Golden Waxcap	2024		
Hygrocybe coccinea	h	Scarlet Waxcap	2024		
H total	**5**				
Entoloma conferendum	e	Star Pinkgill	2024		
Entoloma infula	e	Chaste Pinkgill	2024		
E total	**2**				
CHEGD 0 5 2 0 0					

Discussion

It was noted that the thatch was relatively undeveloped in the unimproved section – quite possibly a result of the sheep grazing around tussocks, opening up the sward for the fungi to fruit in.

Prior to improvement, it is quite probable that the whole field was good for waxcaps. Continued grazing and lack of further ploughing or application of fertilizers would assist with this site becoming of more mycological interest. Wherever possible, when long vegetation is cut, the cuttings should be removed to assist in maintaining a low nutrient status.

BALNACRAIG (3101) Site Number 43

Management History

No historical management information is available although it was reported to be rich in waxcaps in 2007 during the CNPA inbye botanical survey. The 2024 survey notes that most of the flatter areas seemed to have received some improvement with only a few *Cuphophyllus virgineus* (known to be slightly more tolerant of nitrogen) recorded. There was evidence of recent grazing by cattle and sheep.

The areas of most mycological interest were the large banks of either fluvial or glacial origin. These areas are likely to avoid most agricultural improvements.

Results

Average sward height 2024, 11 cm.

Total number of CHEGD genets - 41

The diversity of the site shows in the relatively high number of genets. With only seven waxcaps recorded (Table 14), the site was not particular rich on the evidence of this visit.

Two species were of note:

- *Hygrocybe quieta* has been assessed as vulnerable by the IUCN and is rare in a European context. In the UK it would not be considered a particular indicator of a rich waxcap site.
- *H. punicea* has been listed as an indicator of rich waxcap sites by JNCC. Interestingly, in Scotland this species turns up at nearly every site.

Table 14: *CHEGD species present at Balnacraig (3101) 2024*

Scientific name	**CHEG**	**Common name**	**Year**	**IUCN**	**JNCC indicator**
Cuphophyllus pratensis	h	Meadow Waxcap	2024		
Cuphophyllus russocoriaceus	h	Cedarwood Waxcap	2024		
Cuphophyllus virgineus	h	Snowy Waxcap	2024		
Gliophorus laetus	h	Heath Waxcap	2024		
Hygrocybe coccinea	h	Scarlet Waxcap	2024		
Hygrocybe punicea	h	Crimson Waxcap	2024	VU	yes
Hygrocybe quieta	h	Oily Waxcap	2024	VU	
H total	**7**				
Entoloma conferendum	e	Star Pinkgill	2024		
Entoloma jubatum	e	Butter Waxcap	2024		
Entoloma sericeum	e	Golden Waxcap	2024		
E total	**3**				
CHEGD 0 7 3 0 0					

Discussion

Continued grazing and lack of further ploughing or application of fertilizers would assist with this site becoming of more mycological interest.

CROFTRONAN (2112) Site Number 44

Management History:

No historical management information is available although it was reported to be botanically and mycologically rich in 2006 during the CNPA inbye botanical survey. The 2024 survey found this still to be the case. The field is currently being grazed by two horses and a small number of sheep.

The field slopes gently down to the south and east and is wet at the lowest point.

Results

Average sward height 2024, 10 cm.

Total number of CHEGD genets - 79

The diversity and richness of fungi across this small field were significant. This was the only site to produce *Geoglossum atropurpureum* – an earthtongue listed as a UK BAP species in the 2020 list of Scottish Priority Fungi (available at https://www.nature.scot/doc/scottish-biodiversity-list). The full list is presented in Table 15.

JNCC diversity indicator species *Hygrocybe punicea* and *H. splendidissima* were both present.

Table 15: *CHEGD species present at Croftronan (2112) 2024*

Scientific name	CHEG	Common name	Year	IUCN	JNCC indicator
Cuphophyllus pratensis	h	Meadow Waxcap	2024		
Cuphophyllus russocoriaceus	h	Cedarwood Waxcap	2024		
Cuphophyllus virgineus	h	Snowy Waxcap	2024		
Gliophorus laetus	h	Heath Waxcap	2024		
Gliophorus psittacinus	h	Parrot Waxcap	2024		
Hygrocybe cerecea	h	Butter Waxcap	2024		
Hygrocybe chlorophana	h	Golden Waxcap	2024		
Hygrocybe coccinea	h	Scarlet Waxcap	2024		
Hygrocybe punicea	h	Crimson Waxcap	2024	VU	yes
Hygrocybe reidii	h	Honey Waxcap	2024		
Hygrocybe splendidissima	h	Splendid Waxcap	2024	VU	yes
H total	**11**				
Entoloma conferendum	e	Star Pinkgill	2024		
E total	**1**				
Geoglossum atropurpureum	g	Dark-purple Earthtongue	2024	VU	
G total	**1**				
CHEGD 0 11 1 1 0					

Discussion

Continuation of the current management will maintain this field and enable further richness and diversity to develop. Further monitoring would undoubtedly increase the number of species in this site.

DUTHILL (2077) Site Number 45

Management History

No historical management information is available although the drier eastern edge was reported to be unimproved and fungally rich in 2006 during the CNPA inbye botanical survey. The 2024 survey found that the eastern edge was still unimproved whilst the larger, lower part of the field was improved and contained no CHEGD fungi. The field was being grazed by a small number of sheep when visited in 2024.

The field is bounded on three sides by plantation pine and a number of associated mycorrhizal species were found around the edges of the field. The unimproved eastern section had a very short sward dominated by of a mosaic of mosses and lichen heath.

Results

Average sward height 2024, 8 cm.

Total number of CHEGD genets – 17

The dominant waxcap was *Gliophorus laetus* (Heath Waxcap) with 10 of the 17 genets from this species. Table 16 lists the species recorded.

Table 16: *CHEGD species present at Duthill (2077) 2024*

Scientific name	**CHEG**	**Common name**	**Year**	**IUCN**	**JNCC indicator**
Cuphophyllus pratensis	h	Meadow Waxcap	2024		
Cuphophyllus virgineus	h	Snowy Waxcap	2024		
Gliophorus laetus	h	Heath Waxcap	2024		
Hygrocybe cerecea	h	Butter Waxcap	2024		
H total	**4**				
CHEGD 0 4 0 0 0					

Discussion

This field is unlikely to become a good waxcap grassland.

DUTHILL (2075) Site Number 46

Management History

No historical management information is available although the field was reported to be mostly unimproved and fungally rich in 2006 during the CNPA inbye botanical survey. Since that time the flatter areas of the field appear to have been improved with only the steeper areas of bank at the southern part of the field retaining an unimproved character with occasional CHEGD Species.

Results

Average sward height 2024, 7 cm.

Total number of CHEGD genets – 6

Some birch trees were present in the field along with associated mycorrhizal species. No CHEGD species of particular interest were recorded (Table 17) and the diversity was low.

Table 17: *CHEGD species present at Duthill (2077) 2024*

Scientific name	**CHEG**	**Common name**	**Year**	**IUCN**	**JNCC indicator**
Gliophorus laetus	h	Heath Waxcap	2024		
Hygrocybe cerecea	h	Butter Waxcap	2024		
Hygrocybe insipida	h	Spangle Waxcap	2024		
H total	**3**				
CHEGD 0 3 0 0 0					

Discussion

Continued grazing and lack of further ploughing or application of fertilizers would assist with this site becoming of more mycological interest.

FLOWERFIELD (373) Site Number 47

Management History

No historical management information is available although the field is known to be of botanical importance (S. Taylor pers. comm..). The field had evidence of cattle grazing.

Results

Average sward height 2024, 11 cm.

Total number of CHEGD genets – 42

Table 18: *CHEGD species present at Flowerfield (373) 2024*

Scientific name	CHEG	Common name	Year	IUCN	JNCC indicator
Clavulinopsis luteoalba	c	Apricot Club	2024		
C total	**1**				
Cuphophyllus russocoriaceus	h	Cedarwood Waxcap	2024		
Hygrocybe splendidissima	h	Splendid Waxcap	2024	VU	yes
Hygrocybe punicea	h	Crimson Waxcap	2024	VU	yes
Gliophorus psittacinus	h	Parrot Waxcap	2024		
Gliophorus laetus	h	Heath Waxcap	2024		
Hygrocybe reidii	h	Honey Waxcap	2024		
Hygrocybe coccinea	h	Scarlet Waxcap	2024		
H total	**7**				
CHEGD 1 7 0 0 0					

The number of species and genets was surprisingly low (Table 18) although both JNCC high diversity indicators (*H. punicea* and *H. splendidissima*) were present.

Discussion

Continuation of the current management will maintain this field and enable further richness and diversity to develop. Further monitoring would undoubtedly increase the number of species in this site.

GLEN BANCHOR Site Number 48

Management History

The presence of prehistoric and post mediaeval remains have been recorded in the area around Dalballoch (https://canmore.org.uk/collection/1944755) so it is very probably that this area, and other areas close to settlements e.g. around NN680991 and the township around NN679994 have all experienced some form of agricultural activity in the past. In 1841 there were eight settlements known in Glen Banchor mostly cleared by the end of the 19th century.

No other historical management information is available and currently the glen is part of an estate (Pitmain and Glen Banchor Estate) with both deer stalking and sheep farming taking place. Large areas along the River Calder were not suitable for waxcaps being either very wet of dominated by heather.

Results

Average sward height 2024, 10 cm.

Total number of CHEGD genets – 142

Table 19: *CHEGD species present in Glen Banchor 2024*

Scientific name	CHEG	Common name	Year	IUCN	JNCC indicator
Clavulinopsis helvola	c	Apricot Club	2024		
C total	**1**				
Cuphophyllus lacmus	h	Grey Waxcap	2024	VU	yes
Cuphophyllus pratensis	h	Meadow Waxcap	2024		
Cuphophyllus russocoriaceus	h	Cedarwood Waxcap	2024		
Cuphophyllus virgineus	h	Parrot Waxcap	2024		
Gliophorus laetus	h	Heath Waxcap	2024		
Gliophorus psittasinus	h	Honey Waxcap	2024		
Hygrocybe cerecea	h	Butter Waxcap	2024		
Hygrocybe chlorophana	h	Golden Waxcap	2024		
Hygrocybe coccinea	h	Scarlet Waxcap	2024		
Hygrocybe punicea	h	Crimson Waxcap	2024	VU	yes
Hygrocybe reidii	h	Honey Waxcap	2024		
Hygrocybe splendidissima	h	Splendid Waxcap	2024	VU	yes
H total	**12**				
Entoloma conferendum	e	Star PInkgill	2024		
E total	**1**				
CHEGD 1 12 1 0 0					

The most productive areas for CHEGD species were around the old township at NN679994 and Creagan Dearg (around NN676999). The old township is adjacent to the Allt Fionndrigh – rivers and streams often seem to generate diverse grassland attractive to grazing animals. The lower, south facing slopes of Creagan Dearg, both sides of a hill track, were well grazed and grassy proving rich in waxcaps and only grading into heather higher up. These two areas both supported JNCC high richness indicators (*H. punicea* and *H. splendidissima*) (Table 19).

C. lacmus (also a JNCC indicator) was found in two places – at Dalballoch (NN6590798618) and close to an old settlement at (NN6801099145).

Taken altogether as the site Glen Banchor, the overall total of 14 CHEGD species with 142 genets making this an interesting site.

Discussion

Continuation of the current management will maintain this field and enable further richness and diversity to develop. Further monitoring would undoubtedly increase the number of species in this site.

HILL OF LETHENDRY (2110) Site Number 49

Management History

No historical management information is available although the field was reported to be species and fungally rich in 2006 during the CNPA inbye botanical survey. The grid reference given from the CNPA survey was in what had been a conifer plantation and surrounding fields appeared to be improved.

Results

Average sward height 2024, 12 cm.

Total number of CHEGD genets – 1

Table 20: *CHEGD species present at Hill of Lethendry 2024*

Scientific name	CHEG	Common name	Year	IUCN	JNCC indicator
Gliophorus laetus	h	Heath Waxcap	2024		
H total	**1**				
Entoloma conferendum	e	Star PInkgill	2024		
E total	**1**				
CHEGD 0 1 1 0 0					

There were a number of fungal species associated with the decomposition of conifer wood and the only CHEGD species were *Gliophorus laetus* and the very commonly occurring *Entoloma conferendum* (able 20).

Discussion

This site is unlikely to be of interest as a waxcap grassland.

RYNABALLOCH (2270) Site Number 50

Management History

No historical management information is available although the field was reported to be a good unimproved field with some fungi in 2006 during the CNPA inbye botanical survey. The presence of old, wooden pens suggests a history of sheep grazing but this has clearly not taken place for some years.

Results

Average sward height 2024, 15 cm.

Total number of CHEGD genets – 1

This site was under grazed with a tall sward and dense thatch, with occasional herbs. The field is bounded by a *Picea* plantation along the south eastern edge and a number of mycorrhizal fungi associating with the *Picea* were present along that edge. The only CHEGD species was *Gliophorus laetus* (Table 21).

Table 21: *CHEGD species present at Rynaballoch (2270) 2024*

Scientific name	CHEG	Common name	Year	IUCN	JNCC indicator
Gliophorus laetus	h	Heath Waxcap	2024		
H total	**1**				
CHEGD 0 1 0 0 0					

Discussion

This site is unlikely to be of interest as waxcap grassland.

TOLVAH (1309) Site Number 51

Management History

No historical management information is available although the field was reported to be 'very good, fungi, mainly CG10a' in 2006 during the CNPA inbye botanical survey. It is likely that grazing has been taken off as a part of the tree regeneration policy being undertaken in Glen Feshie.

Results

Average sward height 2024, 29 cm.

Total number of CHEGD genets – 0

No CHEGD species were fruiting during this visit.

Discussion

This site is currently unlikely to be of interest as a waxcap grassland. Should targeted grazing be re-introduced it is possible that both the botanical and fungal interest could be regenerated.

TOMACHROCHAR (448) Site Number 25

Management History

No historical management information is available although Tomachrochar was recorded as containing a large extent of species-rich grassland in 2006 during the CNPA inbye botanical survey (species-rich

grassland types included U4c 30%, CG10a 10%, U5c 5%.). Aerial imagery assessment in 2021 indicates no change.

Results

Average sward height 2024, 10 cm.

Total number of CHEGD genets – 132

This site has been previously surveyed for CHEGD fungi in 2010 and 2018 (Holden 2010: Holden 2018). Records from these visits are included in Table 21 alongside those from 2024.

The survey in 2018 recorded very few CHEGD species and demonstrates how difficult it is to rely on one year of records only. In 2018 only three waxcaps were recorded. The 2024 survey recorded 14 waxcaps to the 12 of 2010 including *Neohygrocybe nitrata* – a JNCC high diversity indicator and new to the site. JNCC indicators *H. punicea* and *H. splendidissima* were both present in 2010 and 2024 but only *H. punicea* in 2018 (Table 22). The areas of interest in 2024 remain the same as in 2010.

Table 22: *CHEGD species present at Tomachrochar (448) 2024*

Scientific name	CHEG	Common name	Year 2010	Year 2018	Year 2024	IUCN	JNCC indicator
Clavaria acuta	c	Pointed Club	2010				
Clavulinopsis corniculata	c	Meadow Coral	2010		2024		
Clavulinopsis helvola	c	Yellow Club	2010				
C total	**3**		**3**		**1**		
Cuphophyllus pratensis	h	Meadow Waxcap	2010		2024		
Cuphophyllus russocoriaceus	h	Cedarwood Waxcap	2010		2024		
Cuphophyllus virgineus	h	Snowy Waxcap	2010	2018	2024		
Cuphophyllus virgineus var ochraceopallida	h				2024		
Gliophorus laetus	h	Heath Waxcap			2024		
Gliophorus psittacinus	h	Parrot Waxcap	2010		2024		
Hygrocybe cerecea	h	Butter Waxcap	2010		2024		
Hygrocybe chlorophana	h	Golden Waxcap			2024		
Hygrocybe coccinea	h	Scarlet Waxcap	2010	2018	2024		
Hygrocybe conica	h	Blackening Waxcap	2010				
Hygrocybe insipida	h	Spangle Waxcap	2010		2024		
Hygrocybe miniata	h	Vermilion Waxcap	2010				
Hygrocybe punicea	h	Crimson Waxcap	2010	2018	2024	VU	yes
Hygrocybe reidii	h	Honey Waxcap	2010		2024		

Hygrocybe splendidissima	h	Splendid Waxcap	2010		2024	VU	yes
Neohygrocybe nitrata	h	Nitrous Waxcap			2024	VU	yes
H total	**16**		**12**	**3**	**14**		
Entoloma caeruleum	e	Beautiful Blue Pinkgill	2010				
Entoloma sericeum	e	Silky Pinkgill			2024		
E total	**2**		**1**		**1**		
CHEGD 1 14 1 0 0 2024 **CHEGD 3 16 2 0 0 All**							

Discussion

13.4 hectares would make this the largest area for species rich grassland in Badenoch & Strathspey, however, much of the delineated area is unsuitable for CHEGD fungi. The field complex closest to the road (particularly around NH982205, NH983207) and the banks of fluvial or glacial origin were however very rich and diverse, particularly in waxcap species, making this the best of the sites visited in 2024. None of the CHEGD totals reach the JNCC thresholds for consideration as an SSSI.

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APPENDICES

Appendices 1 (full data set in excel) and 2 (site maps in excel) are presented as separate documents.

Appendix 3: *Sward heights (cm) from 2024 waxcap sites*

Site name	Site number	Sward range	Av sward height
Abernethy: Auchtergannach	36	8 - 29	18
Ábernethy: Rynerrick	37	14 - 50	32
Abernethy: Inchtomach (grassland only)	38	9 – 13	10
Rynettin compartment 1	39	8 – 24	11
Rynettin compartment 2	40	5 - 17	13
Rynettin compartment 3 (RSPB)	41	11 - 30	18
Lyngarrie (1330) (unimproved corner)	42	12 - 42	24
Balnacraig (3101)	43	3 - 35	11
Croftronan (2112)	44	2 - 21	10
Duthill (2077)	45	2 - 20	8
Duthill (2025)	46	3 - 12	7
Flowerfield	47	2 - 11	11
Glen Banchor	48	3 - 16	10
Hill of Lethendry (2110)	49	8 - 15	12
Rynaballoch (2070)	50	4 - 25	15
Tolvah (1309)	51	22 - 38	29
Tomachrochar (448)	25	5 - 18	10

Appendix 4*: Total number of CHEGD genets per site 2024*

Site name	Site number	CHEGD species 2024	Total CHEGD spp	Total CHEGD genets	Av sward height
Abernethy: Auchtergannach	36	0 3 1 0 0	4	4	18
Ábernethy: Rynerrick	37	0 3 0 0 0	3	3	32
Abernethy: Inchtomach (grassland only)	38	0 0 0 0 0	0	0	10
Rynettin compartment 1	39	1 15 3 0 0	19	127	11
Rynettin compartment 2	40	1 10 0 0 0	11	34	13
Rynettin compartment 3 (RSPB)	41	0 6 1 0 0	7	18	18
Lyngarrie (1330) (unimproved corner)	42	0 5 2 0 0	7	13	24
Balnacraig (3101)	43	0 7 3 0 0	10	41	11
Croftronan (2112)	44	0 11 1 1 0	13	79	10
Duthill (2077)	45	0 4 0 0 0	4	17	8
Duthill (2025)	46	0 3 0 0 0	3	6	7
Flowerfield	47	1 7 0 0 0	8	42	11
Glen Banchor	48	1 12 1 0 0	14	142	10
Hill of Lethendry (2110)	49	0 1 1 0 0	2	17	12
Rynaballoch (2070)	50	0 1 0 0 0	1	1	15
Tolvah (1309)	51	0 0 0 0 0	0	0	29
Tomachrochar (448)	25	1 14 1 0 0	16	132	10

Appendix 5: *Division of the genus Hygrocybe (Lodge et al 2014)*

Cromosera		*Gliophorus*	
	C. citrinopallida		*G. europerplexus*
	C. lilacina		*G. irrigatus*
	C. viola		*G. laetus*
	C. xanthochroa		*G. psittacinus s.l*
Cuphophyllus			*G. reginae*
	C. aurantius	*Gloioxanthomyces*	
	C. canescens		*G. vitellinus*
	C. colemannianus		
	C. fornicatus	*Neohygrocybe*	
	C. lacmus		*N. nitrata*
	C. pratensis		*N. ovina*
	C. pratensis var. pallida (aka C. berkleyii)		
	C. radiatus	*Porpolomopsis*	
	C. russocoriaceus		*P. calyptriformis*
	C. virgineus	*Hygrocybe*	
		All other species remain in *Hygrocybe*	

Appendix 6: *List of sites informally visited for CHEGD species during the 2024 survey*

Site name	**Approx site centroid**	**CHEGD species totals**	**Comments**
Tromie Meadow	NN787996	3	Under grazed, tight thatch. Potential for restoration. *H. punicea* present.
Balnacraig (bottom field)	NH825036	4	Records from the field edges, particularly the bank near the top field. *H. punicea* present.
Croftronan (middle field)	NH964196	5	Records mostly from the field edges but occasional collections of *C. virgineus* in main field. Adjacent to excellent field – potential for restoration. *H. punicea* present.
Nethy Bridge: Bailiemore	NJ000228	4	Fluvial / glacial banks have potential although all flatter areas improved
Tomnagowan	NH970162	13	A good site – be great to encourage manager. *H. punicea* and *H. splendidissima* present.
Ord Ban	NH881772	11	Rothiemurchus deer farm. A good site *H. punicea* and *H. splendidissima* present.
Tor Alvie	NH8608	2	Very little found two fields visited – *H. punicea* present.