

Observation to An Bord Pleanála re proposed Kilbarry Strategic Housing Development, Cork City.

By Dr. Isobel Abbott (Principal Ecologist, Abbott Ecology)

Address: Knockatee, Monilea, Mullingar, Co. Westmeath, N91V9W3

Date: 8th August 2022

Waxcap grassland and fungi of national and global conservation significance at the edge of Cork City

I am aware of the urgent need for new housing supply within Cork City to address the national housing and rental crisis. However, we are also in the midst of a biodiversity extinction crisis.

Interested parties need to be aware that the development at Kilbarry, as proposed, is likely to result in the permanent and irreversible regional extinction of "waxcap grassland" habitat and fungi species of national (and worldwide) conservation significance, as described below. Fungal diversity is rarely considered in EIARs in Ireland, and this aspect of loss of biodiversity has not been addressed in the EIAR for the Kilbarry SHD.

Description and Evaluation of the Conservation Significance of the Fungal Assemblage at Kilbarry

I have recorded a diversity of rare and threatened fungi on the development site during many walks in the years 2015 to 2018 (Table 1). These fungi are characteristic of old, unfertilised, undisturbed, semi-natural grassland.

Such grassland habitat is commonly referred to as waxcap grassland when it supports a diverse assemblage of a colourful and characteristic fungal group, the waxcaps (genus *Hygrocybe sensu lato*) (see Plate 1 for example). Sadly, waxcap grasslands have disappeared from much of Europe, mainly as a result of intensive farming practices and urban development. Ploughing and reseeded, excavation, or the addition of artificial fertilizers are extremely destructive to this habitat. More than 90% of unimproved grasslands have vanished in Western Europe over the last century (Griffith *et al.*, 2013), and hence waxcaps, and other waxcap-grassland fungi, have become endangered at a European scale. These fungi feature on the national fungal red lists of most European countries. Ireland is among a minority of European countries that have not yet produced a fungal red list.



Plate 1. A selection of waxcaps recorded on 19.10.2016 at the proposed Kilbarry SHD site.

While waxcaps are often a major constituent of waxcap grasslands, there are other key indicator species, collectively referred to as the **CHEGD** fungi (McHugh *et al.*, 2001), an acronym for the key fungi groups involved;

- Clavariaceae (fairy clubs, spindles, and coral fungi)
- Hygrocybe* (*sensu lato*) (waxcaps, although recent DNA analyses have split up the genus),
- Entoloma* (grassland pinkgills)
- Geoglossaceae (earth-tongues and relatives)
- Dermoloma* (crazed caps and relatives)

Concerns about the rapid decline of grassland fungi were first raised in the Netherlands and later in Scandinavian countries, prompting surveys to inventory grassland sites which are of national or international importance. Various scoring criteria have been proposed to answer the question of how rich a site needs to be in fungal species to be of priority conservation importance.

In 1985, Rald, a mycologist working in Denmark, proposed a simple count of the number of *Hygrocybe* s.l. species present to indicate conservation value. This system has been adapted (as shown in Table 1) and remains in use in Europe and Britain, generally giving similar results to more complicated scoring systems. I have recorded 19 waxcap species at the Kilbarry site to date (Table 2), scoring it as a site of national importance under this system.

The waxcap count of 19 at Kilbarry also reaches the threshold count (19) for which a site should be considered for designation as a Site of Special Scientific Interest (SSSI) according to Joint Nature Conservation Committee (JNCC) guidelines, if the site were within Britain (Bosanquet *et al.*, 2018). The Kilbarry site also hosts five waxcap species that have been highlighted in these JNCC guidelines as 'high diversity indicator species'; namely, *Porpolomopsis calytriformis* (Pink Waxcap), *Cuphophyllus flavipes* (Yellow Foot Waxcap), *Hygrocybe intermedia* (Fibrous Waxcap), *Neohygrocybe ovina* (Blushing Waxcap), and *Hygrocybe punicea* (Crimson Waxcap) (highlighted in bold in Table 2). These indicator species of grassland fungi tend to be recorded at sites that support a high overall grassland fungal diversity (Bosanquet *et al.*, 2018). All of the above listed species are also currently proposed for, or listed on, **the global IUCN Red List of Threatened Species** (see http://iucn.ekoo.se/iucn/species_list).

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

Conservation value	<i>Hygrocybe</i> spp in one visit	Total no. of <i>Hygrocybe</i> spp multiple visits
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

Other more comprehensive scoring systems involve counting or weighting *all* CHEGD species. This approach has the disadvantage that all species within difficult genera such as *Entoloma* (pinkgills) need to be identified, making such scoring systems less accessible to non-professional mycologists (McHugh *et al.*, 2001). Building on previous European and British scoring systems, McHugh *et al.* (2001) developed a scoring system to rank and highlight the conservation value of Irish waxcap grassland sites. It includes all waxcap species, with supplementary scoring from other CHEGD groups which are both easily identifiable and good indicator species. There is a quality, as well as quantity, element in the scoring system, with fungi considered to have the highest indicator value receiving a higher score than others. This system is used here to put the conservation significance of the Cork city waxcap site at Kilbarry in context with other recognised Irish waxcap grasslands (Table 2).

As seen in Table 2, this results in a McHugh *et al.* (2001) 'Irish Score' of 48. This score places the Kilbarry waxcap grassland among the top-ranked Irish waxcap sites in the country, and also characterises it as of national conservation importance.

Table 2 indicates the areas where each species was found within the Kilbarry site, labelled as separate fields in the aerial imagery in Figure 1 below.

Table 2. McHugh *et al.* (2001) Irish grassland species quality scores for the Kilbarry SHD site

English name	Scientific name (traditional)	Latest scientific name	Class	Irish Score	Waxcap Count	Site field reference*
Violet Coral	<i>Clavaria zollingeri</i>		A	4		6
Big Blue Pinkgill	<i>Entoloma bloxamii s.l.</i>		A	4		5
Blushing Waxcap	<i>Hygrocybe ovina</i>	<i>Neohygrocybe ovina</i>	A	4	1	5,6
Crimson Waxcap	<i>Hygrocybe punicea</i>		A	4	1	2,4,5,6
Cooke's Earthtongue	<i>Geoglossum cookeanum</i>		B	2		2
Crazed Cap	<i>Dermoloma cuneifolium</i>		B	2		2,3,4
Lilac Pinkgill	<i>Entoloma porphyrophaeum</i>		B	2		2,5,6
Mealy Pinkgill	<i>Entoloma prunuloides</i>		B	2		6
Pink Waxcap	<i>Hygrocybe calyptriformis</i>	<i>Porpolomopsis calyptriformis</i>	B	2	1	2,3,4,6
Yellow Foot Waxcap	<i>Hygrocybe flavipes</i>	<i>Cuphophyllus flavipes</i>	B	2	1	6
Glutinous Waxcap	<i>Hygrocybe glutinipes</i>		B	2	1	2
Fibrous Waxcap	<i>Hygrocybe intermedia</i>		B	2	1	5,6
Slimy Waxcap	<i>Hygrocybe irrigata</i>	<i>Gliophorus irrigatus</i>	B	2	1	2,3,4,5,6
Oily Waxcap	<i>Hygrocybe quieta</i>		B	2	1	5
Golden Spindles	<i>Clavulinopsis fusiformis</i>		C	1		5
Goblet Waxcap	<i>Hygrocybe cantharellus</i>		C	1	1	6
Butter Waxcap	<i>Hygrocybe ceracea</i>		C	1	1	3,6
Golden Waxcap	<i>Hygrocybe chlorophana</i>		C	1	1	2,3,4,5,6,7
Scarlet Waxcap	<i>Hygrocybe coccinea</i>		C	1	1	2,3,4,5,6,7
Blackening Waxcap	<i>Hygrocybe conica s.l.</i>		C	1	1	1,5
Spangle Waxcap	<i>Hygrocybe insipida s.l.</i>		C	1	1	2,3,4
Vermilion Waxcap	<i>Hygrocybe miniata</i>		C	1	1	5,6
Meadow Waxcap	<i>Hygrocybe pratensis</i>	<i>Cuphophyllus pratensis</i>	C	1	1	2,3,4,5,6,7
Parrot Waxcap	<i>Hygrocybe psittacinus s.l.</i>	<i>Gliophorus psittacinus</i>	C	1	1	1,2,3,4,5,6,7
Honey Waxcap	<i>Hygrocybe reidii</i>		C	1	1	4,5,6,7
Snowy Waxcap	<i>Hygrocybe virginea s.l.</i>	<i>Cuphophyllus virgineus</i>	C	1	1	1,2,3,4,5,6,7
Total scores for assessing conservation significance of the site				48	19	

** Site field references as per labels in Figure 1 are listed if the species has been recorded in that field.

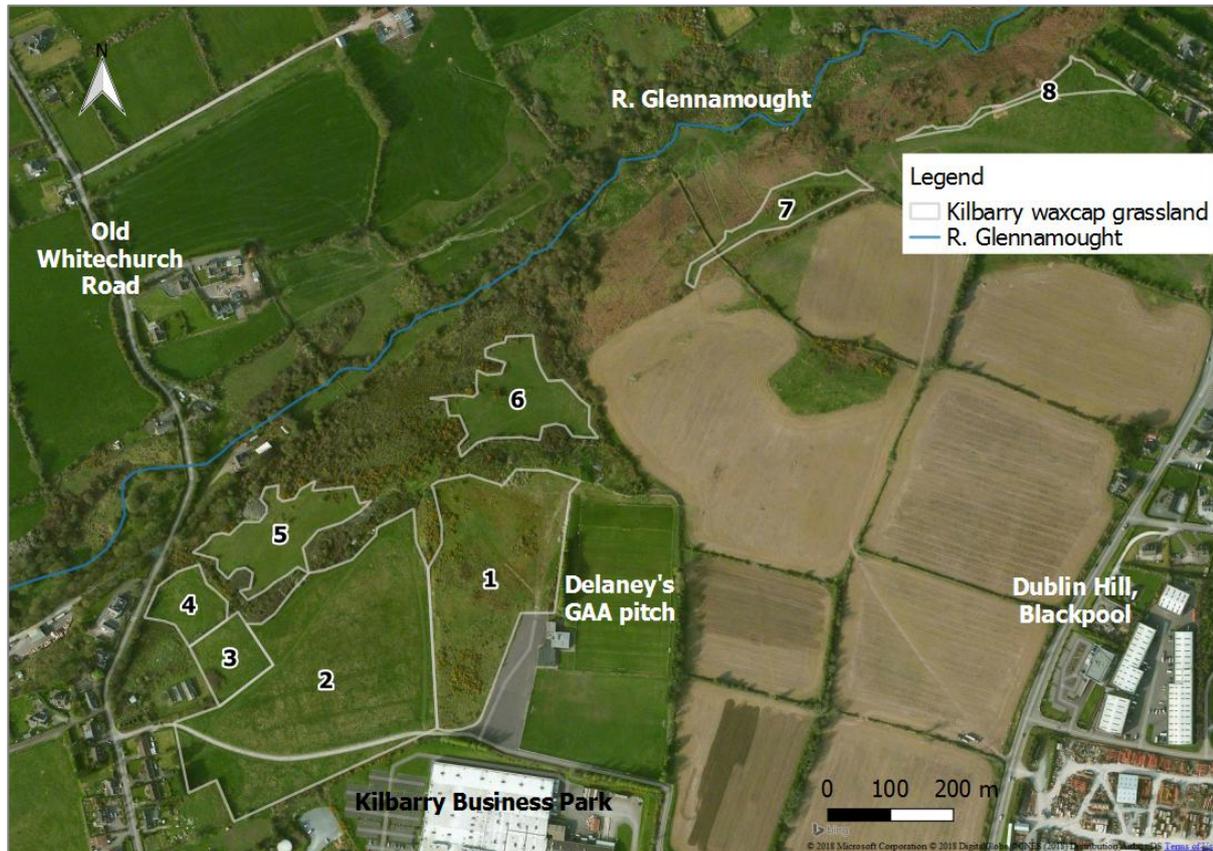


Figure 1. Site location showing Kilbarry waxcap grassland field numbers for reference in text and Table 2.

Some Fungal Species Highlights at Kilbarry

Violet Coral, *Clavaria zollingeri*, was found on 17 June 2015 in field 6 at Kilbarry (Figure 1), as shown in Plate 2. This is a distinctive, coral-like fungus with a striking violet colour. There are few records (if any) in the Republic of Ireland, and it has been recorded rarely in the Northern Ireland. It is one of a small number out of thousands of fungi species which have been designated as a "Northern Ireland Priority Species". These are species which require conservation action because of their decline, rarity and importance in an all-Ireland and UK context. Violet Coral has been highlighted as another indicator species that suggests that the site may have exceptionally high grassland fungal diversity. It is also listed as globally vulnerable on the IUCN Red List of Threatened Species <https://dx.doi.org/10.2305/IUCN.UK.2019-2.RLTS.T70402563A70402575.en>.



Plate 2. Violet Coral, *Clavaria zollingeri*, photographed at the Kilbarry SHD site.

Big Blue Pinkgill, *Entoloma bloxamii*, was found on 20 October 2016 in field 5 at Kilbarry (Figure 1), as shown in Plate 3. It is quite a distinctive member of the pinkgill genus, in that it is large, fleshy, with steely grey-blueish hues in the cap and stem. It has also been designated as a "conservation priority species" in England, Scotland, Wales and Northern Ireland because of their decline, rarity and importance in an all-Ireland and UK context. Big Blue Pinkgill (now a species complex following DNA sequencing) is listed in the global IUCN Red List of Threatened Species <https://www.iucnredlist.org/species/147245319/147869057>, and is red-listed in 17 European countries (Ainsworth *et al.*, 2018).



Plate 3. Big Blue Pinkgill, *Entoloma bloxamii*, photographed at the Kilbarry SHD site.

Blushing Waxcap, *Neohygrocybe ovina*, was first found on 8 October 2017 at Kilbarry (in fields 5 and 6, Figure 1), as shown in Plate 4. It is not the most colourful of the waxcaps, but it is one of the rarest, and a strong indicator of high quality fungally diverse grassland sites. It is easily identified due to its appearance, smell, and its characteristic reddening/pinkening (or blushing) of the gills and flesh a while after they have been bruised. It is also a Northern Ireland Priority species requiring conservation action. It is listed as globally vulnerable on the IUCN Red List of Threatened Species <https://www.iucnredlist.org/species/147321622/147972653>.



Plate 4. Blushing Waxcap, *Neohygrocybe ovina*, photographed at the Kilbarry SHD site.

Pink Waxcap, *Porpolomopsis calytriformis*, was found numerous times at the Kilbarry site (in fields 2,3,4 and 6, Figure 1), as photographed for example in Plate 5. Sometimes called the ballerina waxcap, it is a distinctive, rare and beautiful species. Up until 2007, it was a UK Biodiversity Action Plan (BAP) species,

but following extensive publicity and surveys it was found to be more widespread than thought. Britain and Ireland may be European strongholds for this waxcap, as it is very rare on a European Scale, and features on the red lists of threatened species of numerous European countries. It is listed as globally vulnerable on the IUCN Red List of Threatened Species <https://www.iucnredlist.org/species/125434807/151188119>.



Plate 5. Pink (or Ballerina) Waxcap, *Porpolomopsis calytriformis*, photographed at the Kilbarry SHD site.

Crimson Waxcap, *Hygrocybe punicea*, is often a relatively large and brilliantly striking waxcap, as shown in Plate 6. It is another globally rare and threatened species, which is also listed as vulnerable on the IUCN Red List of Threatened Species (http://iucn.ekoo.se/iucn/species_view/356817). Compared to the species listed above, the Crimson Waxcap has been found quite abundantly and regularly at the Kilbarry site, highlighting the site's value to support such threatened species.



Plate 6. Crimon Waxcap, *Hygrocybe punicea*, photographed at the Kilbarry SHD site.

Grassland Pinkgills (*Entoloma*) Are Diverse But Under-recorded at the Proposed Kilbarry Site

As mentioned, members of the pinkgill genus, *Entoloma*, are difficult to identify. I am not a professional mycologist (person who studies fungi) and have only managed to identify a proportion of the pinkgill species that I have found on the site. See for example the Lilac Pinkgill, *Entoloma porphyrophaeum*, which was found quite regularly at the site in Plate 7.

However, I recognised that there are clearly other different species of *Entoloma*, and if a professional mycologist surveyed the site for *Entoloma* species, I strongly suspect that the site would reach the criteria for national conservation significance based on this genus alone.



Plate 7. Lilac Pinkgill (*Entoloma porphyrophaeum*) and an earth tongue *Geoglossum* sp. photographed at Kilbarry

There are also many, many more fungi species at the site which have not been mentioned here, as the CHEGD fungi are the ones that really highlight the conservation significance of the site.

Conclusion

The importance of the fungal community at the Kilbarry site is truly remarkable. It is a conservation jewel at the edge of Cork City. The proposed protection of grassland habitat for Marsh Fritillary butterfly may also protect some of the waxcap grassland, provided there is no excavation or soil disturbance. However, soil disturbance/excavation/fill for the proposed landscaping/elevation profiling and provision of paths, roadways, tree planting, services etc. is highly likely to destroy the special fungal community that currently exists there. The most diverse and important fields to protect are fields 4, 5, and 6 in Figure 1. Given the number of high quality indicator species that have already been found, it merits a professional team of mycologists surveying and evaluating the site in order to inform the planning process and conservation strategy.

I wish to request an oral hearing as part of this observation, and include the appropriate fee herewith.

Yours Sincerely,
Dr. Isobel Abbott
8th August 2022

References

- Ainsworth, A.M., Dougl, B., Suz, L. (2018). Big Blue Pinkgills formerly known as *Entoloma bloxamii* in Britain: *E. bloxamii* s. str., *E. madidum*, *E. ochreoprunuloides* forma *hyacinthinum* and *E. atromadidum* sp. nov. *Field Mycology* **19** (1), 5-14.
- Bosanquet, S., Ainsworth, A.M., Cooch, S., Genney, D., & Wilkins, T. (2018). Guidelines for the Selection of Biological SSSIs. Part 2: Detailed Guidelines for Habitats and Species Groups. Chapter 14 Nonlichenised Fungi. Joint Nature Conservation Committee, Peterborough.
- Griffith, G., Gamarra, J., Holden, E., Mitchel, D., Graham, A., Evans, D., Evans, S., Aron, C., Noordeloos, M., Kirk, P., Smith, S., Woods, R., Hale, A., Easton, G., Ratkowsky, D., Stevens, D., Halbwachs, H. (2013). The international conservation importance of Welsh 'waxcap' grasslands. *Mycosphere* **4** (5). 969-984.
- 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**: 225-242.
- Rald, E. (1985). Vokshatte som indikatorarter for mykologisk værdifulde overdrevslokalteter. *Svampe* **11**, 1-9.
- Vesterholt, J., Boertmann, D., Tranberg, H. (1999) 1998—et usædvanlig godt år for overdrevssvampe. *Svampe* **40**, 36–44.