

## Waxcap Grasslands

The most prominent components of waxcap grasslands are the colourful familiar-shaped mushrooms with a waxy or slippery-looking cap. There are other types of waxcap fungi with differently shaped fruiting bodies, called earth-tongues, pinkgills and fairy clubs. They are found in grasslands with low levels of nutrients such as old pastures, sand dunes, heathland, grassy areas such as graveyards and mown banks, or unfertilised hay meadows. Often waxcap grasslands tend to be poorer in wildflowers and grasses and, as a consequence, the later fruiting fungi can be overlooked. Waxcap grasslands

look their best in the autumn when the brightly-coloured fruiting bodies emerge from the ground. They are a rare grassland treasure.

Fungi are used as indicators of unimproved grassland; these consist of the fairy clubs, waxcaps, pinkgills, earthtongues, Dermolomas and others (also referred to with the acronym CHEGD based on the scientific family names). These fungi are intolerant of modern agricultural practices such as ploughing, fertilising and reseeding, thus are restricted to unimproved or semi-improved pastures.



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- Fairy clubs or coral fungi (Clavarioids). These are either simple or branched spindle or club shapes. They are typically orange or yellow but may also be white, beige or even purple. They often occur low down in the grass and may be easily overlooked.



- Waxcaps (Hygrocybes and others). These are often brightly coloured mushrooms, although the wide range of species exhibits practically all colours. Some species are rather shiny and viscid as implied by their common collective name but others are dry. The texture of the cap and stipe (stalk of the mushroom) is important in identification. Apart from the distinctive colours and texture, many species have rather broad and widely spaced gills.



- Pinkgills (Entolomas). These are characterised by the pink colour of the gills, which develops as the spores ripen (immature specimens will not exhibit this character). They consist of a very large and diverse group of mushrooms which are often difficult to identify. Many grassland species in sub-genus *Leptonia* are often characterised by attractive bluish colours, while those in sub-genus *Nolanea* are usually brownish and lacking in distinctive characters apart from the very common *Entoloma conferendum* (with star-shaped spores). Microscopic examination is often necessary to confirm identity.



- Earthtongues (Geoglossaceae). These are simple tongue or club-shaped structures, usually blackish. *Geoglossum* have smooth fruiting bodies while *Trichoglossum* have tiny bristles (setae), only visible with a magnifying glass. Olive earthtongue (*Microglossum olivaceum*) lacks setae but is characterised by olivaceous tones. For many earthtongues, microscopic examination is needed to confirm the identity. The earthtongues are Ascomycetes (spore shooters) in contrast to the other CHEGD groups, which belong to the Basidiomycetes (spore droppers).



- Crazed caps (Dermoloma and others). *Dermoloma* consist of dry-capped mushrooms - the commonest, crazed cap (*D. Cuneiformum*) has broad whitish gills and a strong mealy smell. Other groups included in this category are *Camarophylloopsis* (small mushrooms with decurrent gills) and the rather fleshy, brownish *Porpoloma metapodium*.







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## Management of waxcap grasslands

Grassland fungi are extremely sensitive to agricultural intensification. Management that detrimentally affects the diversity, abundance and survival of fungi include ploughing, which destroys mycelia, fertiliser and lime application, which limit the suitability of the growing conditions for grassland fungi and enhances conditions for vascular plants competing with the fungi, and increasing soil nitrogen. Other management that can damage the fungal mycelia, which is quite near the soil surface, also includes harrowing - even the use of chain harrows to control thistles and flatten molehills can cause harm - and compaction by heavy vehicles. Although these activities are part of conventional farm management, extra sensitivity is required on waxcap grasslands to make sure that fungal communities are not damaged. They may recover over time, but

this takes decades of sympathetic management, and the most sensitive species may never recover.

Grassland fungi possibly are an important component of the decomposer community, equivalent to primary producers, and therefore may fulfil a vital ecosystem function. Across the UK there are seven species of grassland fungi that are considered a priority: date-coloured waxcap (*Hygrocybe spadicea*), grey waxcap (*Hygrocybe lacmus*), blushing waxcap (*Hygrocybe ovina*), big blue pinkgill (*Entoloma bloxamii*), olive earthtongue (*Microglossum olivaceum*), dark-purple earthtongue (*Geoglossum atropurpureum*) and violet coral (*Clavaria zollingeri*). Five grasslands in England and Wales, and four grasslands in Northern Ireland have been protected through A/SSSI designations for their fungal communities. The low association between a

rich flower and grass community, and a rich waxcap grassland community, complicates the protection of these grasslands, as they are often overlooked. Other issues such as lack of taxonomic expertise, no standard sampling method for grassland fungi, and the fact that the survey season is located outside the regular summer botanical survey, also hamper identification and protection of waxcap grasslands.

The vast majority of conventional lowland farms with enclosed fields are likely to be too intensive for grassland fungi, or may not provide the right growing conditions - for example, water-logged soils provide poor growing conditions for mycelia. Many of the best waxcap grasslands that are known are located in sub-montane or coastal fringes, where farming is less intensive. In some cases pockets of unimproved grassland exist within otherwise intensively farmed areas; these are usually found on steep banks, which effectively prevent modern farming practice. Such well-drained grasslands, with nutrient-poor soils, are often rich in good indicator species, including crimson waxcap (*Hygrocybe punicea*), which is restricted entirely to unimproved grasslands.

Many larger fungi are unpredictable in fruiting and may not appear every year. Also, numbers of fruiting bodies differ considerably between years, largely as a result of weather conditions. This means that the observation of fruiting bodies may not provide an accurate assessment of the value of a site for waxcap grassland fungi, and it is not possible to gain a true picture of fungal diversity from a single visit in any year. Fewer than 25% of macrofungi are estimated to be found during a foray and anywhere between 3-20 years has been recommended to gather a comprehensive species list. Some fungi, such as the pinkgills, fruit much earlier than others, with the earthtongues being the latest. To allow for this, grassland sites should be visited at different times during the autumn - but remember that even after many years surveying a site, additional species will continue to be recorded.

The sensitivity of fungi to changes in management practices is extremely relevant when considering restoration and recreation of species-rich grasslands and meadows. Some of the practices undertaken such as creating a large amount of bare ground, would seriously damage fungal mycelia, and future management may not provide suitable conditions for macrofungi to fruit. Waxcap grassland fungi are a target for management in a similar manner to wildflowers and require specific practices, including avoidance of fertilisers, manures and herbicides, retaining permanent pasture or hay cutting without any inputs such as farm yard manure. If damaged, waxcap grasslands can take over 50 years for the more common fungi more tolerant of agricultural improvement to appear. It is very hard to restore or recreate such grasslands, as the mycelia cannot be inoculated onto new land easily, if at all. Hay cropping without fertiliser applications can be used as a rehabilitation measure for grassland last cultivated 50-60 years ago, but fungal spores are slow to colonise and it may take years for the scarcer species to recolonise, even under suitable management.

