

WAXCAP-GRASSLAND SURVEY

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With their characteristic bright colours and attractive appearance, Waxcaps (*Hygrocybe* species) fire the enthusiasm of both novice and expert mycologists. However, few people realize that they represent a group of fungi that is causing increasing conservation concern, particularly in Continental Europe, where recording schemes have shown that many species have drastically declined in recent years. To a large extent, this decline reflects loss of their characteristic habitat - ancient or unimproved grasslands - particularly because of agricultural intensification. In turn, Waxcaps serve as indicator species - like orchids or *Fritillaria meleagris* - by which to monitor the loss of particular traditional habitats.

Since the end of the Second World War, in Britain we have lost 95 per cent of our hay meadows and 80 per cent of our chalk pasture. Traditional grassland has been treated with selective herbicide, fertilized, ploughed and reseeded, so that the complex communities of native plants were replaced with monocultures of domesticated strains of grass, such as highly-productive Perennial Rye-grass (*Lolium perenne*). Among the many higher plants the range of which has been severely reduced by agricultural intensification is the common vetch known as Eggs and Bacon (*Lotus corniculatus*). With the vetch has gone the Common Blue butterfly (*Polymmatius icarus*), whose caterpillars feed on it. Both plant and butterfly were extremely common in rural Britain but are now rare on British farmland. These changes are well documented for other kingdoms, but the fungal component needs to be added to the picture. Waxcaps and their allies are known to have been casualties of

the change in agricultural practices. The remaining traditional grasslands are in urgent need of investigation and protection since, once 'improved', it takes decades before a site recovers sufficiently for characteristic grassland fungi to re-appear (Arnolds, 1988).

In this Centenary year, the British Mycological Society is planning a survey of the fungi of unimproved grasslands so that the most important locations can be identified, studied more fully and protected. Potentially suitable sites include pastures, meadows and parkland, rabbit-grazed sand dunes, commons, village greens and lawns. The ultimate aim is to produce an inventory of grassland sites which are of national or international importance mycologically. Such an inventory will be of great value in focusing conservation efforts and in providing original information about the national distribution of the complex of fungal groups concerned. However, this raises the important question of how rich a site needs to be in fungal species to be of conservation importance. The more immediate aim of the Survey will therefore be to define the criteria by which the mycological importance of a site may be assessed. Once a system of ranking of sites has been developed, this may be compared with other systems which have been developed on the Continent. For example, if more than 17 species of Waxcaps are recorded on a site, should it be accorded national priority as has been proposed for Denmark (Rald, 1985)? Or is the situation rather less critical in the UK, where (compared to Denmark) unimproved grasslands are still relatively abundant?

The term Waxcaps has been chosen after some deliberation. They are perhaps the most

conspicuous members of the distinct community of fungal species which characterises ancient grassland. Arnolds (1988) used the term 'Hygrophorus grasslands' for such habitats and they have been called more precisely 'Hygrocybe grasslands' by subsequent authors, eg Feehan & McHugh (1992). 'Waxcap grasslands' is thought to be the most appropriate and user friendly term partly because it has some meaning to non-mycologists. An important element of the Survey is to involve naturalists and ecologists of other disciplines in order to develop a holistic approach to site assessment and conservation strategies.

Waxcaps are, of course, only one of the fungal indicators of ancient grassland. (Throughout this paper, the name *Hygrocybe* is used *sensu lato*, ie including *Camarophylloopsis*). *Hygrocybe* species (H) may be accompanied by fairy clubs (clavarioid fungi) (C), earth tongues (Geoglossaceae) (G), species of *Nolanea* and *Leptonia* - Entolomataceae (E) and *Dermoloma* (D). Many taxa belonging to these groups are included in the British and European Red Data Lists (RDLs) of threatened or endangered species and are also featured on many of the 11 published national RDLs in Europe. Arnolds & Vries (1993) report that *all* European species of *Clavaria* are included in a Red Data List somewhere in Europe. Comparative figures for other genera are *Hygrocybe*, 89 per cent on at least one RDL; *Entoloma s.l.*, 97 per cent; and *Clavulinopsis*, 67 per cent. This grassland fungal community is clearly endangered on a European scale.

Some 20 people have already indicated their willingness to take part in the survey. Other volunteers are welcome, either as individuals or as representatives of a local fungus group. Each volunteer is being asked, initially, to select three grassland locations where *Hygrocybe* species occur. They are then being asked to make a minimum of three visits to each of these locations during 1996, one in spring, one in later summer and one in the autumn, selecting occasions most likely to coincide with grassland fungal fruiting, eg a week or two after substantial rainfall. All species encountered should be recorded on an amended BMS database recording form which will be supplied to volunteers, along with a site inventory form which will ask contributors to

note details such as the size of the site they are investigating, its ownership, habitat type, soil type, aspect, grazing pressure and management history etc.

As to which unimproved grassland locations should be selected for investigation, it is suggested that any site on which three or more H species occur (or a total of six or more spanning the groups H, C, G, E and D) are likely to prove rewarding. The number of H species recorded on a single visit can be a useful indicator of total H flora of a selected area of grassland (Rald, 1985). In his study of Danish grasslands, he predicted that if between six and ten H species were found on one visit, then a total up to 16 species would subsequently be recorded there. This justified a site being regarded as having regional importance. If more than 11 species were found on a single visit, then the eventual total for the site was likely to be 17-plus, meriting national priority. The individual species themselves may indicate the type of soil of a particular grassland. Vesterholt (pers. comm.) has shown that the H species *radiata*, *laeta*, *flavipes*, *punicea*, *cantharellus (lepida)*, *helobia*, *phaeococcinea*, *russo-coriacea*, *splendidissima*, *ingrata*, *turunda*, *insipida*, *ovina* and *subpapillata* never occurred on Swedish soils with a pH higher than 4.5. Conversely, he found that *aurantiosplendens*, *colemanniana* and *fornicata s.l.* occurred only where the soil pH was higher than 5.0. Other species had a broader tolerance.

For the purposes of comparison, it will also be vital for volunteers to look also at some examples of grassland which are known to have been improved by modern agricultural methods or might be classified as semi-improved. These are expected to be mycologically very dull and in practice, therefore, surveying them should be a quite speedy process. But depauperate as they may be, we must have data to show that the basic premise of the Survey (that traditionally-managed grasslands are rich in Waxcaps and their associates while improved grasslands are not) is actually demonstrable. Preserved remnants of ancient grassland often occur cheek by jowl with improved grassland, so selecting the modern grassland sites will not be difficult. It is hoped that the geographical distribution of survey volunteers will ensure that acid, neutral and basic grasslands are all included. The ideal would be to have examples of all nine combina-

tions of improved, semi-improved and unimproved grassland on acid, neutral and basic soils. Volunteers who have difficulty in identifying the different categories of habitat type will be assisted in doing this. It is intended that relevant conservation bodies will be involved at an early stage, both to help identify appropriate grassland sites and to raise the profile of fungal conservation within such organizations. A number of conservation bodies have already completed surveys of grasslands which are important for their vascular plant flora; it would be valuable to assess whether such sites also tend to be mycologically rich.

It is hoped that a number of forays will be organized by local groups to complement the activities of the Survey. Grassland sites are often ignored by organized forays, so this approach could be of great value in increasing the amount of information available for selected sites. To provide support and taxonomic guidance to participating volunteers, it is intended to hold a grassland survey weekend, based in South Wales, in October or November 1996 and a BMS workshop on the Hygrophoraceae is planned for 1997. A clear taxonomic framework is fundamental to a survey of this nature, particularly in critical genera such as *Hygrocybe*. A working list of currently acceptable names for British *Hygrocybe* species is at present under preparation (Alick Henrici, pers. comm.); it is hoped that a field key will be produced based on this work. Dr Jack Marriott, Associates' National Coordinator, is heading a "nucleus" of BMS members who have experience in identification of *Hygrocybe* species. However Dr Marriott will not be able to offer his services until after 1996. Keys to *Hygrocybe* and the other groups involved will eventually be produced and anyone currently working on, or with experience of the taxonomy of, any of the indicator groups is urged to contact one of the authors.

It is not essential that the participants identify every fungus they record in the Survey. The important thing is to be able to distinguish the number of "different" species encountered. Thus a list might include such entries as *Hygrocybe* sp.A (yellow cap); *Hygrocybe* sp.B (red cap); *Leptonia* sp.A (blue stem); clavarioid sp.A (solitary, yellow); clavarioid sp.B (fasciculate, yellow), etc. Such data will allow calculations to be made as to the relative diversity of the fungal commu-

nities. High-scoring locations will be investigated in more detail as the Survey progresses.

The organizers of the Survey would greatly welcome ideas or feedback and there has already been a great deal of valuable response. Dr Peter Long has sent details of fungi recorded on the 70-90 year old lawns at the botanic garden at Leicester University. These include records of H = 15; C = 5; E = 8; G = 2. The lawns therefore clearly qualify as Waxcap grasslands. Dr Irene Ridge has sent data compiled since 1989 from seven acres of unimproved acid grassland at Smalley's Farm, Clitheroe, Lancashire. Her lists show H = 29 (3 unidentified); C = 16 (2 unidentified); E = 21 (5 unidentified); G = 4. (Her figures show the value of recording unnamed taxa, as well as those that have been identified). Jo Weightman supplied several lists from Kent including one from Down House grassland which has H = 11; C = 7; E = 5; G = 1; D = 1. Sheila Wells has contributed a list of species from Upwood Meadows in Cambridgeshire, which includes H = 9; C = 3; E = 1. Alick Henrici has volunteered to compile a list of all fungi recorded from the lawns at Windsor Castle over a period of several years - the equivalent of writing up already-completed field survey work.

Individuals or groups who would like to participate should contact one of the regional coordinators given below. Early in 1996, a Survey information pack will be distributed to interested parties so that they can begin collating information about important sites. As the Survey develops, results will be communicated to participants through the pages of the *Mycologist* and the Newsletter.

Regional coordinators for England: Maurice Rotheroe; Ireland: John Feehan; Scotland: Adrian Newton; Wales: Shelley Evans.

References

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