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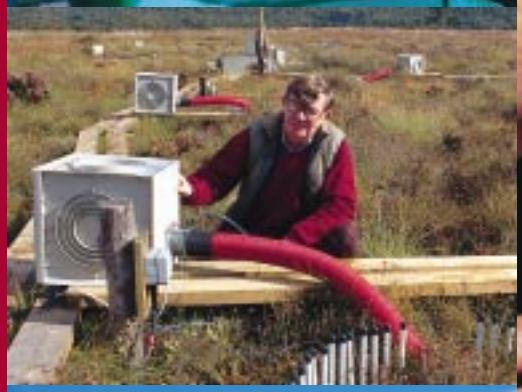

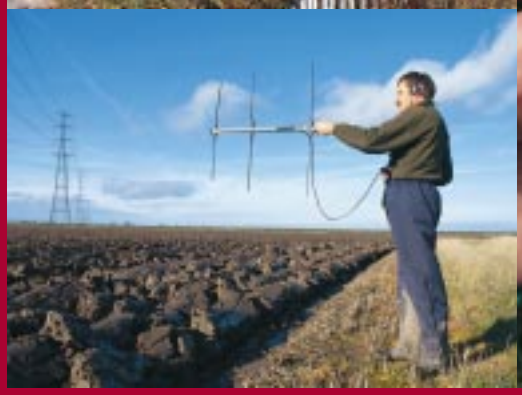

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Number 541

Report on hazel gloves *Hypocreopsis rhododendri,* a UK BAP ascomycete fungus (with reference to willow gloves *H. lichenoides*)

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Summary

Hazel gloves *Hypocreopsis rhododendri* was added to the British list in 1973 and was recorded from three sites in Devon in 1988. The strongholds for this species in the British Isles are in western Scotland and Eire. *H. rhododendri* is also found in areas of USA and France with predominantly oceanic climates. It is ranked as *Vulnerable* in the UK Biodiversity Action Plan (BAP), but as *Rare* in *A provisional Red Data List of British fungi* (Ing 1992).

Hypocreopsis rhododendri forms conspicuous brownish-orange lichen-like stromata, on branches, usually of hazel or blackthorn. A frequently observed association with the crust-like fruit bodies of the basidiomycete fungus *Hymenochaete corrugata* warrants further investigation. The stromata are usually visible throughout the year. Microscopy of ascospores is required to confirm identification.

Conservation management should focus on balancing site grazing intensity and hazel regeneration. Temporary fencing may be required at some sites. Reinstating lapsed coppice cycles and dead wood removal should be avoided.

Willow gloves *Hypocreopsis lichenoides* was initially collected in Yorkshire in Feb 1790 and described as *Sphaeria riccioidea* by J. Bolton in 1791. There is a suspected corresponding association between this species and *Hymenochaete tabacina*. **Although this species has no Species Action Plan (SAP) the last English record was made in 1968 and there is only one extant site known in the UK. It may be on the brink of extinction in the UK.** Publicity is urgently required to find extant sites.

The information and advice contained in this report is based on the best information available to the author at the time. If the conservation of *Hypocreopsis rhododendri* is to be ensured the following survey and research work is urgently required.

Survey, monitoring and publicity needs

- Sites that have records for *H. rhododendri* require more survey work to determine the extent of existing populations and these populations should be monitored.
- Other sites with stands of Atlantic hazel/blackthorn woodland, should be surveyed.
- Conservation bodies already involved in managing likely sites throughout the country, particularly in Devon, Cornwall and other areas with Atlantic hazel/blackthorn woodland, need to be informed about conservation needs of this fungus.

Research

The ecology of this fungus needs to be investigated, including, but not limited to, answering the following questions:

- How does it colonise nutritional resources?
- How does it compete for resources?

- What is the exact relationship with *Hymenochaete corrugata* (eg DNA sequence comparisons to identify cultures derived from stromatal tissue and underlying wood where *Hymenochaete* fruit bodies are absent)?
- What is its breeding system?
- What are the overall levels of genetic variation?

Scope

The brief for this report was to investigate the existing records and literature for *Hypocreopsis rhododendri*, a BAP species, with a published SAP. However, references will also be made as appropriate to *H. lichenoides*, a poorly known close relative with even fewer UK records and without a published SAP at the time of writing in March 2003.

Contents

1. Accepted scientific name and synonyms

The last published checklist of accepted names for the British ascomycete fungi is long overdue for revision (Cannon, Hawksworth & Sherwood-Pike 1985) and the project "Ascomycetes of Great Britain and Ireland" is unpublished and no longer funded. The BMSFRD (the online British Mycological Society Fungus Records Database) has the following entries:

Hypocreopsis rhododendri Thaxt.
Hypocreopsis lichenoides (Tode) Seaver
Family: *Hypocreaceae*
Order: *Hypocreales*

There are a number of synonyms for *H. lichenoides* and the recent treatment of Nordic species edited by Hansen and Knudsen (2000) favours the use of P. Karsten's combination *H. riccioidea*. In the BMSFRD the synonyms are listed as:

Hypocrea parmelioides Mont.
Hypocrea riccioidea (Bolton) Berk.
Sphaeria riccioidea Bolton
Hypocreopsis riccioidea (Bolton) P. Karst.

2. Established English names

The *H. rhododendri* BAP refers only to the scientific name noting that this is a lobed, bracket-like ascomycete fungus. It is suggested that use of the phrase "bracket-like" is unhelpful, misleading and should be discontinued. A lack of general familiarity with either of these strikingly unusual species has probably contributed to the lack of any truly established English name. In Sweden the name "trollhand" has been used (Hansen & Knudsen 2000; Ryman & Holmåsen 1984). However the recent unpublished SNH report on *H. rhododendri* (Coppins & Coppins 2000) does include a suitably descriptive English name:

hazel gloves

This name has since been publicised and the fungus described as an excellent indicator of a high quality, old-growth Atlantic hazelwoods supporting important lichen assemblages in western Scotland (Coppins, Coppins & Quelch 2002). Consequently it is quite likely that this English name will now become increasingly established, at least in field mycological and conservation-related contexts. This seems highly appropriate, but it is worth bearing in mind that the species is not entirely restricted to hazel and has been recorded on other substrata including blackthorn and *Salix* (see below). Similarly *H. lichenoides* could be given the English name:

willow gloves

Again it must be remembered that this species is often recorded on *Salix* but has also been recorded on hazel (see above).

The drawback with establishing these names is the temptation to assume uncritically that fruit bodies on hazel are those of *H. rhododendri* and those on *Salix* are of *H. lichenoides*. For the field mycologist, these fungi need to be in fertile condition and the mature ascospores examined microscopically to settle this issue (see below).

3. Description and distinguishing features

3.1 Stromatal characters of H. rhododendri

H. rhododendri forms conspicuous orange-brown, tan to reddish-brown lobed lumpy patches, stromata, on branches and other woody stems. As the stromatal patches develop over the existing epiphytic assemblage, the radiating paler margins become increasingly lobate and branched until the component strap-like 'fingers' attain a width of approximately 5 mm. A single stroma may exceed 20 cm in diameter and completely girdle the supporting stem. As development proceeds, the central area darkens and becomes dotted with even darker embedded microscopic sexual fruiting structures (perithecia) housing the ascospore-producing cells or asci. At maturity, the ascospores are forcibly ejected from the protruding perithecial necks via an apical opening (ostiole). Although resembling a brownish crustose lichen, and certainly attracting the attention of lichenologists in the field, the mature thalloid structure is correctly described as a perithecial stroma. *Hypocreopsis* stromata are not regarded as edible.

3.2 Fruiting season for H. rhododendri

Coppins & Coppins (2000) recorded the concurrent presence of fertile and freshly developing stromata and disintegrating old stromatal remnants at Scottish sites in March and May. This suggests that it may be possible to find some evidence of this fungus all year round. Indeed, an isolated hazel at Ballachuan was visited in December 1997 (Coppins & Coppins 1997) and revisited in March 2000 (Coppins & Coppins 2000) to record the status of three healthy stromata after 28 months. Surprisingly all three were still visible as dead fragments on the second visit. Interestingly from a resource relations viewpoint, one stroma seemed to have died away but proliferated marginal clusters of offshoot maturing stromata in a small "fairy ring". This phenomenon should be investigated further to determine the connection between offshoot stromata and their resource supply. This serves to highlight the enormous gaps in our knowledge of this fungus. Basic field data from monitoring individual stromata in the field are still required to fully understand the dynamics of stromatal development. No data exist regarding fertilisation; if, when and how it occurs. In N. Europe, *H. lichenoides* is reported to develop perithecia on overwintered stromata (Niemelä & Nordin 1985).

3.3 H. rhododendri ascospore characters

Microscopic characters compiled from Candy and Webster (1988) are as follows:

Eight ascospores in each ascus, although they often become cemented together and discharged in adherent short chains.

Ascospores hyaline, subglobose to short ellipsoid, mostly developing a cross-wall (septum) thereby becoming two-celled.

Mature ascospores develop a thick roughened "warty" outer layer and are reported to be 12-17 x 12-13.5 µm (Dennis 1975; Rossman *et al* 1999) although estimations from published micrographs of Candy and Webster (1988) indicate maxima approaching 25 x 17 µm.

Several unsuccessful attempts have been made to germinate the ascospores (A.M. Ainsworth unpubl.; Candoussau 1990; Candy & Webster 1988).

3.4 Distinguishing characters of H. lichenoides

H. lichenoides is expected to be similarly visible all year round (Courtecuisse 1999), although Dennis (1981) states September to May whereas Ellis and Ellis (1997) state May to September. The stromata of both species are very similar in the field and microscopic examination of the mature ascospores is required to confirm identification. However this does not necessitate collection of whole stromata or even whole lobes. All that is required is a sample of fertile central stromatal surface with sufficient ripe perithecia to discharge ascospores for microscopic observation and measurement. This is easily achieved if a microscope slide is placed directly above the sample with damp tissue nearby which is then covered,eg with inverted plastic tub, to maintain a humid atmosphere. It may then be possible to see long tendrils of spores (spore horns) emerging from the ostioles of the perithecia as sometimes occurs in the related genera *Hypocrea* and *Cordyceps*. Alternatively the spores ejected on to the slide can be mounted in water and observed directly.

Microscopically, the centrally septate ascospores of *H. lichenoides* differ in being generally narrower and more fusoid, ie they are slightly tapered at each end. They are in the range 24-30 x 8-9 µm according to Courtecuisse (1999), Dennis (1981) and Ellis and Ellis (1997). Ryman and Holmåsen (1984) reduce the lower values to 20 µm long and 6 µm wide, whereas Hansen and Knudsen (2000) record variable sizes and shapes, stating shorter spore lengths of 16-25 µm. This brings the range of lengths very close to the range for *H. rhododendri*. Although hardly resolved in the light microscope, the spores are minutely warted and electron microscopy indicates that the outer coat is thinner than in *H. rhododendri*. The ornamentation is so fine when viewed with light microscopy that the spores have previously been regarded as smooth (Dennis 1981).

Young stromata may also develop central patches bearing asexual spores (then known as conidial stromata) in brown mealy patches (Niemelä & Nordin 1985). This stage in the life cycle is called *Stromatocrea cerebriforme*. The spores (conidia) are globose, 9-11 µm in diam., with warted yellowish 0.5 µm thick walls (Rossman *et al* 1999).

4. Published illustrations and other information

H. rhododendri

Colour photographs of stromata are on p19 in Candy & Webster (1988) with accompanying light micrographs of an ascus, ascospores and sectioned perithecia. Colour photographs of stromata and sectioned perithecia are on p170 in Candoussau (1990) with accompanying electron micrographs of ascospores. Colour photographs of the fungus (p21) and its habitat are in Coppins, Coppins and Quelch (2002) and on pp14-15 in Watling and Ward (2003).

Line drawings of an ascus and ascospores are on p360 in Dennis (1975).

The first European record was made on hazel from Mull by M.C. Clark (Dennis 1975) and his collection from October 1973, amongst others, is stored in RBG Edinburgh Herbarium.

H. lichenoides

A colour photograph of a stroma with perithecia is on p170 in Candoussau (1990) with accompanying electron micrographs of ascospores. Colour photographs of stromata are also on p39 in Courtecuisse (1999), p666 in Ryman and Holmåsen (1984) and p25 in Rossman *et al* (1999).

Monochrome photographs of stromata are on pp76-77 in Niemelä and Nordin (1985).

A colour painting, Pl. XXXIA, is in Dennis (1981).

Line drawings of ascospores are on p360 in Dennis (1975), a stroma and ascospores are on Pl. 107 in Ellis and Ellis (1997) and on Pl. 20 in Seaver (1910).

Bolton's type material of *Sphaeria riccioidea* collected in February 1790 on a fallen twig of *Salix* from near Halifax (where it grew on sallow and hazel) is stored in RBG Kew Herbarium.

5. Status and distribution

5.1 Conservation status of H. rhododendri in British documents

H. rhododendri is classified as *Vulnerable* in its BAP. It receives general protection under the Wildlife and Countryside Act 1981.

This species is classified as *Rare* in *A provisional Red Data List of British fungi* (Ing 1992).

It is not listed in a provisional Red List of endangered European macrofungi (Ing 1993).

5.2 Conservation status of *H. lichenoides* in British documents

H. lichenoides does not have a BAP.

This species is classified as *Endangered* in *A provisional Red Data List of British fungi* (Ing 1992).

It is classified in *Group C* in a provisional Red List of endangered European macrofungi (Ing 1993).

5.3 Distribution of *H. rhododendri* outside UK

- **USA**: *H. rhododendri* was discovered in 1888 in North Carolina, growing on a branch of *Rhododendron maximum*, hence its specific epithet. Subsequent records were made in eastern Tennessee, Maryland and West Virginia (Dennis 1975; Rossman *et al* 1999).
- **Eire**: The Burren, Clare, seems to be a stronghold for this species with records dating back to the 1970s, eg a 1978 collection from Carron in RBGE (Coppins & Coppins 2000). J. Hedger (pers.comm.) is familiar with it in this locality and has repeatedly observed a good population in the hazelwood just opposite the University of Galway Field Centre near Carron village. It has also been recorded in the hazelwoods on Slieve Carran (eg BMSFRD record by H. Fox, 1993) and by the author in the hazels of the collapsed limestone cavern at Poulavallan near the Glen of Clab (Figure 1). Indeed, J. Hedger (pers. comm.) regards it as quite frequently encountered in hazelwoods all over The Burren. A more recent southerly discovery of the fungus was with hazel in a floodplain woodland, The Gearagh, Cork, (BMSFRD record by K. Alexander, det. A. Henrici, 1998).
- **France**: Five sites were reported from the Atlantic Pyrenees in southern France, all in a low mountainous region with an oceanic climate (Candoussau 1990).
- **Sweden**: No records in the Nordic countries (Hansen & Knudsen 2000), although in practice it should be noted that Swedish *H. lichenoides* may be routinely identified from both hazel and *Salix* without microscopic confirmation (B. Nordén, pers. comm.).

5.4 Distribution of *H. lichenoides* outside UK

- **USA**: *H. lichenoides* has been recorded from New Hampshire and the asexual state has also been recorded in Idaho (Rossman *et al* 1999).
- **Canada**: Newfoundland, Ontario and Quebec (Cauchon & Ouellette 1964; Niemelä and Nordin 1985).
- **Denmark**: rare (Hansen & Knudsen 2000).
- **Norway**: recorded in the temperate zone in SE Norway (Hansen & Knudsen 2000).
- **Sweden**: occasional as far north as central Sweden (Hansen & Knudsen 2000).
- **Finland**: found in the hemiboreal extreme south and subarctic/subalpine extreme north (Hansen & Knudsen 2000).

- **Lithuania**: recently found by Reda Irsenaite (B. Nordén, pers. comm.).
- **Spain**: collected in the Pyrenees in the Luchon region (Candoussau 1990).
- Also recorded in Belgium, France, Germany, Luxembourg, Russia and The Netherlands (Courtecuisse 1999; Dennis 1975; Rossman *et al* 1999).

5.5 Distribution of H. rhododendri within UK

There are no known records of this species in Wales or Northern Ireland. However, its populations in western Scotland, where it is described as very local in occurrence but abundant within small areas of Argyll, Mull (Figure 2) and Eigg, are relatively well documented (Coppins & Coppins 2000). These authors reported 11 hectads in Scotland with records of *H. rhododendri* and personally logged over 200 stromata during March and May 2000. Notwithstanding this, many potentially suitable coastal Scottish hazelwoods remain to be surveyed and SNH has prioritised the Ardnamurchan peninsula for future study. Research for this report unearthed a more recent record made in September 2002 near Loch Spelve towards the south of Mull at Portfield near Croggan on old but living hazel (J. Hedger pers. comm.).

English records are currently confined to the Atlantic hazelwoods of the south west and concentrated in the region of the Devon and Cornwall boundary and these are treated in detail in Candy and Webster (1988). The sites fall into three hectads and voucher specimens have been deposited in the Herbarium of IMI housed at CABI Bioscience, Egham. Only one of the these sites is logged on the BMSFRD but, at the time of writing, there is no programme to update the associated dot maps and none of the English sites are currently displayed. With the notable exception of the Scottish survey area data, it must be concluded that our knowledge of its UK distribution and our ability to disseminate this knowledge by the BMSFRD are both at a very preliminary stage.

Figure 1 Young developing stroma of *Hypocreopsis rhododendri* with millimetre scale from Corylus, The Burren, Eire, in 1993

Photograph © Martyn Ainsworth

Figure 2 Young developing stroma of Hypocreopsis rhododendri from Corylus, Mull, Scotland, in 1994.

Photograph © Martyn Ainsworth

5.5.1 England

- North Devon, on dead hazel along the disused Tamar aqueduct at Virworthy Mill Farm, Grid Ref SS301099 (Figures 3-6), collected in Nov and Dec 1986 by B. Candy, vouchers at CABI as IMI 313846 and 313847.
- North Devon, on living and dead blackthorn and hazel near the disused Tamar aqueduct at Dexbeer Copse, Grid Ref SS298086 (Figures 3-5), collected in Dec 1986 by J. Webster and B. Candy, vouchers at CABI as IMI 313674, 313844, 313845, 313848, 313849 & 313850, site recorded as copse near Dexbeer, Kilkhampton, Devon. Of these, the only English record in the BMSFRD is identified by D. Brayford at IMI and stored as IMI 313674. The BMSFRD records the site as Kilkhampton, Dexbeer, Devonshire, but without the collector's name (it was J. Webster) and records the date of collection as "-- -- 19XX" (it was Dec. 1996). A dot map supplied to the author by English Nature based on tabulated BMS data which lists this as the only English record, erroneously places Dexbeer in hectad SS21 and erroneously states the collection year as 1900. A more up to date dot map supplied by English Nature to the author highlighting The Culm area, also features a dot in hectad SS21. This dot map is also included on p53 of *UK Biodiversity Group Tranche 2 Action Plans III plants and fungi* (UKBG 1999). On the available evidence, it seems that these dot maps should not have a dot in square SS21, because although this specifies the location of Kilkhampton, a town near to the recording site, the site itself is Dexbeer Copse which is in SS20. Since this dot represents a quarter of the total English hectads shown for *H. rhododendri*, this is an important amendment.
- North Devon, on dead hazel near R. Torridge at Gidcott Mill, near Shebbear, Grid Ref SS421095 (Figures 3,7,8), collected in Feb 1987 by B. Candy, voucher at CABI as IMI 313852.
- North Devon, on hazel by Bude Canal, Bude no Grid Ref, collected in Nov 1986 by B. Candy, voucher at CABI as IMI 312029 (the first of the series). This is an initially puzzling record because there was no reference to a Bude Canal site when Candy and Webster (1988) documented their 1986 records. Inspection of Figure 5 & 6 reveals that the aqueduct they refer to as "the disused Tamar aqueduct" is labelled Bude Aqueduct on these maps, and so the most likely explanation is that the Bude Canal reference simply refers to the same stretch of waterway.

Figure 3 Location of Holsworthy and Stratton near Bude

Figure 4 Location of Stratton and Alfardisworthy near the Tamar Lakes

Figure 5 Location of Alfardisworthy, Lutson Farm, the site at 301099, Dexbeer, the site at 298086, and the Devon/Cornwall boundary

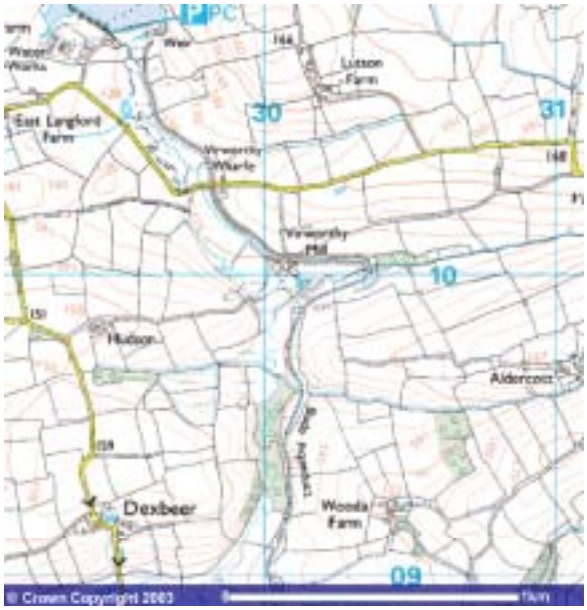

Figure 6 Location of Lutson Farm, Virworthy Mill, the site at 301099 and Dexbeer

Figure 7 Location of Holsworthy and Shebbear

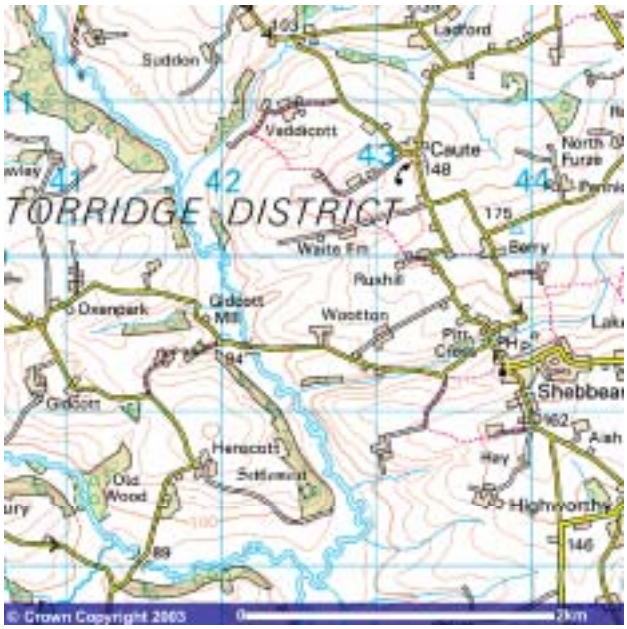

Figure 8 Location of Shebbear, Gidcott Mill and the site at 421095

5.6 Distribution of *H. lichenoides* within UK

There is some 19th century Scottish material from *Salix* stored at RBG Edinburgh (Coppins & Coppins 2000) and RBG Kew (P. Roberts pers. comm.). The Kew material originates from Glamis, Angus, J. Stevenson, Apr 1878 and from Near Dalry, Kirkcudbrightshire, J. McAndrews, 1893. L. Holden (pers. comm.) is not aware of any recent Scotttish records.

There are also two packets from a single extant Welsh site at RBG Kew (P. Roberts pers. comm.). **This is the only known extant site for this fungus in the UK.** It was discovered on *Salix* (according to records at Kew) in a gap in a sitka spruce plantation by F. Lancaster in a wood west of Nant Glas, Radnorshire VC 43 (Grid Ref SN 986 646). Material at Kew was collected on 17 Sep 1989 and 10 April 1993. It is known that a spruce blew down and collapsed on to the *Salix*, but detailed monitoring is difficult and the site owner has refused access (R. Woods pers. comm.). This site is not yet logged in the BMSFRD, indeed the only localised records in BMSFRD are from three English sites on the eastern side of the country as detailed below. The last of these English records was made in Kent in 1968. There is no BMSFRD associated dot map currently available.
England

- South-west Yorkshire, VC 63, on fallen *Salix* twig in J. Bolton's type locality near the brook below Ramsden Wood, on the edge of Halifax, Grid Ref SE0527, collected in Feb 1790, type material at RBG Kew as K(M) 28354. R. Watling (pers. comm.) has revisited the surviving *Quercus petraea* woodland at the site, but did not refind the fungus.
- Lincolnshire, VC 53, Corby Castle, Corby Glen, Grid Ref TF 0025, collected in 1883.
- East Kent, VC 15, Yockletts Bank LNR, woodland centred on TR1247 and TR1248, collected on 02 Nov 1968 on *Salix* and identified by the collector, P. Wilberforce, but no material was kept. P. Wilberforce (pers. comm.) has revisited the site, most recently in the late 1990s, but has not refound the fungus there.

- In addition there are some old collections from more westerly English locations in RBG Kew, eg from Westmorland in 1908 and from Carlisle between 1884-1886, including material from honeysuckle.

In summary therefore, although this species has not been selected for BAP attention, the last English record was made in 1968 and there is only one extant site known in the UK.

It must be concluded that our knowledge of its UK distribution and our ability to disseminate this knowledge by the BMSFRD are both at a very preliminary stage. Despite the absence of a published SAP, this fungus may be on the brink of extinction in the UK and so it warrants urgent publicity and surveys in suitable habitats to gain a clearer picture of its distribution.

6. Ecology

6.1 Ecology of H. rhododendri with a note on H. lichenoides

6.1.1 Climatic factors

All known records of *H. rhododendri* in the UK, Eire and France suggest that the fungus has a western (Atlantic) or oceanic European distribution. It is most often encountered on living, senescing or dead stems of hazel, especially when these are undisturbed (not regularly coppiced) and not subjected to intense woodland shade. In Scotland it "seems to be confined to ancient 'core' stands of hazel which also have a very species-rich lichen flora. It has not so far been found in invasive stands of hazel, nor in stands that have regenerated from clear-cutting" (Coppins & Coppins 2000). It is also found on stems of blackthorn and rarely on *Salix* and *Rosa*.

The known records of *H. lichenoides* suggest less of a strictly oceanic distribution and possibly more of a stronghold in the Nordic countries. It is usually found on *Salix* but is also recorded on hazel and other species. It has been suggested that it has increased in Sweden since the 1960s, perhaps following the invasion of scrubby hazel and *Salix* into former pasture land (Niemelä & Nordin 1985; B. Nordén pers. comm.).

6.1.2 Fungal interactions

The ecology of *Hypocreopsis* may be directly tied to the presence of another fungal genus. Cauchon and Ouellette (1964) examined "a large number of specimens" and suggested that *Hypocreopsis* species were associated with the wood-inhabiting basidiomycete genus *Hymenochaete*. They also noted that the asexual state *Stromatocrea* was sometimes formed directly on *Hymenochaete* fruit bodies. Subsequent records of *H. rhododendri* from the UK, Eire and France have all included observations on the frequent proximity of fruiting *Hymenochaete corrugata*. This basidiomycete species is commonly found in oceanic hazel woodlands, but is also quite common elsewhere. It produces inconspicuous lilac-grey-brown crustose fruit bodies on the underside of branches and twigs of various broadleaved trees, roses, brambles and *Clematis* stems, but probably most frequently on hazel and blackthorn. Interestingly, in the Nordic countries, *Hypocreopsis lichenoides* is regarded as "on dead branches of *Salix*, *Corylus* etc., always parasitic on *Hymenochaete tabacina*" (Hansen & Knudsen 2000) and the photograph in Courtecuisse (1999) shows *Hym. tabacina* fruiting below *H. lichenoides*. *Hym. tabacina* is not often seen in the UK but is usually recorded on

Salix or hazel. There is only one record of this association in the UK records (in Radnorshire), but future recorders of *H. lichenoides* should bear this possibility in mind.

The association with *Hymenochaete* is very interesting, but not simple to analyse thoroughly without further research on samples from the field. A molecular approach would be beneficial, particularly in the identification of non-sporulating cultures derived from stromata or wood underlying stromata because these are often unidentifiable using traditional methods. Cultures were derived from surface-sterilised stromata of *H. rhododendri* in Devon by P.J. Fisher/R.A. Davey and were all described as orange-brown mycelia with sparse aerial components (Candy & Webster 1988). It would be interesting to compare sequence data of such cultured mycelia and perithecial tissues and underlying wood. Mycelia cultured by the author from Mull and Clare stromata were also orange-brown but had overall mycelial characters suggesting they were of *Hymenochaete corrugata* not the target ascomycete. The same conclusion was reached by Cauchon and Ouellette (1964) whose stromatic isolations yielded cultures identical to those of *Hymenochaete*. Candy and Webster (1988) themselves reported that examinations of seven separate collections of *H. rhododendri* from Dexbeer Copse revealed the presence of brown setae (hyphal structures characteristic of *Hymenochaete* and its relatives). Cauchon and Ouellette (1964) noted that setae were often found in or on stromata. Hence there is strong evidence that tissues of *Hymenochaete* exist within *Hypocreopsis* stromata. The hypothesis to be tested is whether the ascomycete is always parasitic on the basidiomycete even when the former is fruiting on living wood in the absence of nearby *Hymenochaete* fruit bodies (possibly when the *Hymenochaete* is present cryptically within the wood as a symptomless endophyte or latent invader).

Certainly both *Hymenochaete* spp. present many opportunities when tufts of mycelium are present on the exterior of twigs and branches and presumably available for colonisation by a parasite. This is related to their remarkable 'wood-welding' properties whereby neighbouring woody items are bonded together by mycelial bridges which develop into melanised and waterproofed junctions (Ainsworth & Rayner 1990). Indeed, Coppins and Coppins (2000) refer to *Hym. corrugata* as the "glue" fungus, a potentially problematic choice given that *Hym. tabacina* also exhibits this behaviour and fruit bodies of *Phellinus* are often seen bonding various branches together. The early stages of the bonding process are characterised by the fungus emerging from lenticels, scars etc along colonised twigs and branches to form yellow mycelial tufts in prolonged humid weather. Should these tufts make contact with neighbouring woody resources and the humidity remains high enough to prevent early desiccation, a bridge may be formed ultimately resulting in colonisation of the adjoining woody tissues. By this strategy the fungus can move around and exploit a closely spaced canopy (naturally so in hazel, thorns and woody climbers but also a feature of abandoned coppice) and 'filter feed' by trapping woody items which fall or blow into sufficiently prolonged contact with the emergent yellow tufts. Hence there is a window of opportunity for contact between spores of *Hypocreopsis* and aerial mycelium of *Hymenochaete*, not just when the basidiomycete emerges to form fruit bodies but also when it produces tufts of aerial mycelium within its canopy colonisation strategy.

Unfortunately, attempts to germinate the ascospores of *H. rhododendri* in the presence of *Hym. corrugata* mycelium were not successful (A.M. Ainsworth unpubl.). Similar attempts could be made with collected ascospores and naturally emerging tufts of *Hym. corrugata* mycelium *in situ*. Some could be subsequently enclosed in a small plastic bag to investigate the effects of prolonged humidity and prevention of arrival by naturally occurring airborne colonists. We have no information on the number of genetic individuals on a tree or at a site

nor of the degree of genetic variation present in the relatively isolated populations. Clearly the role of *Hymenochaete* in the ecology of *Hypocreopsis* needs fully elucidating, not least to formulate appropriate conservation strategy in the future.

7. Conservation management advice

The Devon Wildlife Trust and the Devon Fungus Group have been informed of the locations of the published sites but neither organisation had any recent survey data regarding the status of *H. rhododendri* in their county. It now seems both important and urgent to organise a modern survey of all suitable habitats in the vicinity of the historical Devon records to determine the status of this species in England. Candy and Webster (1988) supplied some details regarding the habitat of *H. rhododendri* near Dexbeer, Devon. They described the copse as very boggy in places, "entered by cattle, it was difficult ground rarely visited by humans" and although probably coppiced in the past, "it had not been thinned, felled or managed for many years and contained much standing dead timber, especially of hazel". Given the presence of plenty of unmanaged hazel stems in close proximity, an oceanic climate and local humidity of north Devon river valleys, conditions would seem to be very close to those at the sites in western Scotland and Eire. In passing, it should be noted that these are also ideal conditions for the aerial mycelial spread of *Hymenochaete corrugata* throughout the canopy of the shrub layer. The conservation issues facing the English sites are therefore likely to parallel those identified for Scottish sites Coppins and Coppins (2000). The main threats were identified as ill-conceived plans to invigorate old hazel stands by coppicing and the existence of grazing pressure at levels preventing regeneration of hazel. Perhaps the boggy terrain of Dexbeer copse has conferred some protection on both counts, but the close proximity of farms to this and other small valley woodlands highlights the potential threat of overgrazing and renewed coppicing.

The Devon sites and their environs should be thoroughly surveyed and then assessed and monitored for management of hazel and grazing impact. As in Scotland, the temporary fencing of hazelwoods should be considered if appropriate. The profile of this BAP species needs raising amongst the general field mycological community but also within the various conservation organisations active in the area. The latter could then make a significant contribution to conserving this remarkable but currently neglected element of their local wildlife. The sympathy status of local farmers and landowners may also be ascertained by this route. One threat which may increase with increased publicity for this fungus is excessive sample collection. As explained above (see "Distinguishing characters of *H. lichenoides*"), only fragments of fertile stromata are required for microscopic observation of mature ascospores and experience usually leads to decreasing quantities of sample. This should be stressed from the outset and, furthermore, sampling to confirm identification should be carried out with conservation in mind to avoid leaving a trail of conspicuously mutilated perithecial stromata.

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9. References

AINSWORTH, A.M. & RAYNER, A.D.M., 1990. Aerial mycelial transfer by *Hymenochaete corrugata* between stems of hazel and other trees. *Mycological Research*, **94**, pp. 263 - 288.

CANDOUSSAU, F., 1990. *Hypocreopsis rhododendri* in southern France. *Mycologist*, **4**, pp. 170-171.

CANDY, B. & WEBSTER, J., 1988. *Hypocreopsis rhododendri*, a rare conspicuous fungus. *Mycologist*, **2**, pp. 18-21.

CANNON, P.F., HAWKSWORTH, D.L. & SHERWOOD-PIKE, M.A., 1985. *The British Ascomycotina an annotated checklist*. Slough: CAB.

CAUCHON, R., & OUELLETTE, G.B., 1964. Association of *Stromatocrea cerebriforme* and *Hypocreopsis* species with *Hymenochaete* species. *Mycologia*, **56**, pp. 453-455.

COPPINS, A.M. & COPPINS, B.J., 1997. *Ballachuan Hazelwood, Argyll Main (VC 98): Lichen survey*. Unpublished report for Scottish Wildlife Trust.

COPPINS, A.M. & COPPINS, B.J., 2000. *Species dossier* - Hypocreopsis rhododendri. Unpublished report for Scottish Natural Heritage.

COPPINS, A.M., COPPINS, B.J. & QUELCH, P., 2002. Atlantic hazelwoods, some observations on the ecology of this neglected habitat from a lichenological perspective. *British Wildlife*, **14**, pp. 17-26.

COURTECUISSE, R., 1999. *Collins guide to the mushrooms of Britain and Europe*. London: HarperCollins.

DENNIS, R.W.G., 1975. New or interesting British microfungi, III. *Kew Bulletin*, **30**, pp. 345-365.

DENNIS, R.W.G., 1981. *British Ascomycetes*. Vaduz: J. Cramer.

ELLIS, M.B. & ELLIS, J.P., 1997. *Microfungi on land plants*. Slough: Richmond Publishing.

HANSEN, L. & KNUDSEN, H., 2000. *Nordic Macromycetes Vol 1 Ascomycetes*. Copenhagen: Nordsvamp.

ING, B., 1992. A provisional Red Data List of British fungi. *Mycologist*, **6**, pp. 124-128.

ING, B., 1993. Towards a Red List of endangered European macrofungi. *In*: D.N. PEGLER, L. BODDY, B. ING and P.M. KIRK, eds. *Fungi of Europe: Investigation, recording and conservation*. Kew: Royal Botanic Gardens.

NIEMELA, T. & NORDIN, I., 1985. *Hypocreopsis lichenoides* (Ascomycetes) in North Europe. *Karstenia*, **25**, pp. 75-80.

ROSSMAN, A.Y., SAMUELS, G.J., ROGERSON, C.T. & LOWEN, R., 1999. Genera of Bionectriaceae, Hypocreaceae and Nectriaceae (Hypocreales, Ascomycetes). *Studies in Mycology*, **42**, pp. 1-248.

RYMAN, S. & HOLMASEN, I., 1984. *Svampar*. Stockholm: Interpublishing.

SEAVER, F.J., 1910. The Hypocreales of North America III. *Mycologia*, **2**, pp. 48-92.

UKBG, 1999. UK Biodiversity Group Tranche 2 Action Plans III plants and fungi. Peterborough: English Nature.

WATLING, R. & WARD, S., 2003. *Naturally Scottish: Fungi*. Edinburgh: Scottish Natural Heritage.

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