# Wood Pasture and Parkland Scoping Study 2006

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# Wood Pasture and Parkland Scoping Study

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## SUMMARY

Ancient wood pastures and historic parklands are rich and complex ecosystems and home to many rare, vulnerable, and threatened species. They comprise long-established and relatively undisturbed habitats and countryside, and so preserve old landscapes and historic features which may have been damaged or even destroyed through development in other situations. They also have special aesthetic values, with their old open-grown trees and open mosaic scenery. While open mosaic scenery has survived relatively well over much of Ireland – in comparison to Britain at least - old open-grown trees are in Northern Ireland thought to be virtually unique to historic parklands.

An investigation of the biodiversity of six historic parkland sites in Northern Ireland was carried out during 2006. The sites were selected as having the greatest potential but were at the time relatively unstudied. The importance of these sites for the special biological communities dependent on old open-grown trees - invertebrates (saproxylic and epiphyte assemblages), lichens (epiphyte communities), and fungi (principally deadwood saprotrophs and mycorrhizal thermophilous boletes) - have been investigated as well as the population structure of the old trees themselves. This study aims to inform the Environment & Heritage Service on how to assess the importance of wood pasture and parkland sites, tackle the conservation of such habitats, and make recommendations for further work.

The investigations have confirmed the great nature conservation value of the veteran tree populations surviving within historic parklands in Northern Ireland. Fungal assemblages can be particularly species-rich and diverse, while wood-decay and epiphyte invertebrates can also be of considerable nature conservation value. The epiphytic lichen communities appear to be of lesser importance but of some local significance nonetheless. The biological communities are associated with non-native as well as native tree species as they are primarily associated with broad-leaved woody plants rather than particular tree or shrub species. Key factors include availability of dead woody tissues, and bark structure and pH, none of which are unique to native woody plants.

Key statistics arising from the study are:

- A total of 1446 veteran trees were mapped across the six sites, each site varying from 101 (Drenagh) to 483 (Glenarm),
  - each achieves one of the three criteria for ASSI designation for veteran trees, but only Glenarm and Caledon achieve all three.
- A total of 341 fungus species, including a very significant number new to the Northern Ireland list, as well as Ireland as a whole; additionally many species feature in the provisional British Red List and the European Red List;
  - Glenarm is an outstanding site and achieves UK significance, closely followed by Castle Coole;
- A total of 159 lichen species, including 21 that are used to calculate indices of ecological continuity;
  - None of the sites appear to be outstanding in a Northern Ireland context but Glenarm is the richest, followed by Baronscourt and Castle Coole;
- A total of 200 invertebrate species which develop in decaying wood were found across the six parklands – including 76 Coleoptera and 102 Diptera - this comprises 31.5% of the known Irish saproxylic fauna plus five additions;
  - Glenarm is an outstanding site in an Irish context, with Baronscourt, Caledon and Castle Coole of N Ireland significance;
- The total of epiphyte invertebrate associates was 47 species of which seven are additions to the Irish list;
  - Glenarm is the most species-rich site.

The site data obtained has been explored in the context of the nature conservation importance of the habitat in Northern Ireland, its relationships with the cultural and designed landscape, the land management issues for successful conservation and enhancement, the relative merits of ASSI designation, selection criteria and Common Standards Monitoring.

In conclusion, four of the six study sites are shown to merit ASSI designation – Baronscourt, Caledon, Castle Coole and the Great Deer Park of Glenarm – while it is suggested that Glenarm is of particularly outstanding ecological interest.

The tree populations at five of the sites have a distinct lack of younger generations although tree planting programmes have been initiated under Countryside Management Schemes. Only at Glenarm, with its apparently wild native tree cover, does the tree population appear at all diverse and dynamic – although even here there are short-term problems with oak regeneration.

Recommendations are also made on future work:

- the need for a full baseline review of all remaining historic parklands to identify the numbers of veteran trees present in each and to carry out baseline surveys of their biological interests;
- the production of a 'parkland conservation pack' for landowners and their advisers to promote good practice in land management in historic parklands;
- the development of awareness-raising and special training events to improve the appreciation of and conservation in historic parklands more generally;
- it is also suggested that the Glenarm site is of such unique ecological interest in Northern Ireland that it should be promoted as an important research site.

# 1 BACKGROUND

## 1.1 The role of the Environment and Heritage Service

The Environment and Heritage Service (EHS) is an Executive Agency within the Department of the Environment for Northern Ireland. It is the lead body for the implementation of the Government's environmental strategy and policies in Northern Ireland.

## 1.2 Site safeguard

One of the primary aims of the Natural Heritage function is to identify a network of sites requiring protection which are sufficient in number and size to ensure the survival of Northern Ireland's best habitats, wildlife and physical features. Under the Nature Conservation and Amenity Lands (N.I.) Order 1985 and its successor The Environment Order 2002, EHS has an obligation to designate Areas of Special Scientific Interest (ASSI), which may be declared on account of their flora, fauna or geological, physiographical or other features. EHS is required to notify owners and occupiers of the special interest and boundaries of each ASSI, and to inform them of those operations which damage the scientific interest. An owner wishing to carry out one of these specified operations must notify EHS, who may either consent to the proposed operation or attempt to reach a management agreement that may involve some form of compensatory payment to the owner.

Northern Ireland also has international commitments to protect and manage sites. Under the Habitats and Species Directive, member states are required to put forward a series of sites across a range of habitats and species to ensure adequate protection of the resource within the European Union, and to ensure that individual habitats and species are maintained in (or restored to) favourable condition. These sites – Special Areas of Conservation (SAC) and Special Protection Areas for birds (SPA) will form a network of sites known as Natura 2000. A number of "priority habitats" for which special protection measures are required, have been identified in the Directive. Some of these are particularly well represented in the British Isles, and the UK therefore has a special obligation to ensure their adequate protection.

## 1.3 UK Biodiversity Action Plan

The UK Biodiversity Action Plan (BAP) is now one of the main themes in nature conservation in the UK. A number of habitat statements and costed action plans have been published or are in preparation for key habitats and priority species which are either threatened, or for which the UK has international responsibilities. The mechanisms for conserving habitats and species in these statements and plans are varied and include a range of wider countryside measures. However, one of the central themes consistent across all the plans is that sites of high nature conservation interest must be protected and managed effectively.

## 1.4 Northern Ireland Biodiversity Strategy

More locally the Northern Ireland Biodiversity Strategy is now one of the

main drivers within EHS. Published in August 2002, it aims to engage all sectors in society in achieving its goals. In 2004 the NI Biodiversity Group was constituted with a role to coordinate and monitor implementation of the strategy. Underpinning this strategy is necessary ongoing research to give the evidence base to what EHS are doing. Research can be necessary to inform biodiversity decisions and to help give direction to where resources should be deployed.

### 1.5 The UK Wood Pasture and Parkland HAP

The UK Habitat Action Plan for Wood Pasture and Parkland explicitly acknowledges right at the start that such sites are vegetation structures rather than plant communities, and comments that they are the products of historic land management systems. This is equally true of most, if not all, other habitats with HAPs, of course, but the pre-eminence of the structural element is the key feature of wood pastures and parklands. All British and Irish habitats form part of the cultural landscape, to varying degrees.

The HAP includes (www.ukbap.org.uk):

- Lowland wood pastures and parklands derived from medieval forests and emparkments, wooded commons, parks and pastures with trees in them. Some have subsequently had a designed landscape superimposed in the 16th to 19th centuries. A range of native species usually predominates amongst the old trees but there may be non-native species which have been planted or regenerated naturally;
- Parklands with their origins in the 19th century or later where they contain much older trees derived from an earlier landscape;
- Under-managed and unmanaged wood-pastures with veteran trees, in a matrix of secondary woodland or scrub that has developed by regeneration and/or planting;
- Parkland or wood pasture that has been converted to other land uses such as arable fields, forestry and amenity land, but where surviving veteran trees are of nature conservation interest. Some of the characteristic wood pasture and parkland species may have survived this change of state.

Not included in the HAP are:

- Upland sheep-grazed closed-canopy oak woodland or Caledonian pine forest (covered by other HAPs);
- Parklands with 19th century origins or later with none of the above characteristics.

#### 1.5.1 Definitions

Watson (2002) includes an up-dated definition of wood pasture, as produced by the HAP Advisory Group: *wood pastures are areas that have been managed by a long-established tradition of grazing allowing, where the site is in good condition, the survival of multiple generations of trees, characteristically with at least some veteran trees*. Here, wood pastures are distinguished from parkland by the latter involving *enclosure of a set area to maintain deer or for landscape effect*. While the wood pasture definition is intended for use in unenclosed rangeland, relicts may occur in other situations such as parkland.

Rackham (2006) provides another useful practical definition of wood pasture: 'The essential difference between woodland and wood-pasture is the ground vegetation. In woodland the ground vegetation consists of plants that tolerate or evade shade. Wood-pasture has grassland or some other plant community that calls for unshaded conditions.' Thus wood pastures comprise trees growing sufficiently far apart for the ground vegetation to be indistinguishable from open habitats. The term therefore encompasses enclosed parklands as well as other situations.

Typically the structure of modern wood pastures and parklands consists of large open-grown and high forest trees and shrubs at various densities within a matrix of field layer vegetation which may include grassland, heathland, wetland and/or woodland types. The trees themselves typically include the older age classes – as veterans and/or ancient individuals – as well as younger age classes in the more sustainable systems. Other habitat types may also be present as minor features, such as lakes, ponds, rivers, streams, hedgerows, and so on. These other features may in themselves be covered by other Habitat Action Plans.

The key features of wood pasture and parkland from the nature conservation point of view are the ancient and veteran trees and the specialist biological communities which are associated with them, particularly fungi, epiphytes and invertebrates. It is a misconception that these organisms are 'woodland' species – they are dependent on veteran trees and shrubs growing in situations where relatively high levels of sunlight reach the tree trunks and the ground beneath. They are woody plant associates but do not have a requirement for close-grown hosts.

In Northern Ireland it is generally believed that wood pasture habitat only exists in historic parklands although this has not been fully investigated – the Woodland Trust's *Back on the Map* inventory project has recently found ancient wood pasture habitat outside of historic parklands.

### 1.5.2 Appreciation of the habitat

The habitat type had largely been overlooked or neglected throughout the UK prior to the development of the UK Biodiversity Action Plan and this is very much the case in Northern Ireland. Only two parklands feature in the current ASSI series: Upper Lough Erne: Crom ASSI and Glenarm Woods ASSI, and these are principally designated for other features.

The habitat had first been recognised as having special significance by the Nature Conservancy Council (the UK Government's nature conservation agency in Britain which preceded the current agencies there) which ran a Mature Timber Habitat project (1976-78). This was eventually followed by publication of an overview report (Harding & Rose, 1986).

There are no reliable statistics on the extent of the overall resource, or on historical and current rates of loss or degradation. All of the UK Government nature conservation agencies have been actively examining and developing knowledge in recent years.

### 1.5.3 Activity in England

English Nature ran a Veteran Trees Initiative (VTI) during 1995-2000, and has taken on the role of UK Lead Partner for the HAP. The VTI had many important outcomes: a conference on the way forward (Bullock & Alexander, 1998), the development of a Specialist Survey Methodology (SSM), and publication of *Veteran trees: a guide to good management* (Read, 2000). More recent work has included reviews of the habitat resource in selected English counties (see References section) and of BAP Priority Species of fungi (Roberts 2002; Boddy *et al,* 2003 & 2004; Ainsworth, 2004b), as well as wider work on defining 'old growth' in a UK context (Alexander *et al*, 2003), developing tools for assessing fungal interest of habitats (Ainsworth, 2004a) and assessing the distribution and abundance of veteran trees at a North West European level (Smith & Bunce, 2003).

Following the completion of the Veteran Trees Initiative, work has focused on the Wood Pasture and Parkland HAP and an advisory group has been periodically convened by EN as lead agency on the UK HAP (Kirby & Reid, 2000; Watson, 2002; Isted, 2004). The advisory group has mainly been a reporting vehicle but valuable discussions of various issues have also been achieved, e.g. a discussion of definitions (see 1.5.1). English Nature have also developed a Wood Pasture and Parkland Information System (WAPIS) – this is a web-based metadata system provided as a link to as much of the available data as possible (www.wapis.org.uk).

A small number of English parklands are already designated as SSSI for their specialist biological communities – mainly lichens but occasionally invertebrates and none for fungi. None have been added as a result of the VTI or HAP work. Some now have National Nature Reserve status, including the parks of Calke (Derbyshire), Duncombe (North Yorkshire), and Moccas (Herefordshire). There remain a large number of sites with concentrations of veteran trees which will need assessing under the new JNCC Guidelines (see 9.3).

### 1.5.4 Activity in Wales

The Countryside Council for Wales initiated a project on the lichens and invertebrates of Welsh parklands in 1993. The first stage was development of a provisional inventory of parklands using existing aerial photography (Bray, 1993), followed by rapid ecological appraisal of each site (Bean *et al,* 1994). The sites which appeared to have the most potential then received exploratory surveys of their epiphytic lichens (Orange, 1996) and saproxylic beetles (Hammond & Hine, 1994). A further subset of what then appeared to be the four richest sites received more detailed beetle surveys. The richest sites have now been designated as SSSI. This project has been exemplary by its simplicity and its rapid achievement of a countrywide inventory of parklands leading through specialist surveys to site protection. It unfortunately excluded fungi from the surveys and this may have led to failure to recognise some important sites.

### 1.5.5 Activity in Scotland

The emphasis in Scotland has been on unenclosed wood pastures and Scottish Natural Heritage has carried out a preliminary survey of the

resource, drawing on map and aerial photography evidence (Holl, in Watson, 2002). The distinction between upland and lowland sites is more distinct here and work on the upland sites has been where most progress has been made (Quelch, 2000). Habitat has been the main basis for this work rather than species. Important lowland parklands are already designated as SSSI, e.g. Dalkeith (Lothian), Hamilton High Parks (Strathclyde) and Lochwood (Dumfries).

### 1.5.6 Ancient Tree Forum and the Woodland Trust

The Ancient Tree Forum (www.ancient-trees.org.uk) – an independent charity registered in England but active in many European countries - has also been developing its own initiatives including an inventory of sites with concentrations of ancient trees. It has in recent years been working in close partnership with the Woodland Trust across the UK, and the Trust have recently launched an Ancient Tree Hunt project (www.ancient-tree-hunt.org.uk) to engage the wider population and draw together knowledge of the locations of all ancient trees across the UK.

The Woodland Trust has compiled an ancient woodland inventory for Northern Ireland which aims to include wood pastures as well as more conventional enclosed ancient woodlands (see next section).

## 1.6 Wood pasture and parkland in Northern Ireland

Lowland wood pasture and parkland was one of the earliest habitats to be identified as a priority habitat under the UK BAP, and has been adopted as a priority habitat in Northern Ireland where it is subject to a draft Habitat Action Plan (HAP). Although there are various sources of information on this habitat, none has so far provided a detailed and accurate assessment of the extent of the resource. The recent *Inventory of Ancient and Long-established Woodland for Northern Ireland* (Woodland Trust, 2007) has found 1066 hectares of wood pasture and parkland, i.e. 10.7% of the surviving woodland on the inventory. This is an excellent start in the appreciation of the habitat type but further research is required to establish which and what proportion of wood pasture and parkland sites qualify as the BAP Priority Habitat.

A recent review of the biological communities of old trees associated with this habitat (Anderson *et al,* 2000) indicated the relative importance of significantly aged trees for lichens, dead wood fungi and invertebrates, but stressed the relative lack of knowledge in Northern Ireland and the differences in distribution of both the habitat and some of the represented species in comparison to southern England. In addition there has been some debate over the relative merits of this habitat type in terms of whether or not it exists in Northern Ireland, what the management goals should perhaps be, and how appropriate a protection designation would be. Therefore, it was recognised that a multidisciplinary approach would be required to unravel the various factors in preparing habitat action plans, deciding how best to manage such sites and ascertaining why they are important.

### 1.7 Purpose of scoping study

This project investigates the biodiversity of a selected group of wood pasture and parkland sites in Northern Ireland. The importance of these sites for fungi (primarily species of dead wood, but also mycorrhizal species associated with the parkland trees and other notable taxa), lichens (epiphytic species), and invertebrates (in particular saproxylic species, but also epiphyte associates) has been investigated including the population dynamics of the old trees themselves. This study will inform EHS on how to assess the importance of wood pasture and parkland sites, tackle the conservation of such habitats, and make recommendations for further work.

### 1.8 Content of study

The following general requirements were set out in the brief:

- Establishing selection criteria for wood pasture and parkland ASSI designations under the Environment (Northern Ireland) Order 2002;
- Providing recommendations on site management to ensure that the habitat is maintained and enhanced where appropriate;
- Defining 'favourable condition' of wood pasture and parkland in the context of Northern Ireland;
- Provision of details of similar or related work being carried out in the UK, Ireland and further afield;
- Recommendations for further work.

The following specific requirements were also set out:

- For each site carry out a detailed investigation into the lichen (epiphytic), fungi (primarily those of dead wood) and invertebrate (those associated with old trees, in particular saproxylic taxa) respective flora and faunas;
- Carry out a veteran tree survey which must include both an assessment of tree health as well as some indirect measures of biodiversity value;
- Pulling the data collected,
  - ❍ Explore the relative merits of the designation of such sites as ASSI, including selection of what the site feature should/could be and how this might affect subsequent protection and management;
  - ❍ Explore the value of introduced or non-native trees and their associated flora/faunas;
  - ❍ Investigate the landscape and design element and historical context and how it relates to biodiversity value;
  - ❍ Test and further advise on methodology being developed for the condition assessment of such habitats;
- Give advice resulting from the multidisciplinary approach, on how such sites should be managed, reflecting on the past management traditions;
- Make recommendations for further work, including some assessment of the extent of the resource in Northern Ireland and how best to go about future work given the fairly finite resources available for such relatively intensive type survey methods.

A Steering Group was established to guide the study, comprising representatives from EHS Conservation Science, EHS Historic Gardens, EHS Biodiversity Unit, EHS Habitat Survey, DARD Countryside Management, and the National Trust.

Specialist survey of lichens has been initiated by EHS at a number of sites throughout Northern Ireland and including private estates and parklands, but the results are still being compiled and are unavailable to the current project (M Wright, pers. comm.).

## 2 AN INTRODUCTION TO TREE ECOLOGY

The history of the woodland cover of Ireland has been debated by many authors and is outside the scope of the present report. This report is concerned with the special wildlife features of veteran trees in wood pastures and parklands within Northern Ireland. It is also focused on open-grown trees rather than trees growing under closed-canopy or 'woodland' conditions. Discussions of woodland cover rarely consider open-grown trees and so discussions of 'woodland history' are rarely relevant to the wildlife associated with non-woodland trees.

Some basic tree biology and tree ecology needs to be discussed in order to provide a framework for understanding the biological communities surveyed and described later.

### 2.1 The ageing and wood-decay processes

Each broad-leaved tree species follows a similar pattern of development with age – although the life expectancies vary considerably with species. An individual tree with plenty of space around it grows steadily and expands its canopy to optimise its light-gathering potential. Each year a new annual ring is laid down. At some stage the tree reaches its optimal height and its full crown expression is achieved – this is partly controlled genetically, partly physiologically and partly due to local conditions. New annual rings continue to be laid down, necessarily increasing in circumference and therefore becoming thinner (on average) until it is no longer biologically possible to lay down a complete functional ring. At this stage gaps in the ring begin to form. The thinning rings also eventually become incapable of supplying sufficient water to maintain the fully expanded crown and the tree begins to retrench, the high canopy boughs gradually dying and the canopy thinning. Eventually the old high canopy dies away, and a new lower canopy forms through reiterative growth from the lower branches which is stimulated by increasing light levels in the lower canopy. The retrenchment phase is the beginning of what is termed the ancient tree. Ancient trees have the potential to live for a very long time – it is important to appreciate that the living tissues of any tree are relatively young but cover an aging structure.

The annual rings do not have a long life expectancy. In oak each ring lives for between 20 and 30 years, for example (D. Lonsdale, pers. comm.), so older trees are beginning to accumulate dead inner rings, which form the heartwood. These dead tissues increasingly occupy a higher proportion of the tree's diameter. The probability that this dead heartwood will be

colonised by specialist heartwood decay fungi increases with volume and time – most trees older than say 200 years are likely to be beginning to hollow. The widespread specialist heartwood-decay fungi known from Britain are also mostly just as widespread in Ireland (see below and 5. Fungus Survey).

This means that certain statements which are regularly made by the Northern Irish dendrochronologists are based on misconception. It is often stated that the oldest known oak in Ireland dates from 1649 (Baillie & Brown, 1995) or 1642 (Brown & Baillie, 2005), based on the longest tree ring records, but, of course, the probability that continuous tree ring records will escape fungal breakdown decreases with age. What **is** remarkable is that single oak stumps at Shane's Castle and Belvoir Park, respectively, still have that many rings undecayed. Heartwood decay fungi will naturally remove all of the evidence for older trees. Unfortunately Baillie & Brown (1995) and Brown and Baillie (2005) extrapolate further and suggest that the Irish oak never at any time in the postglacial achieved ages greater than 400 years and that the majority of timbers from bogs and ancient trackways are in the 150-250 year range. The latter is predictable, as heartwood decay will have removed all evidence for older trees – and smaller girth trees are generally easier to work with than large ones, but the conclusion that trees have never grown larger is completely irrational and unfounded. Nevertheless this opinion is uncritically accepted by many authors.

Timber comprises two main components – lignin and cellulose. Most heartwood decay fungi are capable of breaking down both, although some start on the lignin first and cellulose later. These species are generally referred to as 'white rotters' since some whitish cellulose is usually left behind. A few heartwood decay fungi are only capable of breaking down cellulose and leave the lignin – these are referred to as brown-rotters or red-rotters as the lignin has a reddish or orangey coloration. The latter term is used mostly by entomologists

The key heartwood decay fungi are *Laetiporus sulphureus*, *Inonotus dryadeus*, *Fistulina hepatica* and *Grifola frondrosa*, mostly on oak, and *Ganoderma australe* and *Polyporus squamosus* on other broadleaved trees. Interestingly, Brown *et al* 1997 included some heartwood decay fungi in their early proposals for Priority Species:

- *Ganoderma resinaceum*
  - known from Belvoir Park
- *Grifola frondrosa*
  - known from the Saintfield Estate
- *Inonotus hispidus*
  - 30 year old record from Randalstown

The first was not seen during the 2006 study but the other two were (see 5 Fungus Survey).

**2.2 Definition of veteran and ancient trees**

'A veteran tree is a tree that is of interest biologically, culturally or aesthetically because of its age, size or condition' (Read 2000).

The language of veteran and ancient trees is very much a recent development and terminology and definitions have caused much

confusion and difficulty. In the early days of the Ancient Tree Forum and English Nature's Veteran Trees Initiative, 'veteran' and 'ancient' were assumed to be interchangeable, but the ATF has now provided separate and distinct definitions as a practical working tool.

Ancient trees are defined by age and stage in natural development, as indicated in the preceding section - ancient trees are individuals that have reached the retrenchment phase in their growth and development. This stage is reached in different time periods according to tree species but is generally recognisable in an open-grown tree unaffected by human interventions by the natural break-up of the high canopy – although storm damage may advance this stage in some individuals. Tree species such as oak and lime are long-lived and capable of living beyond 1000 years, and the ancient stage in oak may be reached after 3-400 years on average. Oaks provide timber of a most useful and manageable size to people while they are still relatively young and long before heartwood decay sets in.

Veteran trees are defined by their condition alone. They may have many of the decaying wood characteristics of an ancient tree but are younger in age and therefore smaller in girth. The decaying wood may have arisen naturally or be the result of human activity – either directly by cutting or collision – or indirectly through, for example, decline brought on by root damage through soil compaction. The term veteran can be used to encompass ancient trees but not vice versa.

**2.3 Tree Form**

The form of the tree is important in terms of the associated biological communities. An open-grown tree has the space to develop its full potential, unaffected by competition from neighbouring trees. Lateral bough development is maximal and the natural ageing process is able to extend the tree's life beyond full canopy development. Under closed canopy conditions natural retrenchment of an individual tree's canopy provides light and space for younger neighbouring trees to extend their own canopies and out-compete the older tree for light. Ancient trees are therefore very rare under closed-canopy 'woodland' conditions and exceptional.

As full canopy development is achieved so the lowest branches become shaded out and die. These are a unique situation – aerial but sheltered – and have specialist fungal decayers and invertebrate associates as well as being particularly rich in epiphyte invertebrates. Such branches do not form in closed canopy situations as tree growth is invested upwards towards the light rather than laterally. They are also very vulnerable in parklands and are often cut off and removed, to improve light levels beneath the canopy to stimulate grass growth and for vehicle access for fertiliser spreading, etc.

Epiphyte communities are well known for requiring relatively well-lit trunks and boughs, and many of the associated invertebrates are warmth-loving species. Many wood-decay invertebrates are also favoured by the relatively warm conditions provided by well-lit situations, although others favour the higher humidity and moister conditions provided by shadier conditions. The saprotroph fungi also include species which - at least - fruit most prolifically under well-lit conditions and this of course influences their

colonisation by insects. The thermophilic mycorrhizal boletes are another good example of tree associated organisms which require well-lit situations.

The age structure of the tree population is also of enormous significance, both in terms of the older generation trees providing extended habitat continuity for lichens and other epiphyte communities and in the accumulations of dead woody tissues which may be colonised by wood-decay fungi and thereby support diverse saproxylic invertebrate assemblages.

**2.4 Old growth associations**

The study and appreciation of the special biological communities of ancient wood pastures and historic parklands is constantly stalled by a lack of appropriate terminology. Terms such as 'woodland' and 'forest' are a distraction as they conjure up varying images of usually relatively dense tree cover. Even 'wood pasture' can become a distraction, with its associations with formally managed historic landscapes such as the New Forest in Hampshire, Burnham Beeches in Buckinghamshire, and issues concerning pollarding, grazing systems, and so on. While the complex mosaic of habitats within wood pasture systems is a special interest in itself, it is the veteran tree associates which are unique to the habitat – the old woody growth. Butler, Rose & Green (2001), Alexander *et al* (2003), Alexander & Butler (2004) and Alexander (2004) have argued that the North American term 'old growth' most readily describes these interests and now has an established pedigree in nature conservation. The difficulty remains to persuade people that it is an appropriate term for use in European cultural landscapes.

The definition provided by the Convention on Biological Diversity website (www.biodiv.org) forms the basis for the recommended way forward and this is interpreted for application to the cultural landscapes of the UK and Europe: *old growth forest stands are stands in primary or secondary forests that have developed the structures and species normally associated with old primary woodland of that type that have sufficiently accumulated to act as a woodland ecosystem distinct from any younger age class*. The acceptance of 'primary or secondary' disallows objections based on arguments concerning virgin or primary origins of the vegetation and permits the inclusion of old growth habitat and species within cultural landscapes such as wood pastures and parkland. The structures of old primary woodland are subject to considerable debate in Britain and Ireland and only unproven hypotheses are available. The requirement for species 'normally associated with old primary woodland' and 'distinct from any younger age class' provides a firm basis for referring to the tree populations within wood pastures and parkland as old growth – there is palaeo-ecological evidence for some of the saproxylic beetles, and many of the fungi, lichens and invertebrates have their associations with the least disturbed forest habitats across Europe.

While the term 'virgin' clearly cannot be applied to any habitats across Europe, the term 'semi-virgin' may be appropriate to the parklands and wood pastures which are rich in *species normally associated with old primary woodland of that type that have sufficiently accumulated to act as a woodland ecosystem distinct from any younger age class.*

# 3 INTRODUCTION TO STUDY SITES AND OVERALL SURVEY STRATEGY

## 3.1 Site selection

A provisional list of 28 potential parkland sites was compiled by the Project Officer, Mark Wright, and examined at a project initiation meeting of the Steering Group in September 2005. Further sites were suggested by attendees bringing the list to 33 sites. These were whittled down to a short list of 13 sites, and eventually a list of six sites was agreed. Two sites – Crom and Belvoir – were omitted as they were already relatively well worked for their wildlife, although it was noted that Crom is lacking in detailed invertebrate survey.

All six sites feature in the Register of Historic Parks, Gardens and Demesnes, Northern Ireland (www.ehsni.gov.uk/registerni.pdf). Five include areas established as deer park during part of their history, with only Drenagh lacking this feature.

## 3.2 Integrated survey approach

With such a multidisciplinary project it was felt important that the various specialists worked closely together, such that each discipline would be better able to integrate their methodologies and results with each other and to provide feedback across the disciplines. This collaborative approach proved to be extremely valuable in ensuring consistency of data gathering.

The intention had been that all of the team made the first visit to each site together, although unfortunately the lichen surveyor was unavailable due to illness. The first visit provided an opportunity for the owner and/or the site managers to meet the team members, to discuss the project with them, and to identify special access arrangements and any other issues. Once out on site, the tree surveyor was able to discuss the detail of tree recording with the biological surveyors, to ensure good awareness of specialist interests, and the biological surveyors improved their awareness of how they might best work with the tree survey.

As the first site investigation had the potential to be the most time-consuming, it was arranged in March when the time demands on the biological surveyors would be least. This is an ideal time of year for the tree survey as the form of each tree is easily seen without the foliage, and the GPS equipment performs best without foliage. Perennial and persistent bracket fungi are also most easily recorded on this first visit as light levels around the trunks are at their highest, and even entomological work can be facilitated by a good look at the trunks in full daylight to identify rot features for targeting on later visits.

The full team and their respective activities were:

- Project Leader: Keith Alexander
- Tree Survey Leader: John Smith (Mosaic Mapping)
  - Assistance from: Keith Alexander, Janet Lister & Alan Lucas
- Fungus Survey Leader: Alan Lucas
  - Assistance from: Jill Butler (reporting)

- Lichen Survey Leader: Joe Hope
  - Assistance from Sandy & Brian Coppins (identification and reporting)
- Invertebrate Survey Leader: Keith Alexander
  - Assistance from Peter Chandler (fly identification)

### 3.3 Survey Programme

The fieldwork for the project was carried out across nine months during 2006 – see Table 1. The details of each survey by discipline are covered in the following sections.

| Dates | Tree Survey | Fungi | Inverts | Lichens |
|---|---|---|---|---|
| March 28th – April 2nd | GPS locations & Partial Level 2 | Preliminary tree by tree survey; perennial and persistent bracket fungi | Preliminary tree by tree survey; collecting larvae and pupae for rearing; setting up flight interception traps | |
| May 16th – 21st | | Fungal survey | Invert survey | |
| June 13th – 18th | | | Invert survey | Tree by tree survey of part of site |
| July 25th – 30th | GPS locations of second tranche & tree record | Preliminary tree by tree survey of second tranche | Preliminary tree by tree survey of second tranche | |
| August 15th –- 20th | | Fungal survey, especially early mycorrhizal fruiting | Invert survey | |
| September 12th - 17th | | Fungal survey | Invert survey | |
| October 20th - 30th | | Fungal survey | Invert survey | Tree by tree survey of rest of site |
| November 24th -29th | GPS locations of third tranche & tree record | Fungal survey | | |
| December 8th -13th | | Fungal survey | | |

**Table 1** Fieldwork programme for Parkland Scoping Study

### 3.4 Availability of the detailed records

Vouchers specimens have been retained for all significant records, e.g. species rare or very localised in Ireland, but also for organisms where there are known to be taxonomic or nomenclatural issues. These will be deposited in the Ulster Museum.

The detailed tree records and the species lists from the biological survey work are available in the form of Excel spreadsheets. The following sections report on the analysis of this data rather than provide the detailed record of the results.

## 4 VETERAN TREE SURVEY

### 4.1 Planning

#### 4.1.1 Aerial photography

Aerial photography covering five of the sites (not Baronscourt) was provided by EHS at an early stage in planning of the fieldwork. These were examined and what appeared to be open-grown trees were each marked with a red star to focus the surveyors into key areas during the first exploratory site visits. This proved to be an effective targeting tool in the field for planning the route to be taken around the site, and hence reducing the amount of time required for site visits. The availability of aerial photos effectively increased the number of trees which could be surveyed per day.

#### 4.1.2 Tree recording methodology

Tree information gathering was based on the Specialist Survey Methodology (SSM) developed through the Veteran Tree Initiative partnership project in England (1995-2000). This is the industry standard.

Estimates for the number of trees at each site were not available in advance and so the tree survey had to be costed on the basis of recording up to 100 trees at Level 3 SSM – the most detailed level. The planned tree survey programme had, however, to be modified during the course of the fieldwork as the true numbers of parkland trees became apparent.

The original plan had been for up to 100 veteran trees to be mapped with differential GPS - see later - on each site during the first exploratory visit (March 2006). This initial work would then provide the biological surveyors with basic tree maps with individually coded trees for their own specialist survey work which followed. A second visit would be carried out later to complete the more detailed individual tree records, to SSM Level 3.

The March visits revealed that five of the sites – excepting Drenagh – contained considerably more than 100 veteran trees. With agreement from EHS, the plan was revised such that the detail of the individual tree record would be scaled down in order that more time could be spent on tree mapping, to move towards as complete coverage of the parklands as feasible within the time allocations. Complete coverage was agreed to be the higher priority rather than recording each individual tree in great detail.

A second round of differential GPS was therefore carried out in July 2006. The reduced level of tree recording was carried out at the same time for these additional veteran trees. The reduced level of tree recording for the veteran trees which had already been mapped during the first phase of GPS was carried out during October 2006. The July GPS work successfully completed coverage of the veteran trees at Baronscourt, Caledon and Castle Ward, but the two largest sites of Castle Coole and Glenarm could still not be completed in the time available.

A third visit was therefore arranged for these two large parklands in November 2006. While it was clear that complete coverage could still not be achieved within the time available, the final work at these two sites was targeted at completion of a defined block of land which included the main concentrations of veteran trees.

Clumps of trees present particular problems: concentrations of trees are time-consuming to map in detail and the individual trees are often of high forest form (drawn up through competition and lacking side branching). Clumps were therefore mapped as separate groups and only the main component veteran trees were individually documented.

**4.2 Individual tree records**

The individual veteran trees have been mapped using GPS technology – primarily differential GPS (Smith, 2006), but supplemented by hand-held GPS equipment for miscellaneous additional trees selected by biological surveyors during the course of their site explorations and which could not be mopped up by the later tree survey visits. Differential GPS allows an accuracy of less than 1m in positioning. Virtually all trees recorded by differential GPS were also subject to a rapid digital image illustrating the whole structure – a few were accidentally missed.

The criterion for inclusion of a tree as a separate and detailed record was based primarily on a visual judgement of the trunk size. All open-grown trees which appeared to be of about 1m diameter or more were mapped. In some cases a tree was mapped which was clearly smaller but which appeared to be a prominent feature in the landscape. Also tree species which are naturally of smaller diameter even when veteran were also selected on a case by case basis, e.g. hawthorns.

Fig 1 Keith Alexander and Alan Lucas measuring the girth of an ancient oak at Baronscourt.

The provision of individually numbered tags was initially considered but the National Trust did not want these on the grounds that many of their trees were already tagged and additional tags were undesirable. It was therefore agreed with EHS at an early stage that tree-tagging would not be carried out at any of the six sites. Existing tags were noted on the Excel spreadsheet where encountered on trees.

Owing to the agreed reduction in tree recording detail a digital recording form was developed specifically for the EHS project which combined all of the key features of SSM Levels 1 and 2, plus a more limited selection from Level 3, plus some additional features not covered by the SSM. The EHS form is therefore something of a practical hybrid. Some of the features of Level 3 are considered unlikely to prove useful for the EHS purposes and were readily rejected. Others have been modified to some extent to

improve their value to EHS. The data is presented in the form of an Excel Spreadsheet. Table 2 lists all of the fields used for the EHS project and provides a short description or explanation of the type of information recorded and provides a correlation with the VTI SSM standard recording form.

| Field header | Description | Field type | SSM (VTI) Code & Level |
|---|---|---|---|
| ID | Unique site code for individual tree | Numeric | 1 – Level 1 |
| Site | Coded name of parkland* | Text | A - Level 1 |
| Species | Tree species* | Text | 3 – Level 1 |
| Photo | Indicates trees where a digital image is available | Yes/No | Recommended only |
| East | Easting of grid reference | Numeric | 2 – Level 1 |
| North | Northing of grid reference | Numeric | 2 – Level 1 |
| GPS date | Date of GPS location of tree | Numeric | 2 – Level 1 |
| Tree Survey date | Date of detailed tree record | Numeric | K – Level 1 |
| GPS sd | Standard deviation of GPS | Numeric | Not covered |
| Age class | Ancient/ Veteran/ Mature* | Text | Not covered |
| GBH | Girth at breast height (in metres)* | Numeric | 4.1 – Level 1 |
| Estimated | Trees where girth measurement was not feasible | Yes/No | Not covered |
| Height of Measurement | Standard for 'breast height' is 1.3m* (variations were estimated) | Numeric | 4.2 – Level 3 |
| Comment | Relates to trunk form | Text | 4.2 & 5 – Level 3 |
| Old tag | Tag numbers (NT sites) | Numeric | Not covered |
| Issues | 1 Poaching due to livestock<br>2 Compaction due to vehicles<br>3 Compaction due to pedestrian<br>4 Root damage due to ploughing<br>5 [no examples]<br>6 Root damage due to stock<br>7 [no examples]<br>8 Trunk bark-stripping due to livestock<br>9 Basal scarring<br>10 [no examples]<br>11 Saltlick/livestock feeder<br>12 Machinery damage to buttress<br>13 Machinery damage to trunk | Dropdown list | 28 – Level 2 |

| | | | |
|---|---|---|---|
| Potential hazards | Suggestion for consideration by qualified Health & Safety operative<br>1 Buildings<br>2 Power cables<br>3 Adjoining property<br>4 Public road<br>5 Vehicle track<br>6 Footpath | Dropdown list | Not covered |
| Competition Priority | Individual trees being badly affected by other tall growth and a priority for release | Yes/No | 29 – Level 3 |
| Competition Desirable | As above, but less urgent attention required | Yes/No | 29 – Level 3 |
| Regeneration Competition | Presence of young growth around the tree that has the potential to cause competition | Yes/No | 29 – Level 3 |
| Crown Reduction | Suggestion for consideration | Yes/No | Not covered |
| Management Comment | Suggestion for consideration | Yes/No | Not covered |
| Previous Management | Record of any obvious past cutting, etc<br>1 Crown-lifting<br>2 Deadwood pruning<br>3 Crown reduction | Dropdown list | 27 – Level 3 |
| Dead Trees | Standing<br>Fallen<br>Cut stump only<br>Broken stump only<br>Cut stump and trunk<br>Broken stump and trunk | Dropdown list | 6 & 8 – Level 2 |
| Tree Form | Managed pollard<br>Natural pollard<br>Forked trunk<br>Maiden<br>Coppard | Dropdown list | 6 – Level 2 |
| Deadwood attached | Present<br>Abundant<br>Super-abundant | Checkbox | 20 – Level 2 |
| Deadwood fallen | Present<br>Abundant<br>Super-abundant | Checkbox | 21 – Level 2 |
| Heartwood exposed | Present<br>Abundant<br>Super-abundant | Checkbox | 11 – Level 3 |

| Field header | Description | Field type SSM (VTI) Code & Level | |
|---|---|---|---|
| Hollowing | Present<br>Abundant<br>Super-abundant | Checkbox | 16 – Level 2 |
| Holes | Present<br>Abundant<br>Super-abundant | Checkbox | 17 – Level 2 |
| Tears | Present<br>Abundant<br>Super-abundant | Checkbox | 14 – Level 2 |
| Fluxes & sap-runs | Present<br>Abundant<br>Super-abundant | Checkbox | 12 – Level 3 |
| Red Rot | Present<br>Abundant<br>Super-abundant | Checkbox | 19 – Level 2 |
| White Rot | Present<br>Abundant<br>Super-abundant | Checkbox | 19 – Level 2 |
| Epicormic Growth | Present<br>Abundant<br>Super-abundant | Checkbox | 10 – Level 3 |
| Ivy | Present<br>Abundant<br>Super-abundant | Checkbox | 23D – Level 2 |
| Bracket Fungi | Fruiting bodies visible | Present/ Absent | 22 – Level 2 |
| Entomologist access | Trees with good low level access to heartwood decay | Yes/No | Not covered |
| Habitat Notes | Miscellaneous text for features not covered elsewhere | Text | Various |
| Ownership | Separation of Lord Belmore's land from NT at Castle Coole | Text | F – Level 1 |
| Comments | Other miscellaneous information | Text | Various |

**Table 2** Tree recording details used for 2006 Parkland Scoping Study

The distinction between the main phases of tree growth and development – ancient /veteran/ mature can be difficult and relies on expert opinion (see 2.2). It is not covered by the SSM but was introduced into the data gathering for the EHS project. Only one of the people carrying out tree recording was however confident of making this judgement and so only partial coverage was achieved – essentially those trees covered by the first round of survey. While the incomplete record makes analysis by phase of tree growth and development impossible, the data is included as it enables a minimum number of ancient trees to be assessed for the purposes of using the new JNCC guidance for selection of ASSI/SSSI of sites important for veteran trees.

**4.3 Numbers of trees recorded**

Table 3 provides an overview of each site by the total number of trees recorded by species.

Some smaller tree and shrub species are locally abundant in some of the parklands. Only key individuals of these were located using GPS in order to save time. These were included partly to create a record of the presence of the species and partly to highlight the more important examples:

- Alder at Glenarm
- Elder
- Elm at Castle Coole (fallen dead trunks in situ)
- Hawthorn
- Hazel at Glenarm
- Sallow, i.e. the broad-leaved willows *Salix caprea* or *S. cinerea*.

These species are indicated in Table 3 by an asterisk.

| | Baronscourt | Caledon | Castle Coole | Drenagh | Glenarm | Castle Ward |
|---|---|---|---|---|---|---|
| Alder* | 2 | 2 | 1 | - | 18 | - |
| Ash | 7 | 7 | 14 | 15 | 24 | 27 |
| Beech | 58 | 60 | 19 | 10 | - | 9 |
| Birch | - | - | - | - | 7 | - |
| Cherry | - | - | - | - | - | 2 |
| Elder* | - | 1 | - | - | - | 2 |
| Elm* | - | - | 5 | - | 12 | 3 |
| Field Maple | - | - | 1 | - | - | - |
| Fir | - | 2 | - | - | - | - |
| Hawthorn* | 4 | 13 | 10 | 2 | 3 | 7 |
| Hazel* | - | - | 1 | - | - | - |
| Holly | | | 1 | - | - | - |
| Hornbeam | 1 | 1 | - | - | - | - |
| Horse Chestnut | 5 | 18 | 18 | 3 | - | 1 |
| Larch | - | 1 | - | - | - | - |
| Lime, Common | 7 | 4 | 7 | 16 | - | 10 |
| Norway Maple | - | 1 | - | - | - | - |
| Oak | 87 | 82 | 60 | 45 | 413 | 109 |
| Oak, Luccombe | - | - | - | - | - | 2 |
| Oak, Turkey | 3 | - | - | - | - | 1 |
| Plane | - | - | 1 | - | - | - |
| Sallow* | 1 | - | 2 | - | 6 | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Scots Pine | - | 2 | 1 | 1 | - | - |
| Sweet Chestnut | 2 | 4 | - | 2 | - | - |
| Sycamore | 23 | 9 | 7 | 7 | - | 22 |
| Walnut | - | - | 1 | - | - | 1 |
| Wellingtonia | - | 8 | - | - | - | - |
| **Total trees** | **200** | **215** | **249** | **101** | **483** | **198** |

**Table 3** Total numbers of different tree species mapped by site [*not all veterans mapped - see text]

These should be considered minimum figures, since they exclude some of the trees mapped at group level only (see 4.1.2), and are selective with species such as alder, elder, hawthorn, hazel and sallow (see above). Glenarm and Castle Ward still have a few live wych elms but most encountered are dead and many fallen.

The two native oaks – sessile and pedunculate – were not distinguished as separation can be time-consuming and hybridisation in particular makes decisions difficult if not impossible.

Breakdowns of these figures by size class are given in the individual site assessments (section 8).

**4.4 Observations on tree form**

Most of the six parklands show signs of histories of tree-planting and landscape gardening, with the Great Deer Park at Glenarm a notable exception. The trees here appear self-sown and therefore of wild genotype.

The wild tree population at Glenarm is of considerable interest as the trees demonstrate tree behaviour in a way that cannot normally be observed in more formal parklands where human intervention is the norm. The majority of the trees have sustained damage in their early lives and are now multi-stemmed as a result. There are many examples of self-sown trees developing within the protection of old alders and thorn scrub, out of reach of browsing livestock. Fallen trees have also generally been left to develop into 'phoenix' trees, i.e. former branches have developed into new trunks once the original trunk has fallen.

The old alders also have special features of their own - beyond the shelter they provide for regeneration. Most are multi-stemmed, with large numbers of younger shoots surrounding the central older shoot. Once the older shoot has died and decayed away there may be little left to demonstrate the age of the new clump of young shoots. The large old alder are therefore almost impossible to date and are likely to be older than might otherwise be thought.

Phoenix trees have the potential to survive in other parklands, in more remote corners where people are less likely to intervene. An interesting case is a common lime in a far corner of the deer park of Castle Ward. A small low crown belies the history of this tree. The fragments include an old root plate, up-ended and in situ, the top having been sawn up but only partially removed. Sections of sawn trunk and/or bough have produced

new roots and shoots and are still living, creating a fragmented circle of a new 'tree' or group of trees.

# 5 FUNGUS SURVEY

## 5.1 The purpose of the fungus survey

To investigate the fruiting presence of selected ecological groups of macrofungi with particular focus on:

- deadwood saprotrophs
- mycorrhizal thermophilous boletes associated with the parkland trees
- waxcap communities in the grassland around the parkland trees
- other notable taxa such as red listed, BAP species, potential indicator species and
- new records for Northern Ireland.

To use the results of the survey to assess the importance of wood pasture and parkland sites for fungi and make recommendations for site management and further work.

## 5.2 Introduction

Fungi are recorded by their visible fruiting bodies. Every species has slightly different requirements for fruiting or a different fruiting strategy. Any survey over a short time period will only record a fraction of the species likely to be present on a site. Many species only fruit briefly and will only appear if the conditions are right for fruiting and this may be only once in many years; some rare species may only appear once in 20 to 30 years. The only way to build a reasonable assessment of the fungal mycota is to survey a site over many years throughout the seasons.

Furthermore there is no macrofungal species whose distribution is completely known. The true distribution of fungi, i.e. of fungal mycelia, is unknown. It is highly likely that the mapped 'fruiting distribution' of a species is a subset of a much larger 'mycelial distribution' area which extends beyond the fruiting zone.

## 5.3 Methodology

Eight site visits were made to each site during the period March to December 2006 to survey for durable fruit bodies or remnants. The first two visits were to record spring fungi and the remainder of the visits were to cover the period when summer and autumn species would be fruiting.

During the first six visits all individually mapped trees were visited to record the presence of the larger saprotrophic bracket fungi. It is generally accepted that this period will cover the best fruiting time on the trees for the annual bracket fungi and at the same time the new growth of the many of the perennials will be apparent. July and August is the peak period for species such as the oak polypore, *Piptoporus quercinus*.

As each individual tree was visited the root zone around the tree was surveyed for any mycorrhizal fungi especially bolete species. The last three visits increasingly concentrated on this aspect of the survey but also included surveying the grassland around each tree for waxcap community species. Surveying the grassland for waxcap community species was primarily between October and December. Fruit bodies of other species that are easily recognised in the field that were encountered during the survey of the site were recorded.

Generally, during the survey the weather conditions were drier than usual especially in the first half of the survey period.

Whenever possible, fungi were identified in the field. Any species that required further microscopic investigation were taken away especially any non gilled species i.e. the Aphyllophorales, found on fallen dead wood. Digital photography was used to record some of the more unusual specimens. Voucher specimens were retained for confirmation of identification for some rare species and those that have not been previously recorded for NI. Voucher specimens have been retained for some species new to Northern Ireland as follows: *Amanita friabilis*, *Ceriporia purpurea*, *Chromocyphella muscicola*, *Cyphella ferruginea*, *Gloeophyllum sepiarium*, *Ionomidotis fulvotingens*, *Mycoacia fuscoatra*, *Nodulisporium cecidiogenes*, *Peniophora laeta*, *Perenniporia fraxinea*, *Tremella steidlerii*, *Tulasnella violea*. Voucher specimens were also collected for: *Bjerkandera fumosa*, *Dichomitus campestris*, *Eichleriella deglubens*, *Henningsomyces candidus*, *Junghunia nitida*, *Merismoides anomalus*, *Panus conchatus*.

Collected specimens were identified using keys and reference texts along with chemical tests. Nomenclature follows the new *Checklist of the British and Irish Basidiomycota* (Legon & Henrici, 2005) but not all fungi are covered by standard checklists. One species in particular is still unclassified as the taxonomy is uncertain.

### 5.4 Results

A summary of the results is presented in Table 4.

| | Baronscourt | Caledon | Castle Coole | Castle Ward | Drenagh | Glenarm | Totals for all sites |
|---|---|---|---|---|---|---|---|
| **No. trees surveyed** | 200 | 215 | 249 | 198 | 101 | 483 | **1446** |
| % of trees with brackets | 24% | 29% | 26% | 27% | 15% | 8% | **19%** |
| | | | | | | | |
| **No. of fungi species** | 113 | 127 | 158 | 80 | 98 | 181 | **343** |
| | | | | | | | |
| **No species of ecological groups of interest:** | | | | | | | |
| Heartwood saprotrophs | 7 | 7 | 8 | 6 | 3 | 8 | **11** |
| Thermophilus boletes | 1 | 1 | 0 | 1 | 0 | 1 | **4** |
| Grassland waxcaps | 3 | 3 | 7 | 3 | 1 | 7 | **11** |
| | | | | | | | |
| **No species:** | | | | | | | |
| New for Northern Ireland | 3 | 6 | 6 | 2 | 3 | 10 | **22** |
| Basidiomycetes not known from Republic of Ireland (RoI) | 12 | 16 | 21 | 7 | 6 | 30 | **54** |
| Basidiomycetes new for whole of Ireland | 2 | 4 | 5 | 1 | 2 | 8 | **16** |
| Ascomycete new for whole of Ireland | 0 | 0 | 0 | 0 | 0 | 1 | **1** |
| Red List species (Great Britain excluding NI) | 0 | 0 | 0 | 0 | 0 | 5 | **5** |
| European Red List species (1993) | 0 | 2 | 4 | 2 | 2 | 9 | **15** |

| Table Colour Key |
|---|
| Species of Ecological Groups/ Interest |
| British/ EU Red List Species |

**Table 4**: Summary comparison of six parkland sites.

Although 341 different species of fungi were recorded across all the parkland sites, this represents a very small proportion of the estimated total UK list of 20,000 species. A full list of species is provided in a separate Excel spreadsheet.

Less common species were assessed against the British Mycological Society's Fungal Records Database (BMSFRD). This Database gives the number of occurrences of individual species in the UK and Ireland. The Database is not kept fully up to date and many historical records feature. Counts refer to records and not sites. Despite some concerns the Database is the best guide available to the rarity of macrofungi in the UK and Ireland. For this report we assessed fungi as rare if there were less than 30 records on the Database.

The findings were also cross checked with the Northern Ireland Fungus Group on line atlas. According to the web site www.nifg.org.uk the atlas was last updated in September 2005.

In addition the rarer Basidiomycete fungi were cross checked against the *Checklist of the British and Irish Basidiomycota* (Legon & Henrici, 2005) to establish if the species had been previously recorded in the Republic of

Ireland.

None of the four species on the Wildlife and Countryside Act (1981) were recorded nor were any UK BAP fungi species seen. No fungi species on the current NI BAP list were found however *Inonotus hispidus* and *Grifola frondosa* were on a previous list. One of the priority species for Northern Ireland, *Geoglossum atropurpureum* was found in the survey area at Glenarm.

A very significant number of species new to Northern Ireland were found. These findings are based on the Northern Ireland Fungus Group Atlas which may not be kept fully up-to-date. It is however the best guide to the status of fungi in Northern Ireland. Many of the Basidiomycetes that are new for Northern Ireland are also new to the Republic of Ireland. It is not possible to compare the information for Ascomycetes as there are no data available.

Furthermore, four Provisional British Red List species (2006) were recorded, all of them at Glenarm. The British Red List is provisional and on the BMS database for consultation. It does not cover Northern Ireland. There are no lists available for Nationally Scarce species.

In 2001 Plantlife in partnership with the Association of British Fungus Groups and the British Mycological Society published *Important Fungus Areas: A provisional assessment of the best sites for fungi in the United Kingdom*. Sites were assessed by the presence of rare or threatened species, by richness and by the mycological importance of the habitat. The criteria are shown in Box 1.

**Box 1 Criteria for selecting Important Fungus Areas**

**Criterion A:** *The site holds significant populations of rare fungal species which are of European or UK conservation concern.*
A site should be considered if it includes at least five species from:

- The provisional UK Red Data List (Ing, 1992)
- UK Biodiversity Action Plan and/or Schedule 8
- European Red Data List (Group A and B) and/or species of European concern (based on Bern Convention proposals)

**Criterion B:** *The site has an exceptionally rich and well-recorded mycota in a UK context.*
A site should be considered if it includes at least 500 recorded species

**Criterion C:** *A site which is an outstanding example of a habitat type of known mycological importance.*

Although none of the survey sites were included in the provisional list in 2001, Glenarm stands out as a very high quality site for fungi in a UK context. This is based on Criterion A, as it has four UK Red list species on the revised British Red List plus one additional fungus which was on the Ing 1992 British Red List, 10 European Red List species, 14 species new to Northern Ireland and 30 Basidiomycete species new to the whole of Ireland. The number of European Red List species also indicates that Glenarm is an

important site in a European context. Castle Coole, which has 4 European Red List species, 7 Species new for Northern Ireland and 21 Basidiomycete species new to the Ireland, may be of significance in a European context and potentially regional context.

Criterion B is subject to the amount of recording that has been undertaken and is not applicable to the results in this report as insufficient survey has been undertaken on the sites.

The full lists are available as a separate Excel spreadsheet, while highlights from each site are detailed in Section 8.

### 5.4.1 Ecological groups of fungal species of conservation concern.

For this parkland habitat, three ecological groups i.e. Species of Conservation Concern (SoCC) were chosen as a focus for the surveys: (i) deadwood saprotrophs, (ii) thermophilous boletes and (iii) waxcap species (Ainsworth 2004).

#### 5.4.1.1 Deadwood saprotrophs

These species are saprotrophs living on the deadwood of broadleaved trees (standing, fallen, felled, or attached to living trees) and are the ones that generally fruit on larger diameter, bulky elements. The saprotrophs of interest are those found in the central deadwood cylinder of living trees, with or without distinct heartwood, where they cause primarily white or brown rot (also known as red rot, especially by entomologists). They fruit on larger diameter wood which is more abundant on and near older trees and in older woodlands with long continuity of uneven aged tree cover which has sustained veteran and ancient trees. A sustainable supply of large bulky deadwood in all its forms is necessary if the habitat is to maintain its continuity of saprotrophic diversity.

At all sites, there was a diversity of deadwood saprotrophic species present which create either white or brown rot habitat – see Table 5 - except for Drenagh where only white rot fungi were recorded. Fruit bodies of *Ganoderma australe*, which causes a white rot, were very evident in 5 out of the 6 sites. However Glenarm had the least amount of fruit bodies of this fungus.

There was less evidence of fungi known to create brown rot. At Drenagh none of the trees showed fungal fruit body evidence of brown rot fungi out of 101 trees. By comparison Glenarm had the most evidence of active brown rot decay and the highest number of trees with *Fistulina hepatica* (beefsteak).

Many oaks show hollowing of the buttress. This type of hollowing is likely to be due to *Inonotus dryadeus* even where there were no fruit bodies present on the trees. Many hawthorns have brown cubic rot present and this is thought to be due to the action of *Coniophora puteana* although this fungus was not recorded as present on them. Many ash trees were hollow however there was no visual presence of bracket fungi on trees that were part of the survey and it is not possible to specify what might have been the causal fungus species.

| Sites | | | Barons court | Caledon | Castle Coole | Castle Ward | Drenagh | Glenarm | Total Trees |
|---|---|---|---|---|---|---|---|---|---|
| **Fungi** | **Type of decay** | **Tree host** | **Number of trees with fungal fruit brackets** | | | | | | |
| *Fistulina hepatica* | Brown rot | Oak | 2 | 3 | 4 | 3 | 0 | 20 | |
| *Laetiporus sulphureus* | Brown rot | Oak, beech | 4 | 5 | 6 | 6 | 0 | 2 | |
| *Piptoporus betulinus* | Brown rot | Birch | 0 | 0 | 0 | 0 | 0 | c3 | |
| *Ganoderma australe* | White rot | Broadleaves | 26 | 39 | 29 | 35 | 13 | 4 | |
| *Grifola frondosa* | White rot | Oak | 2 | 0 | 1 | 1 | 0 | 0 | |
| *Inonotus dryadeus* | White rot | Oak | 4 | 6 | 19 | 7 | 1 | 8 | |
| *Inonotus hispidus* | White rot | Ash | 0 | 0 | 0 | 0 | 0 | 2 | |
| *Meripilus giganteus* | White rot | Beech | 6 | 3 | 1 | 2 | 1 | 0 | |
| *Perenniporia fraxinea* | White rot | Oak | 0 | 1 | 2 | 0 | 0 | 0 | |
| *Phellinus igniarius* | White rot | Willow | 0 | 0 | 0 | 0 | 0 | 2 | |
| *Polyporus squamosus* | White rot | Broadleaves | 3 | 5 | 3 | 0 | 0 | 1 | |
| **Total number of trees/ site with fungal brackets** | | | **47** | **62** | **64** | **54** | **15** | **39** | **282** |
| No. individual recorded trees | | | 200 | 215 | 249 | 198 | 101 | 483 | 1446 |
| % trees with brackets | | | 24 | 29 | 26 | 27 | 15 | 8 | 20% |

**Table 5** Numbers of trees with saprotrophic heartwood fungi and the different types of decay

Many saprotrophic species are possibly currently under recorded in Northern Ireland and the Republic of Ireland. For example, *Peniophora laeta*, which is associated with hornbeam and is new for the whole of Ireland, was found on the hornbeam surveyed at Baronscourt and Caledon. It is therefore possible that this species is more widespread than the records indicate where hornbeam occurs. This species has been recorded 41 times on the BMS database for Britain.

In all the parklands, most of the fruit bodies were found on live standing trees as most fallen dead wood was generally limited to small lengths of branchwood or the occasional fallen tree. In some parks fallen trees had been relocated into surrounding woodland areas. This has probably reduced the potential quality and diversity of resupinate and poroid saprotrophic fungi within the areas surveyed.

**Deadwood saprotroph species summaries:**

***Fistulina hepatica*, Beefsteak.**

- A large, bracket-like fungus. At maturity it has a soft, wine-red fruit body with a fleshy texture and when cut resembles a piece of beefsteak and hence its common name. The annual fruit body was found between August and October.
- This fungus is one of the main species (see *Laetiporus sulphureus*) causing heartwood decay of oak trees making them hollow. This species seems to need a long period of decay before fruit bodies are produced and is therefore usually found on larger girthed trees. It can be found anywhere on the stem of the tree.
- It was found at all sites apart from Drenagh and most frequently at Glenarm.

***Ganoderma australe*, Southern Bracket** (Synonyms: *Fomes australis, Ganoderma adspersa, Ganoderma europaeum, Polyporus australis*)

- A large, perennial, very hard and woody bracket fungus. It has a dark brown/black upper surface with a white margin when growing. May easily be confused with another perennial, woody bracket - *Ganoderma applanatum*, which was not recorded during this survey.
- This fungus causes a white rot on a wide range of deciduous and conifer species although only recorded on deciduous trees in this survey. It can be found anywhere on the stem of the tree.
- It was the most frequently recorded bracket fungus by far on all sites except Glenarm.

***Grifola frondosa*, Hen of the Woods.**

- Tongue-like, brownish fruit bodies arising in clumps from a common repeatedly branching stem, creating the appearance of an irregular rosette. The annual fruit body was found between September and October.
- This fungus causes a white rot on broadleaved trees but was only found on oak in this survey. It is found at the base of trees. It is on the Provisional European Red List (Category C - Scattered Populations, some extinctions).
- Found in five sites on one or two trees – the exception was Glenarm. It was recorded at Drenagh on a tree which was not one of the trees surveyed.

***Inonotus dryadeus*, Oak bracket**

- Large, corky bracket, ageing through grey, brown and black and when young has red droplets on the surface. Usually found at the base of the stem. The annual fruit body is persistent and may remain on the tree for at least one year. Fresh fruit bodies were seen in late summer.
- This fungus causes a white rot in the heartwood of butts and roots usually on oak species.
- Found on all sites but most frequent by far at Castle Coole where it was fruiting on 19 different oak trees.

***Inonotus hispidus*, Shaggy Bracket**

- A large, velvety reddish brown bracket ageing to black found on the stem of the tree. The annual fruit body is persistent and may remain on the tree for sometime. During this survey only old fruit bodies were found.
- This fungus causes a white rot in the stem and was only found on ash in this survey and only at one site on two trees.
- This fungus has only previously been recorded pre 1980 from one site near Antrim. It is recorded from the Republic of Ireland. It is on the Provisional European Red List (Category A or B-Extinct or Endangered).

***Laetiporus sulphureus*, Chicken of the Woods**

- Large, fleshy cream, orange or egg-yellow, fan-shaped brackets often in tiered clusters. The annual fruit body appears on trunks or stumps and was seen from July through to August.
- This fungus is one of the main species (see *Fistulina hepatica*)

causing heartwood decay of oak trees making them hollow.
- It was found on all sites except Drenagh, mainly on oak but also on beech at Caledon.

***Meripilus giganteus*, Giant Polypore**
- Massive, compound rosette of soft brown fan shaped caps arising from a common base. The annual fruit body appears at the base of stems and on root systems and was seen in September and October.
- This fungus causes a white rot in the extreme base of broadleaved trees but was only found on beech in this survey.
- It was found on all sites except Glenarm.

***Perenniporia fraxinea***
- A large, corky, dirty grey/brown bracket often becoming greenish with algae with a cream and yellow coloured growing margin. It may be confused with Ganoderma species but it can be separated by its white spore deposit. The perennial fruit body appears at the base of stems.
- This fungus causes a white rot in at the base of the stem on a wide range of species but was found only on oak in this survey at two sites: Caledon (1 tree) and Castle Coole (two trees).
- According to the Northern Ireland database it has not been recorded previously from Northern Ireland. Nor has it been recorded from the Republic of Ireland. There are 143 records on the British Mycological Society database and therefore the lack of records may be due to under recording.

***Phellinus igniarius*, Willow Bracket**
- Large, hoof-shaped, grey to black, very hard, woody bracket. The perennial bracket appears on the trunks of broadleaved trees but mainly willows.
- It causes a white rot of the stem of trees. It was found on only two willow trees at Glenarm.
- The Northern Ireland database map shows two locations where *Phellinus igniarius* has previously been found however they are labelled as 'unknown'. No further information is available. It has not been recorded from the Republic of Ireland. There are over 500 records on the British Mycological Society database and these are widespread across Britain and therefore the lack of records in Northern Ireland may be due to under recording.

***Piptoporus betulinus*, Razorstrop fungus**
- A bracket like fungus usually with a stipe and a smooth upper creamy white upper surface when young turning ochre brown to grey brown with age.
- The annual bracket appears on the trunks of birch trees. It causes a brown rot. It was recorded on at least three birch trees at Glenarm only.

***Polyporus squamosus*, Dryad's saddle**
- Large, leathery, creamy-brown, scaly-capped fruit body with a stipe. The annual fruit body appears on various broadleaved trees seen during August to October.

- It causes a white rot frequently seen where branches have been removed or broken off.
- Found on all sites except Castle Ward and Drenagh on a wide range of broadleaved trees.

5.4.1.2 Thermophilus bolete fungi

These species have mycorrhizal associations with living broadleaved tree roots, often of oak and beech but also sweet chestnut. They are generally considered warmth-loving since peak fruiting follows hot weather in late summer. In parkland, although these boletes may be with trees that are in their first few centuries of life, perhaps even with planted trees, the presence of much older trees suggests a source of late-stage mycelial inoculum that should be preserved as long as possible.

| Thermophilus boletes | | Baronscourt | Caledon | Castle Coole | Castle Ward | Drenagh | Glenarm |
|---|---|---|---|---|---|---|---|
| *Boletus radicans* | Rooting bolete | | 1 | | | | |
| *Boletus reticulates* | | 1 | | | | | |
| *Gyroporus castaneus* | Chestnut bolete | | | | 1 | | |
| *Leccinum pseudoscabrum* | Hazel bolete | | | | | | 1 |
| | **Total** | **1** | **1** | **0** | **1** | **0** | **1** |

| Other ectomycorrhizal boletes | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Boletus edulis* | Cep | 1 | | | 1 | | 1 |
| *Boletus luridiformis* | Scarletina bolete | 1 | 1 | 1 | | 1 | |
| *Boletus luridus* | Lurid bolete | | | 1 | | 1 | 1 |
| *Leccinum scabrum* | Brown Birch bolete | | | | | 1 | 1 |
| *Leccinum varicolor* | Mottled bolete | | | | | | 1 |
| *Suillus grevilei* | Larch bolete | | 1 | 1 | | | |
| *Xerocomus cisalpinus* | | | 1 | | | | |
| *Xerocomus declivitatum* | | 1 | 1 | 1 | 1 | 1 | |
| *Xerocomus porosporus* | Sepia bolete | 1 | 1 | 1 | 1 | | |
| *Xerocomus pruinatus* | Matt bolete | | 1 | | | | |
| *Xerocomus rubellus* | Ruby bolete | | 1 | | | 1 | |
| *Xerocomus subtomentosus* | Suede bolete | 1 | 1 | 1 | 1 | 1 | 1 |
| | **Total** | **5** | **8** | **6** | **4** | **6** | **5** |

Thermophilus boletes were generally very poorly represented with only 4 species recorded. Each of these species was recorded from a different site and in each case fruit bodies were generally scarce. One of these species is new to the whole of Ireland: *Leccinum pseudoscabrum*. However, according to the NI Database, thermophilous and ectomycorrhizal boletes *(Boletus, Suillus, Xerocomus* and *Leccinum species*) are not generally common anywhere in Northern Ireland.

**Table 6** Numbers of thermophilous and other ectomycorrhizal bolete species and their associated hosts at the each site

**Thermophilous boletes - species summaries**

***Boletus radicans*** ( **synonym *Boletus albidus***), **Rooting bolete**

- A medium to large grey/white capped bolete with bright lemon pores and bulbous stipe. Solitary or in small groups usually on calcareous soils. A single fruit body was found only at Caledon under beech.
- 5 previous records from Northern Ireland but not on the Republic of Ireland database.

***Boletus reticulatus*** (**synonym *Boletus aestivalis***), **Summer bolete**

- A large dull brown capped bolete with white pores and a stout stipe with a coarse net covering the whole stipe. Solitary or in small groups under broadleaves. Only one fruit body was found at one site, Baronscourt, under oak.

***Gyroporus castaneus,*** **Chestnut bolete**

- A bolete of variable size with tawny brown cap and stuffed stipe due to the chambers inside it. Solitary or in small groups usually with oak. A cluster of fruit bodies were found under hazel at Castle Ward.
- The Northern Ireland database has only one entry for this fungus labelled as 'unknown'. The BMS database shows it as a pre-1960 record.

***Leccinum pseudoscabrum*** (**Synonym *Boletus carpini***), **Hazel bolete**

- A medium sized bolete with a mid brown wrinkled cap, which frequently shows cracking and scaly stipe. Solitary or scattered and found with hazel and hornbeam. A cluster of fruitbodies were found with hazel at Glenarm.

In addition 12 different species of ectomycorrhizal boletes were recorded. Fruit bodies were generally scarce; however, at Caledon, more species were recorded than at other sites and fruit bodies of all species were more frequently seen there. Moreover *Xerocomus cisalpinus* which is new for the whole of Ireland was only recorded from Caledon. *Xerocomus rubellus* is also new to Northern Ireland but has been recorded from RoI and was only recorded at Caledon and Drenagh. One other new species for Ireland is *Xerocomus pruinatus.*

5.4.1.3 Waxcap fungi

These species are associated with short turf of unimproved grassland which may be floristically species-poor and are becoming popularly known as waxcap grasslands. Their mode of nutrition is currently assumed to be saprotrophic. Sites with 17 or more Hygrocybe genera are regarded as of national importance. Castle Coole and Glenarm were the sites with the most waxcap species with 7 species recorded at both sites. However analysis of Scottish waxcap grassland survey data (Ainsworth, 2004b) indicates that more than 16 visits spread over several years could be required for adequate characterisation of site diversity.

| Waxcaps | | Baronscourt | Caledon | Castle Coole | Castle Ward | Drenagh | Glenarm |
|---|---|---|---|---|---|---|---|
| *Cuphophyllus virgineus* | Snowy waxcap | | 1 | 1 | | | 1 |
| *Hygrocybe ceracea* | Butter waxcap | | 1 | | 1 | 1 | |
| *Hygrocybe chlorophana* | Golden waxcap | 1 | | | | | |
| *Hygrocybe coccinea* | Scarlet waxcap | | | | 1 | | |
| *Hygrocybe conica* | Blackening waxcap | | | 1 | | | 1 |
| *Hygrocybe fornicata* | Earthy waxcap | | | 1 | | | |
| *Hygrocybe irrigata* | Slimy waxcap | | | | | | 1 |
| *Hygrocybe pratensis* | Meadow waxcap | 1 | | 1 | | | 1 |
| *Hygrocybe psittacina* | Parrot waxcap | 1 | 1 | 1 | 1 | | 1 |
| *Hygrocybe punicea* | Crimson waxcap | | | 1 | | | 1 |
| *Hygrocybe russocoriaceus* | Cedarwood waxcap | | | 1 | | | 1 |
| | **Total species** | **3** | **3** | **7** | **3** | **1** | **7** |

**Table 7** Numbers of waxcap species at the different sites

Across all the sites, 11 different species of waxcap fungi were recorded. Fruit bodies were generally scarce at all sites. At Castle Coole they were recorded on the roadside verges leading to the main house where the grass is kept short through regular cutting. At Glenarm they were mainly found in two small areas, one immediately to the west of Middle Bridge and the other further towards the main house on the east side of the road.

Generally the parklands were poor for grassland species in diversity and frequency of fruit bodies. Where trees were concentrated it tended to be slightly better.

5.4.2 Species new for Northern Ireland

There are 28 species new for Northern Ireland and of these 16 basidiomycetes are also new for the whole of Ireland (Table 8). 14, i.e. 50% of these were found at Glenarm.

| Species new for Northern Ireland | | New RoI | Baronscourt | Caledon | Castle Coole | Castle Ward | Drenagh | Glenarm |
|---|---|---|---|---|---|---|---|---|
| *Amanita friabilis* | Fragile amanita | yes | | | | | | 1 |
| *Bolbitius reticulatus* | Netted Fieldcap | yes | | | 1 | | | |
| *Ceriporia purpurea* | | yes | | | | 1 | | |
| *Ceriporia viridans* | | | | 1 | | | | |
| *Ceriporia reticulata* | | | 1 | | 1 | | | |
| *Chromocyphella muscicola* | | | | | | | | 1 |
| *Cristinia helvetica* | | yes | 1 | | | | | |
| *Cyphella ferruginea* | | yes | | | 1 | | | 1 |
| *Gloeophyllum sepiarium* | | yes | | | | | 1 | |
| *Helvella ephippium* | | ? | | | | | 1 | |
| *Inocybe erubescens* | | | | | | | | 1 |
| *Inomidotis fulvotingens* | | | | | | | | 1 |
| *Lactarius azonites* | | | | | | | | 1 |
| *Mycena corynephora* | | yes | | | | | | 1 |
| *Mycoacia fuscoatra* | | | | 1 | 1 | | | |
| *Nodulisporium cecidiogenes* | | ? | | | | 1 | | 1 |
| *Peniophora laeta* | | yes | 1 | 1 | | | | |
| *Perenniopora fraxinea* | | yes | | 1 | 1 | | | |
| *Phanerochaete laevis* | | yes | | 1 | 1 | | | |
| *Phlebiopsis ravenelii* | | yes | | | 1 | | | 1 |
| *Pholiota tuberculosa* | | yes | | | | | | 1 |
| *Pluteus phlebophorus* | Wrinkled Shield | | | 1 | | | | |
| *Tremella steidleri* | Brown Brain | yes | | | | | | 1 |
| *Tricohloma sejunctum* | Deceiving Knight | yes | | | | | 1 | 1 |
| *Tulasnella violea* | | yes | | | | | | 1 |
| *Vuilleminia corylii* | | | | 1 | | | | 1 |
| *Xerocomus cisalpinus* | | yes | | | | | | |
| *Xerocomus rubellus* | Ruby bolete | | | 1 | | | 1 | |
| **Total number of species /site** | | | **3** | **8** | **7** | **2** | **4** | 14 |

**Table 8** Species new for Northern Ireland from the six different parkland sites.

Species summaries:

***Amanita friabilis*, Fragile amanite**

- A small fragile amanite that is mycorrhizal with all species of Alnus. A single fruit body was found in the Middle Bridge area at Glenarm. It is new for the whole of Ireland. It is also on the BMS database provisional Red List (endangered).

***Amanita lividopallescens***

- A large amanite that is mycorrhizal with broadleaves but was recorded at Glenarm with oak. There is one previous record on the Northern Ireland database and it is on the BMS database provisional Red List (vulnerable).

***Ionomidotus fulvotingens***

- A small, olive black to red brown, goblet to cup shaped ascomycete emerging in little groups from fissures in the bark of small branches of various broadleaved trees and recorded at Glenarm on hazel. This is a spring species and was found in April. It is new for the whole of Ireland. Although included in the Provisional British Red List (Ing 1992), it has been removed from the revised preliminary British Red List (2006) because the records for this species are so recent it is impossible to establish its status.

***Russula aurea,* Gilded Brittlegill (Synonym *Russula aurata*)**

- A distinctive red capped and yellow gilled and stiped mushroom. It is mycorrhizal and associated with a range of different trees found at Glenarm under hazel. There is only one pre 1980 record for Northern Ireland and it does not feature in the RoI. It is on the BMS provisional Red List (vulnerable)

***Tremella steidleri,* Brown Brain**

- A brown brain-like jelly fungus that is parasitic on Stereum species and was found at Glenarm on oak (tree number 9) in association with *Stereum hirsutum*. This is new for the whole of Ireland and is on the BMS provisional Red List (rare).

# 6 LICHEN SURVEY

## 6.1 Methods

Sites were surveyed during two visits to Northern Ireland, the first being in July 2006 and the second in October and November of 2006. Two days were allocated to each site but the total twelve days was reallocated slightly since the majority of the habitat at Drenagh was covered in a single day.

Trees were identified on the basis of the annotated maps supplied by Mosaic Mapping as part of this project. Lichen records were associated with individual tree numbers. At the beginning of each site survey, lists for each tree were as comprehensive as possible. At each site, after several oak trees had been recorded, a list of typical species would be drawn up and subsequent tree records might only include records of species extra to the typical species list. Trees that only included species on the typical species list were recorded as NSI (No Special Interest).

Standard methods were used to record lichen taxa from trees. All accessible microhabitats were searched and scanned with a hand lens (for example: exposed roots, dry shaded bark, exposed lignum, sap runs). High parts of the trees - i.e. such parts requiring specialised climbing techniques for access- were not examined. The majority of material encountered was identifiable in the field by simple observation with a hand lens. In shaded habitats, and in the earlier and later parts of the day in the autumn visit, the Lichen Candelaris illuminating hand lens (hand built by Erich Zimmermann, Switzerland) was invaluable. Confirmation of some identifications was aided by the use of chemical spot tests in the field with aqueous solutions of potassium hydroxide (K) and calcium hypochlorite (C).

Material which could not be identified in the field was collected, packaged and labelled for laboratory study. In the case of fertile material, this usually involved microscopical examination of the ascomata.

**6.2 Results**

6.2.1 General

A total of 505 trees were examined over all of the six sites – see separate spreadsheet. Combined records from these trees yields 159 lichen species (plus two additional varieties) and six lichenicolous fungi (see Table 9). Species names of lichens are largely as in Coppins (2002).

Four of these species - *Buellia schaereri*, *Caloplaca phlogina*, *Micarea micrococca* and *Xanthoria ucrainica* – are potentially previously unrecorded in Northern Ireland: there are no records of these species in the database of the British Lichen Society (BLS) mapping scheme up to late 2006. However, none is likely to be actually rare in Northern Ireland; the first is probably generally overlooked for *Amandinea punctata*, the latter three are recent splits from *Caloplaca citrina*, *Micarea prasina* and *Xanthoria candelaria* respectively. However, at the present time there is an unusually high level of lichen recording activity taking place in Ireland on account of the LichenIreland project being run from the Ulster Museum. Thus it is unlikely that these species will be represented by unique records for very long.

The assembled records include 29 new vice-county records. The reference for vice-county records is the database of distributions of Irish lichens held by Prof. Mark Seaward at the University of Bradford. The database has been regularly updated from the most recent published account of vice-county distributions of Irish lichens (Seaward, 1994).

There is no Red Data Book for either the whole of Ireland or the Republic of Ireland and the most recent Red Data Book (Woods and Coppins, 2003) applicable to the rest of the UK, does not cover Northern Ireland. Also, there seem to be no accepted definitions of Nationally Scarce or Nationally Rare species for Ireland or Northern Ireland. In the absence of such measures, a definition of convenience has been constructed whereby those species previously having modern (post-1960) records in five hectads or fewer in Northern Ireland can be considered to be scarce or under-recorded. This has been assessed by visual inspection of the distribution maps for all of Ireland so in some cases it is not clear whether records from particular hectads relate to Northern Ireland or the Republic. In all such cases the assumption has been made that the species may have been recorded in Northern Ireland; the implication for the set of 'nominally scarce' species is that errors of commission have been eliminated at the expense of possible errors of omission. Thirty six of the species recorded in this study may be considered scarce or under-recorded in Northern Ireland based on the above condition.

### 6.2.2 Indices of Ecological Continuity (IEC)

Many lichens are very effective colonisers of new habitats but it was noticed by Francis Rose that a few lichen species of old woodlands and parkland appear to have very restricted powers of dispersal and are very slow to colonize new secondary woodland or recolonise woodland that has undergone major disturbance. Rose developed the idea of indices of ecological continuity as a means to estimate the historical continuity of 'old-growth' woodland habitat, based on the present flora of a site. Rose's concept of old-growth habitat was rather closer to old wood pasture habitat than stereotypical 'ancient woodland' with a high forest or ex-coppice structure. The original concept has led to a number of regional variants. The application of the IEC is detailed in Coppins and Coppins (2002). Two variants are considered applicable for use in Northern Ireland: the New Index or Ecological Continuity (NIEC) and The Revised Index of Ecological Continuity (RIEC). NIEC species are divide into 'main list' and 'bonus' species, with the total score expressed as T = (M + B) where M is the index calculated from the main list and B is the number of bonus species. The RIEC uses a single list, but each species contributes a score of five to the index (the idea being that the total would resemble a percentage score).

Although the NIEC and RIEC are considered the appropriate indices for Northern Ireland, this is really by default in the absence of any well-tailored indices. For example the RIEC utilises some species that appear to be poor indicators of ecological continuity (e.g. *Enterographa crassa*) as well as some species which have no records from Northern Ireland (e.g. *Rinodina isidioides*). Species used in the RIEC and NIEC are indicated in Table 9. Twenty one such species were found in the survey as a whole.

| Species | RIEC | NIEC | BC | CA | CC | CW | DR | GA | **All sites** |
|---|---|---|---|---|---|---|---|---|---|
| *Acrocordia gemmata* | | | **4** | **1** | 1 | | 2 | | **8** |
| *Agonimia tristicula* | | | **1** | **1** | 11 | 2 | | | **15** |
| *Amandinea punctata* | | | 1 | 5 | 1 | | 1 | | **8** |
| *Anisomeridium biforme* | | | 3 | 6 | 11 | 1 | 2 | 1 | **24** |
| *Anisomeridium polypori* | | | 2 | | 1 | | | 1 | **4** |
| *Anisomeridium ranunculosporum* | R | M | | | | | | 4 | **4** |
| *Anisomeridium viridescens* | | | | | 1 | | | | **1** |
| *Arthonia anombrophila* | | B | **1** | **1** | | | | 1 | **3** |
| *Arthonia cinnabarina* | | | 1 | 2 | 3 | | | 3 | **9** |
| *Arthonia didyma* | | | | | | | | 1 | **1** |
| *Arthonia muscigena* * | | | **1** | | | | | | **1** |
| *Arthonia pruinata* | | | | 2 | 8 | 14 | 12 | | **36** |
| *Arthonia radiate* | | | 6 | 6 | 1 | | 2 | 1 | **16** |
| *Arthonia spadicea* | | | | | | | | 1 | **1** |
| *Arthonia vinosa* | R | M | 1 | | 2 | | | 7 | **10** |
| *Arthopyrenia analepta* | | | | **1** | | | | | **1** |
| *Arthopyrenia carneobrunneola* * | | | | | 1 | | | | **1** |
| *Arthopyrenia cinereopruinosa* | | | | | 1 | | | | **1** |
| *Arthopyrenia punctiformis* | | | | 2 | | 1 | | | **3** |
| *Bacidia biatorina* | | M | | | | | | 2 | **2** |
| *Bacidia laurocerasi* | | | | 1 | | | | | **1** |
| *Bacidia phacodes* | | | | | 4 | | 1 | | **5** |
| *Bacidia rubella* | | | 3 | 1 | 17 | 1 | **1** | | **23** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Bacidia viridifarinosa* | | | 1 | | | | | | **1** |
| *Biatora epixanthoides* * | | M | | | | | | 1 | **1** |
| *Bilimbia sabuletorum* | | | | | 1 | | | | **1** |
| *Buellia griseovirens* | | | 1 | | | | | | **1** |
| *Buellia schaereri* * | | | | **1** | | | | | **1** |
| *Calicium viride* | | | **3** | **4** | 4 | | **4** | | **15** |
| *Caloplaca cerina var. cerina* | | | 1 | | | | | | **1** |
| *Caloplaca phlogina* * | | | | | **1** | | | | **1** |
| *Caloplaca ulcerosa* * | | | | | 1 | | | | **1** |
| *Candelaria concolor* | | | | | | **1** | | | **1** |
| *Candelariella vitellina f. vitellina* | | | | 3 | | | | | **3** |
| *Candelariella xanthostigma* * | | | **3** | **1** | 9 | 1 | | | **14** |
| *Chaenotheca chrysocephala* * | | M* | | | | | | 1 | **1** |
| *Chaenotheca hispidula* | | M* | | | 4 | | | 1 | **5** |
| *Chaenotheca trichialis* * | | M* | **2** | **3** | | | | 1 | **6** |
| *Chrysothrix candelaris* | | | *22* | *22* | *25* | *14* | *12* | *9* | **104** |
| *Chrysothrix flavovirens* | | | | | | | | 1 | **1** |
| *Cladonia coniocraea* | | | 1 | | 1 | | | | **2** |
| *Cladonia fimbriata* | | | | | 1 | | | | **1** |
| *Cladonia polydactyla var. polydactyla* | | | 3 | | | | | 5 | **8** |
| *Cladonia pyxidata* | | | 2 | | 4 | 1 | | 2 | **9** |
| *Cladonia squamosa var. squamosa* | | | 1 | | | | | 2 | **3** |
| *Cladonia squamosa var. subsquamosa* | | | 1 | | | | | 1 | **2** |
| *Cliostomum griffithii* | | | 2 | 3 | 1 | 1 | 1 | | **8** |
| *Cyrtidula quercus* * | | | | | | | | 1 | **1** |
| *Dimerella lutea* | R | M | 4 | | 3 | | | 1 | **8** |
| *Dimerella pineti* | | | | | | | | 3 | **3** |
| *Diploicia canescens* | | | *3* | *30* | *8* | *32* | *12* | | **85** |
| *Enterographa crassa* | R | | *10* | *16* | *16* | *11* | *8* | *1* | **62** |
| *Eopyrenula grandicula* | | | | | 1 | | | | **1** |
| *Evernia prunastri* | | | *4* | *6* | *7* | *3* | *1* | *3* | **24** |
| *Flavoparmelia caperata* | | | 14 | 6 | 13 | 7 | 4 | 4 | **48** |
| *Flavoparmelia soredians* * | | | | | | **1** | | | **1** |
| *Fuscidea lightfootii* | | | 1 | | | | | | **1** |
| *Graphina anguina* | | | | 1 | 1 | | 1 | 1 | **4** |
| *Graphis elegans* | | | 1 | | 1 | 1 | | 1 | **4** |
| *Graphis scripta* | | | 5 | 2 | 2 | 2 | | 2 | **13** |
| *Gyalecta truncigena* | | | | | 3 | 1 | | | **4** |
| *Heterodermia japonica* * | | M | **1** | | | | | | **1** |
| *Hyperphyscia adglutinata* | | | | 15 | | 8 | | | **23** |
| *Hypogymnia physodes* | | | 2 | | 3 | | | 2 | **7** |
| *Hypogymnia tubulosa* | | | 2 | 1 | 2 | | | 1 | **6** |
| *Hypotrachyna revoluta* | | | 2 | | 4 | | | | **6** |
| *Hypotrachyna sinuosa* | | B | 1 | | | | | | **1** |
| *Japewiella tavaresiana* | | | | | 1 | | | | **1** |
| *Lauderlindsaya acroglypta* * | | | | | | | | **1** | **1** |
| *Lecanactis abietina* | | | *9* | | | | | *18* | **27** |
| *Lecanactis subabietina* * | | M | | | | 1 | | | **1** |
| *Lecania cyrtella* | | | | **1** | 1 | | | | **2** |
| *Lecanora argentata* * | | | | | | | | 1 | **1** |
| *Lecanora carpinea* | | | | 1 | | 1 | | 1 | **3** |
| *Lecanora chlarotera* | | | *22* | *11* | *11* | *9* | *9* | *4* | **66** |
| *Lecanora expallens* | | | *3* | *7* | *2* | *6* | *2* | *3* | **23** |
| *Lecanora horiza* * | | | | | 2 | | | | **2** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Lecanora jamesii* | | M | | | | | | 1 | **1** |
| *Lecanora persimilis* * | | | | | | 1 | | | **1** |
| *Lecidea doliiformis* * | | | | | | | | 2 | **2** |
| *Lecidella elaeochroma f. elaeochroma* | | | *8* | *15* | *8* | *6* | *9* | *2* | **48** |
| *Lepraria incana s. str.* | | | *24* | *14* | *16* | *12* | *13* | *8* | **87** |
| *Lepraria lobificans* | | | *5* | *1* | *7* | | | *14* | **27** |
| *Lepraria rigidula* * | | | | | | | | **2** | **2** |
| *Leptogium gelatinosum* | | | | | 1 | | | | **1** |
| *Leptogium lichenoides* | | M | | | 3 | | | | **3** |
| *Leptogium teretiusculum* | | M | **1** | | 1 | 1 | | | **3** |
| *Melanelia exasperatula* | | | **1** | | 1 | | | | **2** |
| *Melanelia fuliginosa subsp. Glabratula* | | | *2* | *1* | | | *1* | *3* | **7** |
| *Melanelia subaurifera* | | | *5* | *5* | *5* | *1* | *2* | | **18** |
| *Melaspilea ochrothalamia* * | | | | | | | | **1** | **1** |
| *Micarea coppinsii* * | | | **1** | | | | | 1 | **2** |
| *Micarea micrococca* * | | | | | 1 | | | 2 | **3** |
| *Micarea prasina s. lat.* | | | | | | | | 1 | **1** |
| *Milospium graphideorum* * | | | | **1** | | | | | **1** |
| *Mycoblastus caesius* | | | | | | | | 1 | **1** |
| *Mycoblastus fucatus* | | | 1 | | | | | | **1** |
| *Mycomicrothelia confusa* * | | | | | | | | | |
| *Normandina pulchella* | | | 20 | 3 | 17 | 2 | | 11 | **53** |
| *Ochrolechia androgyna* | | | 1 | | | | | 4 | **5** |
| *Ochrolechia subviridis* | | | | | 2 | | | | **2** |
| *Opegrapha atra* | | | *13* | *17* | *11* | *9* | *11* | *3* | **64** |
| *Opegrapha corticola* * | | M | | | | **1** | | | **1** |
| *Opegrapha herbarum* | | | 3 | 4 | 6 | | 1 | 5 | **19** |
| *Opegrapha multipuncta* | | | 1 | | | | | 2 | **3** |
| *Opegrapha niveoatra* | | | **1** | | | | | | **1** |
| *Opegrapha ochrocheila* | | | | | | | | 3 | **3** |
| *Opegrapha sorediifera* | | | | | | | | 1 | **1** |
| *Opegrapha varia* | | | 2 | | 5 | | 1 | | **8** |
| *Opegrapha vermicellifera* | | | 3 | 1 | | | | 4 | **8** |
| *Opegrapha vulgate* | | | 1 | 2 | 2 | 2 | | | **7** |
| *Opegrapha xerica* * | | | | | **1** | **3** | | | **4** |
| *Parmelia saxatilis* | | | 4 | 2 | 5 | | 2 | 3 | **16** |
| *Parmelia sulcata* | | | 2 | 3 | 5 | 1 | 4 | 1 | **16** |
| *Parmotrema crinitum* | R | M | 5 | | 4 | | | 4 | **13** |
| *Parmotrema perlatum* | | | 4 | 5 | 8 | 2 | 2 | 3 | **24** |
| *Parmotrema reticulatum* | | | | | 1 | 3 | | | **4** |
| *Peltigera hymenina* | | | | | 1 | | | | **1** |
| *Peltigera membranacea* | | | | | 1 | | | | **1** |
| *Peltigera praetextata* | | | | | 2 | | | | **2** |
| *Pertusaria albescens var. albescens* | | | | | 2 | 2 | | 2 | **6** |
| *Pertusaria albescens var. corallina* | | | *12* | *1* | *2* | | | *7* | **22** |
| *Pertusaria amara f. amara* | | | 2 | 3 | 1 | | 3 | | **9** |
| *Pertusaria coccodes* | | | **3** | **2** | 1 | | | | **6** |
| *Pertusaria hemisphaerica* | | | **2** | | | | 3 | 2 | **7** |
| *Pertusaria hymenea* | | | 3 | | 5 | | 2 | 3 | **13** |
| *Pertusaria leioplaca* | | | | | | 1 | | 3 | **4** |
| *Pertusaria pertusa* | | | *22* | *8* | *18* | *12* | *5* | *6* | **71** |
| *Phaeographis smithii* | | | 3 | | 2 | | | 1 | **6** |
| *Phlyctis argena* | | | 6 | 2 | 8 | 3 | | 2 | **21** |
| *Pzhyscia adscendens* | | | | 2 | | | | | **2** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Physcia aipolia* | | | | | 2 | | | | **2** |
| *Physcia tenella subsp. tenella* | | | 10 | 3 | 5 | 4 | 1 | | **23** |
| *Physcia tribacia* * | | | | | | **1** | | | **1** |
| *Physconia distorta* | | | 2 | | 1 | 2 | | | **5** |
| *Physconia enteroxantha* | | | **1** | **1** | 3 | | | | **5** |
| *Physconia grisea* | | | | | 1 | | | | **1** |
| *Physconia perisidiosa* * | | | | | 1 | | | | **1** |
| *Placynthiella icmalea* | | | | | | | | 1 | **1** |
| *Platismatia glauca* | | | 1 | | | | | 1 | **2** |
| *Porina aenea* | | | | 1 | 1 | | | | **2** |
| *Pseudevernia furfuracea var. furfuracea* | | | 1 | | 4 | | | | **5** |
| *Punctelia subrudecta s. str.* | | | 3 | 6 | 3 | 2 | | 2 | **16** |
| *Pyrenula chlorospila* | R* | | | **1** | 3 | 3 | 1 | | **8** |
| *Pyrenula macrospora* | R* | | | **1** | 3 | | | 2 | **6** |
| *Pyrrhospora quernea* | | | *18* | *20* | *19* | *13* | *5* | *15* | **90** |
| *Ramalina canariensis* | | | *2* | *6* | *4* | *1* | | | **13** |
| *Ramalina farinacea* | | | *5* | *9* | *8* | *4* | *4* | | **30** |
| *Ramalina fastigiata* | | | 4 | 2 | 3 | 2 | 1 | | **12** |
| *Ramalina fraxinea* | | | 2 | | 1 | | | | **3** |
| *Schismatomma cretaceum* | | | **8** | **20** | 20 | 8 | | **2** | **58** |
| *Schismatomma decolorans* | | | *16* | *37* | *19* | *25* | *1* | *3* | **101** |
| *Strigula taylorii* * | | | **1** | | | | | | **1** |
| *Thelenella muscorum var. muscorum* * | | | **1** | | 4 | | | | **5** |
| *Thelotrema lepadinum* | R | M | 15 | | 3 | | | 23 | **41** |
| *Trapeliopsis pseudogranulosa* | | | | | | | | 1 | **1** |
| *Usnea cornuta* | | | 1 | | | | | | **1** |
| *Usnea subfloridana* | | | | | 1 | | | 1 | **2** |
| *Xanthoria parietina* | | | 9 | 12 | 3 | 3 | 1 | | **28** |
| *Xanthoria polycarpa* | | | 2 | | | | | | **2** |
| *Xanthoria ucrainica* * | | | | **2** | | | | | **2** |
| *Lichenicolous fungi* | | | | | | | | | **0** |
| *Abrothallus microspermus* * | | | 2 | | | | | | **2** |
| *Cyphelium sessile* * | | | **1** | **1** | 1 | | | | **3** |
| *Laeviomyces opegraphae* * | | | | | 2 | | | | **2** |
| *Phoma cytospora* * | | | 1 | | | | | | **1** |
| *Sphinctrina turbinata* * | | | | | 3 | | | | **3** |
| *Vouauxiella lichenicola* * | | | 1 | 1 | | 1 | | | **3** |
| Total lichen taxa | | | 89 | 65 | 97 | 52 | 38 | 80 | **161** |
| Total lichenicoulus fungus taxa | | | 4 | 2 | 3 | 1 | 0 | 0 | **6** |
| NIEC - main index | | | 7 | 1 | 7 | 3 | 0 | 9 | |
| NIEC - bonus | | | 2 | 1 | 0 | 0 | 0 | 1 | |
| RIEC | | | 25 | 10 | 30 | 10 | 10 | 35 | |
| ≤5 hectads in NI | | | 11 | 7 | 11 | 8 | 0 | 12 | **36** |

Notes to Table 9:
Abbreviations: BC = Baronscourt, CA = Caledon, CC = Castle Coole, CW = Castle Ward, DR = Drenagh, GA = Glenarm.
Figures in site columns indicate the number of records from each site.
Figures in bold indicate that the species is potentially a new v-c record.
Figures in italics indicate potential underestimation because the species is an element of the typical flora of a site.
Asterisks after species names indicate species previously recorded from <5 hectads in NI.

**Table 9** Lichen and lichenicolous fungi species from survey sites in Northern Ireland, recorded in 2006.

Asterisks after IEC entries indicate that the species presence will not necessarily contribute to the index score if certain complementary species are also included.

### 6.3 Comparative assessment of the sites

All things considered, the lichenological interest of the sites appears to be fairly indicated by the IEC scores. The sites seem to naturally divide into three relatively 'good' sites and three relatively 'poor'. Glenarm is undoubtedly the best quality site, followed more or less equally by Baronscourt and Castle Coole. Finding interesting records is considerably more of a struggle in the three poorer sites, with Castle Ward being the best and Drenagh the poorest. There is probably a loose correlation of quality with size of site. It is also notable that the two poorest sites are almost purely ornamental parklands whilst the best has a large component of semi-natural wood pasture habitat. Many of the trees at Castle Coole that clearly result from ornamental plantings are actually quite species rich. This may be a result of a more favourable climate at Castle Coole, but it also seems reasonable to suspect that these trees have gained species from earlier wood pasture trees on the edges of the estate. The communities present at Caledon and Drenagh suggest that the bark conditions on these trees are becoming suitable for colonisation by a wide range of species, but accumulation of a rich flora may take a very long time if the species must immigrate from afar. Thus it appears that the lichenological interest associated with nineteenth century designed landscapes is directly related to the degree of association with a pre-existing cultural landscape of woods and wood pasture.

It is difficult to assess the relative importance of these sites in a Northern Irish context because so few parkland or wood pasture sites have been surveyed. What is clear is that the lichenological interest of all of these sites tends to pale in comparison to that of Florence Court (O'Dare and Coppins, 1993b) (NIEC=37, RIEC=95) and Crom Estate (O'Dare and Coppins, 1994) (NIEC=38, RIEC=80) although both these sites contain a mix of parkland and woodland habitats. A small number of surveys exist for woodland sites; data on IEC scores for these woods are presented in Table 10.

**Table 10** Previously surveyed woodland sites in Northern Ireland with IEC scores

| Site Name | County | NIEC | RIEC | Reference |
|---|---|---|---|---|
| Altmover Glen | Londonderry | 14 | 40 | Coppins and O'Dare (1991) |
| Banagher Glen | Londonderry | 39 | 75 | Coppins and O'Dare (1991) |
| Boorin Wood | Tyrone | 21 | 30 | Coppins and O'Dare (1991) |
| Correl Glen | Fermanagh | 33 | 85 | O'Dare (1990a) |
| Drumlea/Mullan | Tyrone | 22 | 40 | Coppins and O'Dare (1991) |
| Hanging Rock | Fermanagh | 16 | 55 | O'Dare (1990b) |
| Marble Arch | Fermanagh | 23 | 75 | O'Dare (1990c) |
| Ness Wood | Londonderry | 33 | 80 | Coppins and O'Dare (1991) |

The data on woodland and woodland sites are really too scant to make firm statements, but, as they stand, they suggest that the park and wood pasture habitat may be less important for lichens than that of other woodland types. This contrasts with the situation in the south of England where the

parklands, especially those of mediaeval origin, can be very rich (NIEC scores of over 30 being not uncommon). Although some of the southern species of *Lecanactidetum premnae* association may be on (or beyond) the edge of their range in Northern Ireland, the presence of rich parkland sites in various parts of Wales and Scotland suggests that climatic conditions do not preclude the existence of rich parkland sites in most regions of Northern Ireland.

### 6.4 The value of introduced tree species to lichens – evidence from the 2006 surveys

Firstly, a caveat: this survey was not designed for the purpose of comparing phorophytes in a quantitative manner. The numbers of trees visited of each species was highly unequal, and many of the tree species were encountered on only a few occasions. Nonetheless, some conclusions can be drawn from the available data.

Table 11 shows the number of lichen species, along with the total number of individual records, found on each tree species. It can be seen that over half (54%) of the records were made from the native oak species and that over two thirds (73%) of all the species recorded were found on oaks. Numerically, the most important exotic species was sycamore, closely followed by beech, both of which were host to approximately 28% of all species recorded.

**Table 11** Native and exotic tree species as phorophytes for lichens

| Phorophyte species | No. records | No. species |
|---|---|---|
| **Native species** | | |
| Alder | 27 | 21 |
| Ash | 202 | 59 |
| Birch | 2 | 2 |
| Cherry | 4 | 4 |
| Elder | 1 | 1 |
| Elm | 2 | 2 |
| Fir (Abies) | 5 | 5 |
| Hawthorn | 88 | 49 |
| Hazel | 22 | 17 |
| Holly | 9 | 9 |
| Oak (native species) | 1018 | 123 |
| Willow | 36 | 29 |
| Subtotals – Native species | 1411 | 155 |

| | | |
|---|---|---|
| **Exotic species** | | |
| Beech | 153 | 47 |
| Hornbeam | 7 | 7 |
| Horse Chestnut | 60 | 40 |
| Larch | 10 | 10 |
| Lime | 46 | 23 |
| Norway Maple | 2 | 2 |
| Red Oak | 14 | 14 |
| Redwood (Sequoia) | 1 | 1 |
| Scots Pine | 4 | 2 |
| Sweet Chestnut | 20 | 17 |
| Sycamore | 155 | 48 |
| Walnut | 1 | 1 |
| Wellingtonia (Sequoiadendron) | 2 | 2 |
| Subtotals – Exotic species | 480 | 88 |
| Totals | 1891 | 169 |

Overall, 81 species were recorded on native tree species but not on exotic species, whilst only 14 species were exclusive to exotic tree species. This latter selection along with host species is shown in Table 12. The absence of beech from the list of phorophytes in this table is interesting, showing that all species found on beech were found on other native species. The species found exclusively on red oak are all attributable to the records from the single red oak at Baronscourt. It seems likely that the singular nature of this tree's flora was due more to the situation of the tree than the species. The role of sycamore and horse chestnut is perhaps more interesting. These trees may have a relatively base-rich bark and so may host species that might otherwise be found on ash or elm. However, both these exotic species tend to have rather dense canopies that cast a heavy shade. This seems to be particularly so for horse chestnut, which frequently has a very low abundance diversity of lichens.

In general there are no exotic tree species which fulfil roles that might not otherwise be filled by a range of native species of varying age classes. In any site some exotic trees will probably support lichen species not found on other trees on that site, but this will probably be due to the usual chance factors which govern the distribution of species on the site. A crucial difference between the role of exotic tree species in a parkland setting from that in a woodland setting is that there is no opportunity for exotics to become invasive in the parkland setting. This means that there is little argument for applying blanket policies for removal of exotic species in parkland, as has frequently been the case in woodland.

| Lichen species | Phorophytes |
|---|---|
| *Buellia griseovirens* | Red Oak |
| *Caloplaca phlogina* | Sycamore |
| *Candelaria concolor* | Sycamore |
| *Heterodermia japonica* | Red Oak |
| *Hypotrachyna sinuosa* | Red Oak |
| *Lecania cyrtella* | Sycamore, Norway Maple |
| *Milospium graphideorum* | Hornbeam |
| *Mycoblastus fucatus* | Red Oak |
| *Peltigera praetextata* | Horse Chestnut |
| *Physconia grisea* | Horse Chestnut |
| *Porina aenea* | Horse Chestnut |
| *Strigula taylorii* | Horse Chestnut |
| *Usnea cornuta* | Red Oak |

**Table 12** Lichen species found exclusively on exotic phorophytes over the course of the study

# 7 INVERTEBRATE SURVEY

## 7.1 Introduction

The tree and shrub component of sites will vary considerably in total abundance (from one tree or bush to an entire forest), density (from open-grown trees and shrubs to dense closed-canopy situations) and age structure (from young examples through to veteran or even ancient trees or shrubs), and these aspects may also vary across a particular site. The invertebrate fauna varies in composition, abundance and conservation quality accordingly. Small numbers of large old and open-grown trees and shrubs are generally of greater conservation interest for invertebrates than larger expanses of dense closed canopy woodland. This is especially the case with saproxylic and epiphyte assemblages.

## 7.2 Survey strategy

The recommended standard approach for surveying saproxylic and epiphyte invertebrates is to make a series of visits across the field season during which as wide a variety of available niches as possible are investigated using the standard hand techniques of beating, sweeping and panning (sorting through accumulations of debris within tree cavities), supplemented by direct observation. These methods will catch different elements of the assemblage so all are needed to collect an adequate range of beetles, flies and aculeate Hymenoptera that are the key groups in this habitat.

Visits should ensure that the three main seasons are adequately covered: i) the late spring optimum in adult abundance (May-June), ii) high summer species (July-August); and iii) autumnal species (September-October). A minimum of one full day is recommended for the average site of 60-70 hectares, with half days on smaller sites and longer on larger sites. Days chosen for visits should ideally be during extended periods of high pressure so that weather conditions are most likely to be optimal – this requirement is naturally often diffcult to meet.

A survey strategy will necessarily depend on what one encounters when one arrives on site, and may be modified by what one finds as one explores the site – determining a detailed strategy in advance is not therefore sensible. The investigation of a site is perhaps better termed 'prospecting' - searching for opportunities. The basic features that need to be investigated – if present – are:

- Large old tree trunks of living trees, especially those with well-lit sunny areas, and both rough-barked and smooth-barked examples – the latter are better for adult Dolichopodidae and Hybotidae flies, but the former are better for barkflies (Psocoptera):
  - Inspection for active invertebrates, eg resting Diptera or hunting spiders, which may be captured directly into a tube, pooted, or netted;
  - Inspection of any sap-runs or other wet fluxes for visible insects, collection of any larvae for rearing;
  - Inspection of any exit holes which may gives clues to identity of inhabitants, including hole shape and size, and watch for secondary occupation by aculeates;
  - Bark cavities:
    - Older trees may develop large cavities within the bark and beneath it, and these may be detected by knocking for hollow sounds or judged by eye; sections need to be pulled off to see if any cobweb beetle larvae are present and to record spiders, etc;
  - Trunk cavities – rot-holes:
    - These are best investigated using emergence traps set across the opening or rearing from samples of wet debris, as most of the contents will be in the larval stage (Diptera predominantly);
  - Trunk cavities – hollowing:
    - Direct investigation of white-rotten or red-rotten decayed wood;
    - Examination of accumulations of wood mould using panning (as in gold-panning, with material sorted by size category in a tray through agitation and tossing) or sieving techniques; Tullgren funnels or Winkler extractors could also be used.
    - Accessing pockets of decay debris within the interior of hollow trunks by placing a net in the base of the hollow and probing the interior above with a beating stick or net pole;
- Aerial dead branches on living trees
  - Beating or tapping over a net, etc; high summer and autumn are important times for specialist beetles of this habitat; epiphyte associated invertebrates are recorded in the same way;
  - Sections of branch, with or without fruiting fungi, can be taken away for rearing purposes;
- Aerial live branches:
  - Beating over a net, etc, to capture resting adults after emergence from saproxylic habitats or in cop;
- Standing dead trunks (snags and monoliths):
  - Much as for live trunks above, but often with better access

to decay and cavities; aculeates are most likely to be found on dead trunks as they will be less shaded in general and a greater range of cavities will be available for nesting; warmth-loving species also favour dead trunks;

- Fallen trunks and boughs:
  - General investigation, breaking into loose and soft material;
  - Turning over to inspect the moister undersides (always placing back as found);
- Fruiting fungi:
  - Inspection for active insects & netting any disturbed by the surveyor;
  - Tapping over net, etc;
  - Inspection for insect exit holes;
  - Breaking a representative sample open & checking for larvae which might be taken for rearing;
- Targeted beating of blossom on flowering trees & shrubs, especially hawthorn, elder, holly, etc;
- Field layer beneath or close to trees & shrubs:
  - Sweep-netting low over field layer & beneath the aerial foliage;
  - Inspection of any flowers, eg hogweed, bramble, etc.

Each site survey should aim to cover all or most of these activities. The requirements for blossom mean that late spring visits are needed to coincide with the peak in hawthorn flowering, and hopefully high summer visits will coincide with elder blossom. The high summer visit will also enable work with fruiting of the heartwood decay fungus *Laetiporus sulphureus* and other earlier bracket fungi, while autumn visits will hopefully coincide with fruiting of *Fistulina hepatica* and other later fungi.

Supplementary work, with a variety of trapping devices may also be feasible. Potential traps include Owen extractors, window and flight interception traps, malaise traps, baited traps (such as bones wrapped in grass cuttings, which can be left in tree cavities to attract carrion species), pitfall traps set within hollow trees, and artificial habitats such as sawdust-filled boxes placed in the canopy or hollow trunks. Canopy fogging is a more demanding technique that has been used mostly in tropical work.

The recommended hierarchy of survey intensity is as follows:

- Exploratory visit – one day or part of a day at any time of year;
- Baseline seasonal survey (recommended for Common Standards Monitoring work) of three visits across field season;
- Intensive survey of at least monthly visits across the field season, from April into October and possibly November, in any one year;
- Full survey, combining the last with a variety of trapping techniques.

The variety of equipment carried around a site is largely down to personal choice and the amount of damage one intends to cause in pursuit of saproxylic invertebrates. Basics are a sweep net (which can also be used as a beating tray), a beating stick, a tape measure, a sharp knife and/or folding hand-saw, and a variety of containers for specimens and samples – a large supply of plastic bags is useful for taking samples of wood and fungi for rearing purposes. A ladder is useful for improving access to aerial cavities but is not recommended due to Health & Safety implications.

In the case of the 2006 EHS Scoping Study, a detailed survey was required and the intensive survey programme was adopted, involving monthly site visits of about a day's duration, supplemented by the use of a small flight interception type trap (FIT) as a means of sampling between visits in case the hand sampling was seriously disrupted by bad weather. The standard sampling techniques of hand search, beating, netting, and rearing techniques dominated the site visits. Coleoptera and Diptera were a major focus of investigation as these two orders contain the highest proportion of the wood decay fauna, but other orders have also been recorded. Epiphyte invertebrates have also been recorded.

Two flight interception traps were operated at each site, set up during the March visit and emptied each return visit. The requirement to keep them out of reach of livestock meant that some could not be placed within the open wood pasture of the parkland but had to be placed just outside within bordering woodland. The traps used for the project are based on four 2L plastic drink bottles attached to a firm base and hung from a branch in the lower canopy of a tree; a large window is cut in the outward-facing side of each, and the neck of the bottle filled with a liquid comprising 50% commercial antifreeze 50% soapy water. The bottle cap enables easy removal of catches. The bottle walls are transparent and so the aim of the trap is to sample insects flying in the lower canopy without attraction.

### 7.3 Analysis of species found during field survey

The full species lists from the 2006 parkland surveys are available in a separate Excel spreadsheet.

The species found during the six site surveys have been classified according to:

- Widespread tree and shrub associates, found in a wide variety of situations in Northern Ireland and clearly relatively mobile and capable of colonising sites as they become suitable;
- Specialists of large open-grown trees and shrubs, which occur widely in historic parklands in Northern Ireland as well as in other sites with concentrations of large open-grown trees and shrubs, but which have a reputation for being rare in Ireland, eg. the false darkling beetle *Orchesia undulata* (saproxylic), the predatory bug *Empicoris vagabundus* (epiphytic), and the barkfly *Pteroxanium kelloggi* (epiphytic);
- Specialist old growth species, of very restricted occurrence in Ireland due to relatively low mobility, eg. the beetles *Phloiophilus edwardsii, Orchesia micans* and *O. minor.*

Provisional listings of these key parkland species are presented in Tables 13 and 14.

| Saproxylic species | Widespread in historic parklands | Quality species of historic parklands | Unclear |
|---|---|---|---|
| **Coleoptera** | | | |
| *Agathidium confusum* | | | * |
| *Agaricochara latissima* | | | * |

| | | | |
|---|---|---|---|
| *Dinaraea aequata* | | | * |
| *Leptusa pulchella* | | | * |
| *Phloeonomus punctipennis* | | | * |
| *Phloeostiba plana* | | | * |
| *Phyllodrepa ioptera* | | | * |
| *Phyllodrepa vilis* | | | * |
| *Malthodes pumilus* | * | | |
| *Phloiophilus edwardsi* | | Baronscourt<br>C Coole | |
| *Dacne bipustulata* | * | | |
| *Cis alni* | | Caledon<br>C Coole | |
| *Cis festivus* | * | | |
| *Cis vestitus* | * | | |
| *Orchesia micans* | | Glenarm | |
| *Orchesia minor* | | Glenarm | |
| *Orchesia undulata* | * | | |
| *Abdera flexuosa* | | | * |
| *Anaspis garneysi* | | Glenarm | |
| *Dryocoetes villosus* | * | | |
| *Trypodendron domesticum* | * | | |
| **Diptera** | | | |
| *Dictendia bimaculata* | | Baronscourt<br>Glenarm | |
| *Mycetophila maculata* | | | * |
| *Telmatoscopus rothschildi* | | | * |
| *Oedalea tibialis* | | Baronscourt | |
| *Tachydromia aemula* | | | * |
| *Tachydromia umbrarum* | * | | |
| *Achalcus melanotrichus* | | | * |
| *Medetera impigra* | * | | |
| *Medetera jacula* | | | * |
| *Medetera tristis* | * | | |
| *Systenus mallochi* | | Caledon | |
| *Systenus pallipes* | | Caledon | |
| *Brachyopa scutellaris* | | Glenarm | |
| *Chalcosyrphus nemorum* | | Caledon | |
| *Drosophila cameraria* | | | * |
| *Drosophila funebris* | | | * |
| *Drosophila phalerata* | | | * |
| *Hirtidrosophila confusa* | | | * |
| *Leucophenga maculata* | | Caledon | |
| *Paykullia maculata* | | | * |
| **Hymenoptera** | | | |
| *Ectemnius cephalotes* | | | * |
| *Passaloecus monilicornis* | | | * |

Knowledge of the biology and ecology tends to be greater with beetles than flies and so it has proved easier to group the beetles as key species. Many of the flies tabled are very provisional.

**Table 13** Provisional list of specialist saproxylic invertebrates of historic parklands in Northern Ireland

| Epiphytic species | Widespread in historic parklands | Quality species of historic parklands | Unclear |
|---|---|---|---|
| *Loricula pselaphiformis* | * | | |
| *Pteroxanium kelloggi* | * | | |
| *Peripsocus alboguttatus* | | C Coole | |
| *Pseudopsocus rostocki* | | C Coole | |
| *Reuterella helvimacula* | * | | |
| *Psococerastis gibbosa* | * | | |
| *Atlantopsocus adustus* | * | | |
| *Loensia fasciata* | * | | |
| *L. variegata* | * | | |
| *Trichadenotecnum majus* | * | | |
| *T. sexpunctatum* | * | | |

**Table 14** Provisional list of specialist epiphyte invertebrates of historic parklands in Northern Ireland

7.3.1 Saproxylic assemblages

Saproxylic invertebrates have the reputation of being poorly represented in Ireland (Speight 1986, 1989). The first attempt made to list the Irish saproxylic fauna reached a total of 615 species (Alexander, 2002) – compared with 1792 in Britain and many more in continental Europe. Ireland appears to have about one third of the British fauna (see Table 15)

| Taxonomic group | Irish species | GB species | Irish fauna as percentage of British |
|---|---|---|---|
| Coleoptera | 259 | 700 | 37% |
| Diptera | 293 | 730 | 40% |
| All invertebrates | 615 | 1792 | 34% |

**Table 15** Total numbers of saproxylic invertebrate sknown from Ireland and Britain

The Irish and British fauna appears to comprise an Atlantic sub-set of the Temperate fauna of central Europe, and species-richness declines both westwards (with increasing oceanicity) and northwards (towards the sub-boreal zone). Thus the fauna of Northern Ireland would be assumed to be relatively species-poor both in comparison with the Republic of Ireland and with Britain. Many of the species which occur in Ireland are restricted to limited areas with concentrations of old trees. The discovery of 200 saproxylic invertebrate species as a result of one year's intensive study in just six historic parklands in Northern Ireland is therefore quite remarkable. These comprise 195 species within the Alexander (2002) listing, ie 31.5% of the whole Irish list, with an additional five species not previously reported from Ireland. A breakdown of the Irish list by Northern Ireland is not available at present.

The five additions to the Irish list comprise four which are almost certainly overlooked natives – the beetle *Agathidium confusum* (at Glenarm) and the flies *Forcipomyia pulchrithorx* (at Castle Coole), *Medetera tristis* (at four sites) and *Hirtodrosophila confusa* (at Caledon and Castle Ward) - and one which is clearly an introduction – the micromoth *Dryadaula pactolia* (at Castle Coole).

Recent work for English Nature – in the development of the Invertebrate Species and habitat Information System (ISIS) which has been designed specifically to guide Common Standards Monitoring for invertebrates – has broken the saproxylic fauna down into three main groupings:

- Heartwood decay in mainly living trees:
  - These require trees and shrubs to be old enough to be colonised by heartwood-decay fungi and for the internal dead heartwood to be broken down from solid wood through to accumulations of friable wood-mould in the bases of the cavities formed; these are the veteran and ancient tree specialists;
- Bark and sapwood decay, including sap-runs:
  - These have the potential to be more widespread in the absence of older generations of trees and shrubs as they are much less dependent on age of the host;
- Fungal fruiting on trees and decaying wood:
  - These have been separated out as they are more accessible (when present) and are therefore more readily sampled. They combine species dependent on heartwood decay and those fungi of more superficial bark and sapwood.

The separation of the heartwood fauna from the more superficial sapwood species - which are less reliant of the availability of veteran and ancient trees - has proved very instructive. No true heartwood species were encountered during the 2006 surveys and indeed none are currently on the Irish list. There are various reasons why this might be:

- Heartwood species are primarily warmth-loving continental species which decline westwards as conditions become more oceanic, and northwards as temperatures decline:
  - This is certainly true and well-known, with one of the most widespread characteristic species *Prionychus ater* (Coleoptera: Tenebrionidae) not occurring in the far west and north of Britain and therefore not having much opportunity for reaching Ireland;
- They may never have colonised/re-colonised Ireland after the last glaciation even if conditions were suitable, perhaps unable to cross after the Irish Sea flooded:
  - This is also possibly the case for a proportion of the species, but at least one *Prostomis mandibularis* (Coleoptera: Cucujidae) is known from palaeo-ecological studies;
- Conditions in the Irish post-glacial native woodlands have never been suitable for them, being closed canopy, and too cool and moist as a result:
  - This would be the argument based on the high forest hypothesis that is promoted in Ireland by Mitchell (2005), but is again undermined by the palaeo-ecological record which has demonstrated the presence in post-glacial Ireland of open wood-pasture beetles such as *Prostomis mandibularis* and *Scolytus mali;*
  - A variation on this is that ancient trees are a relatively recent phenomenon in Ireland, arising from the cultural landscape, and so no habitat was available for colonisation; this is again refuted by the presence of *Prostomis mandibularis* in the palaeo-ecological record;

- Trees do not decay in the same way in Ireland as they do in Britain, presumably due to the more oceanic climate, and so no habitat was available for colonisation;
  - This is clearly incorrect since ancient hollow trees with advanced heartwood decay and hollowing are present in the study sites;

The first reason does seem the most likely explanation, or perhaps the least far-fetched hypothesis. The Irish palaeo-ecological record of beetles is at a very early stage of investigation but has already demonstrated the post-glacial presence of certain beetles which are known to require open-grown trees and/or wood pasture type habitats.

### 7.3.2 Rare saproxylic species

#### 7.3.2.1 Coleoptera

A total of 76 saproxylic beetle species were found of which 22 have been regarded as rare species in Ireland as a whole as well as one which is not presently on the Irish list.

The previously overlooked beetle is:

*Agathidium confusum* (Leiodidae – fungus beetles)

- A little known species which is assumed to feed on wood-decay fungi;
- Known in Britain from very few specimens collected sporadically over the years and more recently with the introduction of flight interception trapping, and accordingly given provisional Red Data Book status (Hyman, 1992);
- Primarily known from the classic ancient wood pastures of the New Forest, Wychwood Forest, Moccas Park and the Box Hill area of the North Downs (Cooter, 1996 & pers. comm.);
- Tapped from a large fallen oak bough in the Great Deer Park, Glenarm; no large fungal growth was evident but there may have been smaller species fruiting; of more than 20 specimens seen four were kept for identification and all proved to be this species; two have been retained by J Cooter for reference purposes, the other two will be passed to the Ulster Museum.

Of the other 22 rarities, the following are the most significant finds:

*Orchesia micans* (Melandryidae – skipjack beetles)

- Develops in a variety of large polypore fungi: especially (in Britain) *Inonotus hispidus* fruiting from standing live mature and older ash trees, but also *I. radiatus* fruiting on standing but dead alder stems; adults rarely seen unless reared from old bracket fungi;
- Mainly, but possibly not exclusively, in ancient woodland and wood pasture situations in Britain, where it has Nationally Scarce status;
- It was reared in numbers from a fungus found growing on birch at Kenmare in County Kerry in 1898 (Johnson & Halbert 1902) – presumably *I. radiatus* – but has not been reported in Ireland since then;

- Melandryid larvae were found in old brackets *of I. radiatus* on standing dead alder stems within wood pasture on both sides of the Great Deer Park, Glenarm, during 2006 but only a single adult was seen on site; adults were later reared from samples of the fungus retained for the purpose

*Orchesia minor* (Melandryidae)

- Develops in the fruiting bodies of a variety of wood-decay polypore fungi and possibly certain Ascomycetes, generally on aerial dead branches;
- especially in permanently damp woodlands, in carr or gorge situations; most often found in ancient woodland and wood pasture in Britain, where it has Nationally Scarce status;
- discovered at Muckross in the Killarney Woodlands of County Kerry by Janson (1920) but not reported since;
- one tapped from an aerial dead branch in the lower canopy of an old open-grown oak on the west side of the Great Deer Park, Glenarm, in October, and another taken in a flight interception trap set amongst old hazels below the waterfall in the north-east side of the park.

*Phloiophilus edwardsi* (Phloiophilidae)

- An autumnal species developing in the fungus *Peniophora quercina,* which fruits on the aerial dead lower boughs of various mature open-grown broad-leaved trees and shrubs, but especially oak,
- generally in old wood pasture and parkland situations in Britain, where it has Nationally Scarce status;
- an old record from Killarney (O'Mahony, 1929) and reported once subsequently under an oak tree at Celbridge in County Kildare (Halbert, 1937);
- single adults tapped from aerial dead branches on mature open-grown oak trees in parkland below Castle Coole mansion and wood pasture in the Gortgonnell area to the west; also one taken in a flight interception trap in an old open-grown oak at Baronscourt.

*Cryptophagus ruficornis* (Cryptophagidae – silken fungus beetles)

- Associated with the fruiting bodies of the fungus *Daldinia* spp., especially on mature and older ash trees, and also favouring burnt wood;
- Apparently favours open-grown trees but no known association with wood pasture or parkland in Britain, Nationally Scarce status;
- First noted in Ireland at Ballyskeagh, County Antrim (Nash, Anderson & O'Connor, 1997), which may suggest a recent colonist from SW Scotland since *Daldinia* is more of a SE species in Ireland;
- Found in numbers running over exposed heartwood on sycamore with burnt out hollow in base of trunk and some fruiting of *Daldinia*, in old avenue at Drenagh.

*Agaricochara latissima* (Staphylinidae – rove beetles)

- Larvae feed on fungal spores and associated with bracket fungi on dead standing stems of broad-leaved trees and shrubs;
- Reported from the Killarney area and Cloverhill, County Cavan (O'Mahony 1929), but not since;

- One found in Baronscourt Park in 2006.

*Cis alni* (Ciidae – minute tree fungus beetles)

- Reputedly associated with Jew's Ear Fungus *Auricularia auricula-judae*, mainly on dead stems of elder, but also regularly found on aerial dead branches of open-grown oak trees; the larvae develop in the soft fungoid sapwood of the colonised dead host tissues;
- Mainly found on open-grown trees and shrubs in wood pasture situations in Britain, although perhaps not exclusively so;
- Reported from Mote Park, County Roscommon (Johnson & Halbert, 1902) and only subsequently known from Castle Coole Park in 1992 where one was knocked from aerial dead branches on an open-grown oak tree (Alexander, unpublished);
- Found again at Castle Coole in 2006, one knocked from old hawthorn branches, and also at Baronscourt Park, from aerial dead branches on open-grown oak trees.

*Abdera flexuosa* (Melandryidae – false darkling beetles)

- Mainly develops in the small brackets of the wood-decay fungus *Inonotus radiatus* on standing dead stems of alder, willow and birch; has also been found on *I. dryadeus* fruiting on standing live old open-grown oak in County Fermanagh and *Phellinus pini* in Aberdeenshire;
- most British records are from ancient woodlands and wood pastures, Nationally Scarce;
- first reported in Ireland from Crom Castle Park in County Fermanagh (Alexander & Foster, 1995) and subsequently found on pasture tree on Molly Mountain (Anderson, 1998);
- numerous on *I. radiatus* on dead alder stems at two places in Castle Coole Park and also in boggy grazed woodland at Caledon Park.

*Cis vestitus* (Ciidae – minute tree fungus beetles)

- a speciality of decay fungi on aerial dead branches of open-grown trees in wood pasture and parkland situations in Britain;
- only published Irish record is from Killarney (Bullock, 1935) although also found here (2001) and in Glengarriff Woods, County Cork (2004) by Keith Alexander (unpublished);
- found on aerial dead branches of old open-grown oaks in all six study sites.

Brown *et al* (1997) included two wood-decay beetles as Priority Species, although these were only known from Belvoir Park – *Gyrophaena pulchella* and *Ptinus subpilosus*. Neither were seen during 2006.

#### 7.3.2.2 Diptera

A total of 102 saproxylic fly species were found of which eight have been regarded as rare species in Ireland as a whole as well as three which are not presently on the Irish list (Chandler, 1998).

The three previously overlooked species are:

*Medetera tristis* (Dolichopodidae – dolis)

- Develops in moist debris in either cavities beneath loose bark on

dead areas of trunk and bough, and/or cavities (rot-holes), and/or bracket fungi;
- The specimens examined are consistent with British tristis but not the European key and it is thought that two species are confounded within the name (DJ Gibbs, pers. comm.);
- Adults found running on trunks of living trees in sunshine at four of the study sites and so possibly a parkland speciality in Northern Ireland: Caledon Park, Castle Ward Park, Drenagh and the Great Deer Park, Glenarm.

*Hirtidrosophila confusa* (Drosophilidae – fruit flies)
- Adult flies have been taken on brackets of the fungus *Polyporus squamosus*; often seen at rest beneath *Ganoderma* brackets among droplets of reddish moisture weeping from the spore-producing surface;
- Taken at *Polyporus squamosus* on horse chestnut in Caledon Park, and at *Laetiporus sulphureus* on oak and *Fistulina* on sweet chestnut in Castle Ward Park.

*Forcipomyia pulchrithorax* (Ceratopogonidae – a midge)
- Develops in the granular, solidifying sap in open wounds on broad-leaved trees;
- Taken in the flight interception trap set inside a hollow old horse chestnut tree in Castle Coole Park.

The ten rarities are:

*Achalcus melanotrichus* (Dolichopodidae – dolis)
- Develops in wet decaying debris in aerial cavities (rot-holes) in the trunks of living trees;
- Added to Irish list by Speight (1987) who reared them from wet rot-hole debris in old birch on drained bog in County Leitrim and from ancient woodlands in Counties Offaly (in birch) and Wicklow (in beech);
- One found at white soft rot exposed on the trunk of an open-grown ash tree in Caledon Park.

*Medetera abstrusa* (Dolichopodidae – dolis)
- Has been reared from bracket fungi and the adults are found on tree trunks, especially beech but also oak;
- Added to the Irish list by Chandler (1982) who found it at Killarney and in County Monaghan;
- One from tree trunks at Drenagh.

*Systenus mallochi* (Dolichopodidae – dolis)
- Develops in wet decaying debris in aerial cavities (rot-holes) and sap-run exudates on tree trunks;
- Added to the Irish list by Speight *et al* (1992) – as *S. alpinus* - who reared them from ancient woodland in County Wicklow (in rot-hole within end of broken branch c1m above ground level on old live oak); Speight (pers. comm.) also has material reared form rot-hole debris in Counties Leitrim and Offaly;
- One found at rest on aerial branch stub on live open-grown oak in Caledon Park.

*Systenus pallipes* (Dolichopodidae – dolis)

- Develops in wet decaying debris in aerial cavities (rot-holes) and sap-run exudates on tree trunks;
- Added to the Irish list by Speight (1987) who reared them from wet rot-hole debris in old birch on drained bog in County Leitrim and from ancient woodland in County Wicklow (in rot-hole in live sycamore);
- One male found at rest on exposed heartwood on the trunk of a live open-grown horse chestnut in Caledon Park

*Oedalea tibialis* (Hybotidae – a dance fly)

- Develops in decaying wood;
- Added to the Irish list by Chandler (1978) from the Killarney area;
- Taken in a flight trap in an old oak at Baronscourt Park.

*Leucophenga maculata* (Drosophilidae – fruit flies)

- Has been reared from the fruiting bodies of many species of wood-decay fungi, including *Inonotus cuticularis* on beech, *Trametes*, *Meripilus*, *Hypoxylon*, *Ganoderma*, *Sarcodon*, *Polyporus* and *Pleurotus*;
- an insect of ancient deciduous forest (Speight *et al* 1990);
- Only reported in Ireland from Glendine in County Waterford (Speight *et al* 1990);
- female attracted to freshly fruiting *Inonotus dryadeus* brackets on old open-grown oak in Caledon Park.

*Chalcosyrphus nemorum* (Syrphidae – hover flies)

- An early successional wood decay species - larvae developing under bark of fallen trunks and branches, either in a layer of decaying sap or in moist decaying bark and sapwood;
- Best known in Britain from ancient wood pasture and parkland situations, but also in sunny situations within mature broad-leaved woodland;
- Only previously known in Northern Ireland from Quoile Wood and Mourne Park, County Down and Barnett's Park, Co Antrim (Nash, 1997); also Counties Wicklow and Cork (Speight & Gittings 2006);
- Adult at felled beech trunk in Caledon Park.

*Dictenidia bimaculata* (Tipulidae – crane flies)

- A large and dramatic cranefly which develops in decaying heartwood and sapwood of a variety of large open-grown broad-leaved trees and also in shadier wet woodlands;
- Recognised as a threatened species in Europe, part of the ancient forest fauna (O'Connor & Speight 1987);
- The best documented of the few earlier Irish records are from undisturbed woodlands, in Counties Cavan, Offaly, Wicklow and Wexford (O'Connor & Speight, 1987);
- Reared from larvae and puparia widely in Baronscourt Park and the Great Deer Park, Glenarm.

Forty fungus gnats are included amongst the finds of saproxylic flies and these include some species which have rarely been reported in Ireland. This group is perhaps less well known than the above flies and so it is difficult to assess their significance. Many are more closely associated with

closed canopy woodland and especially damp sites, and the long list from the traps sited on the edges of the wet woodland of The Misk at Drenagh reflects this. Amongst the least well known are:

- *Cerotelion striatum*, found at Baronscourt and Caledon, but otherwise only known from Counties Kerry, Monaghan and Wicklow, and associated with old woodlands in Britain
- *Symmerus annulatus*, found at Caledon and previously only known in Ireland from Charleville Woods.

#### 7.3.2.3 Digger wasps (Hymenoptera: Sphecidae)

A total of 10 digger wasp species were found one of which is regarded as rare species in Ireland as a whole.

*Passaloecus monilicornis* (Sphecidae – digger wasps)

- Nests in abandoned beetle burrows in deadwood, which are cleaned of wood dust and frass; the nests are stocked with paralysed aphids as food for the developing brood;
- Known in Ireland only from the south: Counties Kilkenny, Laois, Wicklow and Meath (Ronayne & O'Connor, 2006);
- Found in Caledon Park and Castle Coole Park.

### 7.3.3 Relative assessment of site quality for saproxylic beetles

Two systems have been devised for the relative assessment of site quality for saproxylic beetles in Britain: the Index of Ecological Continuity (Alexander, 2004) and the Saproxylic Quality Index (Fowles *et al*, 1999).

#### 7.3.3.1 Index of Ecological Continuity

The Index of Ecological Continuity has been used to identify Britain's most important sites for the saproxylic invertebrates of ancient trees and wood-pasture type habitats – old growth - and a hierarchical site table has been presented. The Index calculation is based on the presence or absence of a select list of beetle species (Harding & Rose, 1986; revised by Alexander, 2004). The species are graded according to their degree of association with old wood pastures and these grades are used as the basis for a scoring system. The total of these scores provides the Index. The approach is based on ecological knowledge of the individual species, rather than rarity.

The species in the qualifying list include many which are difficult to find on demand and so the Index may be built up over a number of years. Records from earlier recording therefore contribute to the Index. A control on old records is however imposed, with only post-1950 records being used in the calculation.

The IEC (Alexander, 2004) is, however, not applicable in Ireland as it is based on a selection of saproxylic beetle species which are relatively well-studied in Britain and which are known to have degrees of association with ancient wood pasture habitat. Only four of these species were found during the 2006 work: *Mesites tardyi* (Castle Ward), *Ampedus pomorum* (Glenarm), *Orchesia undulata* (all except Glenarm and Castle Ward), *Phloiophilus edwardsi* (Baronscourt and Castle Coole), and *Trypodendron domesticum* (Glenarm and Drenagh). Thus the six sites each have one or two species

only. The degree of association between these particular species and site quality has not been demonstrated in Ireland – indeed *Mesites* occurs widely in 'ordinary' countryside in Ireland and is clearly more mobile here than in Britain. Of the four, *Phloiophilus* appears to be only high quality species in Ireland. A separate listing of key species has yet to be developed for use in Ireland.

7.3.3.2 Saproxylic Quality Index

The Saproxylic Quality Index (Fowles *et al,* 1999) is a more recent development designed to take the whole saproxylic beetle fauna into account and to include some control of recording effort. The species are scored according to the level of their national status and on a geometric scale – from 1 point for common species through to 32 points for the rarest. The total of these scores is termed the Species Quality Score and the Species Quality Index is calculated by dividing this score by the number of qualifying saproxylic species recorded and then multiplying the result by one hundred. The SQI is thus a rarity index and its ecological significance is much less clear than the IEC.

The SQI calculation also has certain provisos:

- a threshold of 40 qualifying species have been recorded from the site;
- the list should be complete, ie include all qualifying species recorded during surveys;
- the same attention should have been applied to recording common species as rare ones.

The dependency on agreed national statuses makes this Index equally inapplicable in Ireland where statuses for invertebrates have not yet been determined. Additionally, the requirement for 40 qualifying species is also severely limiting for the smaller Irish fauna. However, this Index most readily of the two lends itself to a provisional proposal. Anderson *et al* (2000) applied it to the data available to them at the time but used the British Rarity Scores without modification. Not surprisingly, none of their data sets produced SQI figures of any significance in a British context.

In the following table Irish Rarity Scores are provisionally suggested for all of the native specialist saproxylic beetles recorded during the course of the 2006 surveys and the resulting SQI values calculated.

Although the intention of the SQI methodology was to avoid recorder effort bias, the uniformity of the site survey effort during 2006 provides additional confidence to any conclusions.

| Saproxylic species | Irish Rarity Score | Baronscourt | Caledon | Castle Coole | Drenagh | Glenarm | Castle Ward |
|---|---|---|---|---|---|---|---|
| Leiodidae | | | | | | | |
| *Agathidium confusum* | 32 | | | | | 32 | |
| *Agathidium varians* | 4 | | | 4 | 4 | 4 | |
| *Anisotoma humeralis* | 4 | | | | | 4 | |
| Scaphidiidae | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Scaphisoma agaricinum* | 4 | | 4 | 4 | | 4 | |
| Staphylinidae | | | | | | | |
| *Phyllodrepa devillei* | 2 | 2 | | 2 | | 2 | |
| *Phyllodrepa gracilicornis* | 2 | 2 | | | | | |
| *Phyllodrepa ioptera* | 4 | 4 | | 4 | | | |
| *Phyllodrepa vilis* | 2 | | | | | 2 | |
| *Phloeonomus punctipennis* | 4 | 4 | | | | | |
| *Phloeostiba plana* | 8 | 8 | | | | | |
| *Atrecus affinis* | 1 | 1 | 1 | 1 | | 1 | 1 |
| *Agaricochara latissima* | 8 | 8 | | | | | |
| *Leptusa fumida* | 1 | 1 | | | | 1 | |
| *Leptusa pulchella* | 4 | | 4 | | | 4 | |
| *Dinaraea aequata* | 4 | 4 | | | | | |
| Lucanidae | | | | | | | |
| *Sinodendron cylindricum* | 4 | | 4 | 4 | | | |
| Elateridae | | | | | | | |
| *Denticollis linearis* | 1 | 1 | 1 | 1 | | 1 | |
| *Ampedus pomorum* | 8 | | | | | 8 | |
| *Melanotus castanipes* | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Cantharidae | | | | | | | |
| *Malthinus flaveolus* | 1 | | | 1 | | | 1 |
| *Malthodes guttifer* | 4 | | | | | 4 | |
| *Malthodes marginatus* | 1 | 1 | 1 | 1 | | 1 | |
| *Malthodes pumilus* | 8 | 8 | | 8 | 8 | 8 | |
| Anobiidae | | | | | | | |
| *Grynobius planus* | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| *Ochina ptinoides* | 2 | | | 2 | 2 | | |
| *Anobium punctatum* | 1 | 1 | 1 | | | | |
| *Ptilinus pectinicornis* | 2 | 2 | 2 | 2 | 2 | | |
| *Phloiophilidae* | | | | | | | |
| *Phloiophilus edwardsi* | 24 | 24 | | 24 | | | |
| Nitidulidae | | | | | | | |
| *Epuraea marseuli* | 1 | 1 | 1 | | | | |
| *Epuraea pallescens* | 1 | 1 | | | | | |
| *Epuraea silacea* | 2 | | | | 2 | | |
| *Soronia grisea* | 4 | | | | | 4 | |
| *Rhizophagidae* | | | | | | | |
| *Rhizophagus dispar* | 1 | 1 | 1 | 1 | | 1 | 1 |
| *Cryptophagidae* | | | | | | | |
| *Cryptophagus dentatus* | 1 | 1 | 1 | | 1 | 1 | |
| *Cryptophagus ruficornis* | 24 | | | | 24 | | |
| Erotylidae | | | | | | | |
| *Dacne bipustulata* | 16 | | 16 | 16 | | | |
| Cerylonidae | | | | | | | |
| *Cerylon ferrugineum* | 4 | 4 | | 4 | | | |
| *Cerylon histeroides* | 2 | | 2 | 2 | | | |
| Ciidae | | | | | | | |
| *Octotemnus glabriculus* | 2 | | | 2 | 2 | | |
| *Cis alni* | 16 | 16 | | 16 | | | |
| *Cis bidentatus* | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| *Cis boleti* | 1 | 1 | | 1 | 1 | | 1 |
| *Cis festivus* | 8 | 8 | | 8 | | 8 | 8 |
| *Cis nitidus* | 4 | 4 | 4 | 4 | 4 | | 4 |
| *Cis vestitus* | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Salpingidae | | | | | | | |
| *Rhinosimus planirostris* | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| *Rhinosimus ruficollis* | 2 | 2 | | 2 | 2 | 2 | 2 |
| *Vincenzellus ruficollis* | 4 | | | | | | 4 |
| Melandryidae | | | | | | | |
| *Orchesia micans* | 32 | | | | | 32 | |
| *Orchesia minor* | 32 | | | | | 32 | |
| *Orchesia undulata* | 4 | 4 | 4 | 4 | 4 | | |
| *Abdera flexuosa* | 8 | | 8 | | | 8 | |
| Scraptiidae | | | | | | | |
| *Anaspis garneysi* | 4 | | | | | 4 | |
| *Anaspis maculata* | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| *Anaspis regimbarti* | 1 | 1 | 1 | 1 | 1 | 1 | |
| *Anaspis rufilabris* | 1 | 1 | | 1 | | 1 | |
| Cerambycidae | | | | | | | |
| *Rhagium bifasciatum* | 1 | 1 | | | | 1 | |
| *Rhagium mordax* | 1 | | 1 | 1 | | 1 | |
| *Grammoptera ruficornis* | 1 | 1 | | 1 | 1 | 1 | 1 |
| *Alosterna tabacicolor* | 4 | | | | | 4 | |
| *Pogonocherus hispidulus* | 8 | | | | | 8 | |
| *Leiopus nebulosus* | 4 | | 4 | | | | |
| Curculionidae | | | | | | | |
| *Mesites tardyi* | 1 | | | | | | 1 |
| Scolytidae | | | | | | | |
| *Scolytus scolytus* | 1 | | | 1 | | | 1 |
| *Leperesinus varius* | 2 | | 2 | | | | 2 |
| *Dryocoetes villosus* | 4 | | 4 | 4 | | 4 | |
| *Trypodendron domesticum* | 4 | | | | 4 | 4 | |
| | SQS | 134 | 83 | 143 | 78 | 209 | 43 |
| | SPP | 36 | 27 | 35 | 21 | 38 | 18 |
| | **SQI** | **372** | **307** | **409** | **371** | **550** | **238** |

**Table 16**: Native saproxylic Coleoptera found at the six historic parklands during 2006 and their use in the calculation of the Site Quality Index

As expected, none of the six sites achieved 40 or more saproxylic beetle species during 2006, although Glenarm is very close. The resulting SQI values are, however, quite instructive. Glenarm (550) lies above the threshold suggested for use in Britain as indicating national quality (500). This threshold is almost certainly set too high and merits lowering. Many British sites which are nationally famous for their saproxylic beetles have SQI figures in the 300s and 400s. This would suggest that - in an Ireland context – Baronscourt, Caledon, Castle Coole and Drenagh all have a notably high SQI although Caledon only scrapes through. Only Castle Ward has a relatively low SQI value. There are however doubts about the Irish status of *Cryptophagus ruficornis* as it was first reported in County Antrim in 1992 (Nash, Anderson & O'Connor, 1997) and so may be a recent colonist from SW Scotland. Its removal from the Drenagh list results in an SQI of 270 which perhaps better reflects the quality of this site for saproxylic beetles.

7.3.4 The overall site quality of the six parklands for saproxylic invertebrates

The key conclusions are that:

- The Great Deer Park of Glenarm is an outstanding site in a whole Ireland context;

- Baronscourt Park is of high significance for saproxylic Coleoptera in a Northern Ireland context;
- Castle Coole is of high significance for saproxylic Coleoptera and Diptera in a Northern Ireland context;
- Caledon Park is of high significance for saproxylic Diptera in a Northern Ireland context and of more moderate significance for saproxylic Coleoptera;
- Drenagh Estate and Castle Ward Park are of more local significance for saproxylic invertebrates.

### 7.3.5 Epiphyte assemblage

The specialist invertebrates associated with the epiphyte cover of the trunks and boughs is dominated by barkflies (Psocoptera).

#### 7.3.5.1 Barkflies (Psocoptera)

Smithers *et al* (1999) provide a modern review of the Irish list of Psocoptera (booklice, barklice or barkflies, psocids) and include their known county distribution. While they comment that Psocoptera are a much-neglected group of insects in Ireland, this situation is nowhere near as bad as in Britain where a modern checklist has only recently been published (New, 2005) and where no county distributions currently exist. In reality, Ireland has had a remarkable history of documentation of its Psocoptera, with many species appreciated here long before they were noticed in Britain (Smithers, 1978; Smithers & O'Connor 1991). It was therefore very surprising to find seven additional species during the course of a single project surveying the fauna of veteran trees in six parkland sites across Northern Ireland. This brings the Irish list to 53 species, an increase of over 10%.

Interest in the free-living Psocoptera in Britain is currently being stimulated through the launch of a national Barkfly Recording Scheme led by Bob Saville of the Lothian Wildlife Information Centre in Scotland. The invention of a new common name for these insects has been adopted as a means of making them more accessible and respectable – stimulating interest using 'psocids' or 'barklice' was thought to be self-defeating. The free-living Psocoptera are predominantly to be found on trees and shrubs, either i) on the bark surfaces of trunks and boughs, where they feed on encrusting and largely epiphytic micro-organisms such as algae, lichen and fungi – they are mostly part of the epiphyte invertebrate assemblage, or ii) on the foliage where they feed on microflora. A few species occur in other situations, on unshaded field layer plants such as reeds and grasses, amongst leaf litter, and on rock-encrusting saxicolous lichens, etc.

The full species list arising is presented in Table 17 and comprises 33 species, ie 65% of the revised Irish list.

| Epiphytic species | Baronscourt | Caledon | Castle Coole | Drenagh | Glenarm | Castle Ward |
|---|---|---|---|---|---|---|
| Lepidopsocidae | | | | | | |
| *Pteroxanium kelloggi (Ribaga)* | Sept | Aug-Oct | Aug Sept | Aug Sept | Aug-Oct | Aug Sept |
| Trogidae | | | | | | |
| *Cerobasis guestfalica (Kolbe)* | | | | Sept | | |
| Caeciliusidae | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Caecilius fuscopterus (Latreille)* | | | Sept | | | |
| *Valenzuela flavidus (Stephens)* | Jun, Aug-Sept | Aug-Sept | Jun-Sept | June | Jun Aug | Sept |
| *Epicaecilius pilipennis (Lienhard)* | | | Sept | Aug | | |
| *Enderleinella obsoleta (Stephens)* | | | July | | | |
| Stenopsocidae | | | | | | |
| *Graphopsocus cruciatus (L.)* | Jun | Aug | Jn-Aug | Jun, Sept | Jun-Jly | |
| *Stenopsocus immaculatus (Stephens)* | | July | Sept | | Sept | |
| Lachesillidae | | | | | | |
| *Lachesilla pedicularia (L.)* | Ag-Sep | | Sept | Aug-Sept | Jly-Aug | Jly-Aug |
| Ectopsocidae | | | | | | |
| *Ectopsocus axillaris (Smithers)* | Jun-Sp | May-Sp | May-Sp | Aug-Sept | July | Aug |
| *E. briggsi McLachlan* | My,A,S | My,A, S | My-Sep | Aug-Sept | Aug | May |
| *E. petersi Smithers* | My,A,S | J, J, S | Jn-Sep | June | Jn,A,S | |
| Peripsocidae | | | | | | |
| *Peripsocus alboguttatus (Dalman)* | | | July | | | |
| *P. milleri (Tillyard)* | | Aug | | | Sept | |
| *P. phaeopterus (Stephens)* | | | | | | Aug |
| *P. subfasciatus (Rambur)* | July | | | | Jly Sep | |
| Trichopsocidae | | | | | | |
| *Trichopsocus clarus (Banks)* | | | | | | July |
| *Philotarsidae* | | | | | | |
| *Philotarsus parviceps Roesler* | Jly Aug | Jly-Sep | Aug Sp | Aug | Aug Sp | Aug Sp |
| Elipsocidae | | | | | | |
| *Elipsocus abdominalis Reuter* | | July | | | July | |
| *E. hyalinus (Stephens)* | My-Jly | Jun Jly | My-Aug | | MyJnAg | MyJyAg |
| *E.moebiusi Tetens* | | | June | June | June | |
| *E. pumilis (Hagen)* | | Jly Aug | | June | June | July |
| *Pseudopsocus rostocki Kolbe* | | | Sept | | | |
| *Reuterella helvimacula (Enderlein)* | Ag Sep | | July | | Aug | Sept |
| Mesopsocidae | | | | | | |
| *Mesopsocus unipunctatus (Mueller)* | June | Jun Jly | June | June | June | |
| Psocidae | | | | | | |
| *Amphigerontia bifasciata (Latreille)* | July | | | | | |
| *Psococerastis gibbosa (Sulzer)* | | Jly Aug | July | | Aug | July |
| *Metylophorus nebulosus (Stephens)* | Jly Aug | July | | | Jly Aug | Aug |
| *Atlantopsocus adustus (Hagen)* | | June | Jn Sep | | Aug | Aug |
| *Loensia fasciata (Fab.)* | | | | May | June | |
| *L. variegata (Latreille)* | Aug | Jly | Jly | Aug | Ag Sep | Aug |
| *Trichadenotecnum majus (Kolbe)* | | Aug | Sept | Aug | | |
| Epiphytic spieces | B | CA | Co | Dr | GI | Wa |
| *T. sexpunctatum (Linnaeus)* | Aug | Jly Aug | | Sept | | Sept |
| Total Psocoptera *33* | 16 | 19 | 22 | 17 | 23 | 16 |

**Table 17**: Barkflies recorded from the six parklands during 2006, with months of capture shown

The seven additions to the Irish list are detailed below in alphabetical order. Two – the *Epicaecilius* and *Peripsocus* - are clearly recent establishments in Ireland but the other five may well be genuinely overlooked native species.

The *Atlantopsocus* were initially assumed to be the Irish speciality *A. personatus* - known from nine counties, from Cork and Waterford north to Galway and Westmeath (Smithers *et al* 1999). However, *A. adustus* was discovered in Cornwall in 2006 (Alexander, in press) and it was felt that the Northern Irish *Atlantopsocus* should also be checked by the European authority, Charles Lienhard. All proved to be A. *adustus* also. This species

has only previously been found in the Canary Islands and Madeira, so its recognition in four parklands across Northern Ireland is quite remarkable. The significance of these records remains unclear however – all reference material for Irish A. *personatus* need re-examination to establish whether or not A. *adustus* is a long-established species or a recent arrival. Fahy (1968) originally regarded A. *personatus* as an introduction, although this opinion was just supposition based on the fact that no material could be found in the national collections in Dublin. It is otherwise only known from Madeira, the Canary Islands and in the Mediterranean basin (New, 2005).

*Elipsocus moebiusi* is something of a mystery, as it has almost certainly been long overlooked in Britain – and possibly Ireland too. Males of this species had been thought to belong to *E. hyalinus* but that species is now known to be parthenogenetic in Britain. Lienhard (1985) first sorted this out, and *E. moebiusi* is now known from widely scattered areas of northern and western Britain (Saville *et al,* 2005). The discovery of an overlooked species in three well separated parkland sites does suggest the species will be found to be more widespread. It was widely found at Drenagh, and also seen at Glenarm and Castle Coole, all during the June visit – the restricted dates may suggest a limited season for the adult stage.

*Epicaecilius pilipennis* was described originally from Madeira and has been regarded as a Madeiran endemic (Lienhard, 1998). It was first found in Britain on tree trunks in Scotland (Saville, 1999) and has been steadily turning up throughout the island. It is now thought to be widespread there. It was found at Drenagh and Castle Coole.

*Peripsocus milleri* was described from New Zealand. Although first found in Britain in ships' holds in Liverpool in 1953, possibly of African origin (Broadhead & Datta, 1960), it only began to turn up in the countryside from the mid 1990s (Saville *et al,* 2007), and it now appears to be widespread there. Examples were knocked from aerial dead branches on open-grown oaks in Caledon Park and at Glenarm.

*Philotarus parviceps* – Charles Lienhard has drawn attention to the fact that all European specimens of *Philotarsus* had been allocated to *P. picicornis* before *P. parviceps* was recognised as a species in its own right in 1954, and this continued in Britain until Saville (2001) drew attention to the fact that *P. parviceps* was actually the commoner of the two in the Lothians. All Irish records for *P. picicornis* therefore need a re-examination of voucher material. All *Philotarsus* found during the 2006 surveys have proved to be *P. parviceps* and the species was common at all six sites. Lienhard (1998) indicates that *P. picicornis* is often the predominant species on conifers and *P. parviceps* on broad-leaved trees, so the 2006 findings are not surprising as few conifers were sampled. It is feasible therefore that *P. picicornis* does occur in Ireland but this requires confirmation.

*Pseudopsocus rostocki* is another enigma as it is primarily known in Britain from the far south-east and is therefore a real surprise in Northern Ireland. Both of the most recent and detailed records come from ancient wood pasture sites (Saville *et al,* 2005). The parkland at Castle Coole does include areas of semi-natural wood pasture as well as more formal parkland.

*Trichadenotecnum sexpunctatum* is the largest and most distinctive of the additions and therefore the most surprisingly overlooked species – it was found at four well-separated parkland sites: Caledon, Baronscourt, Drenagh and Castle Ward. It is a widespread species in the Palaearctic region (New 2005) and is almost certainly native in Ireland. It was mostly knocked from aerial dead branches on open-grown oak trees.

Six other species found during the 2006 study have few previous Irish records and may be genuinely rare: *Pteroxanium kelloggi*, *Peripsocus alboguttatus*, *Reuterella helvimacula*, *Loensia fasciata*, *L. variegata* and *Trichadenotecnum majus*.

Fahy (1970) regarded *Pteroxanium kelloggi* as having a southern distribution in Ireland as it had only been found at a number of sites in County Cork and was also thought to be south-western in Britain at the time. However, Smithers *et al* (1999) later added records from Counties Clare, Donegal and Mayo. Its abundance on aerial dead branches at all six Northern Ireland parklands in September is quite remarkable. New (2005) says that it is found predominantly in leaf litter and more rarely on dead material on trees. It is possible that the relatively humid climate of Ireland makes an aerial existence more favourable, in contrast to drier climates. Its reputation as a rarity in Ireland may reflect a failure to survey trees for it.

*Peripsocus alboguttatus* has only previously been found in Ireland in County Cork (Smithers *et al* 1999). Its discovery in Castle Coole Park, County Fermanagh – knocked from an aerial dead bough on an open-grown oak - might therefore seem surprising. However, its British distribution is not particularly southern – despite what New (2005) says. It is a very distinctive species and may be a genuine rare native in Ireland.

*Reuterella helvimacula* has only previously been found in the Killarney area (Smithers *et al* 1999), but was found in four of the six Northern Ireland parklands. This may reflect limited searching of tree trunks and aerial dead branches. The Killarney record is of a single female found on an oak in 1967 (Fahy, 1970). Examples were knocked from aerial dead branches on open-grown oaks at Castle Coole, Baronscourt, Glenarm and Castle Ward.

The other three species are amongst the largest and most distinctive of the Irish barkflies and the rarity of previous records may again suggest that old parklands are the key habitat in Ireland for them. *Loensia fasciata* and *Trichadenotecnum majus* have only previously been found in single localities in County Wexford during a 1910 survey (Fahy, 1970) but were found in two (Drenagh and Glenarm) and three (Caledon, Coole and Drenagh), respectively, of the six study sites. *L. variegata* is more widely known with records from Counties Dublin, Kerry and Wicklow, and was found in all six study sites.

Site species-richness declines from Glenarm (23), Castle Coole (22), Caledon (19), Drenagh (17), Baronscourt/ Castle Ward (16), and is similar to that for saproxylic (wood-decay) invertebrates found during the project. The Great Deer Park of Glenarm has very extensive high quality wood-pasture habitat, Castle Coole has patches of high quality habitat within a larger matrix, while Caledon, Baronscourt and Castle Ward are more conventional historic parklands, and Drenagh an 18th century estate.

Large open-grown broad-leaved trees are probably the most productive habitat for finding barkflies in Britain and Ireland, and so it is no surprise that long-established parklands on the old demesne estates have proved rich hunting grounds for them. The discovery of the rare *Pseudopsocus rostocki* is the most significant find as an association with ancient wood pasture sites has been suggested in SE England. The species-richness of barkflies and the species content would appear to be an important means of assessing site quality for the ancient wood pasture habitat in Ireland.

7.3.5.2 Other epiphyte invertebrates

The other key invertebrate group found with the epiphyte cover are the predatory bugs and seven species found on the trees appear to be specialists of this situation.

*Loricula pselaphiformis* is the most significant find. County Down is mentioned as the only Irish record in Southwood & Leston (1959) and so the discovery of this species on aerial dead boughs of open-grown trees in five of the study sites – excluding only Castle Ward - is remarkable. The species is rarely found in this situation in Britain despite extensive work there on parkland invertebrates. A possible reason for it having been so overlooked in Northern Ireland may be its notably short adult season – in comparison with *L. elegantula*. All specimens were found during the June visits.

*Empicoris vagabundus* has had a reputation for rarity in Ireland but appears to be just overlooked. O'Connor and O'Connor (1993) added three counties to the existing two known and Nelson (pers. comm.) does not regard it as a rarity. It's appearance as a tiny stick-insect and its habit of occurring at very low density probably explains the lack of records. It was found regularly at five of the parklands, with only Glenarm failing to produce any.

One further epiphyte associate is worthy of special comment: the moss-snipefly *Ptiolina obscura*. The larvae appear to mainly develop amongst moss on a variety of surfaces including tree bark. Most – but not all - records are from woodlands. It appears to be a rare species in Ireland and so its detection in three out of the six parklands is significant. It was found in Caledon Park, Castle Coole Park and in Glenarm.

7.3.5.3 The overall site quality of the six parklands for epiphyte invertebrates
The key conclusions are that:

- The Great Deer Park of Glenarm is the outstanding site in terms of species-richness, closely followed by Castle Coole Park;
- The other sites are of more moderate interest.

# 8 SITE APPRAISALS

## 8.1 Baronscourt

8.1.1 Site Description

The parkland of Baronscourt lies along both sides of the deep valley of a small river and a series of three loughs have been created by a series of dams along its length.

The former Deer Park occupies the western side. The lower, steeper slopes include large areas of unimproved semi-natural grassland, while the rest has been modified for agricultural productivity. Altitudinal range is approx 60-130m.

### 8.1.2 Site History

Baronscourt originated as a plantation estate of the Hamilton family in 1612, with the main residence shifting from Derrywoone Castle (about half a mile north of the present house, within the demesne) to a Palladian villa south-east of the present house in the late 1740s, and the present mansion begun in 1767.

The first serious landscaping is said to have taken place in the 1770s and 1780s, although the earlier historic landscape layout is not recorded. The Deer Park was created by James Broomfield in 1751, although this area was clearly already full of open-grown trees. It was considerably enlarged and landscaped during the 1840s, almost certainly to designs of the famous landscape gardener James Frazer. The landscape park is considered to be one of Ulster's most important.

OS surveys of 1833 and 1907 are available. The Estate Office also holds a series of oblique aerial photos taken in November 1981.

The trees on the estate were badly affected by Hurricane Debbie in September 1961 and many were lost (R Scott, pers. comm.).

### 8.1.3 Tree survey

The most numerous parkland tree is oak but beech is also common in the Deer Park and elsewhere; sycamore is also widely present. Ash is an important feature locally, and hawthorns are also very localised. The older oaks are amongst the best seen during the 2006 surveys, with only Caledon Park possessing similar quality.

| Species | Total mapped | Girth range (m) | Cohort structure for selected species | | | | |
|---|---|---|---|---|---|---|---|
| | | | 2-3.9 | 4-4.9 | 5-5.9 | 6-6.9 | 7+m |
| Alder | 2 | 2.1, 2.4 | | | | | |
| Ash | 7 | 2.92-3.93 | | | | | |
| Beech | 58 | 2.94-7.0 | 5 | 29 | 13 | 4 | 1 |
| Hawthorn | 4 | 0.35-1.6 | | | | | |
| Hornbeam | 1 | 2.5 | | | | | |
| H chestnut | 5 | 2.8-4.66 | | | | | |
| Com lime | 7 | 2.3-5.87 | | | | | |
| Oak | 87 | 2.29-7.7 | 28 | 34 | 14 | 3 | 3 |
| Oak, Turkey | 3 | 2-2.6 | | | | | |
| Sallow | 1 | 2.0 | | | | | |
| Sw chestnut | 2 | 4.35, 5.5 | | | | | |
| Sycamore | 23 | 2.04-4.85 | 18 | 5 | | | |

**Table 18** Summarised tree survey data for Baronscourt

Two oak have dated planting records of 1745, the largest having a girth of 4.44m. This girth is very comparable with trees of a similar age at Windsor

Great Park – a tree of this girth at Windsor would be estimated as being of 230-240 years age (using data provided by J. White). The actual time since planting is 261 years which is only about 10% different – the Baronscourt tree is somewhat smaller in girth than a Windsor oak of equivalent age. This suggests that the Windsor girth/age relationship may be reasonably applicable locally. The largest oaks at Baronscourt have girths of 6.03m (Deer Park), 6.4 (eastern parkland), 7.2m (by duck pen), and 7.7m (the tree identified as the Irish girth champion). A tree of girth 7.7m would be dated to about 640 years old at Windsor, ie started life in around 1365. These older oaks therefore predate the establishment of the plantation estate and demonstrate that the site held mature trees at that time.

Beech also attain notable sizes at Baronscourt: 6.0, 6.6 and 7.0m in the Deer Park, and 6.0, 6.3 and 6.5m in the eastern parkland.

Baronscourt's trees are well known and many are listed in Champion Trees (Tree Council of Ireland):

- *Quercus petraea* – 8.35m gbh @ 1.1 x 24.2m tall – Irish Girth Champion
- *Fagus sylvatica* – 7.29 @ 1 x 25.2 – largest girth in County Tyrone
- *Abies nordmanniana* – 5 x 33.5m – Irish Girth Champion
- *Pinus sylvestris* – 3.69 x 35.5m – Irish Height Champion
- *Nothofagus obliqua* – 3.36 x 26.5 – Irish Girth Champion

Interestingly the *Quercus petraea* measured 7.7 in 2006 – the tree is illustrated in the book and so there is no doubt that it is the same individual. The trunk is barrel shaped from extensive epicormic growth and the TCI measurement must have been taken too high. A girth of 8.35 would suggest an age of about 750 years. No beech as large as 7.29m was found.

The older beeches along the lower slopes of the deer park have the appearance of having been cut at approx 2m once early on, presumably in order to bush out the canopy and form a more prominent tree more quickly.

8.1.4 Fungus survey

**Table 19:** Summary of fungus survey for Baronscourt.

| Sites | Barons Court |
|---|---|
| No. trees surveyed | 200 |
| % of trees with brackets | 24% |
| | |
| No. of fungi species | 113 |
| Heartwood saprotrophs | 7 |
| Thermophilus boletes | 1 |
| Grassland waxcaps | 3 |
| | |
| Number of rare and unusual species: | |
| New species for Northern Ireland | 3 |
| Basidiomycetes not known from Republic of Ireland | 12 |
| Basidiomycete species new for whole of Ireland | 2 |
| Red List species (Great Britain excluding NI) | 0 |
| European Red List species (1993) | 0 |

| Table Colour Key |
|---|
| Species of Ecological Groups/ Interest |
| British/ EU Red List Species |

Although 113 different species of fungi were recorded, this represents a very small proportion of the estimated total UK list of 20,000 species.

There was a diversity of deadwood saprotrophic species present which create either white or brown rot habitat. Fruit bodies of *Ganoderma australe*, which causes a white rot, were most evident. There was less evidence of fungi known to create brown rot. Some trees on the estate show hollowing of the buttress even where there were no fruit bodies present on the trees this season.

| Fungi | Type of decay | Tree host | Number of trees with fungal fruit brackets | |
|---|---|---|---|---|
| 1 | *Fistulina hepatica* | Brown rot | Oak | 2 |
| 6 | *Laetiporus sulphureus* | Brown rot | Oak, beech | 4 |
| 2 | *Ganoderma australe* | White rot | Broadleaves | 26 |
| 3 | *Grifola frondosa* | White rot | Oak | 2 |
| 4 | *Inonotus dryadeus* | White rot | Oak | 4 |
| 7 | *Meripilus giganteus* | White rot | Beech | 6 |
| 11 | *Polyporus squamosus* | White rot | Broadleaves | 3 |
| | | | **Total** | **47** |
| | No. trees surveyed/recorded | | | 200 |
| | % trees with brackets | | | 24 |

**Table 20** Numbers of trees at Baronscourt with saprotrophic heartwood fungi and the different types of decay.

Many saprotrophic species are possibly currently under recorded in Northern Ireland and the Republic of Ireland. For example *Peniophora laeta* which is associated with hornbeam, is new for the whole of Ireland, was found on the hornbeam surveyed at Baronscourt. It is therefore possible that this species is more widespread than the records indicate where hornbeam occurs. This species has been recorded 41 times on the BMS database for the rest of the British Isles.

Most of the fruit bodies were found on live standing trees as most fallen dead wood was generally limited to small lengths of branch wood or the occasional fallen tree. This has probably reduced the potential quality and diversity of resupinate and poroid saprotrophic fungi within the areas surveyed.

Thermophilus boletes were generally very poorly represented with only 1 species recorded and the fruit bodies were generally scarce. However according to the Northern Ireland Database, thermophilus and ectomycorrhizal boletes (*Boletus*, *Suillius*, *Xerocomus* and *Leccinum* species) are not generally common anywhere in Northern Ireland.

| Thermophilus boletes | | Baronscourt |
|---|---|---|
| *Boletus reticulatus* | | 1 |
| | | |
| Other ectomycorrhizal boletes | | |
| *Boletus edulis* | Cep | 1 |
| *Boletus luridiformis* | Scarletina bolete | 1 |
| *Xerocomus declivitatum* | | 1 |
| *Xerocomus porosporus* | Sepia bolete | 1 |
| *Xerocomus subtomentosus* | Suede bolete | 1 |

**Table 21** Numbers of thermophilous and other ectomycorrhizal bolete species at Baronscourt.

Fruit bodies of waxcaps were generally scarce.

| Waxcaps | |
|---|---|
| *Hygrocybe chlorophana* | Golden waxcap |
| *Hygrocybe pratensis* | Meadow waxcap |
| *Hygrocybe psittacina* | Parrot waxcap |
| **Total species** | **3** |

**Table 22** Numbers of waxcap species at Baronscourt.

Generally the parkland was poor for grassland species in diversity and frequency of fruit bodies.

Three species which are all found on deadwood are new for Northern Ireland and of these 2 are also new for RoI. This shows the importance of retaining as much dead wood as possible, ideally where it falls or, if not, relocated to an alternative location nearby.

| Species | English name | NI database | RoI Data-base | European Red List A and B |
|---|---|---|---|---|
| *Ceriporia reticulata* | | New for NI | | |
| *Cristinia helvetica* | | New for NI | New for ROI | |
| *Peniophora laeta* | | New for NI | New for ROI | |
| **Total species / site** | | **3** | **2** | **0** |

**Table 23** Species new for Northern Ireland and Republic of Ireland at Baronscourt.

### 8.1.5 Lichen survey

Two and a half days were spent surveying Baronscourt Estate, during which time 88 lichen species plus one additional variety and three lichenicolous fungi were recorded from 117 trees. Fourteen of these species were not previously recorded from v.c. H37 – County Tyrone (M.R.D. Seaward, pers. comm.). Eleven species were previously recorded from five or fewer hectads in Northern Ireland. On the basis of these records, Baronscourt attains a NIEC score of 9 (7+2) and a RIEC score of 25. If considered for a British site, these scores would tend to indicate low to medium conservation interest, but in the Irish context their indicative value is likely to be higher.

Of particular interest at Baronscourt is a single red oak *(Quercus rubra)*, Tree 88, which supported several notable species not found elsewhere on the site. The lichenicolous fungus *Cyphelium sessile* (parasitic on *Pertusaria coccodes*, growing on the main trunk) has previously been recorded in only one other hectad in Northern Ireland and four hectads in the whole of Ireland (though this species was also found at Caledon and Castle Coole in the course of the present study). Low branches were host to *Heterodermia japonica* (previously recorded in 2 other hectads in Northern Ireland), which is a British Red Data Book species (Woods and Coppins, 2003). The peculiarity of the flora on this tree might well be attributable to its situation on flat damp ground at the edge of the lake. Other trees by the lakeside were on sloping, drier ground. In general the parkland on the west side of the lake is of higher interest than that on the east side.

The estate has been the subject of an earlier lichen survey in 1997 by Mike Simms of Ulster Museum, although he appears not to have investigated the deer park area. He identified a few species of the *Lobarion* community that would elevate the IEC scores if included in the total; however, these species occurred in non-parkland settings and so fall outwith the scope of the present survey. He found the eastern parkland to support a rather impoverished lichen flora reflecting the nutrient enrichment of the pastures. In contrast, an old oak protected from agricultural sprays by its situation in unimproved rough grassland between the nursery and an area of conifer plantation was found to support a particularly rich lichen flora – this is presumably tree 12 of the 2006 tree survey. He noted *Calicium salicinum* on this tree as the first recent record for the whole of Ireland – this tree was not revisited in 2006

### 8.1.6 Invertebrate survey

The parkland trees at Baronscourt support a high quality invertebrate fauna – notable in the context of Northern Ireland - and are of especial interest for wood-decay beetles.

The most important trees for these beetles are the older oaks. Aerial dead branches on the open-grown oak trees are the key habitat and support populations of the rare beetle *Phloiophilus edwardsi* and *Cis alni* as well as more widespread old parkland specialities such as *Orchesia undulata* and *Cis vestitus*. These all breed in the specialist fungi which decay lower canopy branches once they have been shaded out by the main canopy above. *P. edwardsi* and *Cis alni* are only otherwise known in Northern Ireland from Castle Coole Park and are rare throughout Ireland. Another rare fungus beetle, the rove beetle *Agaricochara latissima* also breeds in wood-decay fungi in the park but is known nowhere else in Northern Ireland.

Pockets of decay within the larger trees – beech as well as oak – also support a notably large population of the spectacular black and orange cranefly *Dictenidia bimaculata*. This species is only known in Northern Ireland from Baronscourt and the Great Deer Park of Glenarm, and is rare throughout Ireland. The older oaks are in advanced state of hollowing and so provide excellent quality wood mould habitat within their trunks. Another fly species of interest which develops in decaying wood, the dance fly *Oedalea tibialis*, was taken in the flight trap on an old oak; this species has only previously been reported in Ireland from the Killarney area. The

most interesting of the wood-decay fungus gnats found during the 2006 surveys, *Cerotelion striatum*, was found at both Baronscourt and Caledon Park, and is an old woodland species previously only known in Ireland from Counties Kerry, Monaghan and Wicklow.

The lichen cover of the trees also provides habitat for rare and uncommon invertebrates. Of particular interest is the picture-winged barkfly *Trichadenotecnum sexpunctatum*, which is only known in Northern Ireland from historic parklands.

### 8.1.7 Site Management

The deer park is currently within two agricultural tenancies. The smaller, northern part is currently grazed by dairy cattle and the sward is treated with slurry and NPK fertiliser. The larger, southern, area is grazed by beef cattle and sheep, and the current tenant has used very little fertiliser on the steeper lower slopes for many years, and is effectively under an extensive regime. Rushes have been developing as a result. The eastern parkland is also subject to moderate levels of NPK fertiliser. The swards are topped in high summer.

The designed landscape appears to be a relatively simple one dominated by specimen trees in pastureland surrounded by shelterbelts. A park planting plan was initiated about 5 years ago – as part of a Countryside Management Scheme - with 30 trees to be planted over each 5 year period. These are being sited behind existing trees in the sight-lines from the mansion, in order to maintain the present lay-out.

Wild-living Sika deer are culled at the end of February. Pheasants are reared for release from June onwards.

The estate has a relatively relaxed attitude to dead wood in the Deer Park area, but the eastern parkland is kept clearer of fallen debris while the main drives are kept especially tidy. An intensive phase of clearance of fallen wood was carried out in October, including the deer park.

Vehicle use on the pasture – and over tree roots – occurs from stock management, sward topping and clearance of fallen wood, and has the potential to be causing root health problems from compaction.

Salt or mineral licks, where noted, had been placed well away from trees, thereby avoiding damage to tree roots.

### 8.1.8 Specific conservation management issues

1. Some old oaks have been enclosed within the conifer plantations, notably in area south of Deer Park, and will suffer decline through canopy competition unless opened up.

2. Horses are causing severe damage to trees in one enclosure, to the north of the pheasant pens.

3. Sheep grazing in the eastern parkland is heavy and has the potential to cause declining tree health due to trampling and

compaction over tree roots and nutrient enrichment.

4. Age structure of the trees is potentially a problem but a start has been made on addressing this under the current Countryside Management Scheme. Hawthorn has very restricted distribution and could usefully be included in future plantings.

5. Clearance of fallen branches was severe during October and consideration could usefully be given to retaining more in situ.

**8.2 Caledon**

8.2.1 Site Description

The parkland of Caledon House lies on the west side of the River Blackwater. The main drive separates the river floodplain strip from the current deer park enclosure, the deer fence lying immediately above the drive. The terrain within the deer enclosure is moderately rolling, with a detailed mosaic of low hills and wet hollows. A small loughan lies in the northern part. Old parkland trees lie alongside and below the drive as well as across the deer enclosure. Altitudinal range is approx 40-55m.

8.2.2 Site History

The lands of Caledon were held by the O'Neill family from the 15th century and they had a castle close by. They passed to the Hamilton family by marriage in 1738, through the Earls of Cork and Orrery, who later sold it on to James Alexander (later 1st Earl of Caledon) in 1776. Landscaping of the parkland took place during the 18th century, and red deer were introduced into the park in 1848 (Hingston, 1988).

An OS map of 1834 shows the parkland layout very much as it is today.

8.2.3 Tree survey

The parkland is dominated by old oaks, but there are also significant numbers of old beech together with common lime, horse chestnut, sweet chestnut and sycamore. Old hawthorns are rare, and mostly survive in marginal situations. The survey aimed to cover all open-grown trees and included the larger individuals within clumps and groups. The area of former parkland which surrounds the mansion is no longer grazed but a few of the trees just outside of the deer fence were included.

| Species | Total mapped | Girth range (m) | Cohort structure for selected species | | | | |
|---|---|---|---|---|---|---|---|
| | | | 2-3.9 | 4-4.9 | 5-5.9 | 6-6.9 | 7+m |
| Alder | 2 | 0.9, 1.3 | | | | | |
| Ash | 7 | 3.43-4.8 | | | | | |
| Beech | 60 | 2.83-7.72 | 17 | 23 | 7 | 4 | 2 |
| Elder | 1 | 1.0 | | | | | |
| Fir | 2 | 3.76, 3.86 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Hawthorn | 13 | 0.9-2.74 | | | | | |
| Hornbeam | 1 | 3.2 | | | | | |
| H chestnut | 18 | 2.85-5.5 | | | | | |
| Larch | 1 | 1.0 | | | | | |
| Com lime | 5 | 3.64-5.23 | | | | | |
| Norw maple | 1 | - | | | | | |
| Oak | 82 | 2.24-6.6 | 37 | 27 | 11 | 5 | |
| Scots pine | 2 | 1.5, 2.0 | | | | | |
| Sw chestnut | 4 | 3.92-6.1 | | | | | |
| Sycamore | 9 | 2.2-4.9 | | | | | |
| Wellingtonia | 8 | 4.1-5.8 | | | | | |

**Table 24** Summarised tree survey data for Caledon

Two oak at Baronscourt have dated planting records of 1745, the largest having a girth of 4.44m. This girth is very comparable with trees of a similar age at Windsor Great Park – a tree of this girth at Windsor would be estimated as being of 230-240 years age (using data provided by J. White). The actual time since planting is 261 years which is only about 10% different – the Baronscourt tree is somewhat smaller in girth than a Windsor oak of equivalent age. This suggests that the Windsor girth/age relationship may be reasonably applicable locally. If this is so, then the largest oak at Caledon Park – 6.6m girth – would be about 470 years old, ie established in about 1535 and well before any landscape gardening is recorded.

Caledon Park's trees are well known and many are listed in Champion Trees (Tree Council of Ireland):

- *Picea sitchensis* – 7.47m gbh x 50.2m tall – Irish Girth Champion
- *Picea sitchensis* – 5.86 x 54 – 2nd tallest of its kind in Ireland = 6th tallest tree in Ireland
- *Sequoiadendron giganteum* – 6.34 x 52 – Irish Height Champion
- *Pseudotsuga menziesii* – 6.14 @ 1 x 36.5 – Irish Girth Champion

And so on - all of the champion trees are actually exotics and mostly conifers.

### 8.2.4 Fungus survey

| | |
|---|---|
| No. trees surveyed | 215 |
| % of trees with brackets | 29% |
| | |
| No. of fungi species | 127 |
| Heartwood saprotrophs | 7 |
| Thermophilus boletes | 1 |
| Grassland waxcaps | 3 |
| | |
| Rare and unusual species | |
| New species for Northern Ireland | 6 |
| Basidiomycete species not known for Republic of Ireland | 16 |
| Basidiomycete species new for whole of Ireland | 4 |
| Ascomycete species known to be new for whole of Ireland | 0 |
| Red List species (Great Britain excluding NI) | 0 |
| European Red List species (1993) | 2 |

**Table 25:** Summary comparison of survey results at Caledon

| Table Colour Key |
|---|
| Species of Ecological Groups/ Interest |
| British/ EU Red List Species |

Although 127 different species of fungi were recorded, this represents a very small proportion of the estimated total UK list of 20,000 species. Six species new to Northern Ireland were found of which 4 were also new to the whole of Ireland. No Red List species were recorded.

| | Fungi | Type of decay | Tree host | Number of trees with fungal fruit brackets |
|---|---|---|---|---|
| 1 | *Fistulina hepatica* | Brown rot | Oak | 3 |
| 6 | *Laetiporus sulphureus* | Brown rot | Oak, beech | 5 |
| 2 | *Ganoderma australe* | White rot | Broadleaves | 39 |
| 4 | *Inonotus dryadeus* | White rot | Oak | 6 |
| 7 | *Meripilus giganteus* | White rot | Beech | 3 |
| 8 | *Perenniporia fraxinea* | White rot | Oak | 1 |
| 11 | *Polyporus squamosus* | White rot | Broadleaves | 5 |
| | | | **Total** | **62** |
| | No. trees surveyed/recorded | | | 215 |
| | % trees with brackets | | | 29% |

**Table 26** Numbers of trees at Caledon Park with saprotrophic heartwood fungi and the different types of decay.

There was a diversity of deadwood saprotrophic species present which create either white or brown rot habitat. Fruit bodies of *Ganoderma australe*, which causes a white rot, were most evident. There was less evidence of fungi known to create brown rot. Some trees on the estate show hollowing of the buttress even where there were no fruit bodies present on the trees this season.

Many saprotrophic species are possibly currently underrecorded in Northern Ireland and the Republic of Ireland. For example *Peniophora laeta* which is associated with hornbeam, is new for Northern Ireland and also the whole of Ireland, was found on the hornbeam surveyed at Caledon. It is therefore possible that this species is more widespread than the records indicate where hornbeam occurs. This species has been recorded 41 times on the BMS database for the rest of the British Isles.

Most of the fruit bodies were found on live standing trees as most fallen dead wood was generally limited to small lengths of branchwood or the occasional fallen tree. This has probably reduced the potential quality and diversity of resupinate and poroid saprotrophic fungi within the areas surveyed.

Thermophilus boletes were generally very poorly represented with only 1 species recorded and fruit bodies were generally scarce. However, according to the Northern Ireland Database, thermophilus and ectomycorrhizal boletes (*Boletus, Suillus*, *Xerocomus* and *Leccinum* species) are not generally common anywhere in Northern Ireland.
*Boletus radicans* is new to the whole of Ireland and also on the provisional European Red List.

In addition 8 different species of ectomycorrhizal boletes were recorded. Fruit bodies were generally scarce however at Caledon more species were recorded than at other sites and fruit bodies of all species were more frequently seen there. *Xerocomus cisalpinus* which is new for the whole of Ireland was recorded at Caledon. *Xerocomus rubellus* is also new to Northern Ireland but has been recorded from RoI. Two other new species for the whole of Ireland found in the parkland are *Xercomus declivitatum* and *Xerocomus pruinatus*.

| Thermophilus boletes | |
|---|---|
| *Boletus radicans* | Rooting bolete |
| **Total** | **1** |
| Other ectomycorrhizal boletes | |
| *Boletus luridiformis* | Scarletina bolete |
| *Suillus grevilei* | Larch bolete |
| *Xerocomus cisalpinus* | |
| *Xerocomus declivitatum* | |
| *Xerocomus porosporus* | Sepia bolete |
| *Xerocomus pruinatus* | Matt bolete |
| *Xerocomus rubellus* | Ruby bolete |
| *Xerocomus subtomentosus* | Suede bolete |
| **Total** | **8** |

**Table 27** Numbers of thermophilous and other ectomycorrhizal bolete species and their associated host at Caledon.

| Waxcaps | |
|---|---|
| *Cuphophyllus virgineus* | Snowy waxcap |
| *Hygrocybe ceracea* | Butter waxcap |
| *Hygrocybe psittacina* | Parrot waxcap |
| **Total species** | **3** |

**Table 28** Numbers of waxcap species at Caledon.

Three different species of waxcap fungi were recorded and fruit bodies were generally scarce. *Hygrocybe ceracea* is on the provisional European Red List. Generally the parkland was poor for grassland species in diversity and frequency of fruit bodies.

Eight species found at Caledon are new for Northern Ireland and of these 4 are also new for the whole of Ireland.

| Species | English name | NI database | RoI Data-base | European Red List A and B |
|---|---|---|---|---|
| *Ceriporia viridans* | | New for NI | Yes | |
| *Mycoacia fuscoatra* | | New for NI | Yes | |
| *Peniophora laeta* | | New for NI | New for ROI | |
| *Perenniporia fraxinia* | | New for NI | New for ROI | |
| *Phanerochaete laevis* | | New for NI | New for ROI | |
| *Pluteus phlebophorus* | Wrinkled Shield | New for NI | Yes | |
| *Xerocomus cisalpinus* | | New for NI | New for ROI | |

| | | | | |
|---|---|---|---|---|
| *Xerocomus rubellus* | Ruby bolete | New for NI | Yes | |
| Total species / site | | 8 | 4 | 0 |

| Table Colour Key |
|---|
| Species of Ecological Groups/ Interest |
| British/ EU Red List Species |

**Table 29** Species at Caledon new for Northern Ireland and whole of Ireland and on the Red Lists

8.2.5 Lichen survey

Two days were spent at Caledon, producing records of 65 lichen species plus two lichenicolous fungi from 93 trees. Twelve of these species were not previously recorded from v.c. H37 – County Tyrone (M.R.D. Seaward, pers. comm.). Furthermore, two of these species – *Buellia schaereri* and *Xanthoria ucrainica* – may be previously unrecorded in Northern Ireland (there are no BLS records up to 2006). However, neither is likely to be actually rare in Northern Ireland; the first is probably generally overlooked for *Amandinea punctata* and the second is a recent split from *Xanthoria candelaria*. Five other species have previously been recorded from five or fewer hectads in Northern Ireland, including *Milospium graphideorum* previously recorded from only one other hectad.

The records include few ancient woodland indicators, so the IEC scores are low: NIEC of 2 (1+1), RIEC of 10. Indeed, the RIEC score probably overstates the case since the contributing species (E*nterographa crassa, Pyrenula chlorospila* and *Pyrenula macrospora)* are rather weak indicators of ecological continuity in Ireland.

The area of the estate with the highest lichenological interest is probably the south west corner, with trees here supporting *Calicium viride*, *Chaenotheca trichialis* and *Milospium graphideorum*. In some places in the north of the site livestock density appeared to be quite high, and some trees had the lower portions of their stems abraded by animals. This was not seen so frequently that it would be considered a major problem for the lichen communities, but it may be worth watching.

8.2.6 Invertebrate survey

The parkland trees at Caledon support a high quality invertebrate fauna – notable in the context of Northern Ireland - and are of especial interest for wood-decay Diptera.

Six rare Diptera were found during the survey. Three of these – *Achalcus melanotrichus*, *Systenus mallochi* and *S. pallipes* - develop in wet rot-holes in the old parkland trees, and were associated with oak, ash and horse chestnut trees. Few Irish records are known for any of these species. Two fruit flies of interest were also found: *Hirtodrosophila confusa* and *Leucophenga maculata*. The former wasn't previously known from Ireland at all but was also found in Castle Ward park during 2006 – it may be a speciality of historic parklands and have been overlooked as a result. The

Leucophenga is regarded as a relict old forest species in Ireland and is otherwise only known from County Waterford. The sixth rare Dipteran is a hoverfly *Chalcosyrphus nemorum* which is another old parkland speciality which develops in decaying sap and wood beneath bark on recently dead tree trunks. The most interesting of the wood-decay fungus gnats found during the 2006 surveys, *Cerotelion striatum*, was found at both Baronscourt and Caledon Park, and is an old woodland species previously only known in Ireland from Counties Kerry, Monaghan and Wicklow.

Rare wood-decay beetles are also present in the parkland. *Cis vestitus* and *Orchesia undulata* develop in aerial dead branches in the lower canopy of old open-grown parkland trees, especially oak, and are only known in Northern Ireland from historic parklands. *Abdera flexuosa* develops in fruiting bodies of the bracket fungus *Inonotus radiatus* on dead alders growing in the boggy woodland in the centre of the deer park – it is otherwise only known elsewhere in Ireland from three sites in County Fermanagh. One further rare bracket fungus beetle *Dacne bipustulata* is also present at Caledon Park, where it has been found with the fungus *Polyporus squamosus* fruiting on old ash and horse chestnut trees. The uncommon longhorn beetle *Leiopus nebulosus* breeds in dead oak branches and was only seen in Caledon Park – it hasn't previously been reported from Northern Ireland (Anderson *et al,* 2000).

Two rare deadwood-breeding fungus gnats were taken in flight traps in the ungrazed southern edges to the deer park: *Symmerus annulatus*, previously only reported in Ireland from Charleville Woods in County Laois, and *Anatella lenis*, previously on known from County Wicklow. Other uncommon fungus-breeding flies were also found including: *Boletina sciarina*, *Corynoptera furcifera* and *Apiloscatopse picea*, which had not previously been reported from Ireland at all (the first and last also found at Drenagh in 2006).

A rare digger wasp *Passaloecus monilicornis* nests in old beetle holes in the tree trunks and preys upon aphids in the tree canopy. It was previously only known in Ireland from a few southern counties but was discovered in Caledon and Castle Coole Parks in 2006.

The lichen cover of the trees also provide habitat for rare and uncommon invertebrates. Of particular interest is the picture-winged barkfly *Trichadenotecnum sexpunctatum*, which is only known in Northern Ireland from historic parklands.

### 8.2.7 Site Management

The deer park area is being grazed with red deer, cattle and sheep. Stocking density is notably high and the sward is close-cropped throughout. The sward appears species-poor in broadleaved herbs – although this may a result of intensive grazing rather than fertilisation - and there is no sign of nettle patches and only limited sign of creeping thistle – the parkland is clearly regularly topped in season and probably subjected to herbicides.

There appears to be a Brownian-style designed landscape, with clumps planted on hilltops and denser belts of trees along steeper ground. These areas are open to grazing. New individually-guarded plantings occur where

the clumps are beginning to break up. Platoons of common lime are an interesting feature of one area, with a diamond shaped group crossed by a vista. The monkey puzzle avenue is another unusual feature. Some of the older beeches have the appearance of having been cut at approx 2m once early on, presumably in order to bush out the canopy and form a more prominent tree quickly.

#### 8.2.8 Specific conservation management issues

Substantial resources are being invested in an extreme tidiness policy, including removal of all fallen deadwood, cutting and removal of standing deadwood and even removal of old stumps. It would be interesting to know if separate accounting takes place and, if so, the annual budget for tree tidiness in this parkland. A cost-benefit analysis would be very informative.

The low sweeping live branches typical of old horse chestnuts have also been removed throughout the park, presumably to increase light levels beneath the trees and hence improve grassland productivity.

The park is reported to be having a problem with declining health in the mature parkland oaks. A few such trees were noted. It is suggested that the explanation lies in the current stock-grazing management:

- Livestock numbers are at relatively high density;
- Stock are clearly congregating under selected trees for shade and shelter – the worst affected trees are either trampled bare beneath or bright green from nutrient enrichment due to dung and urine concentrations;
  - root damage will be occurring from soil compaction and nutrient shock;
  - soil erosion is also evident locally;
  - the worst affected area is the central plateau;
- the siting of sheep-lick buckets appears to be exacerbating the problem, and may be a key factor in the declining health of the trees; examples were seen beneath tree canopies (e.g oak 58) and old trampled rings elsewhere bear witness to this very damaging practice;
- sward topping and other treatments also mean that vehicles regularly cross over tree roots and contribute to soil compaction and hence root-damage.

The declining oaks are therefore almost certainly a classic symptom of relatively intensive sward and livestock management. This problem is well-known in the National Trust where a special study was commissioned to examine the relationships (Cox & Sanderson, 2001).

### 8.3 Castle Coole

#### 8.3.1 Site Description

The parkland of Castle Coole surrounds the natural Lough Coole as well as the 18th century mansion, and comprises gently rolling countryside of low hills and poorly-drained pastures – a typical drumlin landscape. Altitudinal range is approx 40-80m.

The site is unusually large and combines a wide variety of situations, from the formal parkland below the mansion on the west side (Lawn Field), the old avenue which leads towards Enniskillen, old wood pastures on boggy pastures (oaks at Gortgonnell Field and horse chestnut above Limekiln Bog), old wood pasture on scrubby hillside (Killynure Field), Enniskillen Golf Course, and more typical agricultural fields with old hedgerow trees and a few infield trees.

### 8.3.2 Site History

Coole was occupied by the Maguire family in the medieval period, but their lands were granted as a plantation estate to Rodger Atkinson in 1611 who built a castle there. The estate was bought by John Corry in 1656, who rebuilt the original Castle Coole. The present house was built by his son James Corry who also made a deer park to the north. The parkland was re-landscaped around the present house, involving W King and J Fraser as designers. The larger extent of wood pasture and parkland have been in the ownership of the National Trust since 1983. Part of the original state remains owned by the Corry family, Earls of Belmore.

Much of the land is broken up by old hedgerows and lanes. The oldest trees are open-grown and scattered widely from the south-west northwards to Filbert Hill and Coneyburrow Wood, immediately north of the Castle. These presumably represent the extent of the former deer park, although the older trees appear to pre-date its formation. The old Dublin coach road skirted the south-west side – in Gortgonnell Townland - and survives as a green lane lined by earth banks surmounted by ancient and veteran trees. Beyond this green lane are a line of old oaks which presumably indicate the course of an old hedgerow. A similar line of former hedgerow oaks forms the north-eastern boundary of Killynure Townland to the north. A key part of the old wood pasture has been incorporated into Enniskillen Golf Course.

Old avenues are a striking feature of the parkland, representing alignments with former residences. The main oak avenue is very clear but there are also avenues across Lawn Field and the Golf Course.

An OS survey of 1834 is available.

### 8.3.3 Tree Survey

Old oaks are the main feature, but overall there are a wide range of tree species including beech, ash, sycamore, horse chestnut and common lime. All of the open-grown trees within the pastures were surveyed along with other adjacent trees, as along the avenue and a few within the fringes of the mown areas around the mansion. The Golf Course was included but the trees in the northern sector were only mapped using a handheld Garmin rather than with differential GPS.

The presence of an old field maple at Gortgonnell is an interesting feature. Rackham (2006) comments that this tree species is said to be introduced into Ireland by people but on no very good evidence.

| Species | Total mapped | Girth range (m) | Cohort structure for selected species | | | | |
|---|---|---|---|---|---|---|---|
| | | | 2-3.9 | 4-4.9 | 5-5.9 | 6-6.9 | 7+m |
| Alder | 1 | 1.0 | | | | | |
| Ash | 14 | 2-4.5 | | | | | |
| Beech | 19 | 2.4-6.2 | 10 | 4 | 0 | 2 | |
| Elm | 5 | 1.38-5.4 | | | | | |
| Field maple | 1 | 3.9 | | | | | |
| Hawthorn | 10 | 0.8-2.9 | | | | | |
| Hazel | 1 | 4.5 | | | | | |
| Holly | 1 | - | | | | | |
| H chestnut | 18 | 2.5-6 | | | | | |
| Com lime | 7 | 3-7.9 | | | | | |
| Oak | 160 | 2.5-7.7 | 80 | 55 | 6 | 2 | 2 |
| Plane | 1 | 2.7 | | | | | |
| Sallow | 2 | 2.1, 2.4 | | | | | |
| Scots pine | 1 | 2.7 | | | | | |
| Sycamore | 7 | 2.75-5 | | | | | |
| Walnut | 1 | 3.2 | | | | | |

**Table 30** Summarised tree survey data for Castle Coole

Two oak at Baronscourt have dated planting records of 1745, the largest having a girth of 4.44m. This girth is very comparable with trees of a similar age at Windsor Great Park – a tree of this girth at Windsor would be estimated as being of 230-240 years age (using data provided by J. White). The actual time since planting is 261 years which is only about 10% different – the Baronscourt tree is somewhat smaller in girth than a Windsor oak of equivalent age. This suggests that the Windsor girth/age relationship may be reasonably applicable locally. If this is so, then the largest oak at Castle Coole Park – 7.7m girth – would be about 640 years old, ie established in about 1365, long before the plantation estate was established. The presence of beech and oak which predate the 18th century landscaping is well known in the Trust.

Castle Coole Park's trees are well known and some are listed in Champion Trees (Tree Council of Ireland):

- *Quercus robur* – 6.59m gbh x 28.3m tall
- *Abies alba* – 5.44 x 33

But none are considered to be the Champion Trees of their species. However, the largest oak measured in 2006 is larger than any listed for County Fermanagh and so may be the county Champion. The field maple measured at 3.9 girth is also larger than the single tree listed at Castlecaufield (3.75m) and so is clearly the county Champion for that species.

8.3.4 Fungus survey

| Sites | Castle Coole |
|---|---|
| **No. trees surveyed** | 249 |
| % of trees with brackets | 26% |
| | |
| **No. of fungi species** | 158 |
| Heartwood saprotrophs | 8 |
| Thermophilus boletes | 0 |
| Grassland waxcaps | 7 |
| | |
| **Rare and unusual species** | |
| New species for Northern Ireland | 6 |
| Basidiomycete species not known in ROI | 21 |
| Basidiomycete species new for whole of Ireland | 5 |
| Red List species (Great Britain excluding NI) | 0 |
| European Red List species (1993) | 4 |

**Table 31:** Summary of fungus survey findings at Castle Coole

| Table Colour Key |
|---|
| Species of Ecological Groups/ Interest |
| British/ EU Red List Species |

Although 158 different species of fungi were recorded, this represents a very small proportion of the estimated total UK list of 20,000 species.

Castle Coole, which has 4 European Red List species, 7 Species new for Northern Ireland and 21 basidiomycete species new to the whole of Ireland, may be of significance in a European context and potentially a regional context.

| Fungi | Type of decay | Tree host | Nos of trees |
|---|---|---|---|
| *Fistulina hepatica* | Brown rot | Oak | 4 |
| *Laetiporus sulphureus* | Brown rot | Oak, beech | 6 |
| *Ganoderma australe* | White rot | Broadleaves | 29 |
| *Grifola frondosa* | White rot | Oak | 1 |
| *Inonotus dryadeus* | White rot | Oak | 19 |
| *Meripilus giganteus* | White rot | Beech | 1 |
| *Perenniporia fraxinea* | White rot | Oak | 2 |
| *Polyporus squamosus* | White rot | Broadleaves | 3 |
| Total number of trees/ site with fungal brackets | | | 65 |
| Nos trees surveyed/recorded | | | 249 |
| % trees with brackets | | | 26% |

**Table 32** Numbers of trees at Castle Coole with saprotrophic heartwood fungi and the different types of decay.

There was a diversity of deadwood saprotrophic species present which create either white or brown rot habitat. Fruit bodies of *Ganoderma australe*, which causes a white rot, were most evident. There was much less evidence

of fungi known to create brown rot. Many trees were hollow however there was no visual presence of bracket fungi on them and it is not possible to specify what might have been the causal fungus species.

Most of the fruit bodies were found on live standing trees as most fallen dead wood was generally limited to small lengths of branchwood or the occasional fallen tree. Some fallen trees had been relocated into surrounding woodland areas. However overall the lack of deadwood has probably reduced the potential quality and diversity of resupinate and poroid saprotrophic fungi within the areas surveyed.

| Species name | English name |
|---|---|
| **Theromophilus boletes** | |
| **Number of species per site** | **0** |
| | |
| **Other ectomycorrhizal boletes** | |
| *Boletus luridiformis* | Scarletina bolete |
| *Boletus luridus* | Lurid bolete |
| *Suillus grevilei* | Larch bolete |
| *Xerocomus declivitatum* | |
| *Xerocomus porosporus* | Sepia bolete |
| *Xerocomus subtomentosus* | Suede bolete |
| **Number of species per site** | **6** |

**Table 33** Numbers of thermophilous and other ectomycorrhizal bolete species at Castle Coole and their associated host.

There were no thermophilus boletes recorded.

Six different species of ectomycorrhizal boletes were recorded. Fruit bodies were generally scarce.

| Waxcaps | |
|---|---|
| *Cuphophyllus virgineus* | Snowy waxcap |
| *Hygrocybe conica* | Blackening waxcap |
| *Hygrocybe fornicata* | Earthy waxcap |
| *Hygrocybe pratensis* | Meadow waxcap |
| *Hygrocybe psittacina* | Parrot waxcap |
| *Hygrocybe punicea* | Crimson waxcap |
| *Hygrocybe russocoriaceus* | Cedarwood waxcap |
| **Number of species per site** | **7** |

**Table 34** Numbers of waxcap species at Castle Coole

Seven different species of waxcap fungi were recorded. Fruit bodies were generally scarce and recorded from the roadside verges leading to the main house where the grass is kept short through regular cutting.

Generally the parkland was poor for grassland species in diversity and frequency of fruit bodies. Where trees were concentrated it was a bit better.

Seven species are new for Northern Ireland and of these 5 are also new for the whole of Ireland.

| Species New for NI | English name | ROI Data-base |
|---|---|---|
| *Bolbitius reticulatus* | Netted Fieldcap | No |
| *Ceriporia reticulata* | | Yes |
| *Cyphella ferruginea* | | No |
| *Mycoacia fuscoatra* | | Yes |
| *Perenniporia fraxinia* | | No |
| *Phanerochaete laevis* | | No |
| *Phlebiopsis ravenelii* | | No |
| **Total species / site** | **7** | **5** |

**Table 35** Species at Castle Coole new for Northern Ireland and Republic of Ireland

There were four species of European significance at Castle Coole.

| Species | English name | British Red List | European Red List A and B |
|---|---|---|---|
| *Eichleriella deglubens* | | - | Red List EU |
| *Geastrum pectinatum* | a species of Earthstar | - | Red List EU |
| *Hygrocybe punicea* | Crimson waxcap | - | Red List EU |
| *Trichoglossum hirsutum* | Hairy earthtongue | - | Red list EU |

**Table 36** Species at Castle Coole on provisional British or European Red Lists

### 8.3.5 Lichen survey

Over a period of two and a half days at Castle Coole, 92 trees were examined, yielding 96 lichen species plus one additional variety and three lichenicolous fungi. County Fermanagh (v.c. 33) has been well recorded for corticolous lichens, as it contains the well-known lichen hot-spots of Florence Court and Crom Estate. Hence only two species from this survey (*Caloplaca phlogina* and *Opegrapha xerica*) were not previously recorded from the county (M.R.D. Seaward, pers. comm.). The former species name does not appear in 2006 BLS records from Northern Ireland, but earlier records of this species would have been recorded as *Caloplaca citrinas*. lat. Similarly, *Micarea micrococca* has no Northern Irish records, but would have been previously recorded as *Micarea prasinas. lat.* In total, 11 of the species recorded from Castle Coole are uncommon in Northern Ireland (5 hectads or less), including the species mentioned above, as well as *Physconia perisidiosa*, previously recorded from a single hectad (Crom) in Northern Ireland (4 hectads in Ireland as a whole).

Based on records made in the current survey, the site attains a NIEC score of 7 (7+0), and a RIEC of 30. If considered for a British site, these scores would tend to indicate low to medium conservation interest, but in the Irish context their indicative value is likely to be higher. A previous detailed survey by O'Dare and Coppins (1993a) recorded a number of species not found in the 2006 survey and thus yielded higher IEC scores: NIEC of 14 (12+2) and RIEC of 45. The discrepancy may be due in part to a longer, more detailed survey in the earlier case, as well as a wider remit - the earlier survey examined the woodlands as well as the parkland elements. Furthermore, there may have been actual losses: *Sticta limbata*, the only member of the *Lobarion pulmonariae* community found in the earlier survey was found on a single plane tree (Number X10, Tags [0903] and [NT BIO 01423]) but was not refound when the tree was revisited in 2006 despite thorough searching. A total of 18 species were recorded as new to

Castle Coole in 2006, though only two of these were IEC species *(Leptogium lichenoides* and *Leptogium teretiusculum)*.

Lichenologically, the most interesting parts of the estate were the avenue of oak trees numbered 123-134, the trees to the west of Loch Coole, and the southern part of Gortgonnell Field. The large veteran trees in the very north of Gortgonnell Field look very promising from afar, but for some reason they are actually rather poor for lichens.

A very preliminary lichen survey had been carried out by Alan Fryday in 1986 (Fryday, 1986) but little of interest identified.

### 8.3.6 Invertebrate survey

The parkland trees at Castle Coole support a high quality invertebrate fauna – notable in the context of Northern Ireland - and are of especial interest for wood-decay beetles.

The most important trees for these beetles are the older oaks. Aerial dead branches on the open-grown oak trees are the key habitat and support populations of the rare beetle *Phloiophilus edwardsi* and *Cis alni* as well as more widespread old parkland specialities such as *Orchesia undulata* and *Cis vestitus*. These all breed in the specialist fungi which decay lower canopy branches once they have been shaded out by the main canopy above. *P. edwardsi* and *Cis alni* are only otherwise known in Northern Ireland from Baronscourt Park and are rare throughout Ireland.

Bracket fungi fruiting on tree trunks are also important for rare beetles at Castle Coole. *Abdera flexuosa* develops in fruiting bodies of the bracket fungus *Inonotus radiatus* on dead alder stems growing in the boggy margins to the Lough and elsewhere – it is otherwise only known elsewhere in Ireland from two sites in County Fermanagh (including Crom) and Caledon Park. One further rare bracket fungus beetle *Dacne bipustulata* is plentiful in the fungus *Bjerkandera adusta* fruiting on the old beech trunk standing below the main drive towards the mansion.

The old horse chestnuts on Lord Belmore's land at Killynure proved to be of special interest for flies which develop in dried and fermenting tree sap. The midge *Forcipomyia pulchrithorax* had not previously been reported from Ireland, while a gnat of the genus *Mycetobia* was also found. This is either *M. obscura or M. pallipes* and both are rare species in Ireland, with records only from Counties Cork and Kerry. One other fly taken from these horse chestnuts, the gnat *Trichosia glabra*, is also previously unknown in Ireland. A further fungus gnat not previously known in Ireland was taken in a flight trap beneath one of the old oaks at Killynure, *Coelosia fusca* (it was also found at Drenagh in 2006).

A rare digger wasp *Passaloecus monilicornis* nests in old beetle holes in the tree trunks and preys upon aphids in the tree canopy. It was previously only known in Ireland from a few southern counties but was discovered in Caledon and Castle Coole Parks in 2006.

The lichen cover of the trees also provide habitat for rare and uncommon invertebrates. Castle Coole Park produced the two most important finds

of barkflies from the 2006 study. *Pseudopsocus rostocki* has been regarded as a rare wood pasture species in south-east England and has never been suspected as occurring in Ireland at all – its presence here is quite remarkable. *Peripsocus alboguttatus* is also a considerable surprise as it has only previously been reported in Ireland from County Cork. Both species were knocked from aerial dead branches on the lower canopy of parkland trees. Castle Coole is also one of the three parklands where the barkfly *Elipsocus moebiusi* was found in 2006 – another species not previously recognised as occurring in Ireland.

These finds place Castle Coole Park well above Crom in terms of invertebrate interest since the study of the invertebrate fauna of Crom has been badly neglected.

### 8.3.7 Site Management

There are five conacre tenants across the site and cattle grazing occurs between April 1st and October 30th (A. Houston, pers. comm.). All are within ESA schemes, with limited fertiliser allowed and controlled stocking using sucklers and calves. Water quality in the Lough is reported to be good. There appears to be a relaxed attitude to dead wood, with tidiness evident mainly along the main avenue and around the house.

A new planting plan has recently been agreed between the National Trust and EHS, under an EHS Parkland Scheme, with the 1834 OS map used as the basis.

The Golf Course is covered by a 999 year lease.

### 8.3.8 Specific conservation management issues

The biggest problem at Castle Coole is the Golf Course which cuts right across the concentrations of veteran oaks. Trees here have suffered very badly from removal of lower limbs and other extreme cutting. Losses appear to have been high too.

Elsewhere there are also problems with excessive cutting and clearance, especially along the main avenue, but this is balanced by a much more relaxed attitude elsewhere.

The new planting plans involves the establishment of 10x10m exclosures with nine trees planted inside, and at various points within the parkland (A. Houston, pers.comm.). The aim is that the nine will be thinned to one in time. This does seem a waste of trees and risks the form of the finally selected individual having been affected by the close proximity of competing individuals. It also begs the question of who will carry out the selection and thinning, and what criteria will be used, and even whether or not it will happen at appropriate times for tree health and form, if at all. A more simple single planting would involve less work long-term and would not risk the loss of form from overcrowding.

## 8.4 Castle Ward

### 8.4.1 Site Description

The Castle Ward Demesne lies on hummocky drumlin terrain overlooking the entrance to Strangford Lough and Castle Ward Bay. There are two main areas of parkland: the deer park south and east of the mansion, and parkland north from the Downpatrick Avenue to the north-west.

The deer park is grazed with cattle and sheep and the sward is largely semi-improved. Mixed scrub forms a prominent feature of the landscape, with elder, blackthorn and gorse all well-represented.

In contrast, the Downpatrick parkland has suffered intensive pasture management in the past, being managed for a dairy herd until very recently. Blocks of gorse scrub form a prominent feature of the western half. The area with the largest concentration of old oaks has been taken out of pasture in recent years and is now linked to the ornamental grounds, with a mown path out to a standing stone, but the rest left uncut.

Altitudinal range is approx 10-40m.

### 8.4.2 Site History

A Historical and Archaeological Survey has been carried out on the estate (McErlean & Reeves- Smith, 1990). The walled demesne of 321ha dates from the 16th century and Old Castle Ward is c 1590 (Register). A new mansion was built around 1720 to the north-west but this was demolished c 1850. The present mansion was built c 1761-7 and extensive landscaping was carried out subsequently. The National Trust has owned the demesne since 1953.

An OS survey of (1834) is available.

### 8.4.3 Tree Survey

The Downpatrick parkland is dominated by oak but there are also a few old ash, common lime and horse chestnut.

The deer park has old ash as a stronger feature, together with a few old oak and beech, as well as much sycamore and some Turkey oak. Ancient hawthorn and elder are an important feature and stands of blackthorn are also significant.

| Species | Total mapped | Girth range (m) | Cohort structure for selected species | | | | |
|---|---|---|---|---|---|---|---|
| | | | 2-3.9 | 4-4.9 | 5-5.9 | 6-6.9 | 7+m |
| Ash | 26 | 1.3-4.85 | 24 | 1 | | | |
| Beech | 9 | 3-6.5 | 4 | 4 | | 1 | |
| Cherry | 2 | 2.7, 3.3 | | | | | |
| Elder | 2 | 0.7, 1.2 | | | | | |
| Elm | 3 | 2.55-3.05 | | | | | |
| Hawthorn | 7 | 0.9-2.1 | | | | | |
| H chestnut | 1 | 3.95 | | | | | |
| Com lime | 10 | 3-4.6 | | | | | |
| Oak | 110 | 2-5.43 | 92 | 13 | 3 | | |
| Oak, Luccombe | 2 | 4, 4.25 | | | | | |
| Oak, Turkey | 1 | 4.62 | | | | | |
| Sallow | 2 | 1.8, 3.5 | | | | | |
| Sycamore | 22 | 2.68-5.93 | 15 | 4 | 2 | | |
| Walnut | 1 | 2.75 | | | | | |

**Table 37** Summarised tree survey data for Castle Ward

Two oak at Baronscourt have dated planting records of 1745, the largest having a girth of 4.44m. This girth is very comparable with trees of a similar age at Windsor Great Park – a tree of this girth at Windsor would be estimated as being of 230-240 years age (using data provided by J. White). The actual time since planting is 261 years which is only about 10% different – the Baronscourt tree is somewhat smaller in girth than a Windsor oak of equivalent age. This suggests that the Windsor girth/age relationship may be reasonably applicable locally. If this is so, then the largest oak at Castle Ward Park – 5.43m girth – would be about 340 years old, ie established in about 1665.

Castle Ward Park's trees are well known and many are listed in Champion Trees (Tree Council of Ireland):

- *Ulmus glabra* – 5.04 @ 0.5 x 24 – Irish Girth Champion
- *Ulmus glabra* – 4.45 @ 1.2 x 20.5
- *Acer pseudoplatanus* – 3.29 x 29.5 – Irish Height Champion
- *Athrotaxis laxifolia* – 2.78 x 16.5 – Irish Girth Champion

The two elms have been lost. The largest beech has greater girth than anything listed for County Down and may be the county Girth Champion.

### 8.4.4 Fungus survey

| | |
|---|---|
| Nos trees surveyed | 196 |
| **% of trees with brackets** | 26% |
| | |
| **Nos of fungi species recorded** | 82 |
| | |
| **Nos species of ecological interest:** | |
| Saprotrophs | 6 |
| Thermophilus boletes | 1 |
| Waxcaps | 3 |
| | |
| **Nos species:** | |
| New for Northern Ireland | 2 |
| New for whole of Ireland | 1 |

| | |
|---|---|
| Great Britain Red List species (excl NI) | 0 |
| European Red List species | 2 |

**Table 38** Summary of survey findings at Castle Ward

| Table Colour Key |
|---|
| Species of Ecological Groups/ Interest |
| British/ EU Red List Species |

Although 82 different species of fungi were recorded at this site, this represents a very small proportion of the estimated total UK list of 20,000 species.

| **Fungi** | **Type of decay** | **Tree host** | |
|---|---|---|---|
| *Fistulina hepatica* | Brown rot | Oak | 3 |
| *Laetiporus sulphureus* | Brown rot | Oak | 6 |
| *Ganoderma australe* | White rot | Broadleaves | 35 |
| *Grifola frondosa* | White rot | Oak | 1 |
| *Inonotus dryadeus* | White rot | Oak | 7 |
| *Meripilus giganteus* | White rot | Beech | 2 |
| **Total number of trees/ site with fungal brackets** | | | **54** |
| Nos trees surveyed/recorded | | | 198 |
| % trees with brackets | | | 27 |

**Table 39** Numbers of trees at Castle Ward with saprotrophic heartwood fungi and the different types of decay.

There was a diversity of deadwood saprotrophic species present which create either white or brown rot habitat. Fruit bodies of *Ganoderma australe*, which causes a white rot, were most evident. There was less evidence of fungi known to create brown rot. Many trees were hollow however there was no visual presence of bracket fungi on them and it is not possible to specify what might have been the causal fungus species.

Most of the fruit bodies were found on live standing trees as most fallen dead wood was generally limited to small lengths of branch wood or the occasional fallen tree. This has probably reduced the potential quality and diversity of resupinate and poroid saprotrophic fungi within the areas surveyed.

Thermophilus boletes were generally very poorly represented with only 1 species recorded. However, according to the Northern Ireland Database, thermophilus and ectomycorrhizal boletes (*bolete*, *suillius*, *xerocomus* and *leccinum* species) are not generally common anywhere in Northern Ireland.

| ***Species name*** | ***English name*** |
|---|---|
| **Thermophilus boletes** | |
| *Gyroporus castaneus* | Chestnut bolete |
| **Number of species per site** | 1 |
| | |
| **Other ectomycorrhizal boletes** | |
| *Boletus edulis* | Cep |
| *Xerocomus declivitatum* | |

| | |
|---|---|
| *Xerocomus porosporus* | Sepia bolete |
| *Xerocomus subtomentosus* | Suede bolete |
| **Number of species per site** | 4 |

**Table 40** Numbers of thermophilous and other ectomycorrhizal bolete species at Castle Ward and their associated host

Four different species of waxcap fungi were recorded. Fruit bodies were generally scarce. Generally the parkland was poor for grassland species in diversity and frequency of fruit bodies. Where trees were concentrated it was a bit better.

| ***Species name*** | ***English name*** |
|---|---|
| *Cuphophyllus virgineus* | Snowy waxcap |
| *Hygrocybe ceracea* | Butter waxcap |
| *Hygrocybe coccinea* | Scarlet waxcap |
| *Hygrocybe psittacina* | Parrot waxcap |
| **Number of species per site** | 3 |

**Table 41** Numbers of waxcap species at Castle Ward

Two species are new for NI and of these 1 basidiomycete species, *Ceriporia purpurea* is also new for the whole of Ireland. This species is also on the provisional European Red List.

| Species | English name | NI database | RoI Data-base |
|---|---|---|---|
| *Ceriporia purpurea* | | New for NI | No |
| *Nodulisporium cecidiogenes* | | New for NI | |

**Table 42** Species at Castle Ward new for Northern Ireland and whole of Ireland.

| Species | English name | NI database | RoI | BMS database/ British Red List | European Red List A and B |
|---|---|---|---|---|---|
| *Ceriporia purpurea* | | New for NI | New for ROI | 110 | Red List EU |
| *Hygrocybe ceracea* | Butter waxcap | | | | Red List EU |

**Table 43** Species at Castle Ward on the provisional British or European Red Lists

8.4.5 Lichen survey

A total of 52 lichen species were recorded from 70 trees at Castle Ward, over the course of two days of fieldwork. Three of these species were not previously recorded from v.c. H38 – County Down (M.R.D. Seaward, pers. comm.), including *Opegrapha xerica*, previously recorded from one hectad in Northern Ireland (two hectads in Ireland as a whole) and *Physcia tribacia* (two hectads in Northern Ireland). In total, eight species were recorded from five hectads or less in Northern Ireland.

The 2006 survey records give rise to a NIEC score of 3 (3+0) and a RIEC of 10. Previous records exist from a BLS visit to the Deer Park (Sanderson, 1992), but these included no ecological continuity indicators other than the widespread *Enterographa crassa*. Sanderson's report attaches special siginificance to the *Arthonietum impolitae* community and its southern affinities. However, this community was encountered frequently in the present survey of historic parklands. The BLS excursion also noted elder trees of being of special note, though elders examined in 2006 were

curiously sparse of lichens.

The most lichen rich parts of the site are the trees to the north of Castleward House (numbered 1–14) and the north west part of the Deer Park (trees 147 – 151). The trees in the far west of the site were found to be rather poor for lichens. Castle Ward was the only site out of the six visited where oak did not support the greatest number of lichens; 31 species were found on oak and 39 were found on ash.

### 8.4.6 Invertebrate survey

The parkland trees of Castle Ward Park appear to be of moderate quality for invertebrates.

The most important trees are the older oaks in the Downpatrick parkland. Aerial dead branches on the open-grown trees are a key habitat and support populations of widespread old parkland specialities such as *Cis vestitus* and *C. festivus* These two species breed in the specialist fungi which decay lower canopy branches once they have been shaded out by the main canopy above. *Cis vestitus* was previously thought to be a rarity in Ireland and had not been noted in Northern Ireland at all, but was found in all six study sites in 2006. *Cis festivus* was only known in Northern Ireland from Deramore Park and Rostrevor NNR, both in Co Down, but was found in four of the study sites. Bracket fungi are also of some interest, with the fruit fly *Hirtodrosophila confusa* being noted here and at Caledon Park, but previously unknown anywhere in Ireland.

The lichen cover of the trees also provide habitat for rare and uncommon invertebrates. Of particular interest is the picture-winged barkfly *Trichadenotecnum sexpunctatum* and *Reuterella helvimacula*, which are only known in Northern Ireland from historic parklands. Prior to the 2006 survey work, *Reuterella* had only been reported in Ireland from the Killarney area.

### 8.4.7 Site Management

The parkland has in the recent past being kept scrupulously clear of deadwood and any fallen material cleared away – this was especially the case in the Downpatrick parkland. The policy has clearly changed very recently, and large items of fallen oak trees have been left largely in situ, although 'lop and top' have generally been removed. The Downpatrick parkland is clearly still managed very intensively for cattle and sheep pasture, with nettle and thistles controlled by spraying.

The Deer Park has been less affected by intensive agriculture, but has fewer old parkland trees.

### 8.4.8 Specific conservation management issues

The western parkland - alongside Downpatrick Avenue – is in remarkably poor condition:

- Tree cover is relatively sparse, with many trees lost in recent decades and not replaced;
- Many of these trees are being severely damaged by the livestock

enterprise
- Tree roots are exposed by soil erosion caused by trampling;
- Soil compaction will also be causing root damage;
- Livestock are congregating beneath the tree canopies, exacerbating the root health issues;
- Heavy NPK fertiliser use will have damaged/destroyed mycorrhizal fungi and hence reduced the trees' abilities to withstand stresses from drought, compaction, etc
- Nonetheless, mineral/salt licks are being placed well away from the trees, which is good practice.

- The sward is very nutrient enriched and poor for tree survival.

## 8.5 Drenagh

### 8.5.1 Site Description

Drenagh lies on a ridge of land lying between the Castle River and Curly River immediately above their confluence. The estate comprises ornamental grounds around the mansion, an old avenue and intensively managed farmland with hedgerows and shelterbelts. There is only a very small area of parkland *per se*. Altitudinal range approx 30-40m

### 8.5.2 Site History

Drenagh demesne dates from the early 18th century when an earlier house was built in 1730; the present house was built on a slightly different site and completed in 1837. There is nothing to suggest any earlier parkland but the riversides may have relict ancient woodland, especially the Glen Plantation area.

OS surveys of 1836 and 1856 are available.

### 8.5.3 Tree Survey

| Species | Total mapped | Girth range (m) | Cohort structure for selected species | | | | |
|---|---|---|---|---|---|---|---|
| | | | 2-3.9 | 4-4.9 | 5-5.9 | 6-6.9 | 7+m |
| Ash | 15 | 1.97-5.13 | 10 | 3 | 1 | | |
| Beech | 10 | 3.48-6.4 | 4 | 4 | | 1 | |
| Hawthorn | 2 | 1, 1.36 | | | | | |
| H chestnut | 3 | 3.16-4.24 | | | | | |
| Com lime | 16 | 2.56-6.5 | 8 | 4 | 3 | 1 | |
| Oak | 45 | 1.74-5.3 | 36 | 7 | 1 | | |
| Scots pine | 1 | 2.74 | | | | | |
| Sw Chestnut | 2 | 4.54, 5.5 | | | | | |
| Sycamore | 7 | 3.95-5.1 | | | | | |

**Table 44** Summarised tree survey data for Drenagh

Two oak at Baronscourt have dated planting records of 1745, the largest having a girth of 4.44m. This girth is very comparable with trees of a similar age at Windsor Great Park – a tree of this girth at Windsor would be estimated as being of 230-240 years age (using data provided by J. White). The actual time since planting is 261 years which is only about 10%

different – the Baronscourt tree is somewhat smaller in girth than a Windsor oak of equivalent age. This suggests that the Windsor girth/age relationship may be reasonably applicable locally. If this is so, then the largest oak at Drenagh – 5.3m girth – would be about 320 years old, ie established in about 1685, long before the house was built.

Drenagh's trees are well known and many are listed in Champion Trees (Tree Council of Ireland):

- *Fagus sylvatica* – 6.28m gbh @ 1.3m x 23m tall
- *Tilia platyphylos 'Laciniata Variegata'* – 1.45 x 17m – Irish Height & Girth Champion
- *Cedrus atlantica* – 3.97 x 33.4 – 2nd tallest of its kind in Ireland
- *Populus nigra 'italica'* – 3.41 x 31 – 2nd tallest of its kind in Ireland; 2nd greatest girth of its kind in Ireland
- *Chamaecyparis pisifera 'squarrosa'* – 2.42 x 20.3 – 2nd tallest of its kind in Ireland; 2nd greatest girth of its kind in Ireland
- *Prunus lusitanica* – 2.02 @ 1.4 x 13.2 – Irish Height Champion
- *Mespilus germanica* – 0.73 @ 1.4 x 4m – 2nd greatest girth of its kind in Ireland.

These are all exotic species of course, introduced with the landscape gardens.

8.5.4 Fungus survey

| | |
|---|---|
| Nos trees surveyed | 102 |
| % of trees with brackets | 17% |
| | |
| Nos of fungi species recorded | 99 |
| | |
| Nos species of ecological interest: | |
| Saprotrophs | 6 |
| Thermophilus boletes | 0 |
| Waxcaps | 1 |
| | |
| Nos species: | |
| New for Northern Ireland | 4 |
| New for whole of Ireland | 2 |
| British Red List species | 0 |
| European Red List species | 2 |

**Table 45**: Summary of fungus survey findings at Drenagh

| Table Colour Key |
|---|
| Species of Ecological Groups/ Interest |
| British/ EU Red List Species |

Although 99 different species of fungi were recorded this represents a very small proportion of the estimated total UK list of 20,000 species.

| Fungi | Type of decay | Tree host | Nos. trees |
|---|---|---|---|
| *Ganoderma australe* | White rot | Broadleaves | 13 |
| *Inonotus dryadeus* | White rot | Oak | 1 |
| *Meripilus giganteus* | White rot | Beech | 1 |
| Total number of trees/ site with fungal brackets | | | 15 |
| Nos trees surveyed/recorded | | | 101 |
| % trees with brackets | | | 15 |

**Table 46** Numbers of trees at Drenagh with saprotrophic heartwood fungi and the different types of decay.

There was some diversity of deadwood saprotrophic species present which create white or brown rot and habitat. Fruit bodies of *Ganoderma australe*, which causes a white rot, were most evident. For all other white rot species there was only one tree per species with the fruit body present. There were no records for fruit bodies of fungi that cause brown rot out of 101 trees surveyed. Many trees were hollow; however, there was no visual presence of bracket fungi on them and it is not possible to specify what might have been the causal fungus species.

Most of the fruit bodies were found on live standing trees as most fallen dead wood was generally limited to small lengths of branchwood or the occasional fallen tree. This has probably reduced the potential quality and diversity of resupinate and poroid saprotrophic fungi within the areas surveyed.

Thermophilus boletes were absent. However, according to the Northern Ireland Database, thermophilus and ectomycorrhizal boletes (*Boletus, Suillus, Xerocomus* and *Leccinum species*) are not generally common anywhere in Northern Ireland.

| *Species name* | *English name* |
|---|---|
| **Theromophilus boletes** | |
| **Number of species per site** | **0** |
| | |
| **Other ectomycorrhizal boletes** | |
| *Boletus luridiformis* | Scarletina bolete |
| *Boletus luridus* | Lurid bolete |
| *Leccinum scabrum* | Brown Birch bolete |
| *Xerocomus declivitatum* | |
| *Xerocomus rubellus* | Ruby bolete |
| *Xerocomus subtomentosus* | Suede bolete |
| **Number of species per site** | **6** |

**Table 47** Numbers of thermophilous and other ectomycorrhizal bolete species at Drenagh

In addition six different species of ectomycorrhizal boletes were recorded. Fruit bodies were generally scarce. *Xerocomus rubellus* is new to Northern Ireland but has been recorded from RoI.

Just one species of waxcap fungus was recorded. Fruit bodies were generally scarce. However *Hygrocybe ceracea* is on the provisional European Red List.

Generally the parkland was poor for grassland species in diversity and frequency of fruit bodies.

Four species are new for Northern Ireland and of these 2 of the basiodiomycete fungi are also new for the whole of Ireland.

| ***Species new for Northern Ireland*** | ***English name*** | ***RoI Data-base*** |
|---|---|---|
| *Gloeophyllum sepiarium* | | No |
| *Helvella ephippium* | | |
| *Tricohloma sejunctum* | Deceiving Knight | No |
| *Xerocomus rubellus* | Ruby bolete | Yes |
| Total species / site | 4 | 2 |

**Table 48** Fungus species at Drenagh new for Northern Ireland and Republic of Ireland

Two species are on the provisional European Red List.

| ***Species*** | ***English name*** | ***NI database*** | ***RoI*** | ***BMS database/ British Red List*** | ***European Red List A and B*** |
|---|---|---|---|---|---|
| *Hygrocybe ceracea* | Butter waxcap | | | | Red List EU |
| *Tricohloma sejunctum* | Deceiving Knight | New for NI | New RoI | 274 records | Red list EU |

**Table 49** Fungus species at Drenagh on the provisional British and European Red Lists

8.5.5 Lichen survey

Being smaller than the other sites by quite a long margin, only a single day's survey was devoted to Drenagh Estate. In that time 38 lichen species were recorded from 61 trees. There were no new vice-county records and no species that occurred in less than five hectads in Northern Ireland; the least common species found were probably *Calicium viride* (6 hectads) and *Pertusaria hemisphaerica* (7 hectads).

The species record includes no NIEC species, and the RIEC score of 10 is based on *Enterographa crassa* and *Pyrenula chlorospila*, which are both widespread and rather weak indicators of ecological continuity in Ireland. The presence of *Arthonia pruinata, Bacidia rubella, Calicium viride, Pertusaria hemisphaerica* and *Schismatomma decolorans* indicate that bark conditions on the older trees are becoming suitable for the development of the *Calicion hyperelli* association of old dry bark (James *et al.,* 1977). The oak communities represented at Drenagh are typical examples of the *Arthonietum impolitae* alliance, which is a rather species-poor facies of the *Calicion*. The absence of the rarer species typically found in such communities is probably attributable to historical break in ecological continuity of the habitat.

### 8.5.6 Invertebrate survey

The parkland trees of Drenagh appear to be of moderate quality for invertebrates.

The most important trees are the older oaks and ashes. Aerial dead branches on the open-grown oak trees are a key habitat and support populations of the widespread old parkland specialities *Cis vestitus* and *Orchesia undulata* These two species breed in the specialist fungi which decay lower canopy branches once they have been shaded out by the main canopy above. *Cis vestitus* was previously thought to be a rarity in Ireland and had not been noted in Northern Ireland at all, but was found in all six study sites in 2006. The *Orchesia* was previously only known in Northern Ireland from Crom Castle Park and was regarded as a rarity throughout Ireland – it was also found in three other parklands during 2006.

The great surprise at Drenagh was the presence of the beetle *Cryptophagus ruficornis* on an old hollow sycamore in the old avenue. This was first reported as Irish only in 1997 when it was found at a site in County Antrim (Anderson *et al* 2000). It is associated with the fungus *Daldinia concentrica.* It seems likely however that this is a recent arrival in Northern Ireland, from SW Scotland.

Three other wood-decay species of note found at Drenagh are:

- the ambrosia beetle *Trypodendron domesticum*, as this has been regarded as a rarity in Ireland; it is known from Barnett's Park, Reas Wood, Moreland's Meadow and Castle Coole Park in Northern Ireland, and now Drenagh and Glenarm; the female beetle excavates a gallery deep into the sappy timber of freshly dead trunks and the larvae feed on the fungi which grow on the gallery walls from the spores carried by the mother beetle; the species has a degree of association with ancient woodlands and wood pastures in Britain;
- the doli fly *Medetera abstrusa*, only previously reported from Killarney and County Monaghan (Chandler 1982); thought to develop in debris beneath loose bark on dead trunks and boughs and/or in cavities and/or bracket fungi; the adults run over bark on well-lit tree trunks in search of prey and mates.

Yellow-legged black soldier fly *Pachygaster leachii* was found in the flight interception traps located at the edge of The Misk. This was previously only known in Ireland from a number of sites across the southern counties. It develops in moist decaying organic debris, and is known to use decaying wood as well as decaying grass litter, etc. It is a widespread southern species in Britain and so was unexpected in Northern Ireland. The traps also found the rare deadwood-developing fungus gnat *Anatella simpatica* which has only previously been reported in Ireland from County Wicklow.

The lichen cover of the trees also provide habitat for rare and uncommon invertebrates. Of particular interest is the picture-winged barkfly *Trichadenotecnum sexpunctatum*, which is only known in Northern Ireland from the historic parklands visited during the 2006 survey. Another species not previously known from Ireland – *Elipsocus moebiusi* – was also found at Drenagh as well as Castle Coole and Glenarm. It was found most widely at Drenagh.

The Misk also proved to be notably rich in fungus gnats which develop in fungi of shaded habitats other than wood-decay species. A number of species had not previously been found in Ireland: *Mycetophila autumnalis* (also found in Glenarm in 2006), *Zygomyia pseudohumeralis*, *Bradysia ismayi* and *Trichosia basdeni*. A scatopsid fly was also the first record for Ireland, *Apiloscatopse picea* (also found at Caledon Park in 2006). Other species of note include: *Allodia silvatica* which develops in cup fungi; *Exechia dizona* which develops in gill fungi (a great rarity in Britain but more widespread in Ireland); *Trichonta clavigera* which is associated with ancient woodlands in Britain and only previously known in Ireland from Charleville Woods, County Laois; *T. fragilis* which is a damp woodland speciality and only previously known in Ireland from County Wicklow; and *Phthinia nigra* (males are needed to identify this species and only females have previously been found in Ireland – this was the first Irish male to be found).

### 8.5.7 Site Management

Lower branches of trees cut and removed very widely on this site, presumably to increase light levels on ground beneath both for spring bulbs and grass growth.

## 8.6 Glenarm

### 8.6.1 Site Description

Glenarm is the southernmost of the seven Glens of Antrim which range northwards from Belfast, and drains a large block of mountain and moorland country which rises to above 400m. The Great Deer Park lies in the centre of the glen, straddling the Glenarm River and rising part way up the valley sides. Altitudinal range is approx 30-100m – despite the actual low altitude the habitats present have a strong upland affinity.

### 8.6.2 Site History

The Glenarm demesne of the McDonnell family, Earls of Glenarm, was founded in the 17th century (www.glenarmcastle.com), the original house being built in 1603. However there had been a castle in the glen since 1260; the pattern of tree cover is reported to be much the same today as was shown on Petty's maps of the 1650s (http://live.backonthemap.org.uk). The Great Deer Park appears to have had a long history although no details have become available during the course of preliminary enquiries. It contains what appear to be many interesting archaeological features, including at least two former water carrying channels. The entry in the Register of Historic Parks, Gardens and Demesnes does not begin to do it full justice, by only focussing on the 18th century and more recent features towards the mouth of the glen. The deer park only receives passing mention.

Part of the Great Deer Park has been designated as an ASSI – Glenarm Woods - but for its woodland and riverine features rather than the more extensive wood pasture habitats. A larger section of the deer park (160ha) has been managed as a Reserve by the Ulster Wildlife Trust since 1982 who manage it as grassland and woodland (www.ulsterwildlifetrust.org). The

surrounding plantations are managed by the Forest Service as Glenarm Forest (www.forestserviceni.gov.uk). The importance of the ancient wood pasture is not mentioned by any of these organisations.

### 8.6.3 Tree Survey

There is little or no sign of any planting within the Great Deer Park other than recent oak plantings between the river and main track at the south end. It seems probable that all of the older trees are self-sown and therefore represent a notable population of wild veteran oaks. High proportions of the older oaks are multi-stemmed but are not obviously old coppice stools. There are a variety of possible explanations, but it is most likely due to storm damage and/or browse damage to saplings by deer and other livestock. Young ash trees developing amongst wet alders and scrub are similarly multi-stemmed, making livestock browsing the most likely explanation.

| Species | Total mapped | Girth range (m) | Cohort structure for selected species | | | | |
|---|---|---|---|---|---|---|---|
| | | | 2-3.9 | 4-4.9 | 5-5.9 | 6-6.9 | 7+m |
| Alder | 18 | 1.22-7 | | | | | |
| Ash | 24 | 1.5-3.6 | | | | | |
| Birch | 7 | 1.2-1.9 | | | | | |
| Elm | 12 | 1.7-4.9 | | | | | |
| Hawthorn | 3 | 1.4-1.6 | | | | | |
| Oak | 376 | 1.05-8 | 245 | 46 | 27 | 5 | 5 |
| Sallow | 6 | 1.8-3 | | | | | |

**Table 50** Summarised tree survey data for the Great Deer Park at Glenarm

Two oak at Baronscourt have dated planting records of 1745, the largest having a girth of 4.44m. This girth is very comparable with trees of a similar age at Windsor Great Park – a tree of this girth at Windsor would be estimated as being of 230-240 years age (using data provided by J. White). The actual time since planting is 261 years which is only about 10% different – the Baronscourt tree is somewhat smaller in girth than a Windsor oak of equivalent age. This suggests that the Windsor girth/age relationship may be reasonably applicable locally. If this is so, then the largest oak at Glenarm – 8m girth – would be about 700 years old, ie established in about 1305.

### 8.6.4 Fungus survey

| | |
|---|---|
| Nos trees surveyed | 483 |
| % of trees with brackets | 11% |
| | |
| **Nos of fungi species recorded** | 181 |
| | |
| **Nos species of ecological interest:** | |
| Saprotrophs | 8 |
| Thermophilus boletes | 1 |
| Waxcaps | 7 |
| | |

**Table 51** Summary comparison of key fungi results at Glenarm

| Nos species: | |
|---|---|
| New for Northern Ireland | 14 |
| New for whole of Ireland | 8 |
| British Red List species | 4 |
| European Red List species | 10 |

| Table Colour Key |
|---|
| Species of Ecological Groups/ Interest |
| British/ EU Red List Species |

Although 181 different species of fungi were recorded, this represents a very small proportion of the estimated total UK list of 20,000 species.

Glenarm stands out as a very high quality site for fungi in a UK context and merits inclusion in *Important Fungus Areas*. This is based on Criterion A, as it has 4 UK Red list species on the revised British Red List plus one additional fungus which was on the Ing 1992 British Red List, 10 European Red List species, 14 species new to Northern Ireland and 30 basidiomycete species new to ROI. The number of European Red List species also indicates that Glenarm is an important site in a European context.

| Fungi | Type of decay | Tree host | nos. trees |
|---|---|---|---|
| *Fistulina hepatica* | Brown rot | Oak | 20 |
| *Laetiporus sulphureus* | Brown rot | Oak, beech | 2 |
| *Piptoporus betulinus* | Brown rot | Birch | c3 |
| *Ganoderma australe* | White rot | Broadleaves | 4 |
| *Inonotus dryadeus* | White rot | Oak | 8 |
| *Inonotus hispidus* | White rot | Ash | 2 |
| *Phellinus igniarius* | White rot | Willow | 2 |
| *Polyporus squamosus* | White rot | Broadleaves | 1 |
| **Total number of trees/ site with fungal brackets** | | | **39** |
| Nos trees surveyed/recorded | | | 483 |
| % trees with brackets | | | 8 |

**Table 52** Numbers of trees at Glenarm with saprotrophic heartwood fungi and the different types of decay.

There was a diversity of deadwood saprotrophic species present which create either white or brown rot habitat. Fruit bodies of *Fistulina hepatica*, which causes a red rot, were most evident. There was less evidence of fungi known to create white rot.

| Species name | English name |
|---|---|
| **Theromophilus boletes** | |
| *Leccinum pseudoscabrum* | Hazel bolete |
| **Number of species per site** | **1** |
| | |
| **Other ectomycorrhizal boletes** | |
| *Boletus edulis* | Cep |
| *Boletus luridus* | Lurid bolete |
| *Leccinum scabrum* | Brown Birch bolete |
| *Leccinum varicolor* | Mottled bolete |

**Table 53** Numbers of thermophilous and other ectomycorrhizal bolete species at Glenarm and their associated host.

| | |
|---|---|
| *Xerocomus subtomentosus* | Suede bolete |
| **Number of species per site** | **5** |

Thermophilus boletes were generally very poorly represented with only 1 species recorded and fruit bodies were generally scarce. However, according to the Northern Ireland Database, thermophilus and ectomycorrhizal boletes (*Boletus, Suillus, Xerocomus* and *Leccinum species*) are not generally common anywhere in Northern Ireland. *Leccinum pseudoscabrum* is new to the whole of Ireland.

| **Species** | **English name** |
|---|---|
| *Cuphophyllus virgineus* | Snowy waxcap |
| *Hygrocybe conica* | Blackening waxcap |
| *Hygrocybe irrigata* | Slimy waxcap |
| *Hygrocybe pratensis* | Meadow waxcap |
| *Hygrocybe psittacina* | Parrot waxcap |
| *Hygrocybe punicea* | Crimson waxcap |
| *Hygrocybe russocoriaceus* | Cedarwood waxcap |
| Number of species per site | 7 |

**Table 54** Numbers of waxcap species at Glenarm

Seven different species of waxcap fungi were recorded. Fruit bodies were generally scarce. At Glenarm they were mainly found in two small areas, one immediately to the west of Middle Bridge and the other further towards the main house on the east side of the road.

Generally the grazed areas were rich in species diversity and frequency of fruit bodies.

| **Species new for NI** | **English name** | **RoI Data-base** |
|---|---|---|
| *Amanita friabilis* | Fragile amanita | No |
| *Chromocyphella muscicola* | | Yes |
| *Cyphella ferruginea* | | No |
| *Inocybe erubescens* | | Yes |
| *Ionomidotis fulvotingens* | | |
| *Lactarius azonites* | | Yes |
| *Mycena corynephora* | | No |
| *Mycoacia fuscoatra* | | Yes |
| *Nodulisporium cecidiogenes* | | |
| *Phlebiopsis ravenelii* | | No |
| *Pholiota tuberculosa* | | No |
| *Tremella steidleri* | Brown brain | No |
| *Tricohloma sejunctum* | Deceiving Knight | No |
| *Tulasnella violea* | | No |
| *Vuilleminia coryli* | | Yes |
| **Total species / site** | 14 | |

**Table 55** Species at Glenarm new for Northern Ireland and the whole of Ireland.

Fourteen species new to Northern Ireland and 8 basidiomycete species new to the whole of Ireland were recorded. Two species are new for Northern

Ireland and also not previously recorded in the Republic of Ireland. These two species *Tricholoma sejunctum* and *Pholiota tuberculosa* are on the provisional European Red List.

| Species | English name | NI database | ROI | BMS database/ British Red List | European Red List A and B |
|---|---|---|---|---|---|
| *Amanita franchetii* | | | No | 55 | Red List EU |
| *Amanita friabilis* | Fragile amanita | New for NI | No | 6/ Red List Endangerd | Red List EU |
| *Amanita lividopallescens* | | 1 record Aug | No | 18/ Red List Vunerable | |
| *Cortinarius nemorensis* | | | Yes | | Red List EU |
| *Geoglossum atropurpureum* | Dark-purple Earthtongue | NI Priority Species SoCC | | | Red List EU |
| *Hygrocybe punicea* | Crimson waxcap | | Yes | | Red List EU |
| *Inonotus hispidus* | Shaggy Braket | 2 records pre 1980 Sept | Yes | 931 | Red List EU |
| *Lactarius fuliginosus* | Sooty milkcap | | Yes | | Red List EU |
| *Pholiota tuberculosa* | | New for NI | No | 158 | Red List EU |
| *Russula aurea* | Gilded brittlegill | 1 record pre 1980 | No | 60/ Red list Vunerable | |
| *Tremella steidleri* | Brown brain | New for NI | No | 25/ Red List Rare | Red List EU |
| *Trichoglossum hirsutum* | Hairy earthtongue | | | | Red list EU |
| *Tricohloma sejunctum* | Deceiving Knight | New for NI | No | 274 | Red list EU |

**Table 56** Fungus species at Glenarm on the provisional British and European Red Lists

8.6.5 Lichen survey

Glenarm is the largest and contains the greatest number of trees of the six sites so the two days spent there were not really sufficient to provide a good coverage of the habitat. A total of 78 lichen species plus two additional varieties was recorded from 72 trees. Three of these had not previously recorded from v.c. H40 – County Londonderry (M.R.D. Seaward, pers. comm.) and 12 species were previously recorded from five or fewer hectads in Northern Ireland. Of particular note are *Lecidea doliiformis* (2 hectads in Northern Ireland, 3 in Ireland as a whole) and *Lepraria rigidula* (1 hectad in Northern Ireland, 2 in Ireland as a whole). This probably reflects the good range of habitats present, with old wood pasture grading into closed woodland and riparian habitats.

These species records give rise to a NIEC of score of 10 (9+1) and a RIEC score of 35. These are the highest of all six sites, despite the fact that the total number of taxa recorded is smaller than those of Baronscourt and Castle Coole.

Glenarm was visited by the BLS in 1992 and many ecological indicator species (including several of the *Lobarion* association) were recorded that were not recorded in 2006. Some of these species were probably found in closed woodland situations though others may well be found in parts of the wood pasture habitat that were not seen during the present survey. There are no localities associated with the 1992 records, but as far as it was possible to discern in 2006, the richest parts of the site are the area around, and to the south of, Corby Bridge. If the 1992 records were included with the 2006 records the IEC scores would be NIEC = 15 (13+2) and RIEC = 50.

### 8.6.6 Invertebrate survey

The parkland trees within the Great Deer Park at Glenarm support a high quality invertebrate fauna – of notable quality in a whole Irish context - and are of especial interest for wood-decay beetles.

While oak is the most frequent tree species present, the concentrations of ancient alder are also of especial note for wood-decay beetles. Old fruit bodies of the bracket fungus *Inonotus radiatus* on standing dead stems are the larval habitat of the extremely rare Irish beetle *Orchesia micans*, only previously known from 'Kenmare' in County Kerry in 1898. Large numbers of larvae were found in the brackets, especially on the east side of the glen. This fungus is more typically the host of another rare Irish beetle *Abdera flexuosa*, which is only known from three sites in County Fermanagh and Caledon Park in County Tyrone. The absence of this species from Glenarm is therefore striking – whether this reflects a competitive interaction or different ecological preferences is unclear. In Britain, the *Orchesia* is more widespread on open-grown host trees, while the *Abdera* is most often found in sheltered, humid, and more shaded situations. This would suggest that the species have the potential to co-exist in Glenarm, where alder is locally widespread and occurs in dense stands as well as more open-grown situations.

Aerial dead branches on the open-grown oak trees are also a key habitat and support populations of another rare beetle *Orchesia minor* as well as more widespread old parkland specialities such as *Cis vestitus*. These all breed in the specialist fungi which decay lower canopy branches once they have been shaded out by the main canopy above. The *Orchesia* was first discovered in Ireland at Muckross in the Killarney Woodlands of County Kerry by Janson (1920) but had not been reported since. Its discovery in Glenarm is therefore of considerable interest,

A fallen oak branch within the open wood pasture was also found to be supporting a large population of the fungus beetle *Agathidium confusum*, a notable rarity in Britain and not previously known from Ireland at all. Its ecology is little known but is assumed to develop in the fruiting bodies of wood-decay fungi.

The interest of Glenarm's wood-decay beetles extends further. Some early records of beetles from the Glenarm valley were published by Thomas Brunton (1878) and include '*Elater cinnabarinus*' – a species now known as *Ampedus pomorum* and still present in the valley. This is one of Ireland's most attractive and spectacular beetles with its cardinal red wing-cases and contrasting black body. Two adults were seen in the course of the survey - one resting beneath loose bark on a hanging dead oak bough (probably a larval development site) and another swept from vegetation beneath an ancient open-grown oak. Glenarm was also found to be the most interesting site for longhorn beetles, with five out of the six species encountered during the project. The two most interesting are *Alosterna tabacicolor* and *Pogonocherus hispidulus*. The former was previously only known in Northern Ireland from Crom Castle Park in County Fermanagh, while the latter only from Rostrevor and Portulla Woods.

Pockets of decay within the larger trees – alder as well as oak – also support

a notably large population of the spectacular black and orange cranefly *Dictenidia bimaculata*. This species is only known in Northern Ireland from Baronscourt and the Great Deer Park of Glenarm, and is rare throughout Ireland.

As well as being the richest site for wood-decay invertebrates, Glenarm proved to have the most species-rich barkfly (Psocoptera) fauna, with 22 species out of the 33 noted during all six surveys. The lichen cover of the trees provides habitat for a wide range of rare and uncommon invertebrates, with barkflies a key group. The 22 recorded in Glenarm include four species which had previously been regarded as Irish rarities - *Loensia fasciata, L. variegata, Pteroxanium kelloggi* and *Reuterella helvimacula* – but which have been found to be widespread in the historic parklands.

Black-fringed moss-snipefly *Ptiolina obscura* is another species of interest noted in Glenarm. The larvae appear to be specialist feeders on mosses encrusting tree bark and bare soil, eg *Hypnum spp*, but not tall dense moss cover, and most British records are from woodland sites. There appears to be just one previous record from Northern Ireland - Holywood in County Down – and only two from the south (Counties Kerry and Wicklow) (Chandler 1975).

The flight traps added a number of other fungus breeding and wetland flies of interest. The fungus gnat *Mycetophila autumnalis* had not previously been reported from Ireland (although was also found at Drenagh in 2006) while *Trichonta fragilis* was previously only known from County Wicklow and *Mycetophila signata* was previously only known in Ireland from County Cork – it develops in boletes and other terrestrial fungi. Two rare wetland moth flies were found: *Pericoma crispi*, previously known from County Wicklow and very rare in Britain, and *Telmatoscopus vaillanti* which was not known in Ireland until 2006 (also found at Castle Ward).

### 8.6.7 Special ecological interest

The Great Deer Park of Glenarm is very clearly an outstanding site ecologically and appears to be of SAC quality rather than ASSI, for its:

- extent of long-established, high quality and clearly viable working wood pasture habitat;
- relatively species-rich assemblages of fungi, lichens and invertebrates;
- dynamic tree population, at its most natural in terms of age structure, relationship with vegetation and soils generally, with natural regeneration promoted by thorn scrub, and fallen trees re-covering as 'phoenix trees';
- relative lack of disturbance or damage caused by modern intensive agriculture, forestry or tidiness.

It is extremely important that this site continues to be managed very sensitively. It would also form a unique research site for studies on the relationships between natural tree and shrub cover and grazing large herbivores.

### 8.6.8 Site Management

A reserve management plan was not available at time of writing. A number of active management operations were noted during the survey. The present grazing regime appears to be well suited to the conservation interests of the site, although a large section is currently fenced out from the grazing areas. These ungrazed areas have recently been subject to hazel coppice management. Clearance of thorn scrub was noted in many areas and is of concern. One area of the upper park has been fenced and planted up with oaks, although the fenceline is no longer stockproof. The rationale for these operations is not easy to discern without access to the site management plan.

### 8.6.9 Specific conservation management issues

The key management issues for nature conservation here are:

- The need to expand the present ASSI boundaries to include all native vegetation, and to redraft the ASSI citation to recognise the great ecological importance of the wood pasture habitat;
- Retention of thorn scrub for its potential to promote natural regeneration of trees and shrubs;
- Retention of light grazing pressure throughout most of the site;
  - The exclusion of such a large central area from grazing requires re-assessment;
  - If hazel coppicing is considered a desirable use of this site then smaller scale working would be advisable, with temporary fencing used to protect re-growth, or at least a gated compartment system whereby grazing is restored at the earliest opportunity after cutting;
  - But note that Glenarm has some hazels with rare epiphytic lichens and these communties could be destroyed by coppicing - the important hazels are probably quite localized and a responsible conservation maanger would arrange for a full lichen survey of the entire site to be undertaken before carrying out any further coppice cutting operations;
- Reliance on natural regeneration rather than tree-planting:
  - The oak population appears vibrant, with an unusually good age structure, and little or no sign of problems;
  - While the general lack of youngest age classes may be of some concern, planting is not the answer; the situation may resolve itself now that jay have returned to the valley.
- Enhancement works beyond the present semi-natural vegetation:
  - allowing reversion of any fertilised pastures;
  - removing the conifer plantations and restoring area to wood pasture.

# 9 EXPLORATION OF DATA

## 9.1 Ecological aspects

9.1.1 The special ecological interests of parkland and wood pastures

The key features of biodiversity interest in parklands and wood pastures are:

- the populations of older age class trees and shrubs, which tend to be rare or absent from all other habitat types;
- the species-richness and quality of:
  - saprotrophic fungi and saproxylic invertebrate communities associated with the wood decay process;
  - epiphyte communities – lichens, bryophytes and invertebrates - associated with the relatively well-lit wood and bark surfaces;
  - mycorrhizal communities associated with the roots of open-grown trees.

Wood pastures and historic parklands with concentrations of old trees and/or pollards are among the richest tree habitats for fungi, lichens and invertebrates in the British Isles (Harding and Rose, 1986; Ing, 1996). This type of habitat has a vital role to play as a reservoir of especially sensitive species. Loss of continuity of ancient trees and their heartwood is a major concern in the conservation of this type of habitat for saprotrophic fungi and also for the mycorrhizal fungi eg the thermophilous boletes associated with trees roots, as well as for lichens and invertebrates. Across northern Europe there has been a dramatic decline in silvopastoral systems, for example in Germany where the remaining small areas are increasingly recognised for their unique character and especially where they retain ancient oaks trees in sparse stands (Finck *et al.,* 2005). Furthermore where wood pastures and parkland remain in Europe there is evidence that soil acidification and nitrification is leading to rapid decline in what were once common species.

Sites which are particularly rich in these organisms tend not only to have relatively large and diverse populations of open-grown trees and shrubs but also to have a long documented history of such woody growth, ie ancient wood pastures and historic parklands. Many of the key species are strongly associated with the oldest examples of the habitat, as demonstrated by research into paper archives. These species have therefore been used as indicator species for site quality for the habitat, although assemblages of such species are thought to be more reliable that single species in isolation. The strong association with long-established examples of the habitat has been further supported by palaeo-ecological studies on sub-fossil remains in dateable deposits, particularly with the saproxylic beetles.

It is common to see the statement that there is 'no trace of any primeval forest' in Ireland. This is really a statement of the obvious and is equally true throughout Europe – it isn't a useful statement and tends to distract people from considering ecological continuity. The important questions are the degree of modification and the extent of survival of the characteristic species.

Wood pasture habitat is thought to be closer to the concept of natural forest than any other form of woodland management, as it includes the

characteristic combination of mixed tree species and ages, with veteran trees and open areas (Sanderson & Wolseley, 2001). This makes the habitat type of considerable ecological interest beyond its species associations as it offers important clues to the structure of the postglacial native vegetation of Europe.

Ecological thinking about the origins of the biological communities of wood pastures and parklands has been developing following the publication of *Grazing Ecology and Forest History* (Vera, 2000). Until recently, the prevailing hypothesis about the structure of the postglacial vegetation was that closed canopy high forest dominated the landscape (as proposed by Arthur Tansley, A.S.Watt and G.F.Peterken). Vera (2000) proposed that the activities of wild large herbivores maintained a shifting mosaic comprising open pastures with scattered trees, thorn scrub and 'groves' of closed canopy woodland – essentially a wood pasture or parkland type of vegetation structure.

The high forest hypothesis fails to explain the richness of the biological communities associated with large old and open-grown trees and shrubs:

- Light levels on tree trunks and other bark surfaces under such closed canopy conditions would be too low to support the diverse epiphyte communities, and the poor illumination would also result in limited warming of the trunks and boughs from sunlight which would be detrimental to many saproxylic invertebrates.
- More damning is the form of tree growth which is possible under closed canopy conditions – trees drawn up tall and thin by competition for light provide very poor habitat for saproxylic species and the probability of survival beyond full canopy development is very low, and so trees would not have lived to their full potential and would not have developed into ancient trees. Without aging and ancient trees, the dependent saproxylic communities would not have survived.
- Vera (2000) has additionally pointed out that oak and hazel do not regenerate under closed canopy conditions and yet the palaeo-ecological studies have consistently demonstrated the widespread and abundant presence of oak and hazel pollen.

The pollen diagrams - upon which the high forest hypothesis is based – have since been shown to be highly misleading in terms of the implications to forest structure (Buchwald & Svenning, in press). They cannot be used to distinguish between closed canopy forest and open wood pasture conditions.

Vera (2000) has therefore now provided a more plausible hypothesis for the structure of the postglacial wildwood – one which is actually consistent with most if not all experience with relict old forest or old growth communities as well as the fossil record - as demonstrated by research on dated deposits. It remains a hypothesis however.

Rackham (2006) states that 'conservation should be based on practical observation rather than unstable theory'. This is very pertinent to any discussion of the nature conservation interests and management requirements of old wood pasture habitats – wherever they occur. It is clear that the historic parklands surveyed during 2006 contain important

concentrations of ancient and veteran trees, and that associated with them are unique and species-rich assemblages of fungi, lichens and invertebrates. The trees and their biological communities are of considerable nature conservation interest and merit special conservation measures.

### 9.1.2 The value of 'introduced' trees and shrubs for biodiversity

Native verses non-native is often seen as a black and white issue, that - before people colonised the land – there was some sort of pristine natural vegetation (generally termed 'the wildwood') comprising the native species. As humans colonised, expanded, and developed technologies, they gradually modified the pristine environment (now termed 'semi-natural') and either intentionally or accidentally brought in other species which then became established. These are termed 'non-native' or 'introduced' species. The human altered vegetation also became suitable for other species which were then able to colonise. This latter category tends to be subsumed in the non-native category, although they fit better as natives since they colonised naturally - as did the true natives. This approach has become something of a mythology in wildlife conservation, and does not bear close scrutiny. Two biological aspects seriously undermine this mythical imagery: species mobility and the structure and composition of the wildwood. There are almost certainly other rational objections.

All trees and shrubs - and their associated wildlife - presumably had to colonise or re-colonise the land following the last glaciation. As they arrived and established they would have provided limited habitat to the species which had preceded them. Their associates would have followed afterwards as these presumably could not establish until the keystone or host species were established. This process is a continuous one and did not stop once human technologies had been developed and once humans had begun to have a significant impact on the ecological landscape. Species continue to colonise, perhaps in response to human-altered landscapes, perhaps in response to human-induced climate change, and almost certainly in response to other things. Species continue to be brought in direct by humans, albeit accidentally or – perhaps more accurately – recklessly.

Once this background is fully appreciated and understood, the value and implications of terms like 'native' and 'semi-natural' become much more obscure, and of academic rather than pragmatic interest.

There are however other important biological considerations. Many so-called non-native tree and shrub species are as capable of supporting native or 'semi-natural' communities as true native tree and shrub species. Parklands and other forms of wood pastures provide the best examples since their key biodiversity features – epiphyte, saproxylic and mycorrhizal communities – are relatively less species-specific in their host associations in comparison to other biological communities. Conventional 'introduced' tree and shrub species can even provide better quality habitat for these communities than long-established 'natives'.

Introductions are not necessarily poorer for fungi, lichens or their associated invertebrates as many species are not precisely tied to a particular tree or shrub species but can exploit others to some extent. This is especially the case where the introduced plant is taxonomically close to a native species,

or where structural similarities, e.g. the type of heartwood, are present (Alexander *et al,* 2006). Often they provide the necessary conditions when the normal host is not present. Wood-decay communities exhibit many fascinating patterns between tree species – a good example being provided by the heartwood of sweet chestnut and false acacia *Robinia* which decays in a very similar way to oak and supports some of the invertebrate species more associated with decaying oak – the heartwood-decay *fungus Laetiporus sulphureus* is the link not the host tree species.

Tree species differ in whether they have true heartwood eg oak and sweet chestnut or ripewood eg beech, ash and birch, it is thought that this distinction probably has little impact on the actual wildlife values of the tree species concerned. All tree species are assumed to naturally hollow at some time in their life through the activity of fungi and other micro-organisms, thus the older stages for any particular tree or shrub species will support a wider range of wood-decay associates.

A well-known example of the value of a tree regarded by many as non-native is the sycamore[1] the bark of which can be of great interest for epiphytic lichen communities. This relates to surface texture, pH and nutrient status of the bark rather than directly to the host tree species (Sanderson & Wolseley, 2001). Old growth lichen species are usually associated with bark of pH 5-7. Bark pH is relatively high in sycamore and Norway maple, indeed the latter has similar bark characteristics to wych elm. In section 6.4, the lichen data from the 2006 surveys has been examined from this point of view and demonstrates that, numerically, the most important exotic species was sycamore, closely followed by beech, both of which were host to approximately 28% of all species recorded. There is no evidence to suggest that these particular lichen species are not native, and – indeed – all of the species found on beech also occurred on native tree species within the sites.

The importance on non-native broad-leaved veteran trees for native saproxylic insects has regularly been emphasised in Irish publications by Martin Speight (1985, 1987, etc) who has pointed out that 'It would seem highly likely that, in its present imperilled condition, the Irish saproxylic fauna is dependent to a significant extent upon old trees of introduced genera for its very survival, simply because there are so few old trees of indigenous species available to provide appropriate habitats' (Speight, 1987).

[1] Sycamore has long been assumed to be a non-native plant in both Ireland and Britain, but Green (2005) has recently outlined a scientific argument for it being regarded as a native, in Britain at least, which has not yet been rigorously scientifically tested and found to be wrong.

## 9.2 Historical and cultural contexts

### 9.2.1 The cultural landscape and biodiversity

The discussion of woodland history in the 2000 review (Anderson *et al*, 2000) failed to acknowledge that the special interest of wood pastures and parklands concerns veteran trees and shrubs growing in well-lit situations. The history of woodland cover is a distraction, as it is the history of open-grown trees and shrubs in the open cultural landscape that is key to the survival and conservation of the specific interests. Dense stands of trees managed for timber products and/or game are an entirely different habitat type.

Woodland history tends to be easier to research as it concerns areas valued and carefully protected for their timber, and relatively well-documented as a result. Wood pasture habitats in contrast attract much less attention unless they are enclosed within historic parklands. They are best detected by field work rather than desk study. This is certainly the case in England and there seems to be no good reason why it is not so in Ireland too. A good example from southern England is the cultural landscape of the Cotswold escarpment, where the uneven, steep, and old land-slipped ground could really only be exploited by people as rough pasture or woodland. It would appear historically that rough pasture was the most profitable use as there are now few enclosed ancient woodlands. Interestingly the rough pastures have a variable light cover of veteran and ancient trees, maidens as well as pollards. No documentation of this historic land management system has been found and probably does not exist – it was 'ordinary' land or 'waste' locally, and not as valued to the local people as the meadow land or the arable fields. Casual invertebrate recording in recent years has revealed that the veteran trees and shrubs through this old cultural landscape are remarkably species-rich in saproxylic species and especially in 'mature timber', relict 'old forest', or old growth species (Alexander, 2003). Casual fungal recording has subsequently found key ancient tree fungi species such as the UK BAP priority species oak polypore *Piptoporus quercinus*.

There is a need for more research into the cultural landscapes of Ireland, and studies which consider the open tree cover element to the landscape, before any judgments can justifiably be made on the history of open-grown trees.

### 9.2.2 Designed landscapes and biodiversity

The historic parklands of Ireland are all *de facto* designed landscapes, in that the owner/manager selected the site, enclosed it and began to modify the tree and shrub content. Planting with imported tree stocks – native as well as non-native species - was very probably carried out, especially in more recent centuries. This is very apparent in five out of the six study sites. The Great Deer Park of Glenarm is exceptional in comprising only locally native tree and shrub species, most if not all of which appear to be self-sown.

High biodiversity values appear to be strongly correlated with the establishment of deer parks in the Northern Irish sites just as is the case in England. It is likely that this is partly related to the less intensive

management of the trees within deer parks in comparison with other types of parkland and also the continuity of pasture and grazing management.

In Victorian times there were over 7000 houses with associated parks on 4ha or more in Ireland (Reeves-Smyth, 1997). What proportion of these lie within Northern Ireland and which of these still contain concentrations of veteran trees has not been investigated as part of this project.

The lichen survey concluded that the lichenological interest associated with nineteenth century designed landscapes is directly related to the degree of association with a pre-existing cultural landscape of woods and wood pasture. This is equally true for fungi and invertebrates.

### 9.2.3 Land management impacts on nature conservation values and recommendations for multi-disciplinary conservation objectives

A general requirement of the project is to provide recommendations on site management to ensure that the habitat is maintained and enhanced, where appropriate. The key documents in this respect are;

- *Trees in historic parks and landscape gardens* (Ancient Tree Guides No. 2, Woodland Trust & Ancient Tree Forum),
- *Trees and farming* (Ancient Tree Guides No. 1, Woodland Trust & Ancient Tree Forum),
- *Livestock Grazing in National Trust Parklands – its impact on tree health and habitat* (Cox and Sanderson, 2001) and
- *Veteran Trees: A guide to good management* (Read, 2000) which address the key land management issues.

#### 9.2.3.1 Priority 1 – avoid root damage

The greatest priority – for historic landscapes as well as nature conservation – is to keep the trees and shrubs alive and healthy. The commonest reason for declining health arises from root damage. Root damage can arise from a wide range of causes:

- Compaction, due to vehicle use over the root zone and also livestock concentrating beneath tree canopies for shade or where supplementary feeders and/or water troughs are placed too close to trees;
- Standing water, causing anaerobic conditions around the roots, which may be caused through land management works in the surrounding landscape;
- Droughting of soils, partly natural but also may be caused by land drainage and water abstraction activities;
- Physical damage from cutting trenches, resurfacing of vehicle access, ploughing and re-seeding, etc, as well as vehicle impact to root buttresses and gnawing by livestock, cutting off roots from their carbohydrate supply from the tree canopy;
- Disruption of mycorrhizal fungal[2] associations with the tree roots

[2] Mycorrhizal fungi are symbiotic with the tree roots, supplying many benefits to the tree in return for carbohydrates. The fungal mycelium spreads throughout the soil around the tree, accessing sources of water and minerals well beyond the scope of the tree's own roots, and also blocks access by root pathogens.

through

- application of agrichemicals to the pastures around the trees, including NPK fertiliser, lime and slurry;
- veterinary treatments to livestock which are voided in the dung and/or urine, with routine use of antibiotics almost certainly a key problem area, although anthelmintics have also been cited as a potential issue; the impact of these chemicals on tree roots and fungi has not been subject to any research;
- well-rotted farmyard manure is much less damaging.

Basically tree health will be best where soil damage is least and where land-use is extensive rather than intensive, with moderate to low levels of stocking. Trees with protection from mycorrhizal fungi are believed to be much less prone to root pathogens such as Phytophthora as well as to drought conditions.

It is important to stress that roots and their fungal mycorrhiza extend out from the tree much further than the drip line of the canopy and therefore an area that has a radius which is more than two and a half times the canopy is the minimum to be protected from damaging operations. This area need not be a perfect circle (See British Standard 5837).

Best practice was seen at Glenarm, where the old deer park area is mostly grazed extensively, with agrichemicals used only very locally on the gentler ground, if at all. Much of the old deer park at Baronscourt is also in relatively good condition due to cessation of fertilising in recent years. Much of the pasture at Castle Coole is similarly in relatively good condition due to cessation of fertiliser use under the ESA Scheme but it suffers from poaching damage and waterlogging due to the relatively high rainfall there.

Worst practice was seen in Caledon Deer Park, where the pastures are very heavily stocked and feeders/licks have been placed beneath tree canopies with consequent declining tree health and loss of significant parkland trees. Pasture management is also notably poor at Castle Ward, where the Downpatrick Avenue parkland shows signs of heavy use of agrichemicals – nutrient stripping using hay and aftermath grazing techniques are recommended here to aid recovery. The eastern parkland at Baronscourt receives moderate levels of NPK and may be vulnerable to problems – enclosures to the north are used for horse grazing and the trees are becoming seriously damaged by gnawing. Drenagh is also subject to high nutrient farming and much of the pasture is actually short-term ley.

#### 9.2.3.2 Priority 2 – maintain age structure of tree and shrub populations

The second priority is to maintain the age structure of the tree and shrub populations, bringing on new generations at a slow but steady rate. Ideally this should be by encouraging natural regeneration but this is much less feasible in designed landscapes than in deer parks or wood pastures, and active planting programmes may be unavoidable.

Planting should aim to maintain a high proportion of native trees and shrubs as well as diverse age structures. Conflicts with designed landscapes may be inevitable if even-aged features are essential to the design, but this usually relates to key features such as avenues rather than the whole

tree population. Planting of shrubs and especially thorn has been neglected in park plantings throughout the UK in recent years. Thorns were often planted by landscapers to protect newly-planted trees from livestock and many old parkland trees still have a few hawthorn associated. This type of mixed planting could usefully be restored – it has historic precedent and also provides a useful source of nectar and pollen for insects, and berries for birds.

Establishment of new plantings is most successful if the young trees and/or shrubs are properly planted in pits with compost, etc, rather than merely slit-planted.

Best practice was seen at Glenarm, where thorn scrub is widespread and provides a seed-bed and protection for natural regeneration. Unfortunately there appears to be a conflict here with grassland management - areas of hawthorn scrub were being removed during the survey period. Some thorn is present in the old deer park area of Baronscourt and in both areas of parkland at Castle Ward.

Tree-planting schemes have recently been initiated at Baronscourt and Caledon, and on a more restricted basis at Castle Ward. The old avenue at Drenagh has had new plantings in gaps. Plans are currently being discussed at Castle Coole.

#### 9.2.3.3 Priority 3 – avoid removing boughs from parkland trees

Trees and shrubs left to develop naturally will develop outspread low boughs some of which will tend to touch the ground in places and layering may result. This is a natural feature of most broad-leaved tree species as they age and is especially characteristic of horse chestnut. Layering enables a new tree to develop and is especially important if the main leader of the tree fails in a storm – a common factor in horse chestnut. Low boughs can also often provide valuable niches for epiphytes, as they offer a wide variety of aspects at low elevation – i.e. where humidity is highest.

Other low canopy boughs are shaded out by the high canopy and die but remain attached to the tree. These aerial dead boughs support a unique assemblage of fungi, epiphytes and invertebrates, in the sheltered and protected environment of the lower canopy.

The retention of decay in broadleaved trees is not normally a problem with regard to tree health – this is a misconception based on trees grown in other situations such as horticulture and plantation forestry.

It follows therefore that the cutting and removal of these boughs is damaging biologically and ecologically. Reasons for cutting (crown-lifting) are manifold and include:

- increasing light levels beneath the canopy and hence improving pasture productivity,
- improving clearance for machinery to gain access for spraying and cutting;
- manipulating tree form for aesthetic reasons, such as promoting 'cathedral'-like impacts along avenues;
- perceptions of health and safety issues.

Cutting may also have other unforeseen effects. Each wound has the potential to weaken the overall tree structure, and trunks riddled with holes after crown-lifting work are more prone to catastrophic collapse as a result.

Best practice was seen at Glenarm, where little sign of tree surgery was apparent.

Worst practice was seen at Castle Ward, where a high proportion of parkland trees have had their lower boughs removed in the past, and also at Caledon where the horse chestnuts in particular have been subject to much tree surgery work. The oaks around the cricket pitch lawn at Drenagh have also suffered from extensive crown-lifting work. Dead boughs were also being removed at Castle Coole during 2006.

#### 9.2.3.4 Priority 4 – leave fallen wood in situ

Dead wood is not just habitat for specialist wildlife. It is part of natural recycling and its removal deprives the trees and shrubs of a valuable resource. Dead wood contains materials that the living trees and shrubs could potentially re-use if it became more accessible and fungal breakdown is the process that frees up the resources. Heartwood decay in particular releases nutrients back to the plants own roots and hollow trees often produce special aerial roots within the cavities to exploit the resource. Fallen deadwood left in situ also decays over the tree's roots and so is returned to the source tree. Decaying wood should be viewed as a natural slow-release fertiliser for the trees or shrubs which generated it. While it is clear that removal of this resource by people does not result directly in tree death or decline, no data is available on the extent to which the tree or shrub benefits from the decay of its own deadwood and to what extent it is less able to survive if it is deprived of it.

Fallen and decaying wood also has the potential to provide a seed bed and protection for growing young trees.

It follows that dead and decaying wood should be left in situ as much as possible.

If fallen or cut wood really must be cleared – for aesthetic or access reasons – the principles are:

- Sooner rather than later, before it has begun to attract and accumulate organisms which will breed in or on it; or much later, after species have had a chance to breed and move on;
- Move it as intact as possible, as larger timber supports a greater variety of organisms than fragmented timber;
- Move as short a distance as possible, to maximise the potential for colonisation from the parent tree; and
- Leave in similar conditions and habitat – partial shade or dappled shade are usually preferable to deep shade or open sunlight, so that the wood will support similar species to those which would have used it if left in situ.

The creation of 'habitat' piles – as recommended in so many conservation handbooks – is really the last resort for a 'tidy' site. It is actually much better

to leave dead wood in as natural a situation and condition as possible and not to saw up and stack.

Best practice was seen at Glenarm, where most deadwood is left in situ. Castle Coole also has relatively good practices in place, although clearance along the main avenue appears rather extreme. The practice at Baronscourt is to clear fallen wood mainly along access routes and from important vistas, but the autumnal clearance work in 2006 was dramatic. Castle Ward has improved deadwood practice in recent years and some large timber appears to be being left, although 'lop and top' is still being removed excessively. The worst practice was seen at Caledon and Drenagh where deadwood appears not to be tolerated at all.

#### 9.2.3.5 Priority 5 – maintain livestock grazing

Livestock grazing is the basic management tool that maintains the structure of parkland and wood pasture that is so important for the special biological communities. The ideal grazing regime for nature conservation is an extensive organic system which aims to operate under the natural productivity of the land with stocking levels that do not completely remove the aerial structure of the sward. Such regimes may not be economically viable at present and so some compromises need to be made. Key considerations are that residues of veterinary products in dung and urine have a deleterious impact on soil fungi, as do most agricultural chemicals, especially NPK fertiliser, lime, and slurry. These may then also have a knock-on affect on tree health and survival – see also Priority 1.

A relatively short-grazed sward is beneficial for the fruiting of mycorrhizal fungi and waxcaps.

#### 9.2.3.6 Priority 6 – control canopy competition

Canopy competition is not normally an issue in parklands but can be if new plantings are established too densely or too close to existing trees. As trees reduce in height as they become ancient – through retrenchment – they are very vulnerable to competion from younger trees which have the capacity to grow taller and out-shade them. This is why ancient trees are very rare under closed-canopy woodland conditions and are most frequent in open situations such as wood pastures and parkland.

Some of the former parkland trees at Baronscourt have been incorporated into shelterbelts and plantations, and need to be released from canopy competition if they are to survive. Oaks at the southern end of the old deer park are being suffocated by conifers and need attention.

### 9.3 Parkland and wood pasture ASSIs

One of the general requirements of the project is to establish selection criteria for wood pasture and parkland ASSI designations under the Environment (Northern Ireland) Order 2002.

9.3.1 The relative merits of designation of parkland sites as ASSI

The key interests in parklands from a nature conservation point of view are the populations of older generation trees – the veterans and ancients – and the special assemblages of fungi, lichens and invertebrates which they support (Section 9.1). These trees are however subject to a wide variety of impacts which may impair their health or even kill them (Section 9.2.3).

Many of the special features are dependent on the retention of old trees and the deadwood which they generate. It follows therefore that these special biological interests merit special protection measures. Countryside Management Schemes and other agri-environment schemes can only only provide limited protection. Tree Preservation Orders are too restricted in their scope and could not realistically be used on sites with large numbers of individual trees – the present regulations also specifically exclude TPOs for trees that are considered 'dead, dying or dangerous' and veteran trees could be regarded as such. It is rarely the case that a viable population of an individual rare species occurs on a single tree. More typically the situation is one of large concentrations of veteran trees supporting the most significant assemblages of rare species. ASSI declaration is clearly the best option available for reliable site protection of the most important examples of the habitat - the broad extent of the population of older trees and associated decaying wood would be an interest feature in its own right.

The special biological interests of old parkland trees are not well documented in Britain or in Ireland and this has recently been acknowledged by the UK Joint Nature Conservation Committee who have recently approved (September 2006*) 'Additional guidance to support the selection of SSSIs of sites of importance for veteran trees'* compiled by the Chief Scientist of English Nature.

9.3.2 Selection criteria for wooded pasture and parkland ASSI designations

The selection criteria approved by JNCC are set out in Table 57 and compared with data on the six study sites generated during fieldwork in 2006.

**Table 57** Application of JNCC approved selection criteria for ASSIs on the six study sites

| Field Measure | Baronscourt | Caledon | Coole | Drenagh | Glenarm | Ward |
|---|---|---|---|---|---|---|
| **Primary assessment criteria** | | | | | | |
| Number of veteran trees | **200** | **215** | **249** | 101 | **483** | 198 |
| Number of ancient trees | [4] | **28** | [6] | 0 | **19** | 9 |
| Number of trees >1.5m dbh | **59** | **47** | **38** | 12 | **50** | 8 |
| **Secondary assessment criteria** | | | | | | |
| Extent of site | **High** | **High** | **High** | Medium | **High** | **High** |
| Tree cohort continuity | | | | | | |
| Visible deadwood | Seasonal | Low | Seasonal | Low | **High** | Low |
| Ground vegetation | Medium | Medium | Medium | Low | **High** | Low |
| Veteran trees in landscape | | | | | | |
| Diversity within veteran tree pop | Medium | Medium | Medium | Low | **High** | Low |
| Associated species interest | **High** | **High** | **High** | Medium | **High** | Medium |
| Documented habitat continuity | | | | | **High** | |
| Potential | **High** | **High** | **High** | Low | **High** | Low |

| **Other field measures** | | | | | | |
|---|---|---|---|---|---|---|
| Density of veteran trees | | | | | | |
| Species composition of veterans | | | | | | |
| Scrub | Medium | Medium | Medium | Low | **High** | Medium |
| Site management/ threats | Medium | Low | Medium | Low | **High** | Low |
| Water-bodies/ wetland habitat | Medium | Medium | **High** | Low | **High** | Low |
| Shape | **High** | **High** | **High** | **High** | **High** | **High** |
| Surrounding landuse | | | | | | |
| Local pollution load | | | | | | |
| | | | | | | |

All six sites meet the first of the primary criteria but only Glenarm and Caledon Park meet all three. Baronscourt and Castle Coole Parks meet two of the three. Glenarm also performs well under the secondary criteria and other field measures, with Baronscourt, Caledon and Castle Coole Parks achieving moderate levels of compliance.

No guidance has been forthcoming on how these criteria should be applied, as little practical experience is yet available. The Great Deer Park at Glenarm clearly excels and merits the full site being covered by extension of the existing ASSI. Castle Coole, Caledon and Baronscourt Parks are also of significant interest and merit ASSI designation in the views of the authors of this scoping study. These four sites all have strong measures from associated species interest, as demonstrated by the scoping study.

While assessing sites on their veteran tree populations alone is unlikely to be completely reliable in identifying the most important sites for rare and threatened assemblages of species, it is a robust approach which can be applied by non-specialists in the key taxonomic groups. The identification and protection of the largest concentrations of veteran trees will undoubtedly conserve many of the best and most viable sites for specialist fungi, lichens and invertebrates in a way economic on resources. Important sites with fewer veteran trees will however need to be assessed on species criteria alone.

### 9.3.3 Defining 'favourable condition' of wood pasture and parkland habitat in the context of Northern Ireland

#### 9.3.3.1 Definition

Isted (2004) contains some provisional guidance on creating condition assessment tables.

| **Attribute** | **Target** | **Comment** |
|---|---|---|
| Area [1] | Extent of mosaic of which the wood pasture is a part.<br>Extent of tree-ed area<br>Number of veteran (near-veteran) trees | Not all of these need be used on every site |
| Structure and natural processes [2] | Veteran/near-veteran trees with free crowns. | In most cases we are trying to avoid overshading of the veterans |
| | Succession of age classes present – a cohort every 100 years | This is a first stab and needs to be tested |

| | | |
|---|---|---|
| | >20% open space spread through the site | An open site is important for some invertebrates and to allow for dappled shade to tree trunks |
| | 10-20% open-grown scrub | |
| | Frequent dead wood on the ground and in the canopies/trunks of trees | |
| Regeneration potential [3] | At least one cohort of trees established in the last 50 years | See notes for what sort of numbers should be considered a cohort; the aim is to get one every 100 years, so if not one in the last 50 years the action is likely to be needed in the next 50 years |
| Tree and shrub composition [4] | >95% native trees and shrubs (based on the area actually occupied by trees and shrubs) [option of specifying minimum numbers or proportions of appropriate native species] | A lower % natives may be acceptable in designed landscape parks where exotics are non-invasive and part of the history of the site.<br>If exotics are important for their species interest and should therefore be maintained this must be specified. |
| Quality indicators 5 | >80% of ground vegetation referable to relevant semi-natural vegetation types (may be grassland or heathland rather than woodland) | Although not strictly features for which sites are notified the presence of archaeological or historical artefacts may be worth noting. |
| | Micro-habitats for key specialist species present (as appropriate) [Key species shown to be still present by periodic survey] | Direct survey for key species is not normally part of the basic condition assessment |

**Table 58** Generic targets for condition assessment of wood pasture and parkland

**Notes to Table 58:**

[1]**Area**

- It is the extent of the mosaic of which the tree cover is but a part that is important. However, it may also be helpful to separate out the extent of land that is under trees, or, given that the interest is the veteran trees, the number of such trees.

[2]**Structure and natural processes**

- It is often important that the veteran trees are not being over-shadowed by younger growth, hence the suggestion that they should have free crowns.
- Continuity of age-classes of trees is critical for the survival of many of the key species; it is suggested that a cohort of at least every 100 years is likely to be needed. The size of the desirable cohort can be calculated as roughly twice [the number of trees in the most extensive veteran or near-veteran class] divided by [the number of centuries for that class]. This means that most parkland, with just a thin scatter of veterans over grass, will be unfavourable.
- The extent of open space will usually be higher in conventional woodland, but also more evenly spread over the site (rather than being concentrated in rides, etc).
- The presence of some scrub in the open is also a desirable structural feature.
- Dead wood on the ground but particulary on the trees themselves is generally more important on these sites than in conventional woodland.

**[3]Regeneration**

- A cohort of trees in the 0-100 year category may be sufficient regeneration for many wood pasture sites.

**[4]Tree and shrub composition**

- It may be that there are particular species associated with 'exotic' species on the site, for example rich lichen communities on old sycamores or saproxylic invertebrates on beech outside its current native range.

**[5]Quality indicators**

- The ground vegetation should normally be semi-natural, but may be of a grassland or heathland type rather than woodland communities (or some combination)
- Exceptionally, in some parklands it may be acceptable that there would be little to be gained by reverting improved grassland to a more desirable state; if so, then the site may (other things being OK) be classed as favourable despite this. However it is unlikely that sites with arable land in between the trees could be treated as favourable.
- Signs of fertiliser or spray drift in sites important for lichens (fungi) would be a negative indicator.
- Characteristics of the trees themselves, e.g. notable rot holes, sap-runs, etc, have not been separately noted. It is assumed that they will usually be present if the veteran tree population is maintained. If there is a particular assemblage or species for which the site has been notified that depends on such a micro-feature then it would have to be included.
- The species associated with the veteran trees will not normally be checked directly on a condition assessment visit. Instead reliance will be placed on the general habitat assessment plus a less frequent re-survey by a specialist.

9.3.3.2 Methodology

Each condition assessment visit will need to attempt to assess and quantify each of the five attributes in Table 58. From a practical viewpoint this will necessarily involve a site visit of a few hours duration and judgement by eye.

9.3.3.3 Testing with 2006 data

| *Attribute* | **Baronscourt** | **Caledon** | **C Coole** | **Drenagh** | **Glenarm** | **C Ward** |
|---|---|---|---|---|---|---|
| *Area [1]* | Fav | Fav | Fav | Unfav | Fav | Fav |
| *Structure and natural processes [2]* | Unfav | Unfav | Unfav | Unfav | Fav | Unfav |
| *Regeneration potential [3]* | Unfav, recvering | Unfav, recvering | Unfav | Unfav | Fav | Unfav, recvering |
| *Tree and shrub composition [4]* | Fav | Fav | Fav | Fav | Fav | Fav |
| *Quality indicators [5]* | Unfav, recvering | Unfav | Unfav, recvering | Unfav | Fav | Unfav |

**Table 59** Example condition assessment of the six study sites
Fav = favourable condition
Unfav = unfavourable condition
Recvring = unfavourable condition, recovering

**Notes to Table 59:**

**[1]Area**

- Five of these parklands have extensive areas of veteran trees in pasture; only Drenagh is lacking.

**[2]Structure and natural processes**

- Only the Great Deer Park at Glenarm meets all five targets
- Succession of age classes has been demonstrated by tree surveys at each (see Section 8);
- Open space is OK;
- Open grown scrub is lacking from Baronscourt (some but less than 5%), Caledon and Drenagh (very sparse);
- Deadwood is the main problem area as it is cleared, at least partially, in all five sites.

**[3]Regeneration**

- Tree-planting programmes are already in place at Baronscourt, Caledon and Castle Ward (only locally here), but only planned at Castle Coole;

**[4]Tree and shrub composition**

- All sites are favourable under this attribute as five are designed landscape parks where exotic species are acceptable.

**[5]Quality indicators**

- Only the Great Deer Park at Glenarm meets all targets for this attribute, as the five designed landscapes have all suffered badly from agricultural intensification of the swards; ESA and CMS are enabling recovery at Baronscourt and Castle Coole.

#### 9.3.3.4 Recommendations

The provisional guidance (Isted 2004) appears to be workable and further testing is recommended.

### 9.3.4 Fungal condition assessment

No information was available on progress with Common Standards Monitoring and fungi but it seems likely that the JNCC guidelines for the use of direct and indirect methods will be adopted, and that the indirect methods will cover similar ground to that described above. Direct methods will be problematic however.

### 9.3.5 Lichen condition assessment

Protocols for assessing site condition as a tool for monitoring lichen habitats have recently been developed for Scottish SSSIs. The approach taken involves the employment of methods of *direct* monitoring in parallel with *indirect* monitoring – as recommended by JNCC. Direct monitoring consists of recording details of the actual lichen communities, whilst indirect monitoring uses assessment of broad habitat indicators.

For park and wood-pasture sites, direct monitoring might use tagged or georeferenced trees as the basic units of recording. Use of fixed quadrats would be a possibility, but it is likely that this would prove too time-consuming to be practical. A more pragmatic option would be to record species in broad but quantifiable abundance classes (e.g. {<10cm$^2$;

10-100cm$^2$; 100-1000cm$^2$; 1000 – 1m$^2$; >1m$^2$}) in well defined regions (e.g. main stem below 1.5m) of a number of trees.

Indirect monitoring is generally more subjective, but it allows for a wider view of the habitat and may identify potential problems before they start to affect the lichen communities. Examples of attributes that might be monitored would be:

- numbers of young, mature, veteran and ancient trees present;
- tree species diversity;
- tree form diversity (e.g. retention of pollards);
- levels of deadwood on site (of differing types: e.g. standing dead trees, dead branches etc.);
- stocking densities of cattle, sheep, ponies, deer etc. and evidence of trampling at tree bases or abrasion of tree boles;
- use of fertilisers on grassland around trees.

These are more or less compatible with the attributes selected for veteran trees in wood pasture and parkland habitat outlined and tested in Section 9.3.3

### 9.3.6 Invertebrate condition assessment

Protocols for assessing site condition as a tool for monitoring invertebrate habitats are currently under progress for ASSIs and are based on JNCC Guidelines (Nelson 2003; Alexander 2006). The approach taken involves the employment of methods of *direct* monitoring in parallel with *indirect* monitoring – as recommended by JNCC. Direct monitoring consists of field investigation of the key invertebrate assemblages (Alexander *et al,* 2005), whilst indirect monitoring uses assessment of broad habitat indicators – along the same lines as 9.3.3 above. The invertebrate assemblage approach is under development by English Nature as the Invertebrate Species & habitat Information System (ISIS) and will be available as a web-based database in due course.

Testing of the ISIS system for English Nature during 2006 has demonstrated that - for saproxylic invertebrates – three site visits are needed across the field season, covering the May/June, July/August and September/October periods. The methodology is for an expert in this assemblage to follow a prospecting approach, as outlined in Section 7.2 above, and using the baseline survey level of investigation. Condition assessment is currently based on species-richness of the assemblage as detected during the three visits and the recommended threshold figures may need to be modified for Northern Ireland sites once data becomes available on a wider range of sites. Site Quality Index and Index of Ecological Continuity aspects may be incorporated into the analysis at a later date, but again will need adjusting for use in Northern Ireland as the SQI relies on assessments of conservation status - which are not available for Northern Ireland - and the IEC requires assessments of the degree of association of the species with long-established habitat, which also is not available for Northern Ireland.

# 10 RECOMMENDATIONS FOR FURTHER WORK

## 10.1 Assessing extent of resource in Northern Ireland

The compilation of inventories of wood pasture and parkland has been notably slow in England. A trial in Bedfordshire and Norfolk took place as part of the Veteran Tree Initiative project (Reid and Wilson, 1995) and has been followed by work in Staffordshire (Webb & Bowler, 2001), Gloucestershire (Alexander, 2003), Berkshire, Buckinghamshire and Oxfordshire (Alexander & Lister, 2003) and the East Midlands. Methodologies have been broadly similar but not consistent in detail. The WAPIS project was started in 2000 in order to provide a cross-linking system. Full inventories have been seen as an essential first stage in assessing the quantity of the overall habitat resource in existence, followed by assessment of site quality and condition.

The Woodland Trust's inventory of ancient and long-established woodland in Northern Ireland includes information on wood pasture sites and therefore provides a good starting point for a baseline review of wood pasture and parkland throughout the province. All of these newly identified sites now merit closer examination and correlation with the Register of Historic Parks, Gardens and Demesnes. Their boundaries need careful examination and their veteran trees mapped and documented to the same level as the six study sites reported in the present project. Ideally they should also be visited by experts in the special fungi, lichens and invertebrates of wood pastures and historic parklands, but perhaps not to the same level of detail as the current project. Fungal assessment is the main problem area as this is very time demanding, but a reduced number of visits may provide sufficient detail to advise on (minimal) site quality. Lichen assessment is much less time demanding. Invertebrate survey could be reduced to the baseline level or three visits across the season, as recommended for Common Standards Monitoring. Until this wider survey and assessment is carried out it is difficult to know how many sites of ASSI quality for the special biological communities of wood pasture and parkland there may be in Northern Ireland

## 10.2 The need for a parkland conservation pack and general awareness-raising initiatives

In the meantime, the EHS Scoping Study has generated a large amount of valuable experience and could be used to compile a 'parkland conservation pack' which could be provided to all owners and managers of historic parklands - and made available to their various land management advisers - as a guide to good practice. Such a pack could draw on various existing documents such as the *Ancient Tree Guides* produced by the Woodland Trust and Ancient Tree Forum.

It is particularly important that people making decisions on tree management work and selecting contractors, etc, are kept informed on the nature conservation values of veteran trees and the implications to their own work. Treework contractors also need to be made more aware of the conservation issues.

Beyond the immediate need to improve awareness amongst parkland owners and managers, there is also an urgent need for awareness throughout the many disciplines involved in conservation and management of veteran trees. A programme of practical discussion workshops and training events needs to be initiated.

### 10.3 The Great Deer Park of Glenarm – a prime site for ecological research into working wood pasture habitats in Ireland

This proved to be the wildly outstanding site of the six study sites. This is a very exciting site and is considered here to be of much wider, UK and possibly even European, significance ecologically. Such a large extent of working and unimproved wood pasture is unrivalled in Northern Ireland and perhaps Ireland as a whole. It offers enormous potential as a study site for research on natural tree population dynamics under an extensive grazing regime. Its semi-naturalness involves not only the tree and shrub populations but also – and most uniquely – the pastureland itself. The site is a classic 'Vera' landscape, where thorn scrub promotes natural regeneration, and where the large herbivores influence the species composition. The role of jay in oak regeneration is also potentially a significant feature here, and ripe for investigation with the recent recovery of the local jay population. The development of this site as an open-air research laboratory could potentially encourage its better appreciation and care by Antrim Estates. Scrub clearance work and tree-planting threaten the unique value of this site. The conifer plantations along the upper slopes could usefully be managed back towards their former wood pasture condition.

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