

FAUNA OF SEMI-NATURAL WOODLANDS IN IRELAND

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Abstract

Throughout the world native woodland habitats generally have a high biological diversity and there is a positive correlation between animal diversity and persistence of the woodland. In Ireland, even though there is almost no primary native woodland and very little planted deciduous woodland of more than 200 years duration, about half of the species of insect, a quarter of species of breeding bird, and almost all species of terrestrial mammal have a preference for woodland habitats. It is in the invertebrates where most woodland biodiversity is to be found; a point of some significance when we consider Ireland's obligations to the Biodiversity Convention. It takes hundreds of years for a deciduous woodland ecosystem to reach its climax state but it may only take a few days to destroy it.

There are few comprehensive studies of invertebrates, or even of birds and mammals done in woodlands in Ireland. Animals are not as obvious as flora, they often require special sampling techniques, and their availability for sampling is frequently seasonal. However, certain animal taxa have been identified as being potentially valuable in studies of woodland ecology and these include snails, hoverflies, butterflies and moths, ground beetles, longhorn beetles and birds. Our understanding of woodland faunas shows that in order to conserve species and maintain biodiversity we must pay attention to the maintenance of micro-habitats such as wet hollows, woodland glades and rides and forest streams. In particular, it is vital to allow trees to become over-mature, die, fall and rot *in situ* in order to provide the habitats required by specialist woodland invertebrates. Measures to conserve the invertebrates will directly and indirectly help birds and mammals, such as the bats.

Natural woodland in Ireland

One of the difficulties in assessing and discussing the fauna of natural woodlands in Ireland is identifying exactly what habitats are being considered. To many naturalists a woodland habitat is typified by a block of trees with a definite outer boundary and a closed canopy with no other habitat of any significance breaking that continuity. This can be described as a closed-canopy woodland. However, in many places woods don't have definite boundaries but thin out at the edges and merge into the adjacent habitat of pasture land, or in Ireland, this may be bog. It is also quite possible that woodland can have clearings of grassland in the middle; or if the grassland is more dominant then one could consider the environment as being of grassland with patches of woodland. These forms of woodland are described as savannah woodland, or wood pastures, and it may well be the case that a landscape with this mosaic of habitats has been the normal type of woodland in Ireland for many hundreds of years. From the view point of the fauna it makes an enormous difference whether a woodland is closed canopy or of the open savannah type. It also makes a huge difference to the apparent area occupied by natural woodlands in Ireland if savannah-type woodland is included in the definition. Old hedgerows comprising native trees and shrubs, are very important habitats for many invertebrates and birds in Ireland and are often regarded as being woodland ecosystems when considering woodland faunas.

Relatively little work has been done on woodland faunas in Ireland and so for the purposes of this contribution, a wide definition of 'native woodland' has been adopted and the use of the term 'semi-natural

woodland' would seem more appropriate. This means that the following discussion draws on data from studies of truly ancient or primary natural woodland (>400 years of continuous forest cover) and it also includes data on the fauna of long-standing or secondary native woodland (about 200 years continuous cover); both of these categories of woodland being rare or uncommon in Ireland. With such a paucity of data on woodland faunas, it is useful to also take account of studies where stands of trees that are composed of native species but are of less than 200 years standing were involved. In Fossitt (2000), these woodlands would all be classified as semi-natural woodland but it is not unusual for those studying fauna to widen the definition even further and include long-standing linear woodland such as hedgerows and tree lines in their consideration of native woodland habitats.

Ecological attributes of native woodlands

Woodland habitats are primarily described by botanists who classify them using phytosociological criteria (e.g. Cross this volume, Kelly this volume, Fossitt, 2000). Two major text books that present detailed discussions of woodland ecology (Barnes *et al.*, 1998; Kimmins, 2004) rely heavily on examples from North America and devote a disproportionately small amount of space to the fauna. Work done in other European countries show there is a good understanding of faunas of native woodlands (e.g. Peterken, 1974 & 1981), but as natural woodland in Ireland has historically lacked so many of the native trees found on the European continent (beech, field maple, hornbeam, lime, sweet chestnut, horse chestnut and sycamore) one must be careful when drawing conclusions and making generalisations about the fauna. Important characteristics of woodland that affect woodland faunas include:

- A high structural (physical) diversity (e.g. herb, shrub and canopy layers), which is positively correlated with faunal diversity.
- Woodlands create their own more stable microclimate (less wind, higher humidity, buffered temperatures, less light, lower quantity of rainfall reaching the ground), which positively influences faunal stability.
- A high botanical diversity (including mosses, herbs, lichens and fungi) support a high faunal diversity, and all of this leads to a significantly greater biodiversity (complexity of food webs, of species, of genes). This can be simply summarised by saying that the producers (trees, shrubs, herbs, epiphytes) are only half the ecological story, as the consumers (herbivores, carnivores, decomposers comprising of the fauna, bacteria and fungi) process all of the energy in the forest ecosystem.
- Like all ecosystems, woodlands pass through a recognised succession of changes towards a climax state with a different community of species at each stage. Some ecosystems can almost complete their succession in a matter of years (an organically polluted river can recover in 5-10 years and a seashore can recover from oil pollution and cleaning with detergents in 10-15 years) but forests take hundreds of years to reach a state of climax. Some scientists believe that the forest soil may even take a thousand years to develop its mature fungal flora. In the long-term, climax ecosystems characteristically show diversity, stability, resilience, persistence and sustainability.
- A significant proportion of species found in native woodland are specialists, with long life-cycles, low reproduction rates, small population sizes, poor ability to disperse and colonise new places, and may be prone to extinction. Such species have been termed 'K-selected' species and it is believed that their presence in woodland might be used to indicate continuous forest cover in an area. Such species are known to include mosses, lichens, fungi and invertebrates.

Fauna of native and semi-natural woodland

Ireland has a depauperate flora and fauna due to this island's glacial history and geographical isolation from continental Europe (see Sleeman, Devoy & Woodman, 1986). There is good evidence from cave deposits to suggest that Ireland's woodland fauna was once much more diverse (e.g. Scharff *et al.*, 1903) but that the loss of continuous forest cover as people created pasture woodland and selectively felled particular tree species, led to the demise of many invertebrates, mammals and birds. For example, the loss of Scot's pine (*Pinus sylvestris*) as a native tree, shows how the destruction of woodland may have led to some of Ireland's insect

fauna becoming extinct in historical times (Speight, 1985a & b). The loss of great spotted woodpecker, goshawk, capercaillie and red kite and a number of other birds associated with woodland, are also well documented and discussed (e.g. D'Arcy, 1999; Hall, 1981). Spectacular mammals that were largely associated with woodland habitats in Ireland include wolf, brown bear and perhaps the wild boar, but these are all extinct here now. The story of the demise of the wolf has been meticulously pieced together by Fairley (1975). For a more general discussion of woodland decline, see Mitchell (1986) and Cabot (1999).

Even though there are few examples of long-standing woodland in Ireland today, there is still a widely held view that the woodland fauna makes a particularly important contribution to national biodiversity and that the remaining fragments of native woodland are generally rich in animals species (Nairn, 1988; Whelan, 1995). As has already been indicated, woodland studies in Ireland have tended to concentrate on botanical knowledge for purposes of classification and conservation assessment. In Little, 2005 (this volume) Gaughran and McInerney did separate studies on invertebrates. A study of Ballyannan Wood in Co Cork, which is at least 350 years old, recorded 35 species of gastropods and 59 species of hoverflies making it one of the few general studies of ancient woodland that included data on more than one group of animals (Gittings, 2004).

Invertebrate fauna

Studies involving the invertebrate faunas of Irish woodlands tend to be focussed on a specific invertebrate taxon that is found in woodlands as well as other habitats, rather than being a wide-ranging study of the invertebrates in woodland. Thus there is a body of information on woodland snails in Ireland because these animals were surveyed as a part of a project resulting in a distribution atlas (Kerney, 1999). Over the last 30 years a substantial amount of knowledge has been assimilated about hoverflies (Diptera; Syrphidae) some of which are woodland specialists, and this is published in numerous papers by Dr Martin Speight. The gall wasps and several families of minute wasps that are often associated with trees and woody shrubs have been comprehensively studied by Dr Jim O'Connor and Dr Robert Nash and their results published by the Irish Biogeographical Society. Soil faunas, including those of woodland ecosystems have been sampled by Dr Tom Bolger and his co-workers while working on a project concerned with acid rain. Beetles have been sampled from woodlands beside Lough Ree (Good, 2002); and carabid beetles have been used in Northern Ireland to help assess the conservation value of woodland sites (Day *et al.* 1993) and these ground beetles have also been used in oak woodlands by Fahy & Gormally (1998) at Derryclare Wood, Co Galway and Poole *et al.* (2003) at Kilinahue Wood, Co. Wexford.

Several generalisations can be made about the invertebrates of native woodlands.

- This is where most of the biodiversity of woodland is to be found.
- Invertebrates have two primary requirements, namely food and cover.
- Invertebrates of woodlands include many diverse animal groups and within most of the taxa there are specialists confined to woodland habitats.
- There are an estimated 16,000 insect species in Ireland and it is estimated that half of the Irish insect species are dependent on deciduous woodland.
- In Britain it has been observed that some native trees have a far greater diversity of insects than other species of native tree:

Scientific name	Common name	Number of insect species
<i>Quercus</i> spp.	oaks	284
<i>Salix</i> spp.	willows	266
<i>Betula</i> spp.	birches	229
<i>Crataegus monogyna</i>	hawthorn	149
<i>Prunus spinosa</i>	blackthorn	149
<i>Populus</i> spp.	aspen/poplars	97
<i>Malus sylvatica</i>	crab apple	93
<i>Pinus sylvestris</i>	Scot's pine	91
<i>Alnus glutinosa</i>	alder	90
<i>Ulmus</i> spp.	elms	82
<i>Corylus avellana</i>	hazel	73
<i>Fraxinus excelsior</i>	ash	41
<i>Sorbus aucuparia</i>	rowan	28
<i>Juniperus communis</i>	juniper	20
<i>Ilex aquifolium</i>	holly	07
<i>Taxus baccata</i>	yew	04

Number of insect species found to be associated with native trees in Great Britain (after Rose & Harding 1978).

- Insects are particularly diverse with several groups especially associated with woodland habitats e.g. longhorn beetles, bark beetles, ladybirds, leaf beetles, weevils and true bugs.
- Soil faunas reach their greatest diversity and abundance in undisturbed, uncompacted forest soils with an accumulation of leaf litter e.g. earthworms, snails and slugs, millipedes, centipedes, woodlice, insects, mites, spiders, false scorpions.
- Phytophagous (herbivorous) insects such as butterflies and moths (Insecta; Lepidoptera) feed directly on the trees and shrubs. Studies in Britain have shown that some woody plants are better than others for Lepidoptera (Anon., 1973) :
 - outstanding : oak, birch, goat willow
 - extremely good : hawthorn, blackthorn other willows
 - very good : apple, poplars, elm, alder, hazel, wild roses & brambles
 - good : ash, rowan honeysuckle and gorse
- British data show that tree and shrub species native to an area support a greater diversity and abundance of species than non-native trees. Sometimes introduced trees can be prone to pest outbreaks in which case diversity is low but abundance of a species can be enormous.
- Invertebrates live in microhabitats and the availability of microhabitats determines species diversity e.g. convolutions in tree bark, standing dead wood, rotting dead wood on forest floor, over-mature trees with rot holes where branches have come off, pools left after trees fall, damp or wet hollows, sunny glades and woodland rides, glades where sun reaches rock outcrops in wood, diverse flora with flowers for nectar and pollen, lichen and moss growth on trees and rocks, toadstools.

Several management actions can be undertaken to maximise the diversity and abundance of the invertebrate fauna in native woodland by encouraging a diverse ground flora, by paying attention to the maintenance of micro-habitats, by avoiding the use of insecticides and limiting the entry of heavy machinery that leads to soil compaction.

Invertebrates can be used to assess and monitor the value of management actions for conservation and it has been suggested that taxa such as snails (Mollusca; Gastropoda), hoverflies (Insecta; Diptera; Syrphidae), moths and butterflies (Insecta; Lepidoptera), ground beetles (Insecta; Coleoptera; Carabidae) and longhorn beetles (Insecta; Coleoptera; Cerambycidae) might all be suitable candidates. It is noted that Gittings (2004) used the first two of these groups in his assessment of Ballynann Wood in Co Cork and that (Day *et al.*, 1993; Fahy & Gormally 1998; Poole *et al.*, 2003) used ground beetles.

Birds

Birds are a highly visible and audible part of woodland ecology that are often at the top of their food chain. One quarter of Irish breeding birds use woodland as their primary habitat choice. Studies on woodland birds in Ireland include an investigation of the bird communities in Killarney (Batten, 1976), breeding bird communities of sessile oak woodland (Wilson, 1977), breeding and wintering bird communities of Glenveagh National Park, Co. Donegal (MacLochlainn, 1984), a study of breeding bird communities of broad-leaved woodland in the Glen of the Downs, Co. Wicklow (Nairn & Farrelly, 1991) and a comparative study of breeding bird populations of oakwoods and conifer plantations (Whelan, 1995). A survey currently underway is studying the breeding birds of Wicklow oakwoods (MacLochlainn, 2004). Several specialist woodland birds that are present throughout most of Europe including Great Britain; such as tawny owl, great spotted woodpecker and nuthatch; are absent from Ireland. On the other hand, studies have found that more generalist species like blue tit and goldcrest, breed at higher densities in Irish woods than in British ones, probably because they are able to occupy a wider ecological niche due to the absence of other species.

The ways in which birds use woodland show a great deal of variability and consequently their requirements of the woodland are also diverse. For example birds,

- may use woodland for breeding (sparrowhawk, stock dove), feeding (treecreeper) or roosting (rook, starling);
- they may be resident all year round (wood pigeon, long-eared owl), summer visitors (blackcap, wood warbler, redstart) or winter visitors (fieldfare, brambling);
- they may use the canopy (tits, jay, crows, sparrowhawk), wood edges and rides (blackcap, finches, spotted flycatcher) or the woodland floor (thrushes, woodcock, robin, wren).

Those that breed in woodland need cover in which to build their nests such as hollow trees, tree holes and ivy, and they may require song posts from which they can declare their territory. For feeding it depends upon whether the species are specialised insect feeders, or may require seeds or berries, or perhaps they are more omnivorous and change their food preferences according to their age or season. It is commonly the case that the young of a number of omnivorous species are more dependent upon insects than are the adults. Some species only use the woodland for roosting but feed in other places such as farmland like the rook and jackdaw. When these birds enter the woodland they seek cover from predators and shelter from wind and rain. Whelan (1995) found that soil fertility, tree species and vegetation structure influence the population density and species diversity within woodland.

To many people the birds are a measure of woodland's value to conservation, and they can certainly be used to monitor the effects of management actions. In order to maximise the diversity and abundance of birds, the food supply can be increased through measures to encourage insects already mentioned and by planting trees and shrubs that produce large amounts of fruit such as the Family Rosaceae or 'mast' from trees like alder, ash and oak. Breeding sites are more available in older trees that support growths of ivy or produce tree holes or become hollow. In the absence of mature trees, provide different types of nest boxes. Most perching birds benefit from an abundance of sheltered sunny edges, rides and clearings around the wood and the availability of song posts. The use of biocides (fungicides, herbicides, insecticides) is detrimental to all life forms, but birds being higher up the food chain are susceptible to the problems caused by bio-magnification. Some species of birds are sensitive to disturbance and need remote areas for their well being.

Mammals

There are very few species of mammals in Ireland with only a very few being woodland specialists i.e. red squirrel, pine marten, long-eared bat. Mammals such as fox, badger, wood mouse, hedgehog, pygmy shrew, deer species and several bats reach their highest densities around the edges of native woodland and in woodland rides and clearings, but are not totally dependent upon these habitats. Whelan (1995) noted that the mammals of Irish woodlands need food, cover and breeding sites. He divided species into those that prefer woodlands (wood mouse, bank vole, red squirrel, grey squirrel, pine marten and deer species) and those that use the woodland for cover and open areas for feeding (pygmy shrew, hedgehog, bat species, Irish hare, badger and

fox). Dr Caroline Shiel carried out a detailed study of Leisler's bat, a European rarity, which has highly significant populations in Ireland. She found that this species, favours situations where broadleaved woodland borders on pasture fields for feeding (Shiel *et al.* 1998) and so this species is partially dependent on the presence of semi-natural woodland. Whilst the contents of this paper are mainly concerned with conservation and biodiversity, it has to be noted that some mammals such as deer and grey squirrel, are seen as a threat to woodlands by foresters (e.g. Whelan, 1994; Coad, 1995).

Semi-natural woodland is an important habitat for mammals, and as several species are at the top of the woodland food chain, mammals can be used to monitor the success of conservation measures. Many mammals require invertebrate food so by protecting invertebrates one is also encouraging them. For some species, disturbance by people is an issue, so parts of a wood need to be kept remote and access restricted. Bats require roosting sites and use different sites between summer and winter. Hollow trees are a scarce commodity in younger woodland and in these circumstances bat boxes have proven to provide a good substitute for natural sites.

Conservation & Biodiversity

With so little semi-natural woodland in Ireland, it has been a matter of concern to conservationists for many years that these precious sites are being allowed to deteriorate and be lost to activities such as commercial felling, scrub clearance, under planting with exotic conifer species, and the spread of invasive species like *Rhododendron*, cherry-laurel and red-osier dogwood (e.g. Nairn, 1988; Kelly, 1990). At the same time there is a growing awareness that semi-natural woodlands are biodiverse habitats that need to be monitored and protected. Coillte have been very active in promoting the protection of such sites in their care and their training course manual is a model of an action to raise the knowledge and understanding of conservation measures (Coillte, 2001). There are also many small publications and guidelines that promote biodiversity and include information on how to protect invertebrates, birds and mammals in semi-natural woodlands (for example SAILLET (1983), Stubbs (1972), Angelstam (1999), Forest Service (2000), Anon (not dated)).

At the end of the day, it is important to realise that biodiverse, semi-natural woodlands cannot be created over a short time period. The species found in a recently planted wood are mainly common and widespread and only rarely reflect the variety characteristic of ancient woodland sites. It takes hundreds of years for a deciduous woodland ecosystem to reach its climax state but it may only take a few days to destroy it!

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