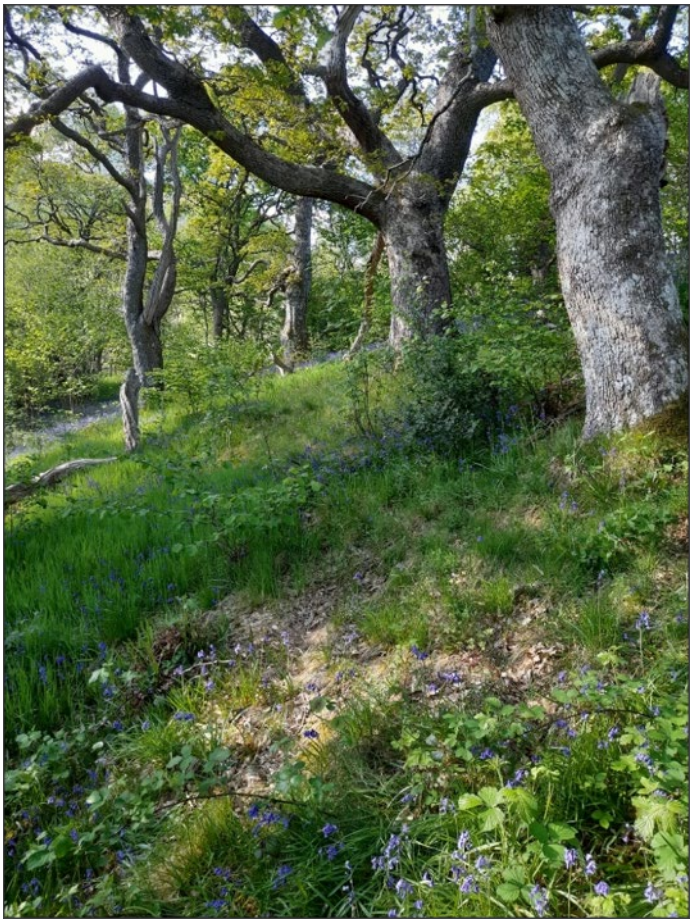
Saproxylic invertebrates at Gilfach RWT Reserve in 2022

Natur am Byth! Evidence Report No. 006

Author: David Boyce



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Supported by the National Lottery Heritage Fund and Welsh Government, the ten partners are Amphibian & Reptile Conservation; Bat Conservation Trust; Buglife; Bumblebee Conservation Trust; Butterfly Conservation; Plantlife; Marine Conservation Society; Natural Resources Wales; RSPB Cymru; Vincent Wildlife Trust.

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1. Crynodeb gweithredol

Cynhaliwyd arolwg o anifeiliaid di-asgwrn-cefn pren marw (saprosylig) Gwarchodfa Natur Gilfach, sy'n eiddo i Ymddiriedolaeth Natur Sir Faesyfed ac yn cael ei rheoli ganddi, dros bedwar diwrnod dyn yn 2022. Mae'r gwaith hwn yn rhan o brosiect partneriaeth Natur am Byth!, sy'n ceisio hyrwyddo adferiad rhywogaethau allweddol dethol yng Nghymru. Roedd arolwg Gilfach yn cynnwys amrywiaeth o dechnegau chwilio â llaw a gosod pum trap asgellog a weithredwyd rhwng mis Mai a mis Medi.

Mae'r arolwg wedi dangos bod Gilfach yn cynnal ffawna infertebrat amrywiol sy'n cynnwys nifer o rywogaethau prin. Gyda **Mynegai Dilyniant Ecolegol (IEC) o 5** a **Mynegai Ansawdd Safle (SQI) o 314.5**, nid yw'r casgliad o infertebratau saprosylig yn y Gilfach mor gyfoethog â'r hyn sydd yng ngwarchodfa Carn Gafallt y Gymdeithas Frenhinol er Gwarchod Adar (RSPB), a arolygwyd eleni hefyd fel rhan o'r prosiect Natur am Byth!. Mae hyn oherwydd bod yr adnodd o goed llydanddail goraeddfed a hynod yn llawer llai nag ar y safle olaf ac nid oes pydredd rhuddin.

Serch hynny, mae gan warchodfa Gilfach gasgliad sylweddol o infertebratau saprosylig sy'n cynnwys rhywogaethau fel y chwilen ysgarlad anfynych *Schizotus pectincornis* a'r chwilod crwydr *Bolitochara mulsanti* a *Phyllodrepoidea crenata*, sydd ar eu terfynau dosbarthiad deheuol yma, neu yn agos iawn iddynt. Mae'r rhywogaethau hyn yn rhan o gasgliad nodedig a phwysig sy'n nodweddiadol o safleoedd pren marw yng ngogledd a gorllewin Prydain sydd wedi'u cynrychioli'n dda iawn mewn hen goedwigoedd a choed pori (gan gynnwys Carn Gafallt) ar hyd ymyl dwyreiniol Mynyddoedd Cambria.

Rhoddir mesurau rheoli sydd â'r nod o wella'r casgliadau o infertebratau saprosylig a gofnodwyd yn y Gilfach yn y tymor hwy, gan gynnwys teneuo tyfiant iau mewn ardaloedd coediog lle mae nifer sylweddol o hen goed a nodi carfannau o goed iau i gymryd lle'r coed goraeddfed a hynod presennol. Dylid cadw a hyrwyddo'r rhywogaethau coed allweddol, sef derw mes digoes a bedw, a dylid ystyried plannu perllan ar laswelltir sy'n brin o rywogaethau er mwyn darparu cynefinoedd saprosylig ychwanegol yn y tymor hwy.

2. Executive summary

A survey of the dead wood (saproxylic) invertebrate fauna of the Gilfach Nature Reserve, which is owned and managed by the Radnorshire Wildlife Trust (RWT), was undertaken over four man-days in 2022. This work is part of the Natur am Byth! Partnership project, which aims to promote the recovery of selected key species in Wales. The Gilfach survey involved both a range of hand-searching techniques and the installation of five vane traps that were operated between May and September.

The survey has shown Gilfach to support a diverse invertebrate fauna that includes a number of scarce species. With an **Index of Ecological Continuity (IEC) of 5** and a **Site Quality Index (SQI) of 314.5**, the saproxylic invertebrate assemblage at Gilfach is not as rich as that of the RSPB Carn Gafallt reserve, which was also surveyed this year as part of the Natur am Byth! project. This is because the resource of over-mature and veteran broadleaved trees is much smaller than at the latter site and heartwood decay is absent.

Gilfach nonetheless has a significant saproxylic invertebrate assemblage that includes species such as the Scarce Cardinal Beetle *Schizotus pectinicornis* and the rove beetles *Bolitochara mulsanti* and *Phyllodrepoidea crenata*, which are at or very close to their southern distributional limits here. These species are part of a distinctive and important assemblage characterisitic of dead wood sites in northern and western Britain that is very well represented in old woods and wood-pastures (including Carn Gafallt) along the eastern fringe of the Cambrian Mountains.

Management measures are given that aim to enhance the saproxylic invertebrate assemblages recorded at Gilfach over the longer term, including the thinning of younger growth in wooded areas where there are significant numbers of old trees and the identification of cohorts of younger trees to act as replacements for the current over-mature and veteran trees. The key tree species, Sessile Oak and birch, should be retained and promoted and consideration should be given to planting an orchard on species-poor grassland to provide additional saproxylic habitats in the longer term.

3. Introduction

The work reported here is part of an extensive programme funded through the Natur am Byth! Partnership project. It is a Wales-wide species recovery programme that is being developed by a number of NGOs and is planning species recovery work for 66 species at risk in Wales, from coastal waters to upland crags. More information on the project can be found at Natural Resources Wales / Natur am byth! Saving Wales' threatened species.

Over the summer of 2022, the author was contracted by Buglife Cymru to carry out an invertebrate survey of Carn Gafallt and Gilfach Nature Reserve. This report is concerned with the latter site (hereafter referred to simply as 'Gilfach'), the former being covered by a separate report (Boyce, 2023). Gilfach lies in the county of Powys, mid-Wales (vice county [vc] 43, Radnorshire). The main emphasis of the contract was to assess the importance and condition of the saproxylic (dead wood) invertebrate assemblage of the site.

The site is located on steep to moderate slopes in the lower part of the Marteg valley, which flows into the upper Wye (Afon Gwy) just to the west of the site boundary. A central Grid Reference for Gilfach lies at approximately SN964716. It is owned and managed by the Radnorshire Wildlife Trust (RWT). In addition to being a nature reserve, it also comprises an element of the Marcheini Uplands, Gilfach Farm & Gamallt Site of Special Scientific Interest (SSSI), which includes both this site and the areas of upland heath and grassland to the north. The lower half of the Afon Marteg running through the reserve (from the Marteg waterfall west to the site boundary) comprises an element of the Afon Gwy Special Area of Conservation (SAC), which covers both the river channel and the strip of riparian woodland that lines its banks. Figure 6 shows the location of the site.

Gilfach includes a number of habitats typical of the Cambrian Mountains. Plateau areas of the Reserve have upland heath dominated by Ling *Calluna vulgaris* and Bilberry *Vaccinium myrtillus*. On the unenclosed valley slopes, there are typical ffridd mosaics that include drier heaths with Western Gorse *Ulex gallii* and Bell Heather *Erica cinerea*, acid grassland dominated by Sheep's Fescue *Festuca ovina* and Common Bent *Agrostis capillaris* and extensive stands of Bracken *Pteridium aquilinum*. A feature of the ffridd is the presence of scattered trees and bushes of species such as Hawthorn *Crataegus monogyna*, Rowan *Sorbus aucuparia* and birch *Betula* sp. Cover of the latter is increasing very markedly at Gilfach currently in response to reduction or removal of grazing animals. Old, open-grown birch trees here are known to host a breeding population of the Welsh Clearwing moth *Synanthedon scoliaeformis*, a Nationally Scarce species whose larvae develop in the living trunk of such trees.

The enclosed farmland on the lower slopes of the Marteg valley mostly comprises cattle and sheep-grazed pastures. Some of these grasslands are agriculturally semi-improved with only moderate botanical diversity. However, there are also stands of dry, unimproved acid-neutral grassland that are extremely species-rich. The presence of abundant Yellow

Meadow Ant *Lasius flavus* nest mounds indicates that they have been subject to very little disturbance. The sward in these fields has a mix of acid and neutral grassland species, including Common Bird's-foot-trefoil *Lotus corniculatus*, Bitter Vetch *Lathyrus montanus*, Common Knapweed *Centaurea nigra*, Devil's-bit Scabious *Succisa pratensis*, Betony *Betonica officinalis* and Heath Spotted-orchid *Dactylorhiza maculata*. Some calcicolous element such as Fairy Flax *Linum catharticum* and Wild Thyme *Thymus drucei* are also present, the latter being most frequent on anthills. Damper, ranker grasslands near the Marteg have other local species such as Greater Burnet *Sanguisorba officinalis* and Wood Bitter-vetch *Vicia orobus*.



Figure 1. Gilfach SU2b, unimproved grassland with Betony, Harebell etc.

Dividing the fields are a series of outgrown hedges with a range of trees and shrubs present, including Hazel *Corylus avellana*, Hawthorn, Blackthorn *Prunus spinosa*, Sessile Oak *Quercus petraea*, Ash *Fraxinus excelsior*, birch, Grey Willow *Salix cinerea* and Bird Cherry *Prunus padus*. There are some mature specimens, including a number of over-mature and veteran specimens of Ash, birch and Grey Willow that have dead wood habitat features. For example, Figure 2 shows two over-mature Ash trees on the southeastern boundary of SU3b.

The greatest concentration of veteran trees is in a small area of wood-pasture above the Afon Marteg (SU2d). In all, this sub-compartment contains 13 over-mature to veteran

Sessile Oaks and a single veteran Ash. The general appearance of this area is shown on the report cover and on Figure 3.



Figure 2. Gilfach SU3b, over-mature Ash trees, including fallen branch on boundary.

Along both the riparian corridor of the Marteg (see Figure 4) and down spring-fed flush lines, there are strips of wet woodland dominated by Alder *Alnus glutinosa*, Grey Willow, Hazel and Ash that include some over-mature trees with dead wood habitat features.

Coed Gilfach is an area of ancient semi-natural woodland (ASNW) situated on moderate north-facing slopes at the eastern end of the Reserve. This has typical upland oak woodland dominated by even-aged stands of Sessile Oak, with some Downy Birch *Betula pubescens* and a sparse understorey of Rowan and Hazel. The oak trees show clear evidence of having been coppiced in the past. The woodland is typical of neglected upland oak coppices throughout Britain; the canopy is closed and the trees are all mid-aged. They are too young to have developed heartwood decay but there is a reasonable quantity of fallen dead branches, as well as some small-diameter standing dead trees (snags) and hanging dead branches that have partially snapped off but are still suspended above the ground. There are two veteran Sessile Oak trees along the path that runs along the bottom of the wood, one of which is shown in Figure 5. These have completely hollowed trunks and one is regularly used by nesting Tawny Owls *Strix aluco*.



Figure 3. Gilfach SU2d, over-mature oaks in informal wood-pasture.



Figure 4. Gilfach SU3d, riparian woodland by Afon Marteg.



Figure 5. Coed Gilfach SU1, former Sessile Oak coppice with one veteran oak (GFVAT1).

This report sets out findings of the work carried out in 2022. The methods used to undertake the survey are laid out in the following section and the results are presented in Section 5. The latter lists all the invertebrates recorded during fieldwork at Gilfach in 2022. Sub-section 5.1 provides short profiles of any key species found here this year, which have

brief notes on their identification, British distribution, ecology and occurrence at Gilfach. In sub-section 5.2, the key species list is used to identify key invertebrate habitat features at Gilfach. This sub-section also analyses the importance of dead wood invertebrate assemblages at Gilfach using the Revised Index of Ecological Continuity (RIEC) (Alexander, 1988, 2004) and the Saproxylic Quality Index (SQI) (Fowles *et al.*, 1999). Section 6 gives some conclusions on the overall importance of the site for saproxylic invertebrates and Section 7 lists management works that aim to maintain and enhance its importance for the dead wood fauna.

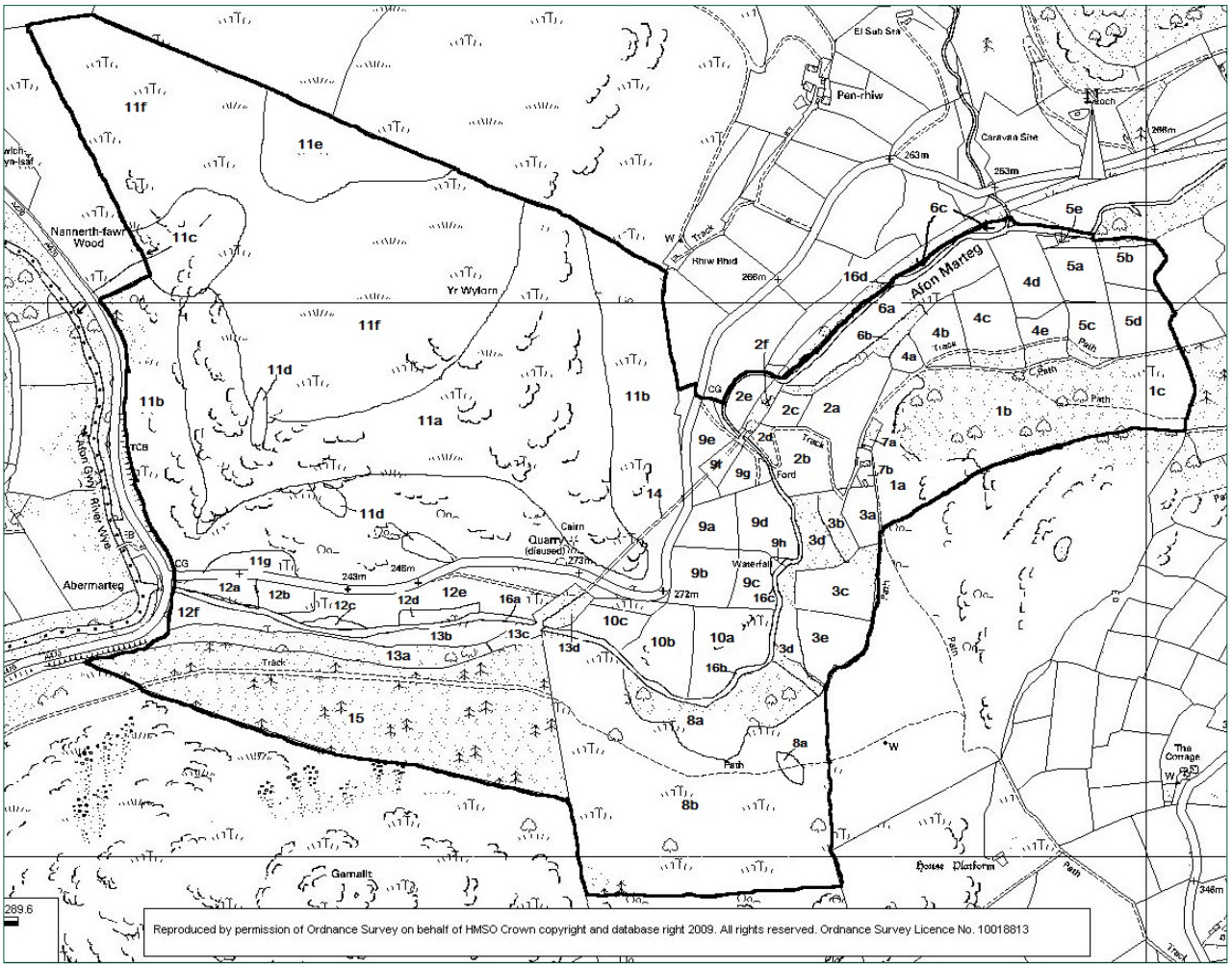

Figure 6. Gilfach, showing invertebrate survey units (SU) in 2022.

4. Methods

4.1 Objectives

The aim of this project was to assess the importance of Gilfach for saproxylic invertebrates. The methods used are outlined below, but generally follow the advice given by Webb & Hackmann (2018).

4.2 Desk study

No saproxylic invertebrate surveys have been undertaken at Gilfach previously. The results and discussion in sections 5 and 6 is therefore based entirely on the results of this survey.

4.3 Field survey

Four days' fieldwork were undertaken at Gilfach over five days in 2022. These visits were on 24th May, 21st June, 29th July, 15th September and 22nd December. The main focus of recording effort has been on dead wood beetles, which make up the largest and most important element of the specialist saproxylic fauna. Casual records of other invertebrate species that could be identified in the field (e.g. butterflies, Orthoptera etc.) have also been made. Figure 6 shows the location of the survey units (SU) into which Gilfach has been divided. These are the same as the management compartments into which the RWT sub-divides the Gilfach Reserve. These have also been adopted as the units to sub-divide survey effort in this contract.

Five vane traps were set up at each site during the May visit, with details of the location and siting of these being provided in Table 2 below. In May, beating flowering Hawthorn was a major focus of sampling effort. Additionally, on all visits much time has been spent beating foliage and dead branches of mature and veteran trees and hand-searching under bark and in heart-rot of veteran trees. During the September visit, the vane traps were emptied and removed and sampling effort focused on hand-searching saproxylic fungi. The December visit aimed to search for northern-distributed saproxylic species that are known to have occurred in the upland oak woods on the fringes of the Cambrian Mountains.

Table 1. Vane trap location and siting, Gilfach 2022.

Vane trap no.	Grid Reference	Survey Unit (SU) no.	Siting
VATGF1	SN96937187	1c	Veteran Sessile Oak with hollowed trunk cavity, upland oakwood on lower slopes of Coed Gilfach.
VATGF2	SN96807182	1b	Hanging dead branches on mid-aged Sessile Oak in closed canopy upland oakwood, Coed Gilfach.

Vane trap no.	Grid Reference	Survey Unit (SU) no.	Siting
VATGF3	SN96307175	2d	Veteran Sessile Oak with exposed red heart-rot, shaded wood-pasture above the Afon Marteg.
VATGF4	SN96317173	2d	Veteran oak with hollowed trunk cavity, shaded wood-pasture above the Afon Marteg.
VATGF5	SN96397165	2b/3b	Birch snag with brackets of Birch Polypore fungus, outgrown hedgerow.

4.4 Limitations

The very hot, dry weather over the spring and summer of 2022 is considered to have been a limiting factor, particularly for groups such as the craneflies (Tipuloidea), many of which require rather cool, damp conditions. Certainly, catches of Diptera in the vane traps, were small, with surprisingly few interesting saproxylic species.

5. Results

Table 2 gives a checklist of the 231 invertebrate species recorded at Gilfach during the 2022 survey, and Table 3 lists all the important species found here this year. The emboldened codes in the 'Status' column of these tables identify those taxa with a formal threat or rarity status in Britain. The notes at the end of the table explain these threat or rarity codes. Invertebrates with a threat or rarity status are described in this report as being 'key species'. For each key species, sub-section 5.1 provides a short profile, which outlines their UK distribution and ecology and occurrence at Gilfach in 2022. The 'Status' column of Tables 2 and 3 also includes those beetles with a high fidelity to wooded sites such as parkland and wood-pasture where there is a long continuity of well-developed dead wood habitats (SFG2 and SFG3: Harding & Rose, 1986, as updated by Alexander, 2004). Note that these habitat specialists are not regarded as key species unless they also have a formal threat/rarity status.

In sub-section 5.2, key saproxylic invertebrate habitats are delineated. These are defined as those in which at least one key saproxylic species was recorded in 2022. This sub-section also includes a discussion of the importance of the various saproxylic habitats at Gilfach for invertebrates.

Table 2. Checklist of invertebrates recorded at Gilfach in 2022.

Species scientific name	English name	Status	Survey unit(s)
Arion rufus	Large Red Slug	-	GF3b
Arion subfuscus agg.	Dusky Slug	-	GF3b
Lehmannia marginata	Tree Slug	-	GFVAT4; GF3b

Species scientific name	English name	Status	Survey unit(s)
Limax maximus	Leopard Slug	-	GF3b
Glomeris marginata	Pill Millipede	-	GF3b
Calopteryx virgo	Beautiful Demoiselle Damselfly	-	GF2f
Pyrrhosoma nymphula	Large Red Damselfly	-	GF6a
Cordulegaster boltonii	Golden-ringed Dragonfly	-	GF6a
Omocestus viridulus	Common Green Grasshopper	-	GF3b
Forficula auricularia	Common Earwig	-	GFVAT5; GF2d
Acanthosoma haemorrhoidale	Hawthorn Shieldbug	-	GF5b
Elasmostethus interstinctus	Birch Shieldbug	-	GF5c
Pentatoma rufipes	Forest Shieldbug	-	GF2d,5d
Piezodorus lituratus	Gorse Shieldbug	-	GF5b
Loricula elegantula	A microphysid bug	-	GF3b
Aquarius najas	River Skater	**NS**	GF6a
Leistus ferrugineus	A ground beetle	-	GF3b
Carabus violaceus	Violet Ground Beetle	-	GF1b
Carabus problematicus	A ground beetle	-	GFVAT1; GF3b
Elaphrus cupreus	A ground beetle	-	GF6a
Pterostichus oblongopunctatus	A ground beetle	-	GF1b
Pterostichus aethiops	A ground beetle	**NS**	GF1b
Pterostichus niger	A ground beetle	-	GF2d,3b
Limodromus assimilis	A ground beetle	-	GF2d
Calodromius spilotus	A ground beetle	-	GF2d
Dromius agilis	A ground beetle	-	GF2d
Dromius quadrimaculatus	A ground beetle	-	GFVAT1; GF2d
Megasternum concinnum	A hydrophilid beetle	-	GF3b
Anisotoma humeralis	A leiodid beetle	-	GFVAT4
Agathidium varians	A leiodid beetle	-	GFVAT2
Phosphuga atrata	A silphid beetle	-	GF1b,6c
Acrulia inflata	A rove beetle	-	GF3b
Phyllodrepa floralis	A rove beetle	-	GFVAT1
Dropephylla gracilicornis	A rove beetle	**NS**	GFVAT4
Dropephylla ioptera	A rove beetle	-	GF2d
Omalium rivulare	A rove beetle	-	GFVAT1
Phyllodrepoidea crenata	A rove beetle	**NS**	GF2d
Proteinus brachypterus	A rove beetle	-	GF3b
Bibloporus bicolor	A rove beetle	-	GFVAT3
Phloeocharis subtilissima	A rove beetle	-	GF2d
Aleochara diversa	A rove beetle	**N**	GFVAT1
Aleochara sparsa	A rove beetle	-	GFVAT1,2,3,5

Species scientific name	English name	Status	Survey unit(s)
Phloeopora corticalis	A rove beetle	**N**	GF2d
Phloeopora testacea	A rove beetle	-	GFVAT5
Haploglossa villosula	A rove beetle	-	GFVAT1,2,5
Oligota apicata	A rove beetle	**N**	GF3b
Leptusa fumida	A rove beetle	-	GF1c,2d,3b
Leptusa pulchella	A rove beetle	-	GF3b
Leptusa ruficollis	A rove beetle	-	GF1b,1c,3b
Bolitochara mulsanti	A rove beetle	**N**	GF3b
Bolitochara obliqua	A rove beetle	-	GF2d
Gyrophaena joyi	A rove beetle	**N**	GF3b
Agaricochara latissima	A rove beetle	-	GF2d
Dinaraea aequata	A rove beetle	-	GF2d,3b
Atheta membranata	A rove beetle	-	GFVAT1
Atheta pallidicornis	A rove beetle	-	GF1c
Atheta vaga	A rove beetle	-	GFVAT1,4,5; GF3b
Atheta laevana	A rove beetle	-	GFVAT5
Atheta marcida	A rove beetle	-	GF3b
Atheta fungi ss	A rove beetle	-	GF3b
Atheta taxiceroides	A rove beetle	-	GFVAT1
Neuraphes ruthenus	A rove beetle	-	GF3b
Stenus impressus	A rove beetle	-	GF1c
Stenus tarsalis	A rove beetle	-	GF6a
Stenus flavipes	A rove beetle	-	GF2f
Stenus juno	A rove beetle	-	GF6a
Atrecus affinis	A rove beetle	-	GF3b
Quedius cruentus	A rove beetle	-	GFVAT1
Quedius mesomelinus	A rove beetle	-	GFVAT1,2,4
Quedius scitus	A rove beetle	SFG2	GFVAT4
Ocypus olens	Devil's Coach-horse beetle	-	GF3b
Gabrius splendidulus	A rove beetle	-	GF2d,3b
Sinodendron cylindricum	Rhinoceros Beetle	-	GF3b
Acrossus rufipes	A dung beetle	-	GFVAT5
Hoplia philanthus	A chafer beetle	-	GF6a
Melolontha melolontha	Cockchafer beetle	-	GF6a
Phyllopertha horticola	Garden Chafer beetle	-	GF3b
Dascillus cervinus	Orchid Beetle	-	GF3b
Epiphanis cornutus	A eucnemid beetle	-	GFVAT4
Agriotes pallidulus	A click beetle	-	GF6a
Dalopius marginatus	A click beetle	-	GFVAT1; GF5c

Species scientific name	English name	Status	Survey unit(s)
Melanotus villosus agg.	A click beetle	-	GF6c
Athous haemorrhoidalis	A click beetle	-	GF1b
Denticollis linearis	A click beetle	-	GF2d
Prosternon tessellatum	A click beetle	-	GF3b
Cantharis decipiens	A soldier beetle	-	GFVAT3; GF5b, 6a
Cantharis rustica	A soldier beetle	-	GF6a
Malthodes marginatus	A soldier beetle	-	GF5b
Grynobius planus	A woodworm beetle	-	GFVAT4
Phloiophilus edwardsii	A phloiophilid beetle	**NS,** SFG3	GF2d
Dasytes aeratus	A melyrid beetle	-	GF6a
Rhizophagus bipustulatus	A monotomid beetle	-	GF2d
Rhizophagus dispar	A monotomid beetle	-	GF2d,3b
Cryptophagus dentatus	A cryptophagid beetle	-	GFVAT5
Cryptophagus scanicus	A cryptophagid beetle	-	GFVAT3
Atomaria vespertina	A silken fungus beetle	-	GFVAT4
Pediacus dermestoides	A cucujid beetle	SFG3	GF2d
Epuraea biguttata	A nitidulid beetle	-	GFVAT2
Epuraea distincta	A nitidulid beetle	**Na**	GF1c
Cryptarcha strigata	A nitidulid beetle	**Nb**	GFVAT2
Glischrochilus quadriguttatus	A nitidulid beetle	-	GFVAT1,2
Cerylon ferrugineum	A cerylonid beetle	-	GF3b
Calvia quattuordecimguttata	Cream-spot Ladybird	-	GF2d
Cartodere nodifer	A mould beetle	-	GF3b
Latridius porcatus	A mould beetle	-	GF3b
Corticarina similata	A mould beetle	-	GF1b
Octotemnus glabriculus	A ciid beetle	-	GF3b
Cis bidentatus	A ciid beetle	-	GF3b
Cis bilamellatus	A ciid beetle	-	GFVAT5; GF3b
Cis fagi	A ciid beetle	**-**	GF5c
Cis festivus	A ciid beetle	**Nb**	GF1c,2d
Orchesia micans	A false darkling beetle	**NS**	GFVAT5
Orchesia undulata	A false darkling beetle	SFG3	GF3d
Lagria hirta	A darkling beetle	-	GFVAT5
Oedemera lurida	An oedemerid beetle	-	GF1a
Schizotus pectinicornis	Scarce Cardinal Beetle	**NR**	GF3b
Salpingus planirostris	A salpingid beetle	-	GFVAT5; GF2d,5d
Salpingus ruficollis	A salpingid beetle	-	GFVAT2
Aderus populneus	An aderid beetle	**NS**	GFVAT4
Anaspis fasciata	A scraptiid beetle	-	GF5b, 6a

Species scientific name	English name	Status	Survey unit(s)
Anaspis frontalis	A scraptiid beetle	-	GF5b
Anaspis regimbarti	A scraptiid beetle	-	GFVAT4
Anaspis thoracica	A scraptiid beetle	**NS**	GFVAT5
Anaspis rufilabris	A scraptiid beetle	-	GFVAT2,5; GF6a
Rhagium bifasciatum	A longhorn beetle	-	GFVAT4
Grammoptera ruficornis	A longhorn beetle	-	GF6a
Pogonocherus hispidulus	A longhorn beetle	-	GF5c
Chrysolina staphylaea	A leaf beetle	-	GF3b
Gonioctena olivacea	A leaf beetle	-	GF5b
Galerucella lineola	A leaf beetle	-	GFVAT3
Apion cruentatum	An apionid weevil	-	GF3b
Perapion curtirostre	An apionid weevil	-	GF3b
Eutrichapion ervi	An apionid weevil	-	GF2f
Furcipus rectirostris	Bird Cherry Weevil	**Nb**	GFVAT3
Archarius salicivorus	A weevil	-	GF1c
Trichosirocalus troglodytes	A weevil	-	GF2f
Strophosoma melanogrammum	A weevil	-	GFVAT1
Otiorhynchus singularis	A weevil	-	GFVAT2; GF3b,6a
Phyllobius argentatus	A weevil	-	GF1b
Phyllobius pyri	A weevil	-	GF6a
Sitona suturalis	A weevil	-	GF2f
Hylesinus varius	A bark beetle	-	GF3b
Dryocoetes villosus	A bark beetle	-	GFVAT1
Scolytus intricatus	A bark beetle	-	GFVAT2; GF2d
Sericostoma personatum	Welshman's Button caddisfly	-	GFVAT3,5
Adela reaumurella	A longhorn moth	-	GF5d
Ochlodes sylvanus	Large Skipper butterfly	-	GF6a
Anthocharis cardamines	Orange Tip butterfly	-	GF5b
Pieris napi	Green-veined White butterfly	-	GF3c,5b
Gonepteryx rhamni	Brimstone butterfly	-	GF3b
Lasiommata megera	Wall Brown butterfly	**EN/S7**	GF1a
Coenonympha pamphilus	Small Heath butterfly	**VU/S7**	GF3b,5b
Aphantopus hyperantus	Ringlet butterfly	-	GF3b
Maniola jurtina	Meadow Brown butterfly	-	GF3b
Boloria selene	Small Pearl-bordered Fritillary butterfly	**VU/S7**	GF2f
Argynnis paphia	Silver-washed Fritillary butterfly	-	GF9c
Speyeria aglaja	Dark Green Fritillary butterfly	**NT**	GF6a
Vanessa cardui	Painted Lady butterfly	-	GF6a
Lycaena phlaeas	Small Copper butterfly	-	GF4d

Species scientific name	English name	Status	Survey unit(s)
Favonius quercus	Purple Hairstreak butterfly	-	GF9c
Polyommatus icarus	Common Blue butterfly	-	GF6a
Thyatira batis	Peach Blossom moth	-	GFVAT4
Hydriomena furcata	July Highflyer moth	-	GFVAT1,5
Apamea monoglypha	Dark Arches moth	-	GFVAT4
Polia nebulosa	Grey Arches moth	-	GFVAT5
Diarsia brunnea	Purple Clay moth	-	GFVAT5
Tipula scripta	Common Saw-tailed Mottle cranefly	-	GFVAT3
Cheilotrichia cinerascens	Grey Fork-winged Twist-tail cranefly	-	GFVAT4
Limonia nubeculosa	Three-banded Limonia cranefly	-	GFVAT2,3
Ormosia nodulosa	Common Tabbed Bead cranefly	-	GFVAT1,2
Rhypholophus varius	Dark False Bead cranefly	-	GFVAT1
Austrolimnophila ochracea	Drab Splinter Longtail cranefly	-	GFVAT4
Neoplatyura flava	A keroplatid fungus gnat	-	GFVAT2
Brevicornu flaveola	A mycetophilid fungus gnat	-	GFVAT2
Phronia basalis	A mycetophilid fungus gnat	-	GFVAT2
Phronia coritanica	A mycetophilid fungus gnat	-	GFVAT3
Phronia exigua	A mycetophilid fungus gnat	-	GFVAT2
Trichonta vitta	A mycetophilid fungus gnat	-	GFVAT2
Mycomya annulata	A mycetophilid fungus gnat	-	GFVAT2,3
Neoempheria pictipennis	A mycetophilid fungus gnat	-	GFVAT4
Acnemia nitidicollis	A mycetophilid fungus gnat	-	GFVAT4
Monoclona rufilatera	A mycetophilid fungus gnat	-	GFVAT2
Sylvicola cincta	An anisopodid fly	-	GFVAT2
Sylvicola fenestralis	An anisopodid fly	-	GFVAT3,4
Sylvicola punctatus	An anisopodid fly	-	GFVAT3
Xylophagus ater	Common Awl-fly	-	GF1b,3b
Rhagio scolopacea	Downlooker Snipefly	-	GF4d
Beris fuscipes	Short-horned Black Legionnaire Soldierfly	-	GFVAT3
Chloromyia formosa	Broad Centurion Soldierfly	-	GF2f
Empis tessellata	A dance fly	-	GF5d
Empis trigramma	A dance fly	-	GFVAT3
Dolichopus popularis	A long-headed fly	-	GFVAT4
Sybistroma obscurellum	A long-headed fly	-	GFVAT4
Baccha elongata	A hoverfly	-	GF6c
Chrysotoxum bicinctum	A hoverfly	-	GF3b
Episyrphus balteatus	Marmalade Hoverfly	-	GF6a
Helophilus pendulus	A sun-fly	-	GF4d
Platycheirus granditarsus	A hoverfly	-	GF6a

Species scientific name	English name	Status	Survey unit(s)
Syritta pipiens	A hoverfly	-	GF3b
Volucella bombylans	A hoverfly	-	GF6a
Chamepsila rosae	Carrot Fly	-	GFVAT3
Palloptera umbellatarum	A pallopterid fly	-	GFVAT3
Dryomyza anilis	A dryomyzid fly	-	GFVAT5
Dryope flaveola	A dryomyzid fly	-	GFVAT2
Tephrochlamys flavipes	A heleomyzid fly	-	GFVAT1,5
Hylemya nigrimana	An anthomyiid fly	-	GFVAT2,5
Gymnocheta viridis	A parasite fly	-	GF3b
Rhopalum clavipes	A hunting wasp	-	GFVAT5
Andrena wilkella	Wilke's Mining Bee	-	GF6a
Andrena haemorrhoa	Orange-tailed Mining Bee	-	GF6a
Bombus lucorum agg.	White-tailed Bumblebee	-	GFVAT4
Bombus terrestris	Buff-tailed Bumblebee	-	GF3c
Bombus hortorum	Garden Bumblebee	-	GF1c,6c
Bombus lapidarius	Red-tailed Bumblebee	-	GFVAT4; GF4d
Bombus rupestris	Hill Cuckoo Bumblebee	**Nb**	GF2d
Bombus hypnorum	Tree Bumblebee	-	GF3b
Bombus jonellus	Heath Bumblebee	-	GF3b
Bombus pratorum	Early Bumblebee	-	GF1b,3b
Bombus pascuorum	Common Carder Bumblebee	-	GF1b,3b,6c
Nomada lathburiana	Lathbury's Nomad Bee	-	GF6a
Lasius flavus	Yellow Meadow Ant	-	GF2b,3b,4d,6a
Myrmica ruginodis	A red ant	-	GF3b
Myrmica scabrinodis	A red ant	-	GF3b
Trichoniscus pusillus	Common Pigmy Woodlouse	-	GF3b
Oniscus asellus	Common Shiny Woodlouse	-	GF3b
Philoscia muscorum	Common Striped Woodlouse	-	GF3b
Porcellio scaber	Common Rough Woodlouse	-	GFVAT1,4,5; GF3b
Lepthyphantes minutus	A money spider	-	GFVAT4
Nuctenea umbratica	An orb-weaving spider	-	GF2d
Pisaura mirabilis	Nursery Web Spider	-	GF6a
Amaurobius similis	An amaurobiid spider	-	GF2d

Notes on Table 2
The abbreviated status categories given in column 3 are explained below.

EN (GB) – GB Red List, Endangered. A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future.
VU (GB) – GB Red List, Vulnerable. Taxa which either have a very small British range and/or are declining rapidly with a quantifiable probability of becoming extinct if the causal factors for decline continue to operate.

NT (GB) – IUCN Near Threatened. A taxon is Near Threatened when it has been evaluated against the IUCN criteria and does not currently qualify for Critically Endangered, Endangered or Vulnerable status, but is close to qualifying, or is likely to do so soon.
NR - Nationally Rare. In recent National Reviews the plethora of Red Data Book categories used in earlier publications (RDB1, RDB2, RDB3, RDBI and RDBK) have been subsumed into a single category covering species occurring in 15 or fewer hectads.
Na – Nationally Scarce Category A. Taxa thought to occur in 30 to 16 10 km squares of the National Grid (Hyman & Parsons, 1992 & 1994).
Nb – Nationally Scarce Category B. Taxa thought to occur in between 30 and 100 10 km squares of the National Grid (Hyman & Parsons, 1992 & 1994).
N – Nationally Scarce. Taxa which are estimated to occur within the range of 16 to 100 10km squares, but where division into Na or Nb status has not been attempted due to limited availability of information on British distribution. Second status review not yet completed and status therefore taken from first review (Falk, 1991; Hyman & Parsons, 1994).
NS – Nationally Scarce. In recent reviews the Na and Nb sub-divisions have been subsumed into a single category covering species occurring in 16 to 100 10km squares of the National Grid. Unlike the previous 'N' category, which covers the same distribution range, the amalgamation does not necessarily result from inadequate information on the British distribution.
S7 – Species of Principal Importance for the maintenance and enhancement of biodiversity in Wales that are listed in Section 7 of the Environment (Wales) Act, 2016.
SFG2 – Saproxylic Fauna Group 2 - Saproxylic beetles that occur mainly in areas believed to be ancient woodland, with abundant dead wood habitats, but which also appear to have been recorded from areas that may not be ancient, or for which the locality data are imprecise (Harding & Rose, 1986).
SFG3 – Saproxylic Fauna Group 3 - Saproxylic beetles that occur widely in wooded land, but which are collectively characteristic of ancient woodland with dead wood habitats (Harding & Rose, 1986).

5.1 Key invertebrate species recorded at Gilfach in 2022

Table 3 lists the 23 key invertebrates recorded at Gilfach in 2022. The species names of these are shown in emboldened font in Table 3 and marked with an asterisk. Species with a formal threat or rarity status are regarded as the key species in assessing the importance and management of the site. Species profiles are given for all of these below.

Table 3. Important invertebrate species recorded at Gilfach in 2022.

Species	Status	SU recorded
River Skater *Aquarius najas**	**NS**	GF6a
Pterostichus aethiops*	**NS**	GF1b
Dropephylla gracilicornis*	**NS**	GFVAT4
Phyllodrepoidea crenata*	**NS**	GF2d
Aleochara diversa*	**NS**	GFVAT1
Phloeopora corticalis*	**N**	GF2d
Oligota apicata*	**N**	GF3b
Bolitochara mulsanti*	**N**	GF3b
Gyrophaena joyi*	**N**	GF3b
Quedius scitus	SFG2	GFVAT4
Phloiophilus edwardsii*	**NS**, SFG3	GF2d
Pediacus dermestoides	SFG3	GF2d
Epuraea distincta*	**Na**	GF1c
Cryptarcha strigata*	**Nb**	GFVAT2
Cis Festivus*	**Nb**	GF1c, 2d
Orchesia micans*	**NS**	GFVAT5
Orchesia undulata	SFG3	GF3d

Species	Status	SU recorded
Scarce Cardinal Beetle *Schizotus pectinicornis**	**NR**	GF3b
Aderus populneus*	**NS**	GFVAT4
Anaspis thoracica*	**NS**	GFVAT5
Bird Cherry Weevil *Furcipus rectirostris**	**Nb**	GFVAT3
Wall Brown *Lasiommata megera**	**EN, S7**	GF1a
Small Heath *Coenonympha pamphilus**	**VU, S7**	GF3b, 5b
Small Pearl-bordered Fritillary *Boloria selene**	**VU, S7**	GF2f
Dark Green Fritillary *Speyeria aglaja**	**NT**	GF2b,6a
Hill Cuckoo Bumblebee *Bombus rupestris**	**Nb**	GF2d

5.1.1 River Skater *Aquarius najas* NS

The large size (at least 13mm body length) and completely black thorax of *Aquarius najas* (DeGeer, 1773) are sufficient to identify this easily recognised pond skater. It has a scattered distribution in Britain from southern Scotland southwards with the strongest populations being in western areas of England and Wales. The River Skater is found on slow-moving stretches of rivers and streams, often where the water is shaded by overhanging trees. It occurs in large flotillas and like other Gerrids, it is predaceous, feeding on invertebrates that are trapped on the water surface. At Gilfach, a large population of the River Skater was present on the Afon Marteg (northern boundary of survey unit GF6a).

5.1.2 *Pterostichus aethiops* NS

In its large size and evenly rounded thorax, *Pterostichus aethiops* (Panzer, 1796) closely resembles the very common ground beetle *P. madidus*. However, it always has black legs and has three setiferous punctures on the third elytral interval (respectively most often red and with just one in *P.madidus*). *P. aethiops* is an upland species of northern and western areas. Most of its populations are in Scotland, northern England, Wales and on the moors of the southwest peninsula. It is found on open moorland in the summer months, whilst over the winter it can be found under bark and moss of dead stumps, branches and trunks in woodlands on the moorland fringe. A number of adults were found hibernating in such situations in Coed Gilfach (SU GF1b & GF1c) during the December visit to the site.

5.1.3 *Dropephylla gracilicornis* NS

Dropephylla gracilicornis (Fairmaire & Laboulbène, 1856) is a small, reddish-brown rove beetle that is closely similar to its congeners, being most easily recognised by the presence of furrows on the head that stretch back as far as the ocelli and also by the form of the male genitalia. It has a very thinly scattered distribution across England and Wales. Most records are from dead branchwood of broadleaved trees, but it has also been found in reed litter. At Gilfach, two females and a male were collected in vane trap GFVAT4 between July and September 2022.

5.1.4 *Phyllodrepoidea crenata* NS

The single British *Phyllodrepoidea, P. crenata* (Ganglbauer, 1895) is a distinctive, pitchy-red, mid-sized rove beetle. The elytra are irregularly striate, the antennae are blackish with

orange-yellow basal segments and the last palpomere well-developed and very elongate. It is restricted to northern and western Britain, from northern Scotland, south as far as Wales and Derbyshire. *P. crenata* is a dead wood species, which is found under the bark of both broadleaved and coniferous trees in woods and parkland. At Gilfach, a single adult was collected under the bark of a fallen Ash branch in SU2d during the December visit to the site.

5.1.5 *Aleochara diversa* N

Aleochara is a large genus of Aleocharine rove beetles with a characteristic broad body form. *A. diversa* (Sahlberg, J., 1876) is one of a group of four black shiny species with reddish legs in the *A. sparsa* group that can only be distinguished with certainty by very careful examination of the palps and genitalia. Though it is poorly known, *A. diversa* is clearly one of the rarest members of this group, with recent records confined to a few locations in southern England and Wales. Like other members of the genus, it is believed to be a parasitoid of fly larvae, with the adults most frequently found in fly-rich patch habitats, such as carrion, dung, rotting fungi and decomposing vegetation. Most records of *A. diversa* are from rotting bracket fungi or heart-rot associated with over-mature trees. A male was collected at Gilfach from vane trap GFVAT1 between July and September 2022.

5.1.6 *Phloeopora corticalis* N

The genus *Phloeopora* includes five British representatives, all of which are small rove beetles found in saproxylic habitats. *P. corticalis* (Gravenhorst, 1802) can be distinguished from its congeners by its narrow body form, dark colouration and the strong microsculpture on the top of the thorax, which gives it a rather matt appearance. The form of the male aedeagus and female spermatheca are also useful guides to identification. Like other members of the genus, *P. corticalis* is most often found under bark, with broadleaves such as oak, beech and maple being the most frequent hosts, though it has also been found occasionally under conifer bark. A single adult was beaten from dead Sessile Oak branches in survey unit GF2d at Gilfach in July 2022.

5.1.7 *Oligota apicata* N

Despite its very small size, *Oligota apicata* Erichson, 1837 can be easily distinguished from all related Aleocharine rove beetles by a combination of its broad, rounded shape, strongly tapering abdomen and five-segmented antennal club, the terminal segment of which is usually darker than the rest. The form of the male genitalia is also diagnostic. It is quite widely, but very locally distributed across England and Wales and has also been found in southern Scotland. It is most often found in association with bracket fungi, where it is thought to be a predator of small invertebrates. An association with the larvae of Ciid beetles has been suggested. At Gilfach, specimens were tapped from Birch Polypore *Piptoporus betulinus* brackets on a dead birch trunk at the edge of GF3b on the 24th May and 29th July.

5.1.8 *Bolitochara mulsanti* N

The five British members of the genus *Bolitochara* are all shiny, heavily punctate rove beetles with strikingly patterned black and reddish-orange bodies. *B. mulsanti* Sharp, 1875 is one of the species with raised lines running under the eyes. It can be distinguished specifically by its relatively large size and the sharp, almost right-angled pronotal hind angles. Like other *Bolitochara* species, it is associated with saproxylic bracket fungi, with some British records from Birch Polypore *Piptoporus betulinus*. It has also been found on a dead Scot's Pine. There are very few British records, the majority coming from northern England and Scotland. There is a single previous Welsh record on the NBN database, from the Berwyn Mountains, Montgomery (vc47). Though it is certainly under-recorded, it is clearly a genuinely scarce species that is probably an element of the important northern-distributed saproxylic beetle assemblage found along the eastern flank of the Cambrian Mountains. A single female was tapped from Birch Polypore brackets in survey unit GF3b at Gilfach on 29th July.

5.1.9 *Gyrophaena joyi* N

The large genus *Gyrophaena* includes 20 British species of very small, shiny rove beetles that usually have a pattern of black and yellow-orange markings. Examination of the male genitalia, which are very distinctive, is the most reliable way of distinguishing *G. joyi* Wendeler, 1924 from its congeners. All members of the genus are fungus feeders, with *G. joyi* being one of the group that is usually found on 'soft' saproxylic fungi (e.g. *Lentinus*, *Pleurotus*, *Polyporus* etc.). It is thought to be particularly associated with fungi growing on willow and Alder in carr woodland, though in western Britain, it is often found in drier woodland types. It has been found at scattered sites across much of southern England and is also known to occur very locally throughout Wales. At Gilfach, adults were tapped from fruiting bodies of the small Pleurotoid fungus *Crepidodotus calolepis* growing on a large fallen Ash branch at the edge of survey unit GF3b.

5.1.10 *Phloiophilus edwardsii* NS, SFG3

The phloiophilid beetle *Phloiophilus edwardsii* Stephens, 1830 is a mid-sized beetle in which the head and thorax are dark brown to black and the elytra are pale orange-brown with a very distinctive pattern of darker spots and lines. *P. edwardsii* is a saproxylic species that is usually found on dead branches of oak and other broadleaves, where the larvae feed on the encrusting fungus *Phlebia merismoides* (Alexander, 2002). In Wales, it is of very local occurrence, being restricted to a handful of old woods and parks. This is one of a suite of species that are characteristic of wooded habitats with abundant dead wood habitats (Alexander, 2004; Harding & Rose, 1986). At Gilfach, adults were beaten from dead oak branches in survey unit GF2d in September 2022.

5.1.11 *Epuraea distincta* Na

Epuraea distincta (Grimmer, 1841) is a small, pitchy-yellow pollen beetle with darker brown spots on the elytra. Amongst this difficult genus, *E. distincta* is easily determined with a hand lens by its strongly notched pronotal hind angles. It is a very scarce beetle of wet woodland habitats, which is most frequently encountered in Wales and southwest England.

It is a saproxylic specialist whose larvae appear to develop exclusively in the brackets of the Maze-gill fungus *Daedaleopsis confragosa*, which is most often found on dead and dying branches of various willows *Salix* spp. At Gilfach, adults were tapped from the host fungus growing on a dead Grey Willow branch in a small stand of wet woodland at the northern edge of Coed Gilfach (SU GF1c).

5.1.12 *Cryptarcha strigata* Nb

Cryptarcha strigata (Fabricius, 1787) is a dark black-brown, oval nitidulid beetle with yellow undulate markings on the elytra. The borders of both the thorax and elytra are paler reddish-orange and the apex of the prosternal process is emarginate. It has a very local distribution across England and Wales, north as far as Yorkshire. *C. strigata* is exclusively associated with sap runs, especially those caused by larvae of the Goat Moth *Cossus cossus*, which feed on sap- and heart-wood within living trunks and larger branches of a range of native broadleaved trees. A single adult was collected in vane trap GFVAT2 at Coed Gilfach in 2022.

5.1.13 *Cis festivus* Nb

The genus *Cis* currently includes 15 British species, most of which are small, nondescript brown beetles that are hard to distinguish from each other without careful microsocopic examination. *Cis festivus* (Panzer, 1793) has the outer edge of the front tibia and the pronotal sides rounded and the elytral bristles quite short. It can be distinguished from the very similar *C. vestitus* by the relatively well-marked fringe of bristles along the front margin of the pronotum, the pale antennal clubs, rich golden-brown colour of the body and the poorly defined fovea on the basal abdominal segment of males. *C. festivus* is widely, but locally, distributed across Britain north as far as the southern Scottish Highlands. However, the vast majority of sites are in Wales and southern England, south of a line between the Mersey and the Wash. Like all British Ciids, it feeds on fungi growing on dead trees, with this species being a specialist of encrusting *Stereum* fungi and related genera. It is found most frequently on dead Hazel branches, in association with *S.rugosum*. At Gilfach, it was tapped from this fungus growing on dead Hazel branches in survey unit GF1c.

5.1.14 *Orchesia micans* NS

Orchesia micans (Panzer, 1793) is a small, elongate, pitchy-red melandryid beetle that jumps vigorously when disturbed. *O micans* has a wide but very scattered distribution in woodland throughout Britain. The adults are most easily found by scraping old, decaying fruiting bodies of the Alder Bracket fungus *Inonotus radiatus* growing in wet woodland. However, it can also be found in drier woodlands, most often on Shaggy Polypore *I. hispidus* on Ash. The orange-yellow larvae can be recorded from inside these fungi at almost any time of the year. An adult was collected in vane trap GFVAT5 at Gilfach in 2022.

5.1.15 Scarce Cardinal Beetle *Schizotus pectinicornis* NR

The Scarce Cardinal Beetle *Schizotus pectinicornis* (Linnaeus, 1758) is a medium-sized beetle of a distinctive appearance. The ground colour, other than the black head, is red, with a dark pitchy mark in the centre of the thorax. The head has obtuse hind angles, the elytra have broadly explanate margins and the male antennae are strongly pectinate. *S. pectinicornis* is one of the saproxylic specialities of the Elan woodlands, with this area of mid-Wales being the only place in Britain it occurs outside the Scottish Highlands, where it is also of very local occurrence. Larvae are found under the bark of various broadleaves, with birch being particularly favoured. At Gilfach, the distinctive larvae, which have strongly curved cerci, were noted under the bark of a large fallen Ash branch at the edge of SU GF3b Gilfach in May.

5.1.16 *Aderus populneus* NS

Aderus is a monospecific genus, with *Aderus populneus* (Creutzer in Panzer, 1796) being a small, brown beetle distinguished from the two other British Aderids by its broad body form and the presence of somewhat indistinct bands of pubescence on the elytra. It occurs very locally at sites across southern England as far north as southern Yorkshire and has also been found very locally in southern Wales. Larvae are thought to develop in decaying heartwood of a range of native broadleaves, including veteran willows. At Gilfach, a single male was collected in vane trap GFVAT4 between July and September 2022.

5.1.17 *Anaspis thoracica* NS

The colouration of the scraptiid beetle *Anaspis thoracica* (Creutzer in Panzer, 1796) ranges from yellow-brown to black. The male has paired appendages on the third sternite and the mid-tibiae strongly narrowed behind the apex. Though it is quite widely distributed across southern Scotland, Wales and England (except for the southwest), it is extremely localised. The larvae have been reared from red-rotted oak in Britain but are known from rotted heartwood of a much wider range of broadleaved trees on the continent. At Gilfach, a single male was collected in vane trap GFVAT5 between June and July 2022.

5.1.18 Bird Cherry Weevil *Furcipus rectirostris* Nb

The single British species of *Furcipus*, the Bird Cherry Weevil *Furcipus rectirostris* (Linnaeus, 1758) is reddish with paler stripes on the elytra. It is superficially very similar to *Anthonomus* species but can be distinguished from these by the double tooth on the fore femora and the straight rostrum. *F. rectirostris* is very locally distributed across Scotland, northern England and Wales. Its British distribution mirrors the native range of its foodplant, Bird Cherry *Prunus padus*; larvae developing in the fruits. At Gilfach, a single male was collected in vane trap GFVAT3 between July and September 2022.

5.1.19 Wall Brown *Lasiommata megera* EN/S7

The network of dark lines on the otherwise orange-brown wings make the Wall Brown *Lasiommata megera* (Linnaeus, 1767) easily recognised. It is double-brooded, flying from early-May to late-June and again from late-July to mid-September. Larvae feed on a variety of grasses where these are growing in warm, unimproved grassland sites, often

where there are patches of bare ground. It is also found on coastal undercliffs and dunes, and occasionally in open rides in woodland. Nationally, the Wall Brown is in serious decline and has suffered local extinctions at many former sites, although records remain widespread but scattered across England and Wales. It also occurs in south-west Scotland. Many remaining strongholds are now coastal and the species has become increasingly scarce at inland localities. At Gilfach, a single adult was recorded on dry, acid grassland in SU GF1a on 24th May.

5.1.20 Small Heath *Coenonympha pamphilus* VU/S41

The Small Heath *Coenonympha pamphilus* (Linnaeus 1764) is a small Satyrine butterfly with an orange forewing that bears a single eyespot and a brown, grey and cream hindwing underside. It is still widely distributed across Britain but has recently been upgraded to Vulnerable IUCN status because of a severe and ongoing decline (37%) in its UK distribution over the last 10 years. The reasons for this decline are not well understood though it seems likely that degradation and loss of habitat and climate change are both important negative factors. The decline has been most severe in lowland England and there are still many large populations on acid grasslands in the uplands of Scotland, Wales and northern and western England. This is a butterfly of dry, unimproved grasslands that occurs in both calcareous and acidophilous swards. It favours, short swards where the larvae feed on a variety of fine-leaved grasses such as bents *Agrostis* spp. and fescues *Festuca* spp. It is still very widely distributed at Gilfach, both on dry, unimproved grassland within the enclosed farmland and on unenclosed acid grassland on open moorland.

5.1.21 Small Pearl-bordered Fritillary *Boloria selene* VU/S7

The Small Pearl-bordered Fritillary (Denis & Schiffermüller, 1775) can be distinguished from the very similar Pearl-bordered Fritillary *B. euphrosyne* by the less reddish-brown ground colour and more extensive network of silver-white spots on the underside of the hindwing. It was formerly distributed widely across Britain but has been lost from most of its former woodland colonies in southern and eastern England as a result of the cessation of coppice management. It remains locally common in Scotland, Wales and northern and western England, where it is found in a variety of open habitats, including Bracken slopes, wood-edges and valley bogs. In the former two habitats, the caterpillar feeds on Common Dog-violet *Viola riviniana* or Heath Dog-violet *V. canina*, while in the latter, it utilises Marsh Violet *V. palustris*. At Gilfach, adults were seen in June, along the disused railway cutting (SU GF2f).

5.1.22 Dark Green Fritillary *Speyeria aglaja* NT

The Dark Green Fritillary *Speyeria aglaja* (Linnaeus 1758) is distinguished from other large fritillaries by the absence of any orange-ringed silver spots in the post-discal band on the underside of the hindwing. It has a very wide distribution across Britain, including Orkney and parts of the Hebrides. A range of open habitats are used, including coastal and chalk grassland, Bracken slopes, scrub and wood edges. The larvae develop on a range of violet species: primarily Common Dog-violet *Viola riviniana*, Hairy Violet *Viola hirta* and Heath Dog-violet *Viola canina*. There has been a substantial decline in the south and east of its

British range, which is primarily related to the loss of semi-natural grasslands to intensive agriculture. However, it is still quite frequent in the north and west. Adults were recorded visiting flowers in species-rich grassland (SU GF6a) at Gilfach in 2022.

5.1.23 Hill Cuckoo Bumblebee *Bombus rupestris* Nb

The Hill Cuckoo Bumblebee *Bombus rupestris* (Fabricius, 1793) is a large parasitic bumblebee which is black with a red tail, mimicking its host, the Red-tailed Bumblebee *Bombus lapidarius*. Females of *B. rupestris* have very dark wings and lack pollen-collecting apparatus on the hind tibiae. They emerge from hibernation in late-May or June, with a new generation appearing in late-July or August. The female enters an established nest of *B. lapidarius* and kills the existing queen. It lays female, and then male eggs, which are tended by the *B. lapidarius* workers. Because female *B. rupestris* do not collect pollen to feed their offspring, there are no specific plant associations and the species may be found nectaring at a wide range of flowers. Although the Hill Cuckoo Bumblebee is recorded across much of England and Wales, it is primarily a southern species, with strongholds in south-east and central southern England. Many Welsh records are coastal. It is increasing in frequency currently and extending its range northwards after a period of decline in the mid- to late-20th century. At Gilfach, a female was flying around the wood-pasture in survey unit GF2d.

5.2 Key invertebrate habitats

Harding & Rose (1986) listed 196 beetle species as indicators of ancient parklands and wood pastures with well-developed dead wood habitats. They assigned these to one of three saproxylic fauna groups (SFG). SFG1 species were those having the highest fidelity to ancient wood-pasture and parkland sites with abundant dead wood habitats and SFG3 species had the lowest, being found across a range of landscapes with old trees, though still showing a significant association with ancient parks and wood-pastures. Using this list as a basis, Alexander (1988) devised a simple index of ecological continuity (IEC) for scoring sites where SFG1 beetles score three points, SFG2 species, 2 points and SFG3 species, 1 point. Alexander (2004) subsequently created a revised index of ecological continuity (RIEC). This reduced the list down to 180 qualifying species to take into account the considerable body of additional data on saproxylic beetles generated since Harding & Rose (1986) was published. The index is calculated simply by adding up the points for the various qualifying species. Only one SFG2 species and three with SFG3 status were recorded at Gilfach in 2022, giving a **RIEC score of 5**. Column 4 of Table 4 shows the four species recorded at Gilfach that are included in the RIEC.

The second widely-used index to assess sites is the Saproxylic Quality Index (SQI) developed by Fowles *et al*. (1999). This has the advantage of employing a much longer list of saproxylic Coleoptera, including many that are common and widely distributed across Britain. It can therefore be particularly valuable in assessing saproxylic beetles at sites such as Gilfach without the frequent veteran trees required by many of the species used by the RIEC. The full list of beetles recorded at Gilfach that are used in calculating the SQI can be found in Table 4. The scoring system is based on the rarity of the species, as

defined in the original Coleoptera status reviews (Hyman & Parsons, 1992, 1994), with these Rarity Scores ranging from one for a common species up to 32 for those considered Endangered or Vulnerable. The Saproxylic Quality Index (SQI) is then calculated by totalling the scores for all qualifying species to give an overall Saproxylic Quality Score (SQS), then dividing this figure by the total number of qualifying species and multiplying the result by 100. A great advantage of the SQI is that it should be less influenced by the amount of recording effort than is the strictly cumulative RIEC index, which will continue to increase with further survey work. At Gilfach, a total of 56 qualifying dead wood beetles have been recorded (see Table 4), giving a SQS of 176 and a **SQI score of 314.3**.

Table 4. Saproxylic beetles recorded at Gilfach in 2022.

Species	Status	SQS	RIEC
Anisotoma humeralis	-	2	-
Agathidium varians	-	2	-
Phyllodrepoidea crenata	**NS**	8	-
Acrulia inflata	-	2	-
Dropephylla ioptera	-	1	-
Phloeocharis subtillissima	-	2	-
Atrecus affinis	-	1	-
Gabrius splendidulus	-	1	-
Quedius scitus	-	8	**SFG2**
Gyrophaena joyi	**NS**	8	-
Agaricochara latissima	-	2	-
Leptusa fumida	-	1	-
Leptusa pulchella	-	2	-
Leptusa ruficollis	-	1	-
Bolitochara mulsanti	**NS**	8	-
Dinaraea aequata	-	1	-
Phloeopora corticalis	**NS**	8	-
Phloeopora testacea	-	1	-
Bibloporus bicolor	-	2	-
Sinodendron cylindricum	-	2	-
Melanotus villosus agg.	-	1	-
Denticollis linearis	-	1	-
Epiphanis cornutus	-	8	-
Malthodes marginatus	-	1	-
Grynobius planus	-	2	-
Phloiophilus edwardsii	**NS**	8	**SFG3**
Dasytes aeratus	-	2	-
Epuraea biguttata	-	2	-
Epuraea distincta	**Na**	8	-

Species	Status	SQS	RIEC
Cryptarcha strigata	**NS**	8	-
Glischrochilus quadriguttatus	-	2	-
Rhizophagus bipustulatus	-	1	-
Rhizophagus dispar	-	1	-
Pediacus dermestoides	-	4	**SFG3**
Cryptophagus dentatus	-	1	-
Cerylon ferrugineum	-	2	-
Octotemnus glabriculus	-	1	-
Cis bidentatus	-	2	-
Cis boleti	-	1	-
Cis fagi	-	2	-
Cis festivus	**Nb**	2	-
Rhinosimus planirostris	-	1	-
Rhinosimus ruficollis	-	1	-
Schizotus pectinicornis	**NR**	16	-
Orchesia micans	**NS**	4	-
Orchesia undulata	-	4	**SFG3**
Anaspis frontalis	-	1	-
Anaspis rufilabris	-	1	-
Anaspis thoracica	**NS**	8	-
Aderus populneus	**NS**	8	-
Rhagium bifasciatum	-	1	-
Grammoptera ruficornis	-	1	-
Pogonocherus hispidulus	-	2	-
Hylesinus varius	-	1	-
Scolytus intricatus	-	2	-
Dryocoetinus villosus	-	2	-
Total	-	**176**	**5**

Table 5 compares the RIEC and SQI scores achieved at Gilfach in 2022 with those from Carn Gafallt and three other parkland or wood-pasture sites on the fringes of the Cambrian Mountains in mid-Wales.

Table 5. RIEC and SQI scores for Gilfach and other sites.

Site	No. saproxylic beetles	RIEC	SQI
Gilfach, Radnor (vc43)	56	5	314.3
Carn Gafallt, Brecon (vc42) 2022 only	54	23	363.0
Carn Gafallt 2004-2022	104	36	367.3
Cwm Llyfnant, Ceredigion (vc46)	44	4	284.1
Parc Pont-faen	45	11	260.0

Parc Nanteos, Ceredigion (vc46)	46	8	253.3

Notes on Table 5

The SQI scores for other mid-Welsh sites that meet the threshold for number of saproxylic beetles (40) considered sufficient by Fowles *et al.* (1999) for a valid assessment of their importance for this assemblage included here are taken from the regularly updated list maintained online (Fowles, 2023).

The ancient oak woodlands on the eastern edge of the Cambrian Mountains experience a rain shadow effect that results in a somewhat drier and colder climate relative to other areas of mid-Wales and seems to have encouraged the survival of an unusually rich assemblage of northern- and western-distributed saproxylic beetles that are at or close to their southern range limits here. The Scarce Cardinal Beetle is perhaps the best example of this group. It occurs in a band of woods, parks and wood-pastures from near Llandovery in the south to Abbey Cwm-hir in the north and is otherwise only known in Britain from the Scottish Highlands. There are also a number of northern-distributed dead wood rove beetles in these woods, including *Phyllodrepoidea crenata*, *Xylostiba monilicornis* and *Bolitochara mulsanti*. The Scarce Cardinal Beetle, *P. crenata* and *B. mulsanti* were all recorded at Gilfach this year and this northern element is a distinctive and important part of the saproxylic invertebrate assemblage at Gilfach.

5.2.1 Heartwood decay

The heartwood decay fauna comprises only a small part of the total saproxylic invertebrate assemblage at Gilfach. This is not surprising, as the resource of old trees is quite small and many of the remaining over-mature and veteran specimens have completely hollowed out trunks, with all of the heartwood having rotted away.

The low RIEC score here is a reflection of this, as many of the scoring species for that index are specialists of heart-rot habitats in ancient parks and wood-pastures. One of the key long term objectives for management of the saproxylic invertebrate assemblage will be to increase the representation of heart-rot habitats by selecting a new tranche of mid-aged to mature trees for retention that will augment and replace the existing, very limited stock.

5.2.2 Bark and sapwood decay

The majority of saproxylic invertebrates found at Gilfach are associated with this habitat feature, which is better represented away from ‘classic’ parkland and wood-pasture sites with much over-mature timber. In general, the most valuable fallen timber for invertebrates comprises larger items, such as trunks and larger branchwood. As with the heart-rot assemblage, dead wood that experiences a drier, warmer microclimate tends to have a richer beetle fauna that includes many of the scarcer saproxylic species. For the same reason, standing or hanging dead wood tends to be of greater importance than that which is lying on the woodland floor, as the latter has a cooler, damper microclimate. So, for example ‘hanging’ dead branches that have only partially fallen from the tree can have a rich fauna that includes important species recorded in 2022 such as the rove beetle *Phloeopora corticalis*.

The classic management prescription for dead wood is to leave it in ‘dappled shade’. However, damper, more shaded conditions may be of greater value for groups such as Nematoceran Diptera (e.g. craneflies and fungus gnats) and at Gilfach are also valuable in providing overwintering sites for the ground beetle *Pterostichus aethiops*. It is therefore necessary to retain dead wood in a full range of situations, from dry, sun-exposed situations to deep shade, but being mindful that it is intermediate positions that will usually have the richest saproxylic assemblage.

5.2.3 Fungal fruiting bodies

Many of the most important fungi for saproxylic invertebrates are heart-rotting brackets such as Chicken-of-the-woods *Laetiporus sulphureus*, Beefsteak Fungus *Fistulina hepatica*, Shaggy Bracket *Inonotus hispidus* and the Weeping Bracket *I. dryadeus*. As has already been pointed out in sub-section 5.2.1, Gilfach has only a relatively small stock of over-mature or veteran specimens of the large, slower-growing hardwoods (primarily oak, Ash, Beech and Sycamore) that are of primary importance for these bracket fungi. The scarcity of old specimens of these trees, exacerbated by the exceptionally dry conditions across much of the sampling period, explains the relative dearth of invertebrates associated with this habitat feature. Again, most of these bracket fungi favour relatively dry, warm conditions and in western woodlands at least, are most numerous on open-grown trees in wood-pastures and parks. The maintenance and extension of wood-pasture habitat and retention of other open-grown mature to veteran broadleaves is therefore the key goal of future management requirement for this element of the saproxylic Mycota and its associated invertebrate assemblage.

Over-mature specimens of smaller, faster-maturing trees such as birch, Grey Willow and Alder are more frequent, the latter two primarily along the corridor of the Afon Marteg and the former in wooded areas, hedges and around the moorland fringe. The birch-rotting Birch Polypore bracket was the only frequently recorded bracket at Gilfach in 2022. It is of considerable value, especially because its persistent brackets may provide breeding and feeding sites for mycophagous invertebrates during periods when other saproxylic fungi are scarce or absent. For example, brackets of this species at Gilfach have produced records of the key rove beetles *Bolitochara mulsanti* and *Oligota apicata*, the former being an especially noteworthy find. Key fungal specialists were also recorded from Grey Willow (the Nitidiulid beetle *Epuraea distincta* on Maze-gill brackets) and Alder (the false darkling beetle *Orchesia micans* on the Alder Bracket). These fungi (and many of their associated invertebrate fauna) are less dependent on open conditions and also fruit well within shaded, damp situations such as closed-canopy wet woodland. However, it is still desirable to encourage the growth of over-mature specimens of their host trees in more open situations such as wood-pasture, outgrown hedges, wood-edges and the moorland fringe. Healthy old birches in the latter situation at Gilfach are also of high importance for the Welsh Clearwing moth.

6. Conclusions

Gilfach supports a diverse dead wood invertebrate fauna that includes a number of important species. The saproxylic assemblage is not as rich as that of the RSPB Carn Gafallt reserve, which was also surveyed as part of the Natur am Byth! project in 2022 (Boyce, 2023). This is because the resource of over-mature and veteran broadleaved trees here is much smaller than at the latter site.

Gilfach nonetheless has an important saproxylic assemblage that includes a number of species such as the Scarce Cardinal Beetle and the rove beetles *Bolitochara mulsanti* and *Phyllodrepoidea crenata*, which are at or very close to their southern distributional limits here. This site is one of a group found in old woods and wood-pastures (including Carn Gafallt) along the eastern fringe of the Cambrian Mountains that have an unusually diverse and important assemblage characterisitic of dead wood sites in northern and western Britain. Its interest (and vulnerability to ongoing climate change) is enhanced by its position at or close to the southern range limits of a number of its constituent species.

Management measures are suggested below that aim to enhance the saproxylic invertebrate assemblage of Gilfach over the longer term.

7. Management recommendations

The development and implementation of a programme of capital works for the saproxylic invertebrate assemblage at Gilfach is one of the key aims of the Natur am Byth! project. A list of management proposals is given below that should maintain and enhance the condition of both the key saproxylic habitat features outlined in the previous section and the important species they support. An attempt has been made to order this list to reflect their importance in maintaining the saproxylic invertebrate interest of this site.

- Dense younger growth should be thinned in those wooded areas of Gilfach where there are significant numbers of old trees (e.g. SU2d and 3d).

- It would be very valuable to undertake a tree survey that identified the resource of veteran, over-mature and mature trees. This is a site that currently has a small resource of veteran Sessile Oaks and a few Ash, Beech and Sycamore, with many of these being hollowed-out veterans. Identification of cohorts of younger trees that can be managed to act as replacements for these and to increase the resource of over-mature and veteran trees would be extremely valuable. In the longer term, this should provide a cohort of old trees with heart-rot that can be exploited by invertebrates associated with this habitat feature.

- Sessile Oak should continue to be the main species promoted for saproxylic invertebrates at Gilfach. However, a continuity of over-mature and veteran birch is also very important. This is one of the main larval hosts of the Scarce Cardinal Beetle (though larvae at Carn Gafallt and Gilfach were more frequent under Ash and oak bark in 2022). Very often dead birch branches and trunks have colonies of the Birch Polypore bracket fungus, which itself hosts a diverse invertebrate fauna. At Gilfach, mature birch forms an element of the ffridd habitat that occurs on the moorland edge and open-grown, old birch trees here also support a colony of the Welsh Clearwing moth.

- There are a few old Beech trees around the farm buildings at Gilfach. These should be retained and managed sympathetically and replanting and recruitment of younger examples of this species should be undertaken in order to increase the long-term representation and to provide replacements for the existing old trees. Beech can be an issue as an invasive species in upland oak woods, especially on thinner, rocky soils with W17 or W11 NVC types. It would therefore be better to only retain this species in open situations such as field plantings, in hedgerows or around the farm buildings, where its comparatively heavy seeds make it much less likely to reach any of the ancient Sessile Oak woodland or wood-pasture in sufficient quantity to become a serious management issue.

- Though Ash is only a minor component of the old tree resource at Gilfach, its ongoing loss to Ash dieback disease is detrimental to the diversity of the saproxylic invertebrate fauna (and to epiphytic lichens and many other elements of overall biodiversity). Ash should be retained where there are not compelling safety reasons for its removal. In the longer term, it is hoped that some resistant trees can be favoured to replace and increase the representation of this species. Mature to mid-aged specimens of Sycamore should be retained. This species can have a similar ‘white-rot’ saproxylic fauna (and also has quite base-rich bark like Ash, which can make it a good host for epiphytic lichens). However, the same issues of its non-native status and heavy shading of understorey vegetation that apply to Beech can also pertain to Sycamore, so retained specimens of this species should only be on farmland away from areas of ancient woodland, wood-pasture and riparian woodland along the Marteg.

- The planting of an orchard on farmland where there is species-poor grassland should be considered. Fruit trees share a number of the saproxylic specialists found in association with red heart-rot but develop these saproxylic habitat features more quickly than Sessile Oak (see Whitehead [2022] for his assessment of orchards on the Gwent Levels). Other native trees may also be considered as minor elements of a long-term scheme to increase the representation of dead wood habitats and their associated flora, fauna and Mycota.

- Across much of Carn Gafallt and Gilfach, veteran and over-mature trees are found within closed-canopy ancient woodland or neglected wood-pasture. In those places where the structure and known history suggests a long continuity of woodland cover, it is probably most appropriate to restrict intervention to the thinning of younger trees from around mature, over-mature and veteran specimens (e.g. around old oaks on the lower slopes of Coed Gilfach SU1c or in the closed-canopy woodland with veteran oaks above the road at Carn Gafallt (SU3 and SU5). The retention of relatively closed-canopy conditions, especially on north-facing slopes, may also be very important in maintaining a cooler microclimate that is suitable for northern-distributed specialists, such as the Scarce Cardinal Beetle in the face of ongoing climate change.

- Throughout the stands of woodland and wood-pasture, it is preferable for saproxylic invertebrates if the shrub, field and ground layers are sparse and open, in order to maintain a relatively dry microclimate around old trees and dead wood. Preferably, this is done by light to moderate grazing, which is at a level that prevents excessive regeneration of young trees, shrubs and Bramble. Grazing pressure should be at a level where it controls the regeneration of young growth, but failing this, it may be necessary to carry out periodic cutting where important trees and dead wood items are becoming excessively shaded. Bracken can also be controlled by cutting, rolling and trampling by cattle and/or horses.

- Standing and fallen dead wood, and especially that derived from over-mature or veteran trees, should be retained in situ unless there are compelling safety reasons for it to be moved. Of particular importance are large dead oak branches that are well above ground level. These may, for example, still be hanging from the tree, or be resting against the trunk. In general, larger items of dead wood, such as snags and fallen trunks or main branches are of greater importance than smaller pieces. If it is necessary to move dead wood, it should generally be placed in ‘dappled shade’ where the microclimate is relatively warm and dry. However, dead wood should be provided across the full range of microclimatic conditions, from dense shade to full sun, as all of these situations have their own saproxylic invertebrate community. No items of dead wood with significant invertebrate habitat features such as heart-rot or saproxylic fungi should be removed or destroyed.

- Pollarding of young to mid-aged trees should be considered, as this can accelerate the development of dead wood habitat features. Pollarding can be particularly valuable if applied to quite quick-growing hardwoods such as Ash and Sycamore – though with the former this will only be worthwhile if specimens show clear evidence of resistance to Ash dieback.

- There are high quality stands of wet woodland dominated by Alder and Grey Willow along the valley of the Marteg at Gilfach, in SU2d, 3d and 6c as well as other smaller stands elsewhere. These wet woodlands are also of interest for saproxylic invertebrates. Little management intervention is required in these areas currently.

8. References

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9. Data Archive Appendix

The data archive contains:

[A] The final report in Microsoft Word and Adobe PDF formats.

~~[B] A full set of maps produced in JPEG format.~~

~~[C] A series of GIS layers on which the maps in the report are based with a series of word documents detailing the data processing and structure of the GIS layers.~~

~~[D] A set of raster files in ESRI and ASCII grid formats.~~

~~[E] A database named [name] in Microsoft Access 2000 format with metadata described in a Microsoft Word document [name.doc].~~

~~[F] A full set of images produced in [jpg/tiff] format.~~

[G] Species records held in Welsh Invertebrate Database (WID).

Metadata for this project is publicly accessible through Natural Resources Wales' Library Catalogue https://libcat.naturalresources.wales (English Version) and https://catllyfr.cyfoethnaturiol.cymru (Welsh Version) by searching 'Dataset Titles'. The metadata is held as record no **125529**.