Pixton Park Invertebrate Survey 2017

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Further information

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Contents

Summary

Pixton Park is a historic deer park with an important collection of veteran and ancient trees. Such trees tend to have significant interests for both epiphytic (lichens, mosses and liverworts growing on tree bark surfaces) and saproxylic (fungi causing dead woody tissues to decay and the invertebrates which feed on the products of that decay) species assemblages. These trees are known to be of significant interest for epiphytic lichens but there had been little or no investigation of their saproxylic interests until very recently. Surveys were commissioned by Natural England during 2014 and 2015 in order to assess the current significance of Pixton Park as ancient parkland, for its wildlife habitats, invertebrates and veteran trees. The aim of the surveys was to provide evidence in support of evaluation for possible SSSI status. Only exploratory work on the invertebrates was however possible at that time and this work was expanded during the 2017 field season.

The new survey work has demonstrated that the veteran trees of Pixton Park are indeed of significant interest for saproxylic invertebrates. The total invertebrate species list from sampling has reached 295 species of which 126 are specialist saproxylics, including 72 species of Coleoptera and 53 of Diptera. There is also a significant interest for specialist invertebrates which feed on the epiphytic plants and fungi.

Analytical tools have been developed for assessing site quality using saproxylic Coleoptera (beetles). The Saproxylic Quality Index (SQI) uses the rarity values of the species detected to assess site quality. The additional survey work has resulted in a revised SQI of 313, compared with figures of 338 for Dunster Deer Park SSSI and 327 for Nettlecombe Park SSSI – the highest SQI locally is 363 for Arlington SSSI. The complementary Index of Ecological Continuity (IEC) provides an assessment of the representation of beetle species which are associated with Britain's remaining old growth habitats; this index is cumulative and dependent on survey effort. The IEC for Pixton Park has now reached 17. This figure is comparable with Arlington Park's current IEC of 14, Dunster Park's 17, and Horner Woods 25 but apparently much less rich in old growth indicator species than Nettlecombe Park (IEC = 45). Overall, the SQI and IEC statistics indicate a site of significant interest in the context of southwest England – comparable with existing SSSIs - but not nationally significant, although further survey might well find further, currently overlooked species which could increase the IEC value and take it above the nationally significant level.

Applying Natural England's Invertebrate Species and habitats Information System (ISIS) – a component of the new Pantheon analytical tool – the wood decay invertebrate assemblage is picked out as being in favourable condition. All three components – the invertebrate assemblages associated with fungal fruiting bodies, bark & sapwood decay, and heartwood decay – are also individually picked out as being in favourable condition.

A total of 15 species of saproxylic beetle with Nationally Scarce status – see main text for an explanation of this term - have now been found, with the rove beetles *Quedius aetolicus* and *Placusa tachyporoides* otherwise unknown in Somerset. Another rove beetle *Dropephylla gracilicornis* is otherwise only known in the county from Nettlecombe Park; and the rove beetle *Stenichnus bicolor* and the spider beetle *Ptinus subpilosus* are only otherwise known from Nettlecombe Park and Horner Woods. The rove beetle *Phloeopora testacea*, the sap beetle *Cryptarcha strigata*, the hairy fungus beetle *Litargus connexus* and the weevil *Phloeophagus lignarius* had not been reported in the county for more than 50 years. Pixton Park is the only known Exmoor site for *Prionocyphon serricornis* and *Euglenes oculatus*, the only modern Exmoor site for *Phloiophilus edwardsii*, and the only Exmoor parkland site for *Thymalus limbatus.* One further beetle species with Nationally Scarce status and not previously known in Somerset was also found, associated more with humus-rich soils and decaying vegetable matter, and presumably able to exploit well-decayed wood. It is perhaps best regarded as a facultative saproxylic here: *Scydmoraphes helvolus*. Overall, Pixton Park is clearly a top Somerset site for saproxylic beetles.

Diptera have proved to be just as interesting and include one species with Vulnerable status (the freeloader fly *Madiza britannica*), one Near Threatened (the fungus gnat *Manota unifurcata*), and five Nationally Scarce species, all with saproxylic habits. Pixton Park is the only known Exmoor site for both of the rarest flies, although both are also known from single localities in the east of the county. This is the only record of the *Madiza* from the far South West. One of the Nationally Scarce flies, *Clusia tigrine,* was found in unusually good numbers suggesting a significant population of this particular rarity at its only known Exmoor locality.

The epiphyte associated invertebrates include the nationally rare barkfly (Psocoptera) *Peripsocus parvulus*, a species with a generally south-westerly distribution pattern in Britain and for many years only known from the New Forest. Pixton Park is its only known locality in the far South West – the closest known site is Cwm Clydach NNR in Monmouthshire.

These species of special nature conservation interest all exhibit classic highly fragmented distributions across Britain today as a result of past and continuing damage to - and destruction of - concentrations of veteran trees still capable of supporting viable populations.

Site condition appears to be generally good overall, although secondary woodland development may be having a negative impact on the surviving veteran trees within the lower slopes. Some areas appear relatively sparse in tree cover – the horse paddocks of Pixton Park House and the higher ground towards Pixton Hill; these would be key target areas for the establishment of a new generation of open-grown parkland trees. Spring-flowering native shrubs are a good feature, with locally plentiful hawthorn as well as elder and holly providing an important resource of nectar and pollen for flying insects.

Key recommendations:

- Continued invertebrate survey and monitoring work is recommended in order to refine knowledge of site quality for the specialist assemblages of decaying wood (saproxylics) and lichen and moss cover on bark (epiphytes);
- Consideration needs to be given to developing a tree-planting strategy, in order to maintain the diverse age structure of the open-grown parkland trees;
- Opening up (haloing) around the older trees along sections of the lower slope may be needed in order to protect the formerly open-grown trees from crown competition in the areas of secondary woodland development;

- Clarification is needed on current deadwood retention policies in all ownerships, with improvements recommended on retention of larger items of dead wood wherever feasible, and especially wood where decay is already apparent;
- Maintenance of an extensive approach to pasture management, to support the soil biodiversity on which tree health depends.

1 Introduction

1.1 Background

Ancient parkland is a rare resource. Such sites can be of importance for their old trees, the invertebrates and plants associated with them, together with the habitats such as wood pasture and ancient woodland, grassland and wetlands that are found within the historic boundaries. Wood Pasture and Parkland has accordingly been identified as a Habitat of Principal Importance for the conservation of biodiversity, under the 2006 Natural Environment & Rural Communities (NERC) Act. This provision makes it a statutory duty on planning authorities and other decision makers to consider this habitat when carrying out their duty to further the conservation of biodiversity.

Pixton Park lies within the southern flanks of the Exmoor National Park close to Dulverton. It is set on Pixton Hill, an isolated promontory hill within the confluence of the Rivers Barle and Exe, the land rising from 135m to 237m to the south of the mansion. The underlying geology is described as Baggy Sandstones and the soil is a red loam. The mansion is a Grade II* Listed Building, and the Stables Grade II, but the parkland is not included in English Heritage's Register of Parks and Gardens – the latter is concerned with landscape gardening rather than historic land-use per se.

Pixton Park House and its immediate surrounds are under separate ownership from Pixton Stables, the latter including the main extent of parkland and woodland. Pastures at the House are currently used as horse paddocks, while the Stables land includes deer enclosures and areas previously used for cattle grazing.

1.2 Current knowledge of the biodiversity of Pixton Park and its immediate landscape setting

Dr Francis Rose (a highly-respected botanist and lichen expert based at the University of London) first drew attention to the lichen interest of Pixton Park in the 1980s. A survey of the lichen interests of the parkland and surrounding woods was subsequently carried out (Wolseley et al, 1987) and Pixton Park Wood and Pixton Park were assessed as of outstanding interest for their lichen flora, having 34 old forest species and habitats in which some of these species are found on a diversity of tree species and ages. Sites combining veteran trees with 'old forest' lichens tend to be similarly rich in invertebrates, particularly wood-decay (saproxylic) species as well as those associated with the epiphytic vegetation.

Based on his experience with the lichens, Rose recommended inclusion of Pixton Park in an inventory of sites of potential importance for deadwood invertebrates, as part of the Mature Timber Habitat project in the 1970s (see Harding & Rose, 1986). The private nature of the parkland, with no public rights

of way, has however meant that little information exists on the current interest for invertebrates. A few records of Nationally Scarce (Alexander, 2014; Falk, 1992; Hyman 1992 & 1994) dead-wood associated beetles are available, based on a limited recent visit (D. C. Boyce, pers. comm.): a sap beetle *Epuraea distincta*, and the beetles *Thymalus limbatus* and *Prionocyphon serricornis*. A scarce dead-wood associated hoverfly *Brachyopa insensilis* was also noted at the time.

The parkland at Pixton Park currently forms part of three separate Local Wildlife Sites (LWS): Pixton Park Complex, North Side Pixton Park, and Central Pixton Park.

1.3 Project brief

The author was commissioned by Natural England to complete the invertebrate survey work initiated in 2014 but halted due to budget cuts. The survey was required to assess the significance of Pixton Park as an ancient parkland for its wildlife habitats, invertebrates and veteran trees. The results will allow evaluation for possible SSSI status. The objectives of these surveys are as follows:

- To survey the site for its invertebrates (especially dead-wood invertebrates);
- To collate all existing records from published and unpublished sources;
- To evaluate the significance to the site for invertebrates against SSSI criteria and contribute to the overall evaluation of the site as a SSSI parkland with multiple interests;
- Provide management recommendations to protect and enhance the invertebrate interest for the benefit of the landowner.

2 Land-use history of Pixton Park

Although not part of the project brief, some initial exploration of the park's development history was undertaken in order to better inform the understanding of the antiquity and quality of the wood pasture and parkland habitats present. The early land-use history of the site however remains rather obscure. Pixton was referred to as a manor by 1475, and a hall and farm buildings were present here in 1658, prior to the estate becoming temporarily split up (victoriacountyhistory.ac.uk). The manor and hall may or may not have been surrounded by, or lay adjacent to, areas of parkland or wood pasture. No medieval deer park is listed here in Cantor (1983) and no deer park was mapped by Saxton (1575) during the Tudor period – although suggestive that the deer park post-dated Saxton's compilation, the absence of evidence of an early deer park cannot be taken as proof as these sources only provide positive

evidence and assumptions about the negative implications cannot be sustained.

The first documentation of 'Pixton Park' appears to be in the mid-17th Century after the Dyke family had reunited the estate (thepeerage.com). The use of the name 'park' for the hall suggests that it certainly now lay within parkland, irrespective of whether or not the earlier hall or manor had done so. All previous references to the estate refer to 'Pixton' (or other spellings) alone. The Dykes appear to have moved here from further east in Somerset – a Thomas Dike was referred to as 'steward of the hundred of Williton and Free Manners' in 1622. Increasingly they became involved in the administration of the Forest of Exmoor and deer hunting in particular. Edward Dyke was master of Exmoor staghounds from 1740-46 (MacDermott, 1911). The estate subsequently passed by marriage through the Acland, Herbert (Earls of Carnarvon) and Dru families before finally being broken up and sold in the latter part of the 20th century.

The Aclands made major changes here, building a new mansion about 1760 and updating the landscaping of the parkland, and the Herberts continued along the same lines - demolishing the Acland mansion in 1803 and replacing it with a new mansion completed in 1805 while also developing the parkland plantings. Shirley (1867) described a deer park here of about 140 acres with a herd of 200 fallow deer, while Whitaker (1892) states 168 acres with 200 fallow deer. The area was mapped as a deer park by the Ordnance Survey in their 1st Edition six-inch scale mapping dated 1882-1888, and a large area of enclosed parkland is shown with varying tree density and no enclosed woodlands – enclosure of the lower woods along the western flanks are clearly relatively modern. The literature search found reference to the 5th Earl of Carnarvon afforesting areas locally, and so Pixton Park Wood is likely to have been enclosed and planted up at this time. Whitehead (1950) does not include a deer park here and so the deer herd most probably had been dis-parked by 1949. Small herds of red and fallow deer have subsequently been re-established in enclosures within the historic parkland by the current owner of Pixton Stables.

In conclusion, parkland and/or wood pasture at Pixton certainly appears to date back to the mid-17th century if not before. The oldest trees appear to be ancient pollards of oak and ash, the largest exceeding 6m girth at breast height. Data from John White (retired FC dendrologist) suggest that oak maidens of 6m are likely to be around 400 years old and so larger pollards are likely to be much older, perhaps originating in the mid-17th century – a period when the Dykes were re-uniting the estate.

The Barle Valley woods are close by (nearest woods c 1.5km) and have been known as long ago as the 13th Century (MacDermot, 1911). What is unclear however is how these were exploited, although wood pasture was the traditional use of woodlands at this time (Rackham, 2003) and it was certainly present in the Barle Valley and more extensively on Exmoor (Cannell, 2005). These woods are known to be of exceptional national importance for the richness of the lichens and bryophytes, and significant internationally in this respect. They were notified as a SSSI in 1954. Ecological continuity in the area is clearly very strong and this is also reflected by the quality of Pixton Park.

3 Invertebrate Survey

3.1 Introduction and sampling dates

The baseline standard for saproxylic invertebrate surveys is for three visits to be carried out across the field season, targeting late spring, high summer and autumn (Drake et al, 2007). The Pixton Park surveys project was initiated part way through 2014 and so the first survey visit had necessarily to be the autumn one, carried out on 16th September. Due to budgetary constraints, the late spring and high summer survey visits were delayed until 2017. A third visit during the 2017 field season was also carried out in order to get a full trapping season – see 3.1. below.

Conditions for survey were excellent during the September 2014 visit, the day being warm and dry with little or no wind; although the temperature began low, with the car temperature gauge registering 11 degrees Centigrade, it soon increased into the low 20s. Conditions were reasonable during the 4th May 2017 visit, with temperatures between 10 and 16 degrees, the day starting overcast and breezy but with sunny spells in the afternoon. The 12th July visit was unseasonably cool in the morning, with a temperature around 13 degrees and overcast and breezy, but the sun appeared and warmed to 18 degrees in the afternoon. The final visit on 24th October was warmer, at 16 degrees, but overcast with drizzle rain.

3.1.1 Sampling techniques

The main techniques used were as follows:

- beating lower canopy foliage and branches, using beating tray;
- sweep-netting vegetation beneath tree canopy;
- beating blossom on any flowering shrubs;
- tapping of fruiting wood-decay fungi over a net;
- hand search of fallen branch wood, investigating beneath loose bark and inside decayed heartwood, etc;
- visual inspection of tree trunks for resting invertebrates;
- inspection of accessible cavities in tree trunks and investigating within any accumulations of wood mould and other debris in cavities.

Wherever possible specimens encountered were identified in the field, retaining voucher specimens of the more critical species. Other specimens were taken away for inspection under microscope. Larvae and pupae were also retained for rearing through to the more readily identifiable adult stage.

Flight interception trapping was carried out through the 2017 field season. The type of trap employed is particularly good at sampling saproxylic Diptera, many of which are otherwise difficult to detect with the techniques listed above.

The flight interception traps are of a standardised construction:

- Four 2l plastic drinks bottles, with windows cut in sides, and bases bolted onto a plastic base, the windows facing outwards;
- the base is then hung either within hollow tree trunks or by large trunk cavities – at 1-1.5m above ground level - using baler twine, with bottles hanging upside down beneath;
- The upside-down bottle tops are filled with preservative solution (commercial antifreeze 50/50 with tap-water, plus a little washing up liquid to reduce surface tension) which can then be drained through the plastic cap.

Five trees were selected for trapping (Figure 1), based partly on trees identified during the 2014 visit and partly on additional trees encountered during the May 2017 visit.
The selected trees were as follows:

1. A veteran oak pollard by the northern boundary of the park (SS92511/27592), with a ripped-out major branch giving access to the hollow trunk interior; white-rotten wood is apparent around the cavity entrance (Figure 2);
2. A large hollow turkey oak on the south side of the shallow stream valley below the mansion (SS92621/26887), girth estimated at 6m; interior whiterotten;
3. A veteran oak on the north side of the shallow stream valley below the mansion (SS92498/27034), with cuboidal brown-rotten heartwood exposed by a ripped-out major branch; mycelial mats of Chicken-of-the-Woods fungus *Laetiporus sulphureus* visible in the brown-rot; trunk girth measured at 5.73m;
4. A standing dead hollow beech on the high plateau of the east side of the park (SS92960/27126), with brackets of the heartwood-decay fungus *Ganoderma australe*;
5. A large multi-stemmed ash on the eastern park boundary (SS92983/27063), with ripped-out branches on the east side exposing white-rotten heartwood and pockets of wood mould.

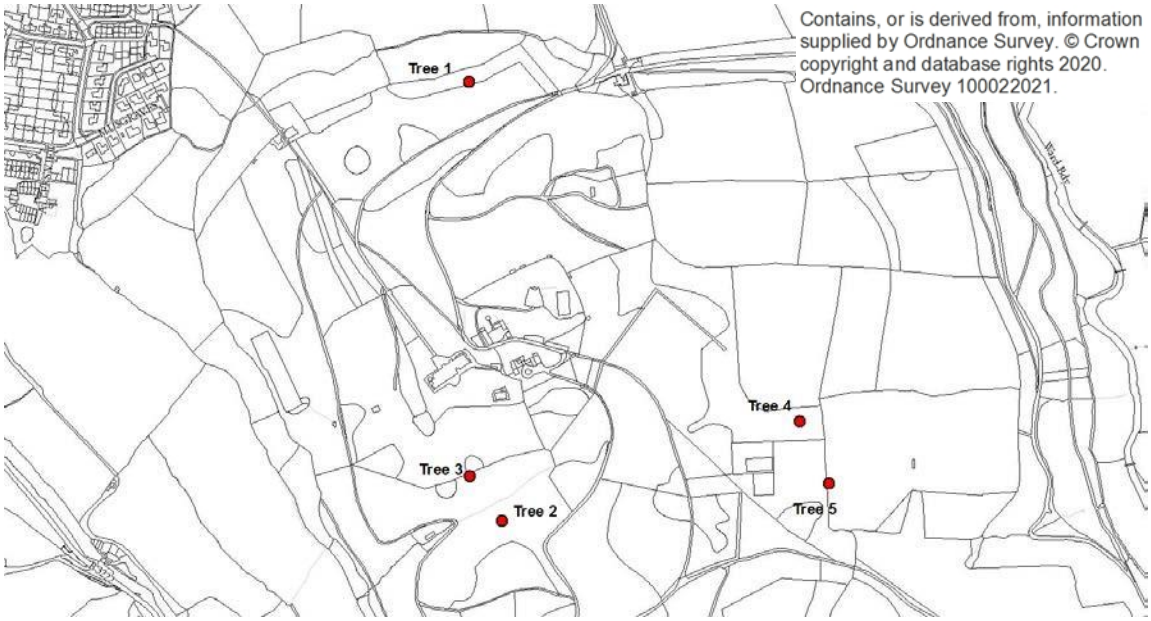

Figure 1 Map showing locations of flight interception traps in Pixton Park

The traps were placed on the May date, emptied in July and October, when they were also dismantled and removed. Trap 3 was found to have fallen by the time of the July visit and the catch lost, but was repositioned and operated again for the latter half of the field season.

3.1.2 Areas recorded

Virtually the whole of Pixton Park was explored during the survey. Emphasis for sampling was placed on the veteran trees of the open parkland and the areas of formerly open parkland but currently with secondary woodland in-fill; these were judged to be the key areas for saproxylic invertebrates. Less time was spent in the enclosed and afforested areas of the lower western slopes. The enclosed ancient woodland site of Steart Wood was only subject to a brief inspection – the areas of semi-natural coppice with standards structure appeared to be of relatively low value for saproxylic fauna.

Figure 2 Flight interception trap No 1 placed at the entrance to a large trunk cavity leading to heartwood decay (©Keith Alexander)

3.2 Invertebrate assemblages

Natural England has been working on an Invertebrate Species & habitat Information System (ISIS) which groups species with similar ecological requirements into distinct assemblage types and then uses the species representation in each assemblage type to assess site condition (Drake et al, 2007). Although the assemblage classification system is still a work in process, ISIS does provide a useful way of analysing a site species list in terms of the features which are of most significance for invertebrates. The statistics additionally provide a basis for monitoring change in site condition.

Table 1 The broad assemblage types (BATs) identified

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness	IEC
A2	wood decay	51	207	favourable	89	17
F2	grassland and scrub matrix	10	112		18	
F3	shaded field and ground	10	106		18	
A1	arboreal	3			5	

W1	flowing water	1			2	
W1	mineral marsh and open	1			1	

Table 2 The specific assemblage types (SATs) identified

SAT code	SAT name	No.spp	Condition	Percentage of national species pool	Related BAT rarity score
A213	fungal fruiting bodies	8	favourable	9	207
A212	bark and sapwood decay	43	favourable	9	207
A211	heartwood	11	favourable	6	207
A215	epiphyte fauna	1		5	207
F001	scrub edge	2		1	207

The broad assemblage types pick out the main features of the parkland for invertebrates, i.e. in this case the wood-decay assemblage. The IEC value shown is discussed in 3.3.5. below. The specific assemblage types further refine the assessment and identify each of the three components of the wood decay broad assemblage type as being in favourable condition. The specialist invertebrate fauna of 'fungal fruiting bodies' and 'bark and sapwood decay' are better represented here than the heartwood decay fauna. This indicates that the fauna at Pixton Park is associated more with the types of decay that occur when the outer living parts of the tree die. The species are found primarily in fallen branches and beneath bark on fallen trunks. The specialist fauna of heartwood decay appears to be somewhat poorer in species representation.

The saproxylic invertebrate fauna found in Pixton Park is considered in more detail in the following section (3.3) and a further assemblage type – the epiphyte fauna – is discussed in section 3.4. The latter is very inadequately covered by the ISIS methodology at present and is actually much richer than indicated once Psocoptera (barkflies) are taken into account.

3.3 The saproxylic invertebrate fauna

3.3.1 Introduction to fungal decay of wood

Very few invertebrates are able to feed directly on dead woody tissues, as the main components - cellulose and lignin - are difficult to digest. Most are therefore dependent on fungi and various micro-organisms to break down the wood into substances which are more accessible to invertebrate digestion. Heartwood decay fungi are especially important to invertebrates as they break down the central core of dead wood within living trees, thereby producing decaying wood habitat in large quantity while the tree is still alive and healthy –

they rarely enter living tissues as their activity is held in check by the high moisture content. Other fungi are more opportunistic and exploit branches, roots, bark and eventually the trunks, as they die – for a variety of reasons.

Pixton Park appears to be relatively rich in heartwood decay fungi. Species noted during the 2014 and 2017 surveys on old oak trees were *Fistulina hepatica*, *Ganoderma australe, G. resinaceum*, *Inonotus dryadeus*, and *Laetiporus sulphureus*, while *G. adspersa* and *Meripilus giganteus* were seen on beech, and *I. hispidus* and *Polyporus squamosus* on ash. Eight species of bracket fungi is a notable assemblage while *G. resinaceum* is a nationally uncommon species. A good range of other widespread wood-decay fungi were also apparent on aerial dead branches, old stumps and fallen branch wood. Pixton Park may be a very special place for wood-decay fungi.

As trees mature and the canopy develops its full potential, then some of the lower branches in the canopy become obsolete, over-shaded from above, and die. These occupy a special situation, sheltered from above and bathed in the moist atmosphere beneath the canopy, and protected from the harsher conditions which surround the tree. These aerial dead branches are colonised by a wide range of fungi which exploit especially the more nutritious cambial layers. *Peniophora quercina* is a widespread and characteristic species of this situation and many scarce wood-decay invertebrates are associated with its activity.

It is important to appreciate the great importance of open-grown trees. A tree given the space to develop its full potential will naturally generate the widest variety of wood-decay habitat and for the longest period of time. Also many associated species are warmth-loving and require well-lit trunks and branches, both for the adults sunning, hunting and displaying on the outer wood surfaces, and for larvae developing within the decaying wood. Other species have requirements for shadier conditions.

The fauna of sites with a long history of large old open-grown trees are best termed “old growth” species as the expressions ‘ancient woodland’ and ‘ancient wood pasture’ have caused much confusion in people’s minds with regard to the habitat associations of the species concerned (Alexander, 2004).

3.3.2 Saproxylic Coleoptera (beetles)

3.3.2.1 Species totals and site quality indices

The 2014 and 2017 surveys produced a list of 71 saproxylic beetles. Table 1 lists these species and those previously reported by D. C. Boyce (pers. comm.), which brings the present total to 72 species. The table incorporates the various scores relevant to calculation of the Index of Ecological Continuity and the Site Quality Index – see section 3.3.6. Species currently with Nationally Scarce status are shown in bold text.

Table 3 Full species list of saproxylic beetles found in Pixton Park during 2014 and 2017 sampling, with SQI and IEC scores
Nationally Scarce species shown in bold; species listed in taxonomic order

Family	**Species**	**SQI Score**	**IEC Score**
Histeridae	*Abraeus perpusillus*	4	
	Paromalus flavicornis	2	
Staphylinidae	*Acrulia inflata*	2	
	Dropephylla gracilicornis		
	Dropephylla ioptera	1	
	Dropephylla koltzei	1	
	Xylostiba bosnica		
	Leptusa pulchella	2	
	Phloeopora testacea	1	

Family	Species	SQI Score	IEC Score
	Placusa tachyporoides	8	
	Atrecus affinis	1	
	Gabrius splendidulus	1	
	Quedius aetolicus	16	1
	Quedius maurus	4	1
Scydmaeninae	*Stenichnus bicolor*	4	1
Pselaphinae	***Euplectus duponti***		
Lucanidae	*Dorcus parallelipipedus*	2	
	Sinodendron cylindricum	2	
Scirtidae	***Prionocyphon serricornis***	8	1
Elateridae	*Melanotus castanipes*	1	
Cantharidae	***Malthinus frontalis***	8	
	Malthodes marginatus	1	
	Malthodes minimus	1	
Lycidae	*Platycis minuta*	8	1
Ptinidae	***Ptinus subpilosus***	8	2
	Anobium punctatum	1	
	Ptilinus pectinicornis	1	
Phloiophilidae	***Phloiophilus edwardsii***	8	1
Trogosittidae	***Thymalus limbatus***	8	2
Dasytidae	*Dasytes aeratus*	2	
Sphindidae	*Aspidiphorus orbiculatus*	2	
Nitidulidae	*Epuraea biguttata*	2	
	Epuraea distincta	8	
	Cryptarcha strigata	8	
Monotomidae	*Rhizophagus bipustulatus*	1	
	Rhizophagus dispar	1	
	Rhizophagus ferrugineus	2	
Cucujidae	*Pediacus dermestoides*	4	1
Cryptophagidae	*Cryptophagus dentatus*	1	

	Cryptophagus scanicus		
	Heroticus serratus	2	
Erotylidae	*Triplax aenea*	2	
Cerylonidae	*Cerylon ferrugineum*	2	
Mycetophagidae	***Triphyllus bicolor***	4	2
	Litargus connexus	2	
	Mycetophagus quadripustulatus	2	
Ciidae	*Octotemnus glabriculus*	1	
	Cis castaneus (nitidus)	2	
	Cis vestitus	2	
Melandryidae	*Orchesia undulata*	4	1
Tenebrionidae	*Eledona agricola*	4	1
	Nalassus laevioctostriatus		
Salpingidae	*Salpingus planirostris*	1	
	Salpingus ruficollis	1	
Aderidae	***Euglenes oculatus***	8	1
Scraptiidae	***Anaspis costai***	2	

Family	Species	SQI Score	IEC Score
	Anaspis fasciata (humeralis)	2	
	Anaspis frontalis	1	
	Anaspis garneysi		
	Anaspis lurida	2	
	Anaspis maculata		
	Anaspis pulicaria		
	Anaspis regimbarti		
Cerambycidae	*Rhagium mordax*	1	
Curculionidae	*Euophryum confine*		
	Phloeophagus lignarius	2	
Scolytinae	*Scolytus intricatus*	2	
	Dryocoetes villosus	2	
	Trypodendron domesticum	2	1
	Hylesinus crenatus	2	
	Hylesinus varius	1	
Species Quality Score		191	
Total qualifying species		61	
Saproxylic Quality Index		313	
Index of Ecological Continuity			**17**

The Nationally Scarce and other more significant beetle species are discussed in more detail in the following sections.

3.3.2.2 Anaspis costai (Scraptiidae)

A tumbling flower beetle. A male and a female were taken by the flight interception trap on the veteran oak pollard at the northern park boundary, another pair in the trap within the hollow Turkey oak below the mansion, and a single individual was taken in the flight trap positioned over a ripped part of the trunk of the multi-stemmed ash on the eastern park boundary. The adult beetles are found on various broadleaved trees and shrubs, and are presumed to breed in their dead wood features, although the precise larval habitat has not been ascertained – other species in the genus are known to develop either beneath

bark or in white-rotten sapwood and/or heartwood. The adults are also attracted to blossom including elder. It has been found widely across lowland England and Wales, although sparingly so – in Somerset all previous records are from the east and so this appears to be the first western record (Duff, 2010). **The available data indicates that this may be the first record from the Exmoor NCA.**

3.3.2.3 Cryptarcha strigata (Nitidulidae)

A sap beetle. A single specimen was taken in the flight trap positioned over a ripped part of the trunk of the multi-stemmed ash on the eastern park boundary and another by the flight interception trap on the veteran oak pollard at the northern park boundary. Associated with freshly exposed and fermenting sap and known from suitable oak and ash trees. It has been found widely across lowland England and Wales, although sparingly so. The only previous Somerset record is an un-localised from Stratton-on-the-Fosse in 1928 (Duff, 2010). The only previous record from the Exmoor NCA appears to be an old one from the Braunton Burrows area (Devonshire Association archive). **Its discovery in Pixton Park therefore may represent the only modern record for the Exmoor NCA and Somerset as a whole.**

3.3.2.4 Dropephylla gracilicornis (Staphylinidae)

A rove beetle. The adult beetles are found under bark and in rotten wood of dead aerial lateral branches of broad-leaved trees, especially oak. It has also been found amongst lichen externally on these branches. It has been found widely across lowland England, although sparingly so. The only other Somerset record is from Nettlecombe Park in 2000 (Duff, 2010). There appear to be no records from the Devon parts of the Exmoor NCA. **Pixton Park therefore appears to be one of only two known sites within the Exmoor NCA and Somerset as a whole.**

3.3.2.5 Epuraea distincta (Nitidulidae)

This member of the sap beetle group develops in the bracket fungi *Daedaleopsis confragosa* fruiting on dead stems of willows and other broad-leaved trees and shrubs. The species appears to be a recent arrival in Britain being first discovered on the Gower, S Wales in 1919, but is now known to be widespread across southern and western Britain, and has even recently colonised Northern Ireland. The first Somerset records came from the Somerset Levels in 1990 and 1991. It clearly should not have conservation status as it is a new arrival which is continuing to expand its UK range.

3.3.2.6 Euglenes oculatus (Aderidae)

A hairy fungus beetle. Taken in numbers by the flight interception trap on the veteran oak pollard at the northern park boundary and a few also in the trap on the brownrotten oak in the valley below the mansion. It develops in moist crumbly red-rotten heartwood in old hollowing open-grown trees, especially oak. The adults feed at blossom and particularly favour that of elder. It has been found widely across lowland England and Wales, although sparingly so – its

requirement for groups of veteran oaks limiting the range of sites available. Duff (2010) only contains a single previous record from Somerset, from Ashton Court Park SSSI, but it has since been found in Horner Woods (A.P. Foster, pers. comm.). It is not known from the Devon side of the Exmoor NCA. **Pixton Park therefore appears to be one of only two known sites within the Exmoor NCA.**

3.3.2.7 Euplectus duponti (Pselaphinae)

One specimen of this short-winged mould beetle was taken by the flight interception trap in the hollow Turkey oak in valley below mansion. On the Continent it seems to live in humus at the foot of old trees and is regarded as a very rare saproxylic species. In Britain it has a thinly scattered distribution, mostly in areas of central and southeastern England. It has only once before been reported in Somerset, from the Ashton Court Estate (Duff, 2010); it is not known from the Devon section of the Exmoor NCA. **The Pixton Park record appears to represent the first record from the Exmoor NCA and only the second from Somerset as a whole**.

3.3.2.8 Malthinus frontalis (Cantharidae)

A soldier beetle. Three were taken by the flight interception trap on the veteran oak pollard at the northern park boundary. Associated particularly with large old and open-grown trees in parkland or other situations. Adults have been found at exposed white-rotten sapwood on standing dead trunks, and it is assumed that the larvae develop within white-rotten wood. It has been found widely across lowland England and Wales, as well as in the Scottish pine forests, although sparingly so – its requirement for groups of veteran trees limiting the range of sites available. Particularly scarce in South West – Somerset records in Duff (2010) are all from the east of the county and so this appears to be the only known site in the west. There are no records from the North Devon part of the Exmoor NCA. **Pixton Park is the only known site in the Exmoor NCA.**

3.3.2.9 Pediacus dermestoides (Cucujidae)

The distinctive larvae of the flat bark beetle *Pediacus dermestoides* were found beneath loose bark on a recently collapsed large oak branch beneath a large veteran oak on the lower slopes of the enclosure holding red deer.

Although sufficiently widespread in Britain not to have any conservation status, this beetle is worthy of special attention as it has been shown to be very localised over most of its European range and has been afforded ‘Data Deficient’ status in the recent IUCN European Red List of Saproxylic Beetles. Climate appears to be a key factor, with the few French colonies occurring in relatively cool and damp forests on the north slopes of mountainous areas. In Germany it is regarded as a high-quality indicator species of old growth forest conditions. In Britain it is widespread across the south, occurring as far north as the North York Moors, and fairly ubiquitous in ancient woodland and ancient wood pasture situations. It is widespread within the Exmoor NCA.

The beetle develops beneath bark on dead broad-leaved timber in the early stages of decay, especially in shattered ends of broken branches. The larvae feed on other insect larvae, while the adults are fungivorous. Adults are very occasionally found at blossom or at bracket fungi, but more usually under bark with the larvae.

3.3.2.10 Phloiophilus edwardsi (Phloiophilidae)

The single Nationally Scarce species found during the September 2014 survey is *Phloiophilus edwardsi*. Adults were found in small numbers by tapping aerial dead branches on a large old multi-stemmed oak within open rough grassland between the deer enclosure and the east side of Pixton Stables.

The larvae of this beetle develop in *Peniophora* species of fungi, which decay aerial dead lower boughs of various mature and maturing open-grown broad-leaved trees and shrubs, but especially oak. Trees as young as 40 years may be suitable, although most records come from 150 to 250 year-old oaks. Older trees increasingly become unsuitable as lower limbs are lost. The requirement for lateral branching means that only open-grown trees are suitable. The species is most frequent in old wood pasture and parkland situations as a result. The larvae overwinter and pupate in the spring, the adults appear in autumn - the adults also feed on the host fungus and so the species is most readily found by tapping suitable aerial dead branches over a net during the autumn.

The species occurs widely across lowland Britain but tends to be known from at most a handful of sites in each county. It is mostly known in Somerset from VC6 (North Somerset): Bushey Norwood, a wood-pasture site above Bath, in 2006; Tyntesfield Park in 2002; and ‘Castle Cary’ during the period 1908-1915 (information from James McGill, 2010). There is just one published record from VC5 (South Somerset): ‘Minehead’ in 1957. The species has also been found on the other side of Exmoor, at Arlington Park in Devon. **Pixton Park is therefore one of only two known current sites in the Exmoor NCA.**

3.3.2.11 Placusa tachyporoides (Staphylinidae)

A rove beetle. A single individual was taken in the trap on the brown-rotten oak in the valley below the mansion. Associated with freshly exposed sap of oak and sweet chestnut. This rove beetle species has not been reported from Somerset previously – records are widely scattered across England but not in the South West. **Pixton Park is therefore the only known site in the Exmoor NCA and in Somerset.**

3.3.2.12 Prionocyphon serricornis (Scirtidae)

A single specimen was taken in the flight trap positioned over a ripped part of the trunk of the multi-stemmed ash on the eastern park boundary and another in the trap on the brown-rotten oak in the valley below the mansion. The distinctive larvae of this species live amongst the bottom debris of water-filled tree-hollows, especially those commonly found between solid and un-decayed root buttresses on large old trees, especially beeches; they probably live a scavenging lifestyle, feeding on a wide variety of dead plant and invertebrate

material. The adults emerge in late spring and early summer, and fly at dusk; they are reported to favour canopy situations for oviposition rather than lower sites. Although long-regarded as a rarity, a recent focus on the larva for recording has demonstrated that the species is actually much more widespread than previously appreciated – it will almost certainly lose its Nationally Scarce status at the next species status review.

The species has been found to be widespread – albeit localised by its need for large old trees - across much of central and southern England, and has also been found in a small number of sites in the far west and north. There are still very few known sites across the SW, and Somerset sites are clustered in VC6. It was discovered in Nettlecombe Park in the 1990s (Peter Hammond, pers. comm.) and the Heddon Valley, Devon in 1990. **Pixton Park therefore is one of just three known sites across the Exmoor NCA.**

3.3.2.13 Ptinus subpilosus (Ptinidae)

A spider beetle. One individual was taken by the trap on the brown-rotten oak in the valley below the mansion. Larvae develop in decaying wood in old hollow trees and under bark, mainly of oak, and old pines in the Scottish Highlands; they have also been found as a scavenger in bird nests. Said to be a reliable marker of old growth conditions. It has only previously been found in Somerset from Nettlecombe Park and Horner Woods, and so appears to be confined to the Exmoor National Park area. It is not known from the Devon part of the Exmoor NCA. **Pixton Park is therefore one of three known sites in the Exmoor NCA and Somerset as a whole.**

3.3.2.14 Quedius aetolicus (Staphylinidae)

A rove beetle. One was taken by the flight interception trap on the veteran oak pollard at the northern park boundary. Most often found in squirrel dreys and bird nests in hollow trees, and in wood mould beneath. Confined to the southern counties of England and not previously known in Somerset nor the Devon side of the Exmoor NCA. **Pixton Park is therefore the only known site in the Exmoor NCA and Somerset as a whole.**

3.3.2.15 Thymalus limbatus (Trogossitidae)

The most significant saproxylic beetle species previously reported from Pixton Park is *Thymalus limbatus*; a single example was found again in 2017, beneath bark on a snapped and dead hanging branch on one of the mature oaks on the upper plateau of the park. The larvae and adults are found beneath loose bark on the decaying wood of a wide variety of trees - broad-leaves and conifers – where the wood beneath is in the later stages of white-rot decay, and when the sapwood and heartwood are relatively dry and soft. The larvae are reported to be associated particularly with the fungus *Daedaleopsis confragosa* (on birch, willow, aspen) in Russia and the Ukraine, while they are more closely associated with decaying oak in Britain. The adult is also often found on the fruiting bodies of various bracket fungi and are assumed to be feeding on fungal material; they are active usually in June and July. The life cycle is between one

and two years. Sites tend to be ancient wood pastures and the species is also regarded as a high-quality indicator species in France (Brustel 2004).

The species also has a wide British range, although is most frequent in the moister climate of the west and north, and absent from a large area of central southern England and East Anglia. It is best known in the SW from the Exmoor and Quantocks area, with modern Somerset records from Nettlecombe Park and Willoughby Cleave (Quantocks). It also occurs in the old Selwood Forest area on the county border with Wiltshire. On the Devon side of Exmoor it is well known from the Arlington Court Estate (Alexander, 2007) and also noted from the Glenthorne Estate coastal woodlands. **Pixton Park has the only Exmoor parkland population**.

3.3.2.16 Triphyllus bicolor (Mycetophagidae)

A hairy fungus beetle. One was taken by the flight interception trap on the veteran oak pollard at the northern park boundary and another in the trap on the brown-rotten oak in the valley below the mansion. Adult beetles can be found all year round; they are associated with the soft fruiting bodies of annual bracket fungi, most often Chickenof-the-Woods *Laetiporus sulphureus* and Dryad's Saddle *Polyporus squamosus*, but also Beefsteak fungus *Fistulina hepatica*, *Inonotus* species and oyster mushroom *Pleurotus* species and are found on the spore-producing surfaces throughout the period from late June until well into the early winter period; they may remain in airdried brackets through into the following spring, provided such habitat is available; in the absence of old brackets, beetles can be found inactive in or on deadwood (Atty, 1983; Stephens, 1936) presumably awaiting the annual bracket fungi to fruit. The larvae are presumed to develop within the dead tissues of the old fungal fruit bodies – it has been reared from *Laetiporus sulphureus* and *Piptoporus quercinus*. Veteran trees are clearly essential and form the primary habitat type; occupied trees tend to be in open sunny situations. Sites are predominantly old medieval forests, historic parklands, common wood pastures, traditional orchards, ancient woodlands and old hedgerows; widespread across the lowlands. Only previously known in the county from Nettlecombe Park. It is also a rare species in Devon and has not been found in that section of the Exmoor NCA. **Pixton Park therefore has one of only two known sites in the Exmoor NCA and Somerset as a whole.**

3.3.2.17 Additional beetle species with Nationally Scarce status

One further beetle species with Nationally Scarce status was taken in one of the flight traps: *Scydmoraphes helvolus* (Scydmaeninae), one from the trap on the multi-stem ash on the eastern boundary. This group of beetles are referred to as stone beetles and are specialist predators of mites, in permanently moist situations. It has been found in a wide variety of situations, including grass litter, woodland moss, riverbanks and sea cliffs. This is the first time it has been found in Somerset. As it is not known from the Devon section of the Exmoor NCA, **Pixton Park is the only known site within the Exmoor NCA and Somerset as a whole.**

3.3.3 Saproxylic Diptera (flies)

Many Diptera are associated with decay and decomposition of plant and fungal material generally and it can be difficult to determine the extent of their association with decaying wood. The following discussion is largely about the most clear-cut cases of saproxylics. Flight trapping is the best way of surveying these species.

The flight traps revealed the presence of about 53 species of saproxylic fly, including one Vulnerable, one Near Threatened and five Nationally Scarce saproxylic fly species.

3.3.3.1 Madiza britannica (Milichiidae)

A freeloader fly. A single female of this **Vulnerable** species (Falk et al, 2016) was taken in the flight interception trap on the split ash on the eastern park boundary. The larvae of this species are saprophagous, and develop in moist wood detritus in cavities and rot holes in veteran trees. Knowledge of the ecology of the species has recently been reviewed (Alexander & Perry, 2013). The species is associated with mature open-grown broad-leaved trees, those which have had enough space to develop lateral branching and hence have the potential to form rot-holes when branches break off. Suitable rot-hole formation is not normally possible within conventional woodlands, where lateral branch development is suppressed by heavy shading of the tree trunks. White-rot appears to be the key type of wood-decay in which the species develops. Dryad's saddle fungus *Polyporus squamosus* is the wood-decay fungus in all except one case where the host fungus was noted. This is the most widespread fungus involved in the formation of rot-holes, especially in horse chestnut, sycamore and poplars. *Ganoderma australe* was the key heartwood decay fungus present noted in the case of the one apparent exception. Associated with a wide variety of broadleaved tree species. Sites include historic parkland, a traditional orchard, and old fen and hedgerow trees (Alexander & Perry 2013).

The British distribution appears centred on East Anglia and the Midlands, with just a single previous record from Somerset, from Failand (1963) in the east of the county. **The discovery of the species at Pixton represents a significant extension to its known range. This is only the 15th known locality in Britain. It is also new to the Exmoor NCA.**

3.3.3.2 Manota unifurcata (Mycetophilidae)

The British status of this fungus gnat has been assessed as '**Near Threatened'** by Falk & Chandler (2005) as only ten records since 1960 were known at that time. A single male was taken in the trap on the ripped-out ash multi-stem on the eastern boundary of the park. The species has been reared from rotten wood bearing fungal growth or myxomycetes; the decayed wood needs to be soft and friable, enabling the larvae to wriggle through when disturbed. The known sites include conventional ancient woodland (Monks Wood NNR), common wood-pastures (Burnham Beeches), and mediaeval forests (New Forest, Windsor, Epping and Wychwood), and Pixton Park represents the second historic parkland where it has been found since the 2005 review; it was

found by flight interception trapping in Lanhydrock Park in 2008. All the known sites are very southern, from Cornwall and Glamorganshire to Essex and Huntingdonshire. **Pixton Park is the first site in the Exmoor NCA and only the second from Somerset as a whole.**

3.3.3.3 Clusia tigrina (Clusiidae)

This rare and distinctive Nationally Scarce fly was found in usually good numbers associated with the ripped-out multi-stem ash on the eastern boundary of the park. A total of four males and two females were trapped over the year, compared with single individuals of the other rare flies detected. The larvae are known to develop in the decaying wood of broadleaved trees, usually of standing trees with exposed heartwood. The known sites are typically with isolated veteran trees within open situations such as ancient wood pastures and parklands, and it has also been reported from at least one hedgerow system. The known sites include a 'who's who' of the richer saproxylic sites across southern Britain, including the New Forest, Windsor Forest, Hatfield Forest, Burnham Beeches and Wychwood NNR. It is well-known in the South West, having been discovered in Cornwall in 1890 and most recently from the Tidna Valley, Morwenstow in 1975, and from three sites in Somerset: Leigh Woods NNR (1980), Neroche Forest (1951) and East Harptree (1978). **Pixton Park appears to be the first for the Exmoor NCA.**

3.3.3.4 Lasiambia brevibucca (Chloropidae)

A single female of this Nationally Scarce fly was taken in the trap inside the large Turkey oak in the valley below the mansion. The habits of this species have recently been reviewed (Alexander, 2014) and it was suggested that the key habitat requirement is for standing, generally living, broad-leaved trees of an age or condition whereby large volumes of decaying wood are present, substantial rot-holes are available, or there are sap-runs present. Tree density and shading appear unimportant, as does site continuity. The larvae appear to develop within moist decayed wood, including rot-holes and accumulations of fermenting tree sap.

The species has been found in open parkland, traditional orchards, hedgerow trees, woodlands, and even urban situations. Its rarity may be more apparent than real due to the difficulties involved in detecting its presence – flight interception trapping is rapidly increasing knowledge of its range and conservation status. Current data indicates Nationally Scarce but down-grading will be required if the current rate of discovery of new sites continues**. Pixton Park is the first site in Somerset where it has been found and also represents the farthest west record in southern England** (Falk et al, 2016).

3.3.3.5 Madiza pachymera (Milichiidae)

Another freeloader fly, with broadly similar habits to those described for *M. britannica* (3.3.3.1), but with a distinctly different British range, and Nationally Scarce. A male was taken in the trap inside the hollow dead beech tree on the eastern plateau. It has been found widely across southern England, from Dorset and the New Forest eastwards to Kent, and north into East Anglia, but is not

known from the Midland counties like *M. britannica*. This means that the two species have only coincided in the past in sites in East Anglian. Pixton Park is the first known site outside of East Anglia to support both species of *Madiza*. It is also, again, the farthest west this species has been discovered. *M. pachymera* is found more widely than *M. britannica* within their respective ranges, and clearly has less exacting habitat requirements. It has been reared from a rotten elm log and its presence in the old and dry long-dead beech at Pixton both suggest a wider range of saproxylic habitats than *M. britannica*. **Pixton Park is the only known site in the Exmoor NCA and Somerset**.

3.3.3.6 Fannia aequilineata (Fanniidae)

A single female of this Nationally Scarce species was taken by the trap on the veteran oak pollard on the northern boundary of the park. The larval habitat is rotten wood and wood detritus, fungi on dead wood, and it has very occasionally been reported from detritus in the nests of birds, social Hymenoptera and small mammals, and so it is not strictly an obligate saproxylic, but is most often encountered in saproxylic situations. The females are attracted to sap-runs and males have been observed to hover beneath tree canopy, presumably display behaviour. Although Falk & Pont (2017) describe it as a species of broad-leaved woodland this is incorrect as many of the known sites are historic parklands and it has also been found in traditional orchards. The author has reared it from old beefsteak fungus in Dunster Park, for example, and trapped it in the ancient wood pasture of Leigh Woods NNR. Known sites are thinly scattered across much of Britain. Details of all known sites are not readily accessible but Falk & Pont (2017) list it as known from both Somerset and Devon.

3.3.3.7 Phaonia laeta (Muscidae)

A single female was taken by the trap on the veteran oak pollard on the northern boundary of the park. The adults of this Nationally Scarce species are most often found at sap runs. The larvae develop in sap runs and rot-holes, where they feed on other small invertebrates. It is known to breed on a wide variety of broad-leaved trees and has also been found using spruce. Records are widely scattered over much of Britain, but Falk & Pont (2017) note only that there have been only 14 records since 1960 and that the New Forest has been one of its best sites. The Pixton Park record is the only modern one from Somerset; the species has not been found in Cornwall, Devon or Dorset. It is interesting that this is the first time the author has found this species despite using flight interception trapping on veteran tree sites for over ten years. **Pixton Park is therefore the only known site in the Exmoor NCA and Somerset as a whole.**

3.3.3.8 Saproxylic hoverflies

Three species of saproxylic hoverfly were also found: *Brachyopa scutellaris*, *Criorhina floccosa* and *Xylota sylvarum*. Boyce (pers. comm.) has reported the presence of the uncommon saproxylic hoverfly *Brachyopa insensilis*. While none of these have conservation status they are all indicators of good quality saproxylic habitat. The two *Brachyopa* species are especially poorly known in

Somerset and the South West in general (Ball et al, 2011); both develop in sap-runs on broad-leaved trees.

3.3.4 Other saproxylic invertebrates

A wide range of other invertebrate groups include species dependent on decaying wood (saproxylic). While Coleoptera and Diptera are pre-eminent, with in excess of 700 saproxylic species each nationally, other important groups are the Hymenoptera and Lepidoptera, but also Hemiptera. The uncommon predatory bug *Xylocoris cursitans* was found beneath bark on freshly collapsed beech wood in the upper park.

3.3.5 Summary of occurrence of rarer saproxylic insects in context of Exmoor NCA and Somerset generally

Table 2 lists all of the insects found during the 2014 and 2017 sampling which have conservation status in Britain, together with information on their occurrence elsewhere in the Exmoor NCA and Somerset as a whole.

Table 4 Occurrence of species with conservation status in the wider Exmoor NCA and Somerset

Species name	**British status**	**Number of other modern records from the Exmoor NCA**	**Number of other known modern sites in Somerset**
COLEOPTERA			
Anaspis costai	NS	0	East Vice County only
Cryptarcha strigata	Notable	0	0
Species name	**British status**	**Number of other modern records from the Exmoor NCA**	**Number of other known modern sites in Somerset**
Dropephylla gracilicornis	Notable	1	1
Euglenes oculatus	NS	1	2
Euplectus duponti	Notable	0	1
Malthinus frontalis	NS	0	East Vice County only
Phloiophilus edwardsi	NS	1	East Vice County only
Placusa tachyporoides	Notable	0	0
Prionocyphon serricornis	Notable	2	Mainly East VC
Ptinus subpilosus	NS	2	2

Quedius aetolicus	Notable	0	0
Scydmoraphes helvolus	Notable	0	0
Thymalus limbatus	NS	4	scattered
Triphyllus bicolor	NS	1	1
DIPTERA			
Clusia tigrina	pNS	0	3
Fannia aequilineata	pNS	At least 1	At least 1
Lasiambia brevibucca	pNS	0	0
Madiza britannica	pVU	0	0 (only previously 1963)
Madiza pachymera	pNS	0	0
Manota unifurcata	NT	0	1
Phaonia laeta	pNS	0	0
Total number of zeros		**13**	**8**
Total number of ones		**4**	**4**

3.3.6 Index of Ecological Continuity and Species Quality Index for Coleoptera

Two systems have been devised for the relative assessment of site quality for nature conservation using saproxylic beetles: the Index of Ecological Continuity (revised in Alexander, 2004) and the Saproxylic Quality Index (Fowles, Alexander & Key, 1999).

3.3.6.1 Index of Ecological Continuity

The Index of Ecological Continuity has been used to identify Britain's most important sites for the saproxylic invertebrates of ancient trees and wood-pasture type habitats, and a hierarchical site table has been developed. The Index calculation is based on the presence or absence of a select list of beetle species (revised by Alexander, 2004). The species are graded according to their degree of association with Britain's remaining areas of old growth – mainly the old wood pastures and historic parklands - and these grades are used as the basis for a scoring system. The total of these scores provides the Index.

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

Experience has suggested that sites of national importance have an IEC in the range of 25-80 while IEC values of 15-24 are of regional importance (Alexander, 2004). Sites in excess of 80 are considered to be of European significance.

The Exmoor National Park area has a small number of known sites of significant interest for saproxylic invertebrates. The only other parkland sites are Dunster and Nettlecombe (Somerset) and Arlington (Devon), whereas important wood pastures or former wood pastures include Horner Woods and Selworthy Combe (Somerset) and Watersmeet (Devon). Table 3 presents current knowledge of the occurrence of the IEC species (see 5.3.5.1) within the Exmoor NCA area.

Table 5 Some local records for beetle species used in the calculation of the IEC (where multiple records, most recent given)

	Dunster	**Nettlec**	**Pixton**	**Arlingtn**	**Horner**	**Other**
Plegaderus dissectus	199X					
Stenichnus bicolor		1988	2017		1995	
Quedius aetolicus			2017			
Q. maurus			2017		1950	
Q. microps		1866				
Q. truncicola	199X				2015	
Q. xanthopus		1990			1995	Selworthy Combe
Trichonyx sulcicollis		1866				
Prionocyphon serricornis		2000	2017			Heddon Valley
Calambus bipustulatus	1999				2015	Barle Valley 1994
Ischnodes sanguinicollis						'Porlock'
Platycis minutus	199X		2017			
Ptinus subpilosus	199X	1988	2017		2015	
Xestobium rufivillosum		1988				
Lyctus brunneus				1988		
Dorcatoma chrysomelina	199X				2015	
Dorcatoma flavicornis		1990				
Phloiophilus edwardsii			2014			'Minehead'
Thymalus limbatus		2000	2017			Glenthorne 1986
Thanasimus formicarius		2000				Coastal woods
Rhizophagus nitidulus					1995	
Pediacus dermestoides	199X	1990	2017	1988	1995	

Biphyllus lunatus	1919	1988		1985	1993	
Diplocoelus fagi	199X					
Cerylon fagi					1993	
Pseudotriphyllus suturalis	199X	1990				
Triphyllus bicolor		1990	2017		2015	
Mycetophagus atomarius	199X	1988		1988		'Porlock'
M. piceus	199X					
Orchesia undulata		1990	2017		1995	Glenthorne 1986
Phloiotrya vaudoueri		1990				
	Dunster	**Nettlec**	**Pixton**	**Arlingtn**	**Horner**	**Other**
Melandrya caraboides						Watersmeet
Bitoma crenata		1988				
Eledona agricola	199X	1990	2017			
Prionychus ater	199X					
Pseudocistela ceramboides		1988			2015	
Ischnomera cyanea	1919				1988	Porlock Bay 1986
Pyrochroa coccinea					1993	
Euglenes oculatus			2017		2015	
Leptura aurulenta		2000			1998	
L. quadrifasciata						'Dulverton'
Anoplodera sexguttata						Watersmeet
Phymatodes testaceus		1990			1995	
Platyrhinus resinosus	199X					
Trachodes hispidus					2015	Watersmeet
Xyloborinus saxesenii		2000				
Trypodendron domesticus		2000	2017			'Porlock'
T. signatus						'Porlock'
Platypus cylindrus		1990				
Index of Ecological Continuity	17	45	17	14	25	

The calculated Index of Ecological Continuity for Pixton Park presently stands at 17 (see Table 4 for detail). This figure is clearly below the level required for national importance but is based on just two visits. A score of 17 from such limited recording effort may suggest that the site does have considerable potential to be supporting a rich fauna, but more recording is required – the IEC depends on recording effort to generate a minimum value.

3.3.6.2 Saproxylic Quality Index

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

The SQI calculation has certain provisos:

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

Fowles et al (1999) suggest that an SQI of 500 is probably an appropriate threshold for assessing national importance. Pixton Park - with a calculated SQI of 328 (Table 4) - therefore falls well below this provisional threshold for national importance.

However, Fowles at al (1999) were unable to present data for more than 14 sites with an SQI of 500 or more and it does seem likely that the threshold is set much too high. Many sites which are nationally famous for their saproxylic beetles have SQI figures in the 300s and 400s.

The Pixton Park species list currently includes 61 qualifying species and so exceeds the recommended 40 threshold. The resulting SQI analysis results in a figure of 313 - an index which compares favourably with many nationally important sites for saproxylic beetles including those available for other local sites (see Table 4).

Table 6 IEC and SQI figures for sites across Somerset and North Devon

Site name	SSSI notified for deadwood assemblage	County	IEC	SQI
Exmoor National Park area				

Pixton Park		Somerset	17	313
Nettlecombe Park (SSSI*)	*	Somerset	45	355
Dunster Deer Park (SSSI*)	*	Somerset	17	335
Arlington (SSSI)	*	Devon	14	363
Horner Woods (SSSI)		Somerset	25	315
Watersmeet Woods (SSSI)		Devon	14	
Other parts Somerset				
Ashton Court Estate (SSSI*)	*	Bristol	27	318
Other parts Devon				
Whiddon Park (SSSI)	*	Devon	37	
Killerton Park (geological SSSI)		Devon	15	

The IEC and SQI for Pixton are placed in square brackets as they are based on very limited sampling; all of the other sites have been subject to more detailed surveys. The presence of a notified biological SSSI is shown in brackets and in a separate column where deadwood invertebrates are a notified feature (Killerton Park only has a geological SSSI; its special interest for ancient and veteran trees and saproxylic communities are not yet acknowledged by any notification).

Although the IEC and SQI figures are relatively unimpressive when viewed in isolation, comparison with other sites across Somerset and Devon clearly shows that the results for Pixton Park are very comparable to sites which have been designated at least partly for their saproxylic invertebrate fauna. The SQI is only exceeded locally by Arlington SSSI and Dunster Park SSSI and these have been based on considerably more recording (is this true at Dunster?).

The SQI approach is of particular use in comparing a series of datasets from a single site – the IEC is less useful for this as the list of qualifying species is intended to be built up over time. It can instructive to see how the SQI figures have changed over time in relation to changes in site management. The control on recorder effort makes the SQI approach particularly useful for site condition monitoring.

3.4 Epiphyte invertebrate assemblage

The special interest of Pixton Park for epiphytic lichens strongly suggested that the Park would also be found to be notable for its epiphyte invertebrate assemblage. Fourteen species of barkfly (Psocoptera) were found during the 2017 survey work and these include the nationally rare *Peripsocus parvulus*, a species with a generally south-westerly distribution pattern in Britain and for many years only known from the New Forest. Pixton Park is its only known

locality in the far South West – the closest known site is Cwm Clydach NNR in Monmouthshire. Uncommon species present include *Pteroxanium kelloggi* and *Reuterella helvimacula*.

A population of *Epicaecilius pilipennis* was also found. This was originally described as 'new to science' from Madeira but has been steadily colonising Britain and Ireland. Whether this is the result of a natural colonisation, the barkflies being carried on south-westerly winds, or through importation with plant material, is impossible to know. The natural habitat on Madeira is humid heath vegetation but it has also been colonising open-grown trees in Britain.

Specialist predators of barkflies were also associated including the bugs *Temnostethus gracilis* and *Buchananiella contigua*. The Tree snail *Balea sarsii* was also typically present.

Overall, the specialist epiphyte invertebrate fauna of Pixton Park appears to be species-rich and of high quality.

3.5 Features of interest across the historic parkland

3.5.1 Pixton Park House ownership

3.5.1.1 Paddock below main access drive

The veteran oaks along the old park boundary are a feature of considerable potential interest for saproxylic invertebrates. Some appear to have a girth of about 6m and have a pollard form, suggesting an age well in excess of 400 years. Although the large old sweet chestnut trees up-slope are presumably much younger, both these trees and the oaks may be expected to contain large volumes of red-rotten heartwood capable of supporting invertebrates of conservation importance. Beefsteak fungus on one of the sweet chestnuts demonstrated the presence of red-rot in that particular tree, while a large hulk at the base of the slope had extensive growth of another red-rot forming bracket fungus Chicken-of-the-Woods. A few widespread invertebrates were found in association, including the fly *Tephrochlamys flavipes* developing in the Beefsteak.

The ancient lime pollard on the eastern upper slope of this enclosure also has considerable potential interest for white-rot invertebrates. A large beech stump by the bend in the driveway had growth of the annual bracket fungus *Meripilus giganteus* which was attracting the fruit fly *Hirtodrosphila confusa*.

3.5.1.2 Paddock below the mansion

A key feature of this area of horse-grazed pasture is the group of old hawthorns at the southern end, one with a girth in excess of 1.5m. These trees are undoubtedly of value for nectaring insects in the late spring period. This enclosure also contains a few old beech and a walnut with valuable rot-holes

suitable as breeding sites for specialist Diptera. The walnut has a girth in excess of 4m. A standing dead beech monolith in the centre of the slope is another valuable feature for invertebrates – emergence holes of the widespread woodworm beetle *Ptilinus pectinicornis* were abundant.

3.5.2 Pixton Stables ownership

3.5.2.1 Ungrazed parkland between deer enclosures and Pixton Stables

On the east side of Pixton Stables is an area of rough grassland with patches of bramble, scattered hawthorns and a few parkland trees.

A large multi-stemmed oak is a feature of particular interest – the trunk has a large cavity giving access to well-developed cuboidal red-rot and there are a few aerial dead branches in the lower crown. The red-rot has the appearance of the type of decay caused by the bracket fungus *Laetiporus sulphureus*, and the old fungal mycelium within a sample examined contained galleries of a medium-sized beetle, presumably the hairy fungus beetle *Mycetophagus piceus* – a species which only narrowly misses Nationally Scarce status - although this remains to be confirmed. This beetle is only otherwise known on Exmoor from Dunster Deer Park, and if correctly identified would increase both the IEC and SQI figures for the site. The aerial dead branches were found to be the richest on the site, with the Nationally Scarce saproxylic beetle *Phloiophilus edwardsi*, as well as the barkflies *Pteroxanium kelloggi, Ectopsocus axillaris* and *Lachesilla pedicularia* and the predatory bug *Buchananiella contigua.*

Two veteran beech trees have a high forest form and presumably are the remnants of a clump planting. These are of large girth, estimated at about 5m, and therefore of potential interest for heart-rot fauna. A large recently fallen branch had attracted the subcortical predatory bug *Xylocoris cursitans* although no prey larvae could be found.

3.5.2.2 Ungrazed fringes on upper east side of deer enclosures

The eastern fringes are notable for a large number of veteran oak and beech, mostly but not exclusively forming old shelter belts. One exceptionally large old Turkey oak has partially ripped apart and has brackets of the uncommon fungus *Ganoderma resinaceum* present on the trunk and collapsed top. The easternmost boundary also has two large old layered ash trees, one of which has started to collapse – exposing extensive white-rot decay and had fresh bracket fungus *Inonotus hispidus* fruiting as well as an old bracket of *Polyporus squamosus*. These are both important decay fungi for invertebrates. The large open-grown parkland ash with growth of the lungwort lichen *Lobaria pulmonaria* has aerial rot-holes and scars providing valuable decay habitats for invertebrates. A large dead standing beech hulk in open parkland still retains some of the fallen upper trunk section alongside; the very wet white-rotten wood contained the uncommon beetle *Abraeus perpusillus*. The large oaks along these fringes appear mostly to be Turkey oak, a species of much lesser value for saproxylic invertebrates than the native oaks.

3.5.2.3 Upper deer enclosure

This has an important concentration of ancient and veteran open-grown oak trees. Heartwood decay is apparent in many of these trees although access for invertebrate sampling proved difficult; one hollow oak had lost its top some time ago and the lying remains showed clear signs of the red-rot caused by *Fistulina hepatica*. Hanging dead branches on some of the oaks proved productive in deadwood beetles, including the oak bark-beetle *Scolytus intricatus*, the rove beetles *Leptusa pulchella* and *Dropehylla kuntzei*, and *Cerylon ferrugineum*. An ancient elder tree on a mound is a feature of note, both for saproxylic invertebrates and for the blossom this provides earlier in the season.

3.5.2.4 Southern deer enclosure

The upper slopes have typical well-spaced and open-grown parkland trees. A standing dead beech tree had fruiting giant polypore *Meripilus giganteus* at the trunk base as well as ascomycetes on areas of loose bark – the uncommon hairy fungus beetle *Litargus connexus* was noted, active on the trunk surface. The minute fungus beetle *Cis vestitus* was found on aerial dead branches of a large open-grown Turkey oak.

Down-slope, tree density is much greater, the older parkland oaks being enveloped within secondary woodland development, largely ash and oak. Larvae of the uncommon flat bark beetle *Pediacus dermestoides* were found beneath loose bark on a freshly fallen large oak bough. Older loose bark on a large collapsed oak top concealed larvae of the uncommon awl-fly *Xylophagus ater* as well as the common saproxylic rove beetles *Atrecus affinis* and *Gabrius splendidulus.*

3.5.2.5 Lower deer enclosure

A pair of oaks have recently collapsed in the centre of the secondary woodland in the lower deer enclosure. One section of trunk lying in a very open and sheltered area was being extensively bored by an ambrosia beetle, probably the uncommon *Trypodendron domesticum*. No adult beetles or fragments could be found and so the record must remain unconfirmed. Sections with looser bark had been colonised by the widespread longhorn beetle *Rhagium mordax* and the uncommon beetle *Cerylon ferrugineum*.

3.5.2.6 Ungrazed valley immediately south of Pixton Park ownership

A large veteran oak has had its top snapped by wind, exposing extensive red-rotten heartwood. Brackets of the fungus *Laetiporus sulphureus* had been colonised by the widespread fungus gnat *Mycetophila tridentata*, while *Meripilus giganteus* was attracting *Hirtodrosophila confusa* and *Suillia variegata* flies. Rove beetles hunting amongst the old *Meripilus* brackets included the widespread *Bisnius fimetarius*. A large old ash pollard is a notable feature in this area as well as many other veteran oaks.

3.5.2.7 Wooded lower slopes

The lower slopes below the current parkland have mostly been converted into dense high forest woodland and including stands of conifer plantation. These areas are currently of much lesser interest for saproxylic invertebrates as they lack large veteran trees, although the more humid and shadier conditions may favour saproxylic Diptera which breed in small branch-wood. A small number of large old oak of high forest form are scattered through and will provide more interesting habitat when they eventually collapse. Younger trees are unlikely to develop into valuable veteran trees however as the tree density is sufficiently too? great for crown retrenchment to lead to the premature death of older trees from over-shading, and oak will be unable to regenerate under the shady conditions.

3.5.2.8 Pixton Hill

This area conatins a small number of veteran trees which may be of interest for saproxylic invertebrates. One mature sycamore has an open side to the trunk with exposed wet white-rotten heartwood. There is also a large open-grown beech on the north side which will generate an abundance of deadwood when it eventually collapses.

3.6 Overall site evaluation for invertebrates

Overall the wood-decay beetle fauna appears to be of comparable quality with the best-known sites within the Exmoor NCA which are rich in saproxylic beetles. The Index of Ecological Continuity figure indicates a site of at least regional significance – the context of South West England. This IEC arises from a single full season of sampling. It may be expected that further survey will increase this figure significantly by discovering species which have been overlooked so far. An assessment of national significance does not seem to be out of reach.

4 Site Condition

Site condition overall is assessed as relatively good but with concerns about the ungrazed areas along the lower slopes. The parkland contains good numbers of ancient and veteran trees of open-grown form, tree health appears generally good, and the pasture appears to be being managed extensively. The lower slopes have however been exclosed from grazing (except by wild red and roe deer) and converted to a high forest structure – any remaining veteran trees of open-grown form remaining here are at risk from crown competition.

The parkland includes good numbers of large old trees, some with heartwood decay and hollowing evident, as well as many mature and younger trees. Analysis is needed of the age structure but an age gap crisis does not appear to be an imminent issue. Information is needed on any current tree planting strategy, which should favour native oaks. Wild development of young trees is

apparent is some areas, e.g. the lower areas of the deer enclosures, and this is an unusual and important feature. Where trees are not developing naturally it will be desirable to initiate a long-term planting strategy and plan.

Deadwood retention appears to vary across the site, with less being apparent in the areas immediately around the two mansions but otherwise plentiful in the outlying areas. The retention of at least two monoliths – one each in the Pixton Park House and Pixton Stables areas – is a good feature, as is the occasional standing dead tree; standing deadwood is one of the rarest and most threatened habitats. A wide variety of fallen deadwood is also apparent, including recently collapsed trees left in situ as well as large main branches which have ripped out from tree trunks.

The most widespread cause of poor tree health and declining vigour nationally is root damage. No serious concerns have been raised as a result of the September visit surveys. Some poaching and soil compaction is evident locally within the deer enclosures but probably at an acceptable level overall. The pasture in the deer enclosures appears relatively untreated by potentially damaging agricultural chemicals, while the pasture in the horse paddocks appears to be reverting from former use of artificial fertiliser. The outer areas of the park pastures are reported to have been cattle grazed until recently, and appear to be in relatively poor condition (in being poor in plant species composition), perhaps mainly due to lack of grazing but possibly were treated with agricultural chemicals in the recent past as well. The potential problem arising from agricultural chemicals is the impact they have on soil mycorrhizal and through this on tree health. Information is needed on current agricultural practices.

The exclosed lower sections of the parkland are in poorer condition for parkland biodiversity both from the point of view of surviving parkland-form trees and from the impact of crown competition on the form of the next generations of trees. Any surviving open-grown veteran parkland trees are at risk from shading of their lower trunk and lateral branches, as well as over-shading and consequent premature death once crown retrenchment begins – either from natural aging or wind damage. Increased shading of the lower trunks will have negative impacts on epiphytic lichens, and loss of live lateral branching from shading will have negative impacts on specialist biodiversity (fungi and saproxylic invertebrates). Once the main crown comes down below the height of the secondary woodland's canopy, these older trees will die prematurely from overshading. Oak is a light-demanding species and high forest conditions are inimical to the development of new generations of oaks. Left ungrazed the wooded slopes will gradually change in species composition towards domination by shade tolerant species such as beech and sycamore – except where actively planted up, or where glades and thinning is practiced?.

5 RECOMMENDATIONS

5.1 Site survey and monitoring

This is the first formal invertebrate survey to be carried out at Pixton Park and much more interest undoubtedly awaits discovery through follow-up work. The flight interception traps revealed the greatest variety of Nationally Scarce species and it is suggested that common standards monitoring work - once the site has been designated – should focus on this approach. Trapping is more efficient both in terms of productivity and time.

5.2 Conservation management

5.2.1 The parkland trees

A park planting strategy and plan is needed to ensure that age structures of the various tree species are maintained. This should take into account wild development of new trees where this is occurring, and preferably actively encouraged through retention of areas of thorn scrub which can act as a nurse for young trees. Planting should aim to supplement any wild development.

5.2.2 Trees within secondary and plantation woodland

Where parkland trees have become engulfed within secondary and plantation woodlands they should preferably be opened up from crown competition (haloing). Future replacement generations of open-grown trees also need to selected and also opened up to encourage lateral branch development.

5.2.3 Deadwood

A deadwood retention strategy is needed to ensure that sufficient decaying wood is left in situ wherever possible. This need not preclude managing trees for production of firewood, etc.

5.2.4 Pasture and grazing

Extensive grazing, using livestock appropriate to rough-style grazing and browsing without agro-chemical inputs, is highly desirable, especially where managed organically. This will help to maintain tree root health and hence long-term survival of veteran trees as a strong feature of the site. The deer regime in the enclosures is leading to localised bark rubbing and bare soil in places. Outside the enclosures the free-ranging red deer may well be very suitable at present, but it is unclear how the horse and cattle enterprises are managed. Clarification of current livestock management practices is needed.

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7 Annexes

Annex 1 Invertebrate species list

Species are listed alphabetically within Family and Order. Identifications by KNA Alexander except for Diptera which were identified by PJ Chandler.
Species Status shown by asterisks, as follows:

*Nationally Scarce (Coleoptera) or pNS (Diptera) or Psocoptera (not reviewed);
** Near Threatened
***Vulnerable

Species with no entry under Flight Interception Trap only found by hand sampling

Order & Family	Species	FIT1 oak	FIT2 Turkey	FIT3 oak	FIT4 beech	FIT5 ash
Coleoptera						
Aderidae	*Euglenes oculatus**	FIT1		FIT3		
Cantharidae	*Malthinus frontalis**	FIT1				
	Malthodes marginatus					FIT5
	Malthodes minimus				FIT4	
Carabidae	*Abax parallelepipedus*					FIT5
	Caladromius spilotus					
	Calathus rotundicollis		FIT2			
	Nebria brevicollis				FIT4	
	Ocys tachysoides					
Cerambycidae	*Rhagium mordax*					
Cerylonidae	*Cerylon ferrugineum*					
Ciidae	*Cis nitidus*				FIT4	FIT5
	Cis vestitus					
	Octotemnus glabriculus					
Coccinellidae	*Adalia 10-punctata*					FIT5
Cryptophagidae	*Cryptophagus dentatus*	FIT1		FIT3		
	Cryptophagus scanicus	FIT1				FIT5
	Henoticus serratus			FIT3		
Cucujidae	*Pediacus dermestoides*			FIT3		

Curculionidae	*Euophryum confine*	FIT1	FIT2		FIT4	FIT5
	Phloeophagus lignarius			FIT3	FIT4	
	Strophosoma melanogramma	FIT1				
Dasytidae	*Dasytes aeratus*					
Elateridae	*Agriotes pallidulus*					
	Athous haemorrhoidalis	FIT1				
	Melanotus castanipes					
Erotylidae	*Triplax aenea*					
Histeridae	*Abraeus perpusillus*				FIT4	FIT5
	Paromalus flavicornis				FIT4	
Hydrophilidae	*Megasternum concinnum*					
Latridiidae	*Aridius nodifer*			FIT3		FIT5
	Corticarina minuta (fuscula)			FIT3		
	Lathridius minutus					FIT5
Leiodidae	*Nargus velox*					FIT5

Order & Family	**Species**	**FIT1 oak**	**FIT2 Turkey**	**FIT3 oak**	**FIT4 beech**	**FIT5 ash**
Leiodidae	*Nargus wilkinii*					FIT5
ctd	*Ptomaphagus medius*				FIT4	
	Ptomaphagus subvillosus					FIT5
Lucanidae	*Dorcus parallelepipedus*		FIT2			FIT5
	Sinodendron cylindricum					FIT5
Lycidae	*Platycis minutus*		FIT2			FIT5
Melandryidae	*Orchesia undulata*					
Monotomidae	*Rhizophagus bipustulatus*					
	Rhizophagus dispar					FIT5
	Rhizophagus ferrugineus		FIT2			FIT5
Mycetophagidae	*Litargus connexus*					
	Mycetophagus quadripustulatus					

	*Triphyllus bicolor**	FIT1		FIT3		
Nitidulidae	*Cryptarcha strigata**	FIT1				FIT5
	Epuraea aestiva			FIT3		
	Epuraea biguttata					
Phloiophilidae	*Phloiophilus edwardsi**					
Pselaphinae	*Euplectus duponti**		FIT2			
Ptinidae	*Anobium punctatum*	FIT1	FIT2	FIT3	FIT4	FIT5
	Ptilinus pectinicornis				FIT4	
	*Ptinus subpilosus**			FIT3		
Salpingidae	*Salpingus planirostris*					
	Salpingus ruficollis	FIT1				
Scirtidae	*Prionocyphon serricornis**			FIT3		FIT5
Scolytinae	*Dryocoetes villosus*			FIT3		
	Hylesinus crenatus					FIT5
	Hylesinus varius					
	Scolytus intricatus					
	Trypodendron domesticum					
Scraptiidae	*Anaspis costai*	FIT1	FIT2			FIT5
	Anaspis fasciata					
	Anaspis frontalis					
	Anaspis garneysi	FIT1	FIT2	FIT3	FIT4	FIT5
	Anaspis lurida				FIT4	FIT5
	Anaspis maculata					
	Anaspis pulicaria					FIT5
	Anaspis regimbarti	FIT1				FIT5
Scydmaeninae	*Scydmoraphes helvolus**					FIT5
	Stenichnus bicolor			FIT3		FIT5
Sphindidae	*Aspidiphorus orbiculatus*		FIT2		FIT4	FIT5
Staphylinidae	*Aleochara sp*					

	Autalia impressa	FIT1		FIT3		
	Leptusa pulchella					
	Phloeopora testacea					
	*Placusa tachyporoides**			FIT3		
	Acrulia inflata			FIT3		

Order & Family	**Species**	**FIT1 oak**	**FIT2 Turkey**	**FIT3 oak**	**FIT4 beech**	**FIT5 ash**
Staphylinidae	*Dropephylla gracilicornis*			FIT3		
ctd	*Dropephylla ioptera*	FIT1				
	Dropephylla koltzei	FIT1				
	Xylostiba bosnica			FIT3		FIT5
	Proteinus brachypterus	FIT1	FIT2			FIT5
	Proteinus laevigatus					
	Atrecus affinis					
	Bisnius fimetarius					
	Gabrius splendidulus					FIT5
	Ocypus olens					FIT5
	Philonthus politus					
	*Quedius aetolicus**	FIT1				
	Quedius cruentus					
	*Quedius maurus**	FIT1		FIT3	FIT4	
	Quedius mesomelinus	FIT1				
	Stenus pusillus					FIT5
	Lordithon lunulatus	FIT1				
	Tachinus proximus				FIT4	FIT5
Tenebrionidae	*Eledona agricola*					
	Lagria hirta				FIT4	
	Nalassus laevioctostriatus					
Trogosittidae	*Thymalus limbatus*					

Diptera						
Anisopodidae	*Sylvicola cinctus*	FIT1	FIT2	FIT3	FIT4	
	Sylvicola punctatus			FIT3		
Anthomyiidae	*Botanophila fugax*					FIT5
	Hydrophoria linogrisea		FIT2			
	Hylemya vagans	FIT1		FIT3	FIT4	FIT5
	Hylemyza partita					FIT5
Asilidae	*Dioctria linearis*	FIT1				
Asteiidae	*Leiomyza scatophagina*	FIT1				
Bibionidae	*Dilophus febrilis*					
Bolitophilidae	*Bolitophila cinerea*		FIT2			
Calliphoridae	*Calliphora vomitoria*			FIT3		
	Pollenia amentaria	FIT1				
	Pollenia angustigena		FIT2			
	Pollenia rudis	FIT1				
Ceratopogonidae	*Forcipomyia pulchrithorax*				FIT4	
Chloropidae	*Chlorops hypostigma*	FIT1				
	*Lasiambia brevibucca**		FIT2			
Chyromyidae	*Chyromya sp*				FIT4	
Clusiidae	*Clusia flava*	FIT1	FIT2			FIT5
	*Clusia tigrina**					FIT5
	Clusiodes sp		FIT2			FIT5
Dolichopodidae	*Australachalcus melanotrichus*				FIT4	
	Chrysotimus molliculus	FIT1				

Order & Family	**Species**	**FIT1 oak**	**FIT2 Turkey**	**FIT3 oak**	**FIT4 beech**	**FIT5 ash**
Dolichopodidae	*Chrysotus gramineus*					FIT5
ctd	*Dolichopus popularis*					FIT5

	Medetera abstrusa					
	Sciapus platypterus	FIT1		FIT3		FIT5
Drosophilidae	*Drosophila busckii*	FIT1				
	Drosophila immigrans	FIT1				
	Drosophila obscura			FIT3		
	Drosophila phalerata	FIT1		FIT3		FIT5
	Drosophila subobscura	FIT1				
	Drosophila subsilvestris	FIT1				
	Hirtodrosophila cameraria			FIT3		
	Hirtodrosophila confusa	FIT1		FIT3		
	Hirtodrosophila trivittata	FIT1				
	Leucophenga maculata					FIT5
Empididae	*Empis livida*				FIT4	
Fanniidae	*Fannia aequilineata**	FIT1				
	Fannia rondanii		FIT2			
	Piezura pardalina	FIT1		FIT3		
Heleomyzidae	*Suillia affinis*			FIT3		
	Suillia atricornis	FIT1	FIT2			
	Suillia variegata					
	Tephrochlamys flavipes	FIT1	FIT2			FIT5
Hybotidae	*Drapetis ephippiata*				FIT4	
	Euthyneura myrtilli	FIT1				
	Platypalpus ciliaris					FIT5
	Platypalpus nigricornis					FIT5
	Tachypeza nubila			FIT3	FIT4	FIT5
	Trichinomyia flavipes		FIT2			
Keroplatidae	*Anlemon servulum*					FIT5

	Cerotelion striatum	FIT1	FIT2			FIT5
	Orfelia fasciata	FIT1				FIT5
	Orfelia ochracea	FIT1				FIT5
	Pyratula zonata					FIT5
Lauxaniidae	*Meiosimyza rorida*	FIT1				FIT5
Limoniidae	*Austrolimnophila ochracea*		FIT2		FIT4	FIT5
	Limonia nubeculosa		FIT2	FIT3	FIT4	
	Molophilus medius					FIT5
	Ormosia nodulosa				FIT4	
	Rhipidia maculata			FIT3		
Milichiidae	*Madiza britannica****					FIT5
	*Madiza pachymera**				FIT4	
Muscidae	*Helina depuncta*	FIT1				FIT5
	Helina pertusa	FIT1				
	*Phaonia laeta**	FIT1				

Order & Family	**Species**	**FIT1 oak**	**FIT2 Turkey**	**FIT3 oak**	**FIT4 beech**	**FIT5 ash**
Muscidae	*Phaonia pallida*			FIT3		
ctd	*Phaonia rufiventris*	FIT1				
	Phaonia subventa			FIT3		
	Phaonia valida	FIT1				
Mycetophilidae	*Acnemia nitidicollis*		FIT2	FIT3		FIT5
	Allodia alternans	FIT1		FIT3		
	Allodia grata	FIT1		FIT3		FIT5
	Allodia truncata					FIT5
	Brevicornu fuscipenne		FIT2			
	Brevicornu griseicolle		FIT2			
	Brevicornu sericoma		FIT2			FIT5

	Cordyla flaviceps					FIT5
	Cordyla pusilla	FIT1				
	Dynatosoma fuscicorne					FIT5
	Ectrepesthoneura hirta	FIT1		FIT3		
	Exechia bicincta	FIT1				
	Exechia dorsalis	FIT1				
	Exechia festiva			FIT3		
	Exechiopsis crucigera					FIT5
	Exechiopsis leptura					FIT5
	Exechiopsis membranacea		FIT2	FIT3		FIT5
	Leia bimaculata					FIT5
	Leia cylindrica			FIT3		
	Leia fascipennis					FIT5
	*Manota unifurcata***					FIT5
	Megophthalmidia crassicornis					FIT5
	Monoclona rufilatera			FIT3		
	Mycetophila abiecta		FIT2			
	Mycetophila adumbrata		FIT2			FIT5
	Mycetophila cingulum	FIT1				
	Mycetophila dentata	FIT1				
	Mycetophila fungorum	FIT1				
	Mycetophila luctuosa	FIT1				
	Mycetophila marginata	FIT1		FIT3		
	Mycetophila ocellus				FIT4	FIT5
	Mycetophila ornata	FIT1				
	Mycetophila rudis	FIT1				
	Mycetophila tridentata	FIT1				

	Mycetophila vittipes					FIT5
	Mycomya annulata	FIT1				
	Mycomya cinerascens		FIT2			FIT5
	Phronia tenuis			FIT3		
	Phthinia mira					FIT5
	Phthinia winnertzi				FIT4	

Order & Family	**Species**	**FIT1 oak**	**FIT2 Turkey**	**FIT3 oak**	**FIT4 beech**	**FIT5 ash**
Mycetophilidae	*Pseudexechia trivittata*				FIT4	
ctd	*Rymosia signatipes*	FIT1				
	Synapha fasciata				FIT4	
	Synapha vitripennis	FIT1				
	Synplasta gracilis					FIT5
	Trichonta vitta	FIT1		FIT3		
Pediciidae	*Ula mollissima*	FIT1		FIT3		
Phoridae	*Anevrina thoracica*	FIT1				FIT5
	Borophaga incrassata				FIT4	
	Diplonevra florescens	FIT1				FIT5
	Spiniphora dorsalis					FIT5
Psychodidae	*Boreoclytocerus ocellaris*			FIT3		
	Pericoma fuliginosa			FIT3		
	Pericoma trifasciata			FIT3		
	Philosepedon humeralis					FIT5
	Psychoda phalaenoides	FIT1		FIT3	FIT4	FIT5
	Trichomyia urbica	FIT1	FIT2		FIT4	FIT5
Rhagionidae	*Rhagio scolopaceus*	FIT1			FIT4	
Rhinophoridae	*Paykullia maculata*	FIT1				
Scathophagidae	*Scathophaga furcata*				FIT4	

	Scathophaga stercoraria					
Scatopsidae	*Apiloscatopse flavicollis*	FIT1	FIT2			
	Apiloscatopse scutellata				FIT4	
	Holoplagia richardsi				FIT4	
	Swammerdamella brevicornis					FIT5
Sciaridae	*Bradysia alpicola*				FIT4	
	Phytosciara flavipes		FIT2	FIT3	FIT4	FIT5
Sphaeroceridae	*Crumomyia nitida*		FIT2			
	Crumomyia roserii		FIT2			
	Limosina silvatica		FIT2			
Syrphidae	*Brachyopa scutellaris*					FIT5
	Criorhina floccosa					FIT5
	Melanostoma scalare	FIT1				FIT5
	Myathropa florea	FIT1	FIT2			FIT5
	Platycheirus albimanus		FIT2			
	Xylota segnis					
	Xylota sylvarum					FIT5
Tipulidae	*Tipula vernalis*					FIT5
Xylophagidae	*Xylophagus ater*					
Heteroptera						
Anthocoridae	*Anthocoris confusus*					
	Cardiastethus fasciiventris					
	Temnostethus gracilis					
	Xylocoris cursitans					
Microphysidae	*Loricula elegantula*					

Order & Family	**Species**	**FIT1 oak**	**FIT2 Turkey**	**FIT3 oak**	**FIT4 beech**	**FIT5 ash**
Tingidae	*Derephysia foliacea*			FIT3		
Hymenoptera						

Vespidae	*Vespa crabro*	FIT1	FIT2	FIT3		FIT5
Lepidoptera						
Noctuidae	*Amphipyra pyramidea*			FIT3		
	Argynnis paphia					
	Polygonia c-album					
	Vanessa atalanta					
Satyridae	*Maniola jurtina*					
Orthoptera						
Tettigoniidae	*Meconema thalassinum*			FIT3		
Psocoptera						
Caeciliusidae	*Epicaecilius pilipennis*	FIT1			FIT4	FIT5
	Valenzuela flavidus					
Ectopsocidae	*Ectopsocus axillaris*					
	Ectopsocus briggsi	FIT1		FIT3		
	Lachesellia pedicularia					
Elipsocidae	*Elipsocus hyalinus*					
	Reuterella helvimacula			FIT3		
Epicaeciliusidae	*Chilenocaecilius ornatipennis*			FIT3	FIT4	FIT5
Lepidopsocidae	*Pteroxanium kelloggi*					
Peripsocidae	*Peripsocus milleri*	FIT1				
	*Peripsocus parvulus**			FIT3		
Philotarsidae	*Philotarsus picicornis*			FIT3		
Psocidae	*Metylophorus nebulosus*		FIT2			
Stenopsocidae	*Stenopsocus immaculatus*			FIT3		
Araneae	*Nuctenea umbratica*					
Pseudoscorpiones						
Chernetidae	*Dinocheirus panzeri*				FIT4	
Opiliones						

Phalangiidae	*Mitopus morio*					
Oniscidea						
	Oniscus asellus					
	Porcellio scaber					
Chilopoda						
Lithobiidae	*Lithobius variegatus*					
Diplopoda						
Blaniulidae	*Proteroiulus fuscus*					
Julidae	*Cylindroiulus punctatus*					
	Ommatoiulus sabulosum					
	Tachypodoiulus niger					
Mollusca						
	Arion subfuscus					
	Balea sarsii					
	Lehmannia marginata					

Order & Family	**Species**	**FIT1 oak**	**FIT2 Turkey**	**FIT3 oak**	**FIT4 beech**	**FIT5 ash**
Mollusca ctd	*Clausilia bidentata*					
	Discus rotundatus					
	Oxychilus alliarius					

Natural England is here to secure a healthy natural environment for people to enjoy, where wildlife is protected and England's traditional landscapes are safeguarded for future generations.

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