Tilbury Fort Marshes Terrestrial Invertebrate Survey Report 2022

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Foreword

The Tilbury Fort Marshes were surveyed in 2022 to determine their quality for terrestrial invertebrates and collect evidence to assess the case for designation as a Site of Special Scientific Interest (SSSI). The report does not itself make a case for designation, rather it provides an objective record of survey findings to support Natural England's independent assessment of special interest. Natural England commission a range of reports from external contractors to provide evidence and advice to assist us delivering of our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

Executive summary

The Tilbury Fort Marshes are a network of brackish watercourses and dry grassland compartments surrounding Tilbury Fort in Tilbury, south Essex.

This report details the results of a terrestrial invertebrate assessment made in 2022 based on four survey visits undertaken during June and July, which employed pitfall trapping in addition to active sampling methods. The survey produced a total of 388 species, 63 of which had a conservation status, including seven Section 41 Species of Principal Importance.

Whole invertebrate assemblage analyses using Pantheon valued the importance of saltmarsh and brackish pool & ditch habitats particularly highly and found the saltmarsh & transitional brackish marsh invertebrate assemblage to be in particularly favourable condition.

Although the invertebrate interest of the grassland was much lower than expected due to overgrazing by horses, the site supported a modest pollinator fauna, including two species of Section 41 bumblebee. Herbivore dung was also an important resource for a number of species of high conservation value.

Contents

1 Introduction and Methodology

Background

1.1.1 On 17th June 2022, Colin Plant Associates (UK) was commissioned by Natural England to undertake a terrestrial invertebrate survey of Tilbury Fort Marshes, South Essex.

1.1.2 The site was divided into five survey compartments surrounding Tilbury Fort, which are shown in Fig.1.

Fig. 1. Location of survey compartments 1-5 at Tilbury Fort Marshes. Map data © 2022 Google

1.1.3 **Compartment 1** comprised the western arm of the outer moat, boundary ditch and associated grassland. A large but very shallow salt pan extends between the moat and northern boundary ditch which is extensively covered by Glasswort *Salicornia* (Fig. 2).

1.1.4 **Compartment 2** comprised the southern part of the eastern arm of the moat, which is seasonally wet and was almost completely dry on the date of the first visit (Fig. 3) and a parcel of heavily horse-grazed grassland to the east.

1.1.5 **Compartment 3** comprised the northern part of the eastern arm of the moat, which is seasonally wet but still held water during the survey period and a large parcel of heavily horse-grazed grassland to the north (Fig. 4).

1.1.6 **Compartment 4** comprised the low lying grassland south of the moats, which is largely dry but receives a very slight brackish influence via seepage at the base of the sea wall adjacent to the riverside path (Fig. 5). The compartment is divided into

two sections.

1.1.7 **Compartment 5** comprised the Bill Meroy Creek and surrounding horse-grazed grassland on the eastern edge of the site. The Bill Meroy Creek is a meandering brackish watercourse which flows into the Thames and held water throughout the survey period (Fig. 6).

Fig. 2. View south from the northern edge of Compartment 1. © Tristan Bantock

Fig. 3. View north from the southern end of the outer moat in Compartment 2. © Tristan Bantock

Fig. 4. View north from the southern edge of Compartment 3. © Tristan Bancock

Fig. 5. View west along the eastern section of Compartment 4. © Tristan Bancock

Fig. 6. View north from the centre of Compartment 5 showing the Bill Meroy Creek. © Tristan Bancock

1.2 Methodology

1.2.1 Invertebrate sampling visits were made on 22nd June, 29th June, 6th July and 29th July.

1.2.2 Sampling was undertaken by two surveyors, each with a different specialist area of invertebrate knowledge/experience.

1.2.3 Invertebrate sampling was undertaken by direct observation/capture and by the following active sampling methods:

Sweep-netting. A stout hand-held net is moved vigorously through herbaceous vegetation or scrub to dislodge resting insects. This technique is effective for many invertebrates, including bees and wasps, flies, many groups of beetles and true bugs and large number of other insects that live in vegetation of this type.

Grubbing/hand searching. Important host plants may be searched by hand. This is particularly useful for species which live on or even below the ground surface and can be found by grubbing around and underneath basal leaf rosettes. Other invertebrate microhabitats such as loose bark, dung, litter, fungi and various decay features associated with dead wood can also be productive when searched by hand. Turning large stones, pieces of wood and other refuse often reveals species which are nocturnally active, in particular spiders, ground beetles and rove beetles.

Pitfall Trapping. Thick plastic cups are placed in the ground such that the rim is flush with or slightly below the surface and these are half filled with saturated sodium chloride solution. Additional salt is added to counteract any dilution effect caused by rainfall and a little detergent is added to reduce surface tension. Traps are covered with a square of coarse mesh which excludes small mammals and amphibians but allows the largest invertebrates to fall through. Traps are marked and typically set in groups along a fixed transect. This is the single most effective means of recording ground beetles (Carabidae) but is also effective for rove beetles (Staphylinidae), some other groups of beetles and true bugs, spiders and many other soil-dwelling invertebrates.

A total of 40 pitfall traps were employed across four of the survey compartments and operated between 22nd June and 6th July. Further details are given below in Table 1.

Table 1. Details and locations of pitfall traps.

Compartment	No. of traps	Grid reference	Details
1	2 rows of 5	TQ649756	At the margins of the shallow salt pan
2	2 rows of 5	TQ653753	At the southern end of the drying outer moat
3	2 rows of 5	TQ652755	On both margins of the outer moat
5	2 rows of 5	TQ653755	Along the western margin of Bill Meroy Creek

1.2.4 The taxonomic scope of the survey is summarised in Table 2.

Table 2. Taxonomic coverage provided by the survey.

Order / higher taxonomic group	Common Name
Araneae	Spiders
Opilliones	Harvestmen
Neuroptera and allies	Lacewings, scorpion flies, snake flies and alder flies
Odonata	Dragonflies and damselflies
Orthoptera	Grasshoppers and crickets
Dermaptera	Earwigs
Dictyoptera	Cockroaches
Hemiptera-Auchenorrhyncha	Leafhoppers and allies
Hemiptera-Heteroptera	True bugs
Lepidoptera	Butterflies and moths
Trichoptera	Caddisflies
Coleoptera	Beetles
Diptera	Flies: All nine families within the larger Brachycera were identified systematically, as well as hoverflies (Syrphidae), snail-killing flies (Sciomyzidae), crane flies (Tipulidae, Ptychopteridae and Limoniidae), picture-winged flies (Tephritidae and Ulidiidae) and various other small families.
Hymenoptera-Symphyta	Sawflies
Hymenoptera-Aculeata	Bees, wasps and ants

1.3 Survey Constraints

1.3.1 The survey was commissioned late due to a last-minute change of contractor. This was of particular relevance given the very dry summer of 2022 and some seasonally wet features were drying out rapidly by the time of the first survey visit.

1.3.2 A small number of pitfall traps were lost in Compartment 5 due to the trampling effects of horses.

1.3.3 Seasonal coverage during the spring and autumn period was lacking. This is of relevance to certain key saltmarsh species, in particular the Sea Aster Bee *Colletes halophilus*, a Section 41 Species of Principal Importance which flies from late summer onwards and collects pollen exclusively from Sea Aster *Aster tripolium*. Britain holds internationally important populations of *C. halophilus* and the Thames estuary and Essex coast are particular strongholds. A brief visit to the narrow strip of open saltmarsh bordering the Thames and located west of Compartment 1 (TQ646752) produced numerous males of the *C. halophilus* in late July. Given the abundance of Sea Aster *Aster trioplium* in Compartment 1, it is highly likely that the survey area is an important foraging site for this species and may also support breeding populations.

2 Invertebrate Species

2.1 Summary

2.1.1 The survey produced a total of 388 species across all five compartments. This is presented in Appendix 1 and annotated with formal conservation status codes which are explained in Appendix 2.

2.1.2 The survey total is broken down by taxonomic grouping in Table 3. Just over half of the species recorded by the survey were beetles (Coleoptera).

Table 3. Taxonomic breakdown of the species recorded by the survey.

Taxonomic group	No. of species	% of total
insect - beetle (Coleoptera)	202	52
insect - true bug (Hemiptera)	62	16
insect - hymenopteran	36	9
insect - true fly (Diptera)	35	9
spider (Araneae)	27	7
insect - butterfly	9	2
insect - moth	7	2
harvestman (Opilliones)	3	1
insect - orthopteran	3	1
insect - dragonfly (Odonata)	1	<1
insect - earwig (Dermaptera)	1	<1
insect - lacewing (Neuroptera)	1	<1
centipede	1	<1

2.2 Species of conservation interest

2.2.1 Several categories of invertebrates are of raised significance in an ecological assessment. These categories are explained in Appendix 2 and the corresponding species found during the survey are now examined.

UK Biodiversity Action Plan (UK BAP) Priority Species/Section 41 Species

2.2.2 UK BAP priority species were those identified as being the most threatened and requiring conservation action under the UK Biodiversity Action Plan (UK BAP). The original UK BAP list was created between 1995 and 1999 and stood at 577 species. Following a two-year review, a revised list was produced in 2007 which increased the number of BAP priority species to 1149. A total of 123 species no longer met the criteria for selection and were removed.

2.2.3 As a result of devolution, and new country-level and international drivers and requirements, much of the work previously carried out by the UK BAP is now focussed at a country level rather than a UK level, and the UK BAP has recently (July 2012) been succeeded by the *UK Post-2010 Biodiversity Framework*. The full list of priority invertebrate species can be viewed at: JNCC UK BAP List of UK Priority Species.

2.2.4 The UK BAP list remains an important reference source and has been used to help draw up statutory lists of priorities in England, Scotland, Wales and Northern Ireland. For England and Wales these statutory lists are currently presented in: *The Natural Environment & Rural Communities Act, 2006:* Section 41*. List of Species of Principal Importance for Conservation of Biological Diversity in England* and Section 42: *List of Species of Principal Importance for Conservation of Biological Diversity in Wales*.

2.2.5 Seven such Species of Principal Importance for Conservation of Biological Diversity in England were recorded during the present survey:

Saltmarsh Short-spur *Anisodactylus poeciloides* S41 NS is a ground beetle found very locally in coastal habitats in southern England between Dorset and East Suffolk. A recent IUCN status review published in 2016 reports presence from 16 hectads since 1980 and the species is very close to qualifying as Nationally Rare. Although historically regarded as a saltmarsh species, *A. poeciloides* seems to be more of a grassland and saltpan species which is rarely found in open saltmarshes proper and avoids exposure to tidal conditions. It seems to use both areas of relatively open and saline terrain and denser adjacent vegetation where the soil may not be at all saline. These conditions may be found, for example, in the vicinity of a saline or brackish pool or borrowdyke that has gently sloping edges as these dry out. Its distribution within a site is likely to be limited to small patches of relatively open ground with early succession salt-associated plants (e.g. Glasswort,

Sea Aster) that are surrounded by or adjacent to relatively dense grass or other vegetation.

Wall *Lasiommata megera* S41 EN is a butterfly found in various habitats with a short and open grass sward including field edges, railway embankments, sand dunes and post-industrial sites, the larvae feeding on various grasses such as *Dactylis glomerata*, *Deschampsia flexuosa* and *Holcus lanatus*. Inland populations have experienced a severe and ongoing decline during recent decades and the species is now primarily coastal and has been assigned an IUCN threat status of Endangered. It is a widespread species throughout England, Wales and southern Scotland, but very local in some parts of its range.

Small Heath *Coenonympha pamphilus* S41 VU is a butterfly found in various open habitats on dry, light soils, the larvae feeding on fine-leaved grasses such as *Festuca* species. Although widespread throughout Britain, the species has undergone a significant decline in recent decades due to the widespread loss and improvement of species-rich grassland and has now been assigned an IUCN threat status of Vulnerable. It was added to the UK BAP list at the end of 2007, and although there were disagreements over the need for this action, it has been automatically included in the Section 41 lists of the NERC Act. It appears to have declined more at inland sites than it has in coastal areas, though it remains present throughout at lower density than before. The presence of large numbers, indicating a thriving population, at an inland site is potentially more important than a similar discovery in a coastal locality, although that should not imply that coastal colonies are unimportant.

Shrill Carder Bee *Bombus sylvarum* S41 NS(Nb) is a bumblebee found in warm and open flower-rich landscapes, including species-rich grassland, coastal grazing marsh, coastal dunes, vegetated shingle and post-industrial sites. The species was given national BAP status, and remains a Species of Principal Importance on the basis of major declines across Britain due to agricultural intensification and it is now completely absent from northern England and the Midlands. Parts of south Wales, Salisbury Plain, the Somerset Levels and the East Thames Corridor are now the major strongholds, supporting the most important metapopulations in the UK. Populations seem to operate at a landscape scale and in the East Thames Corridor this implies dependency upon the entire remaining network of post-industrial sites. The availability of suitable forage (nectar and pollen) sources throughout the whole season from May to September is crucial. The queens require nectar early in the season to replenish diminished energy resources following hibernation. They then need pollen for stocking cells in newly established nests to enable the first workers to develop. Workers require both nectar and pollen both for their own sustenance and to stock the developing nest. These resources need to be provided by an abundance of specific key plants all of which, significantly, have very long flowering seasons as well as long corolla tubes which correspond to the long tongues of the bumblebees. Important plant species used by queens include legumes such as

vetches, clovers, bird's-foot trefoils, as well as labiates such as dead-nettles and Black Horehound. Workers are able to utilise a broader range of species. Observations suggest that a small number of large patches of flowers are used more frequently and are much more important than a larger number of small patches**.** Workers have a peculiar slow hovering flight between flowers, accompanied by a high-pitched (shrill) buzz.

Brown-banded Carder Bee *Bombus humilis* S41 is a bumblebee found in warm and open flower-rich landscapes, including chalk grassland, coastal dunes, vegetated shingle and post-industrial sites. The species was given national BAP status, and remains a Species of Principal Importance on the basis of major declines across Britain due to agricultural intensification and it is absent from much of northern England and the Midlands. The coasts of south-west and south-east England, parts of south Wales, Salisbury Plain and the East Thames Corridor are now the major strongholds, supporting the most important metapopulations in the UK. Populations seem to operate at a landscape scale and in the East Thames Corridor this implies dependency upon the entire remaining network of post-industrial sites. The availability of suitable forage (nectar and pollen) sources throughout the whole season from May to September is crucial. The queens require nectar early in the season to replenish diminished energy resources following hibernation. They then need pollen for stocking cells in newly established nests to enable the first workers to develop. Workers require both nectar and pollen both for their own sustenance and to stock the developing nest. These resources need to be provided by an abundance of specific key plants all of which, significantly, have very long flowering seasons as well as long corolla tubes which correspond to the long tongues of the bumblebees. Important plant species used by queens include legumes such as vetches, clovers, bird's-foot trefoils, as well as labiates such as dead-nettles and Black Horehound. Workers are able to utilise a broader range of species. Observations suggest that a small number of large patches of flowers are used more frequently and are much more important than a larger number of small patches**.**

Five-banded Weevil Wasp *Cerceris quinquefasciata* S41 RDB3 is a medium-sized yellow and black solitary wasp which is found in various open habitats on sandy soils and nests in areas of bare sand in places exposed to the sun. Nests are often aggregated and tend to occur in relatively hard sandy soil, such as paths. The burrows are stocked with weevils, particularly *Apion* and *Sitona* species, but other prey may sometimes be taken, for example pollen beetles. The species is mainly confined to southern and eastern England and occurs in the Brecklands of East Anglia and the Thames Gateway area. It was included in the Natural England 'Species Recovery Programme' because of a severe contraction in its modern range, thought to be due to the loss of open areas of sandy ground for nesting and flower-rich sandy grasslands for foraging. The main metapopulation currently appears to be in the East Thames Corridor, but there are indications that other important centres survive in the Colchester, Ipswich and Breckland areas as well as

very locally in Oxfordshire and at scattered other locations in the south. This species is associated with sporadically disturbed land and the relatively unmanaged parts of heath edge or other sandy habitats. The restricted distribution is probably partly climatic, but also reliant on an abundant prey supply associated with grasslands and scrub containing a diverse flower-rich vegetation with areas of bare ground and uncut stems, seeds, flower heads and fruit heads that support the weevil prey species. Many sites where the wasp is currently known or from which it has recently been recorded are threatened or have already been lost to development, particularly post-industrial sites in the East Thames Corridor.

Horehound Long-horn *Nemophora fasciella* S41 NS(Nb) is a longhorn moth found in various disturbed, open habitats, the larvae feeding on the seeds and leaves of Black Horehound *Ballota nigra*. A very local species confined to south-east England and parts of East Anglia.

Nationally Rare / Red Data Book species

2.2.6 The following 11 species listed in the British Red Data Books (Shirt, 1987; Bratton, 1991) or which have been elevated to the status of Nationally Rare by subsequent formal reviews were recorded by the survey (see Appendix 2):

***Berosus fulvus* VU NR** is a water beetle found in still and shallow open brackish water in coastal parts of south-east England. It is a very local species with most recent records from Kent, Essex and Suffolk.

***Aulacochthebius exaratus* NT NR** is a minute water beetle found in wet and submerged mud in brackish lagoons and drains on coastal levels. The species requires warm summer temperatures and is confined to parts of Essex, Kent and Sussex, with a focus of records from the Thames Gateway.

***Philonthus confinis* NR** is a rove beetle found in open livestock pastures where it is a predator in horse, cow or sheep dung. It is very local in southern England with all recent records from Kent, Essex and Norfolk.

***Orthoperus brunnipes* RDB3** is a minute beetle found in mouldy decaying litter in wetlands and other damp places. It is widespread throughout much of Britain but very local, although probably greatly under recorded.

***Bagous argillaceus* RDB2** is an aquatic weevil found in saltmarshes and brackish ditches in coastal grazing levels. The host plant and larval biology is unknown. A rare species only recorded from five vice counties, mainly around the Thames estuary.

***Lixus scabricollis* RDBK** is a weevil associated with Sea Beet *Beta maritima* in various coastal habitats including vegetated shingle, sea walls and the upper zone of saltmarshes. It was first found in Kent in 1987 and has since spread west along

the coast to Dorset, and is also known from south Wales, and north along the east coast as far as Suffolk.

***Cosmobaris scolopacea* RDB3** is a small weevil which is confined to the upper zone of saltmarshes, the larvae feeding in the stem of Sea Purslane *Halimione portulacoides*. Apart from a single locality in Sussex and very recent records from Lincolnshire, this species is restricted to the saltmarshes of Kent and Essex and sometimes occurs in numbers.

***Orthotylus rubidus* RDB3** is a true bug which is associated with Glassworts *Salicornia* species growing in saline coastal areas, but is confined to situations which are not regularly inundated such as salt pans and seepages; it is not found on open saltmarshes. It is a very local species with a scattered distribution on the coasts of southern and eastern England. It appears to have declined in the modern period.

***Lygus pratensis* RDB3** is a true bug which feeds on various species of Asteraceae. Although formerly extremely local and confined to lowland heathland in southern England, it has recently undergone a significant range expansion and is now widespread throughout much of southern Britain. It no longer warrants any conservation status.

***Gymnosoma rotundatum* RDB3** is a parasitic fly whose larvae are parasitoids of shieldbugs, in particular the Common Green Shieldbug *Palomena prasina*. An uncommon and very local species confined to south-east England, particularly Kent, Sussex and Surrey. Its true status is probably better considered Nationally Scarce.

Blue Carpenter Bee *Ceratina cyanea* RDB3 is a solitary bee found in various warm habitats, including chalk downland, heathland edge and post-industrial sites, nesting in dead hollow twigs and stems; typically brambles close to the ground. Visits a very wide variety of flowers. Formerly considered a great rarity but now widespread in southeast England.

Fig 7. Four Nationally Rare and Nationally Scarce species recorded by the survey (clockwise from top left): the true bugs *Orthotylus rubidus* and *Halosalda lateralis*; the weevils *Lixus scabricollis* and *Sibinia arenariae*. © Tristan Bantock

Nationally Scarce Species

2.2.7 The following 45 Nationally Scarce species were recorded by the survey (see Appendix 2).

Bombardier Beetle *Brachinus crepitans* NS is a ground beetle found in a variety of open habitats usually on calcareous soils, including grasslands, quarries and post-industrial sites. The larvae are parasitic on pupae of other beetles, hosts including rove beetles and other ground beetles. A very local species confined to southern England and south Wales, where it is most frequently coastal.

***Bembidion ephippium* NS** is a small ground beetle found in saltmarsh litter. It is very local around the coasts of southern and eastern England between Dorset and Lincolnshire.

***Bembidion iricolor* NS** is a ground beetle found in various coastal habitats, including tidal riverbanks, saltmarshes and the seashore. Local around the coasts of England and Wales.

***Bembidion normannum* NS** is a small ground beetle found in various coastal habitats, including tidal riverbanks, saltmarshes and the seashore. It is local around the coasts of England and Wales.

***Dicheirotrichus obsoletus* NS** is a ground beetle found in litter in the upper saltmarsh zone, on seawalls and estuary banks. Locally distributed around the English coastline between Cornwall and Lincolnshire.

***Dyschirius nitidus* NS** is a small ground beetle found on sandy or silty substrates in saltmarshes and very rarely inland in sandpits. It is very local around the coasts of England, Wales and southern Scotland.

***Dyschirius salinus* NS** is a small ground beetle found on sandy or silty substrates in saltmarshes. It is local around the coasts of Britain although very rare in Scotland.

***Pterostichus longicollis* NS** is a medium-sized ground beetle found in various damp habitats, usually near water. A local species primarily confined to southern and central England but also found very locally in south Wales.

***Stenolophus teutonus* NS** is a ground beetle found on damp or disturbed ground at the margins of standing water, including ponds, gravel pits and coastal wetlands. Adults are probably predatory. It is widespread but local in southern and central England.

***Limnoxenus niger* NT NS** is a water beetle found in a range of lowland fen habitats, including peaty areas with rich vegetation and exposed clay beside brackish ponds. Although this species has a wide distribution it has declined in the north of its range and is now extinct in the Wash drainage system, presumably due to loss of grazing fen. It is recorded mainly from the grazing levels of the Thames Marshes and the Sussex and Somerset Levels.

***Enochrus bicolor* NS** is a water beetle usually found in brackish ponds or ditches near the coast, but can also occur inland in waters that receive a saline influence. It is a local species with a coastal distribution across much of southern Britain, extending from Anglesey to northern England.

***Cryptopleurum crenatum* NS** is a small beetle found in decaying organic matter and dung, as well as in wetlands amongst plant debris and moss. It is widespread but local throughout much of England and parts of Wales and Scotland.

***Agabus conspersus* NS** is a medium-sized diving beetle confined to brackish water amongst sparse vegetation in coastal lagoons and ditches between south Wales and Yorkshire, with occasional records from highly saline situations inland.

***Rhantus frontalis* NS** is a medium-sized diving beetle which is typically associated with permanent, stagnant water with some vegetation but with the substratum (sand or mud) exposed. It is a lowland species with a remarkably disjunct distribution; it is widespread in Ireland but also found in southern England and East Anglia where it inhabits coastal sites and areas of remnant fen, and is a very rare species in Wales and Scotland.

***Hygrotus parallellogrammus* NS** is a small diving beetle which is confined to brackish stagnant water and inhabits coastal sites and occasionally inland sites which receive a salt water influence. The beetle is primarily eastern in its distribution and is found between Dorset and the Humber, although it is also known from the Severn area in the west.

***Heterocerus obsoletus* NS** is a mud-dwelling water beetle found at the margins of brackish pools and ditches. Widespread but local and most frequent on the coast of southern and eastern England.

***Aphodius plagiatus* NS** is a small scarab beetle which feeds on fungi and vegetable detritus. A littoral species found in coastal habitats including saltmarshes, sand dunes, dune slacks and on the banks of disused and flooded coastal sandpits. Found locally in England and Wales.

***Onthophagus medius* NS** is a scarab beetle associated with horse, cattle and sheep dung in open grasslands, in particular coastal pasture. It is local and predominantly coastal in southern England with a stronghold in the Thames estuary area.

***Saprinus aeneus* NS** is a histerid beetle found in carrion or less frequently dung, feeding on the eggs and larvae of Diptera. This species is confined to open habitats on free-draining soils such as sand dunes and heathlands. It is widespread but local around the coasts of England and Wales, with inland records from the East Anglian breckland.

***Cordicollis instabilis* NS** is a small ground dwelling beetle found in coastal habitats, particularly salt marshes and open sandy shores. Both adults and larvae are saprophagous and feed on decaying organic matter. A local species found on the English coast between Dorset and Norfolk.

***Cyclodinus constrictus* NS** is a small ground dwelling beetle found in sandy habitats, particularly open sandy shores, saltmarshes and riverbanks. Both adults and larvae are saprophagous and feed on decaying organic matter. A local species found primarily on or near the coast of England between Cornwall and Norfolk.

***Omonadus bifasciatus* NS** is a synanthropic species usually found in accumulations of old dung and manure on dry, freely-draining soils, and never found away from agricultural enterprises. Adults and larvae are saprophagous. It is local and scattered in southern and eastern England.

***Dochmonota clancula* NS(Nb)** is a small rove beetle found in litter and moss in damp and wetland habitats. It is uncommon and local in southern England.

***Oxytelus piceus* NS** is a small rove beetle associated with horse and cattle dung. It is rare with a scattered distribution in southern England and Wales north to the midlands.

Adonis' Ladybird *Hippodamia variegata* NS(Nb) is a ladybird found in various disturbed, open habitats, feeding on aphids. Historically a coastal species, in recent years it has spread inland and is now widespread across southern and central England. It no longer warrants any conservation status.

***Sibinia arenariae* NS(Nb)** is a weevil found in saltmarshes and other coastal habitats, feeding on Sea-spurreys *Spergularia* species. It is local in southern England and south Wales, though can sometimes be found in abundance.

***Bagous tempestivus* NS(Nb)** is a small aquatic weevil found in ponds, ditches, dykes and slow-flowing waters on a variety of plants, including *Carex, Potamogeton* and *Sagittaria*. It is scarce and local but widespread throughout much of England and Wales.

***Scolytus mali* NS(Nb)** is a bark beetle found under the bark of rosaceous trees and shrubs, or sometimes elms, feeding in living wood and creating larval galleries. It is scarce and local in England as far north as Cumbria and parts of Wales.

***Phyllotreta cruciferae* NS** is a small flea beetle which feeds on the leaves of various wild and cultivated species of Brassicaceae including *Reseda lutea*; the larvae feeding in the roots. It is local in central and southern England.

***Podagrica fuscicornis* NS** is a leaf beetle found in various open habitats and associated with mallows (Malvaceae), adults feeding on the leaves. Although it can be common where it occurs, the distribution is largely confined to south-east and central England.

***Cassida nobilis* NS** is a leaf beetle found in various open habitats on chalky or sandy soils. Adults and larvae feed on leaves of Fat-hen *Chenopodium album*, oraches *Atriplex* and Corn Spurrey *Spergula arvensis*. Local in southern and central England and south Wales with a scatter of records further north and west.

***Haematopota bigoti* NS** is a horse fly found in saltmarshes and other brackish coastal habitats, the larvae presumably developing as predators in wet mud or decaying vegetation. Found as far north as south-west Scotland but with a very localised and patchy distribution.

***Melieria picta* pNS** is a picture-winged fly found in saltmarshes and brackish ditches of coastal levels. The life history is unknown, but the larvae probably develop in decaying vegetable matter. Widespread but very local apart from in the Thames Estuary where it can be locally common.

***Pentastiridius leporinus* NS(Nb**) is a planthopper often associated with saltmarshes and distributed locally on or near the south coasts of England and Wales. The exact food plants are unclear but probably include *Phragmites* and Sea Club-rush *Scirpus maritimus*, since colonies are usually found in the upper saltmarsh zone.

***Macrosteles sordidipennis* NS(Nb**) is a leafhopper found in saltmarshes, probably feeding on the common saltmarsh grass *Puccinellia maritima*. It is widespread but local around the coasts of England although unrecorded from Wales.

***Raglius alboacuminatus* NS(Nb)** is a true bug which is strongly ground-dwelling and associated with Black Horehound *Ballota nigra* growing in warm, open and disturbed habitats. A local species largely restricted to south-east England.

***Saldula palustris* NS** is a predatory bug found exclusively by brackish water in saltmarshes. It has a local and scattered distribution around the British coastline, including northern Scotland.

***Saldula pilosella* NS** is a predatory bug found exclusively by brackish water in saltmarshes. It has a local and scattered distribution around the English coast between Norfolk and Gloucestershire, with most records from East Anglia, the south-east and the south coast of England.

***Halosalda lateralis* NS** is a predatory bug found exclusively by brackish water in saltmarshes. A local species distributed around the coasts of England and Wales, with a cluster of records from northern Scotland.

Pantaloon Bee *Dasypoda hirtipes* NS(Nb) is a mining bee occurring mainly in sandy habitats, especially heathland, sandpits and sand dunes. Nest burrows are dug in aggregations in bare areas including footpaths and pollen is collected mainly from yellow composites. It is widespread in coastal areas of southern Britain between Norfolk and North Wales, but more local inland and in the west of its range.

Sharp-collared Flower Bee *Lasioglossum malachurum* NS(Nb) is a solitary bee found in various habitats, including arable areas and urban greenspace, with a preference for clay soils. It nests in fairly bare soil and can form huge aggregations along paths and south-facing slopes. A wide variety of plants are used as pollen sources. Formerly scarce, it has expanded its range since 1990 and is now widespread in southern and central England and no longer worthy of a conservation status.

Lobe-spurred Furrow Bee *Lasioglossum pauxillum* NS(Na) is a solitary bee recorded from a wide variety of situations in southern and central England including sandy heathland, calcareous grassland, coastal locations such as soft rock cliffs and other disturbed habitats. Nesting occurs in light soils. Formerly regarded as scarce, it now no longer warrants a conservation status.

Painted Nomad Bee *Nomada fucata* NS(Na) is a cuckoo bee associated with *Andrena flavipes*. Found in various habitats and now common and widespread in southern and central England following recent range expansion. No longer warrants its status as Nationally Scarce.

Swollen-thighed Blood Bee *Sphecodes crassus* NS(Nb) is a cuckoo bee associated with various *Lasioglossum* species which is found in a range of dry open habitats. The species has become more frequent in recent years and is now

widespread and locally common in southern and central England. Its formal status is in need of reassessment.

Ponera coarctata **NS(Nb)** is an ant which favours warm, south-facing situations and is found in open and frequently coastal habitats including quarries, chalk escarpments with clay deposits, landslips and cliffs. It is local in southern England and south Wales.

2.2.8 A summary of all species with a conservation status by survey compartment is presented in Table 4.

Table 4. Taxa with a conservation status recorded by the survey. X indicates where species were present. Blank cells indicate where species are not present.

Species	Group	Conservation status	Compartment				
			1	2	3	4	5
Anisodactylus poeciloides	a ground beetle	Section 41, NS	X	X	X		X
Bombus sylvarum	a bumble bee	Section 41, NS(Nb)		X		X	X
Bombus humilis	a bumble bee	Section 41		X			X
Cerceris quinquefasciata	a solitary wasp	Section 41, RDB3				X	
Nemophora fasciella	a moth	Section 41, NS(Na)		X		X	
Coenonympha pamphilus	a butterfly	Section 41, VU		X	X	X	X
Lasiommata megera	a butterfly	Section 41, EN				X	
Berosus fulvus	a water beetle	VU, NR	X				X
Limnoxenus niger	a water beetle	NT, NS					X
Aulacochthebius exaratus	a water beetle	NT, NR			X		
Philonthus confinis	a rove beetle	NR		X	X		X
Lixus scabricollis	a weevil	RDBK				X	
Cosmobaris scolopacea	a weevil	RDB3		X			
Bagous argillaceus	a weevil	RDB2			X		X
Orthoperus brunnipes	a beetle	RDB3					X
Orthotylus rubidus	a plant bug	RDB3	X	X			X

Species	Group	Conservation status	Compartment				
			1	2	3	4	5
Lygus pratensis	a plant bug	RDB3		X	X	X	
Ceratina cyanea	a solitary bee	RDB3				X	
Gymnosoma rotundatum	a parasitic fly	RDB3				X	
Brachinus crepitans	a ground beetle	NS	X	X			
Bembidion ephippium	a ground beetle	NS	X		X		X
Bembidion iricolor	a ground beetle	NS	X	X			X
Bembidion normannum	a ground beetle	NS	X	X	X		X
Dicheirotrichus obsoletus	a ground beetle	NS	X				
Dyschirius nitidus	a ground beetle	NS	X				X
Dyschirius salinus	a ground beetle	NS			X		X
Pterostichus longicollis	a ground beetle	NS			X		X
Stenolophus teutonus	a ground beetle	NS		X			
Cryptopleurum crenatum	a water beetle	NS		X	X		X
Enochrus bicolor	a water beetle	NS	X		X		

Species	Group	Conservation status	Compartment				
			1	2	3	4	5
Agabus conspersus	a water beetle	NS	X				X
Rhantus frontalis	a water beetle	NS					X
Hydrotus parallellogrammus	a water beetle	NS					X
Heterocerus obsoletus	a water beetle	NS			X		X
Aphodius plagiatus	a scarab beetle	NS		X			
Onthophagus medius	a scarab beetle	NS		X	X		X
Saprinus aeneus	a beetle	NS		X			
Cordicollis instabilis	a beetle	NS			X		X
Cyclodinus constrictus	a beetle	NS	X	X	X		X
Omonadus bifasciatus	a beetle	NS			X		X
Oxytelus piceus	a rove beetle	NS			X		
Dochmonota clancula	a rove beetle	NS(Nb)			X		
Hippodamia variegata	a ladybird	NS(Nb)		X	X		X
Bagous tempestivus	a weevil	NS(Nb)					X
Scolytus mali	a weevil	NS(Nb)	X				
Sibinia arenariae	a weevil	NS(Nb)	X	X	X	X	X
Phyllotreta cruciferae	a leaf beetle	NS		X		X	

Species	Group	Conservation status	Compartment				
			1	2	3	4	5
Podagrica fuscicornis	a leaf beetle	NS	X			X	
Cassida nobilis	a leaf beetle	NS		X			
Haematopota bigoti	a horse fly	NS					X
Melieria picta	a fly	pNS	X	X			X
Pentastiridius leporinus	a planthopper	NS(Nb)	X	X			
Macrosteles sordidipennis	a leafhopper	NS(Nb)	X	X			
Raglius alboacuminatus	a ground bug	NS(Nb)		X	X	X	X
Saldula palustris	a shore bug	NS	X	X	X		
Saldula pilosella	a shore bug	NS	X		X		X
Halosalda lateralis	a shore bug	NS	X	X			
Dasypoda hirtipes	a solitary bee	NS(Nb)		X			
Lasioglossum malachurum	a solitary bee	NS(Nb)	X	X	X		X
Lasioglossum pauxillum	a solitary bee	NS(Na)	X	X		X	
Nomada fucata	a solitary bee	NS(Na)		X			
Sphecodes crassus	a solitary bee	NS(Nb)				X	X
Ponera coarctata	an ant	NS(Nb)		X	X		

Assessment of survey compartments

2.3.1 Compartment 1 produced the lowest total of 108 species, of which 23 had a conservation status. Most survey work here focussed on the edges of the large brackish seepage shown in Fig. 2., which supported large populations of the plant bug *Orthotylus rubidus* and the shore bug *Halosalda lateralis* (Fig. 7). Other saltmarsh indicators included the ground beetles *Dicheirotrichus obsoletus*, *Dyschirius nitidus* and *Bembidion ephippium*, the planthopper *Pentastiridius leporinus* and the water beetle *Enochrus bicolor*.

2.3.2 Compartment 2 produced the highest total of 188 species, this reflecting the fact that both dry and wetland edge habitats were well represented and particularly well sampled by the pitfall traps. Of the 32 species with a conservation status, several were not found elsewhere including the weevil *Cosmobaris scolopacea*, the tortoise beetle *Cassida nobilis*, the scarab beetle *Aphodius plagiatus* and the ground beetle *Stenolophus teutonus*. Three of the five Section 41 species recorded were using Black Horehound *Ballota nigra* as a foodplant or foraging resource: the Shrill Carder Bee *Bombus* sylvarum, the Brown-banded Carder Bee *Bombus humilis* and the micromoth *Nemophora fasciella*.

2.3.3 Compartment 3 produced a total of 133 species, of which 24 had a conservation status. Species of particular note included the water beetles *Aulacochthebius exaratus* and *Heterocerus obsoletus*, as well as the aquatic weevil *Bagous argillaceus* and the ground beetles *Dyschirius salinus*, *Pterostichus longicollis* and *Bembidion ephippium*. The dung invertebrate fauna was particularly well sampled in this compartment and included several key beetle species such as the scarab beetle *Onthophagus medius* and the rove beetles *Philonthus confinis* and *Oxytelus piceus*.

2.3.4 Compartment 4 produced a total of 129 species, of which 15 had a conservation status. This part of the site was uniformly dry and the eastern half supported several key species not found elsewhere including the solitary wasp *Cerceris quinquefasciata*, the solitary bee *Ceratina cyanea*, the weevil *Lixus scabricollis* (Fig. 7) and the parasitic fly *Gymnosoma rotundatum*. It was the only compartment in which the S41 ground beetle *Anisodactylus poeciloides* was not recorded. The eastern half was closely mown and supported very little invertebrate interest.

2.3.5 Compartment 5 produced 148 species, of which 33 had a conservation status. The wetland fauna here had much in common with that of Compartment 3 and included numerous key saltmarsh and brackish pool indicator species. Species not recorded elsewhere included the aquatic weevil *Bagous tempestivus*, the horse fly *Haematopota bigoti* and the water beetles *Hygrotus parallelogrammus* and *Rhantus frontalis*.

The overall invertebrate community

2.4.1 Rarity is only one factor to be taken into account in the assessment of the ecological value of a site. Some sites may have immensely diverse invertebrate assemblages but few rare species within these; they are of equal, if different,

ecological value. It is therefore important to carry out a further assessment that also includes all remaining species.

2.4.2 We have undertaken this using Osiris, a habitat and resource association utility found within Pantheon, a database tool developed by Natural England and the Centre for Ecology and Hydrology and freely accessible online at Pantheon database tool webpage. This system has updated and replaced the Invertebrate Species-habitats Information System (ISIS) as of 2017. A major improvement of Pantheon has been the incorporation of current species conservation status designations, as many have changed since the original release of ISIS.

2.4.3 Pantheon interprets species lists by recognising assemblage types and scoring each type according to its conservation value. This information is used to assess the overall quality of the site, reveal its key ecological resources and ultimately inform decisions regarding habitat management and mitigation. In some cases, habitats that may have been overlooked or not considered important during the survey might be identified as significant.

2.4.4 To date around 12,000 species are included in the Pantheon database, around a quarter of the total macro-invertebrate fauna. It remains limited to those taxa and families where there is enough ecological information to give a fair level of coding accuracy. These include species such as beetles, flies, true bugs, moths, bees and many others.

2.4.5 Invertebrate species are linked to habitats and resources in a large hierarchical database. The hierarchy is arranged with 'Broad biotopes' as the highest level. Each species can be typed to more than one habitat or resource category.

2.4.6 Each Broad biotope can be divided into more detailed 'Habitats' (previously known as 'Broad Assemblage Types' (BATs) in ISIS).

2.4.7 Each Habitat contains a set of 'Resources', defined by typing species to other environmental factors or microhabitats. Only those resources that are considered important to the completion of the life cycle of a species are included. Typing was not attempted for species that are either very catholic or where their ecology was not well defined in the literature.

2.4.8 Specific assemblage types' (SATs) are characterised by stenotopic (ecologically restricted) species that are of intrinsic nature conservation value. SATs are more narrowly defined than Habitats and each SAT is nested within a parent Habitat. *Note that the use of SATs is restricted to Natural England Common Standards Monitoring on SSSIs*.

2.4.9 Pantheon provides the following scoring systems for Broad biotopes, Habitats, Resources and SATs:

- A total count of species in each category.
- The number of species represented in each category which have a conservation status. **Note that some statuses are reported in square brackets [ ], indicating that these are considered out of date and should be used with caution.**

- The number of species belonging to each category as a percentage of the total number of species belonging to each category within the British invertebrate fauna.
- A Species Quality Index (SQI) score for each category where more than 15 species are represented. Each species recorded from the sample is given a Species Quality Score (SQS) based on their conservation status. The SQI score is equal to the sum of all SQS scores divided by the number of species and then multiplied by 100 to give a 3-figure score that does not contain decimal places (e.g.100 rather than a 1.00). *Note that some SQI scores for species which have their status bracketed have been reduced to take account of this*. For example, the status of the plant bug *Lygus pratensis* is listed as [RDB3] and has a corresponding SQS of 1, since it is now widespread and common. For further information please see: Pantheon scoring system webpage

Pantheon output

2.4.10 Pantheon sample scores by Habitat are shown in Table 5. The highest SQI score corresponded to saltmarsh (SQI=312), indicating that this habitat contained the greatest proportion of rare and scarce taxa overall. The percentage representation value was also high, indicating that the site supported 13% of all British species typed to saltmarsh habitat.

2.4.11 High SQI scores were also obtained for brackish pools & ditches (SQI=281) and marshland (SQI= 162), although the number of qualifying species was equal to the cut-off value in the case of the former (n=15). Values based fewer than 15 species may not be reliable due to small sample size.

2.4.12 Scores for the assemblage condition assessment based on ISIS SATs are shown in Table 6. A favourable reported condition was achieved for two SATs: rich flower resource and saltmarsh & transitional brackish marsh. In particular, the latter SAT was very well represented and 17 indicator species were recorded, almost double the number required to achieve favourable condition. None of the remaining SATs were close to favourable condition.

Table 5. Pantheon sample scores by Habitat (Habitats with <15 species have been omitted)

Broad biotope	Habitat	No. of species	% representation	SQI	Species with conservation status	Conservation status
open habitats	tall sward & scrub	178	7	118	12	3 S41, 1 RDBK, 1 RDB3, 5 NS, 1 Nb, 1 [Nb]

open habitats	short sward & bare ground	73	6	137	12	3 S41, 1 NS, 3 Na, 5 Nb
coastal	saltmarsh	39	13	312	23	1 S41, 2 NR, 1 RDB3, 1 [RDB3], 1 [RDB2}, 14 NS, 1 pNS, 2 Nb
wetland	marshland	26	3	162	4	1 NR, 2 NS, 1 Nb
wetland	acid & sedge peats	16	1	138	2	2 NS
coastal	brackish pools & ditches	15	13	281	7	1 NR, 1 [RDB2], 5 NS

Table 6. ISIS Specific Assemblage Types (SATs)

SAT	No. of species	% representation	SQI	Species with conservation	Conservation status	Reported condition
rich flower resource	20	8	150	7	2 S41, 2 Na, 3 Nb	**Favourable** (20 of 15)
saltmarsh & transitional brackish marsh	17	16	376	13	1 S41, 1 [RDB2], 1 (RDB3], 8 NS, 1 pNS, 1 Nb	**Favourable** (17 of 9)
bare sand & chalk	9	2	213	4	1 S41, 1 NS, 2 Nb	Unfavourable (9 of 19)
open short sward	6	3	100	2	2 S41	Unfavourable (6 of 13)
bark & sapwood decay	4	<1	175	1	1 Nb	Unfavourable (4 of 19)
scrub-heath & moorland	4	1	175	2	1|[RDB 3], 1 Nb	Unfavourable (4 of 9)
scrub edge	3	1	100	Not applicable	Not applicable	Unfavourable (3 of 11)
undisturbed fluctuating marsh	2	5	250	1	1 Nb	Unfavourable (2 of 4)
exposed sea-cliff	1	2	400	1	1 Nb	Unfavourable
sandy beaches	1	2	400	1	NS	Unfavourable (1 of 7)

3 Discussion

3.1.1 The areas surveyed at Tilbury Fort Marshes support a moderately large and diverse overall invertebrate assemblage. We regard the 388 recorded species to be a modest total given the size of the site and the use of passive sampling methods (pitfall traps) which continue to operate in the absence of a surveyor.

3.1.2 However, this total should be viewed in the context of the nature and quality of the habitats present, which are limited to brackish wetland features and heavily grazed dry grassland. Saline habitats generally support a rather narrow and specialised range of invertebrates and heavily grazed grasslands are invariably species-poor, since many phytophagous species dependent on the aerial parts of plants to complete their life cycles are restricted.

3.1.3 The fauna is of very high quality, including seven Section 41 species and 56 species which are Nationally Rare or Nationally Scarce. A simple overall benchmark for any survey is the proportion of the recorded fauna composed of species with Nationally Rare or Nationally Scarce status. Sites where this exceeds 10% indicate exceptional quality. The figure for the site under discussion stands at almost 16%.

3.1.4 The Pantheon analysis indicates that the saltmarsh and transitional brackish marsh fauna is of very high importance. This assemblage type is mainly found in areas that are inundated only by spring tides or storm surges and experience greatly reduced levels of tidal disturbance in comparison to open saltmarsh. Beetles (Coleoptera) make up a large proportion of this assemblage and the site supports a very strong population of the Section 41 Saltmarsh Shortspur *Anisodacytlus poeciloides*, which was the most abundant large carabid associated with wetland margins. As discussed earlier, this is primarily a saltpan species which avoids open saltmarshes proper and exposure to tidal conditions. The RDB3 plant bug *Orthotylus rubidus* is another key species present in large numbers. This is associated with areas of *Salicornia* found in saline seepages and saltpans which form behind sea walls and sea banks.

3.1.5 In general, SQI scores exceeding 150 are considered an approximate threshold that corresponds to a ‘good’ site supporting a regionally important invertebrate fauna. However, despite the very high SQI scores assigned by Pantheon for saltmarsh and brackish pools & ditches, it should be pointed out that these habitats contain numerous specialised ecological niches which are more likely to be occupied by rare and scarce taxa. Thus by definition these habitats will always tend to produce higher SQI scores and the threshold values for these categories may need to be adjusted upwards.

3.1.6 A further expectation of a uniformly high grazing pressure might be a lack of forage resources for pollinators. However, this is not borne out by the recorded aculeate Hymenoptera fauna and the rich flower resource assemblage qualified as being in favourable condition. This is a cross-cutting assemblage found in many habitats and all species coded to this SAT are aculeate Hymenoptera, in particular flower-visiting bees. Our observations suggest that Black Horehound *Ballota nigra* is a key floral resource for long-tongued species such as bumblebees, including both Section 41

species.

3.1.7 One positive consequence of the high density of horses is the continuous availability of resources for dung-feeding invertebrates and a large fauna of such species is present, which includes at least five of conservation interest. Although the survey did not record the Hornet Robber Fly *Asilus crabroniformis*, a much-declined Section 41 species which lays its eggs in herbivore dung, there are old records from the Tilbury area and the site appears to be currently in suitable condition, with a good population of *Geotrupes spiniger*, whose larvae may form an important source of prey for *Asilus*.

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5. Appendices

Appendix 1: Recorded Invertebrate Species

National status codes are explained in Appendix 2.

Table 7: Recorded Invertebrate Species. Columns containing empty cells are where there is no English name and/or GB rarity status does not apply.

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
ARANEAE	Araneidae	*Neoscona adianta*		LC			X			X
ARANEAE	Araneidae	*Nuctenea umbratica*		LC		X				
ARANEAE	Corinnidae	*Phrurolithus festivus*		LC			X			
ARANEAE	Gnaphosidae	*Drassodes cupreus*		LC			X			
ARANEAE	Gnaphosidae	*Drassyllus pusillus*		LC				X		
ARANEAE	Linyphiidae	*Erigone atra*		LC		X	X	X		X
ARANEAE	Linyphiidae	*Erigone dentipalpis*		LC		X	X	X		X
ARANEAE	Linyphiidae	*Gnathonarium dentatum*		NE		X				
ARANEAE	Linyphiidae	*Lepthyphantes flavipes*		NE						X

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
ARANEAE	Linyphiidae	*Lepthyphantes mengei*		NE						X
ARANEAE	Linyphiidae	*Micrargus subaequalis*		NE			X			
ARANEAE	Linyphiidae	*Microlinyphia pusilla*		NE		X				
ARANEAE	Linyphiidae	*Oedothorax apicatus*		NE				X		
ARANEAE	Linyphiidae	*Oedothorax fuscus*		LC				X		X
ARANEAE	Linyphiidae	*Oedothorax retusus*		NE		X	X	X		X
ARANEAE	Linyphiidae	*Prinerigone vagans*		NE		X	X	X		X
ARANEAE	Lycosidae	*Arctosa leopardus*		LC		X	X	X		X
ARANEAE	Lycosidae	*Pardosa palustris*		LC		X	X			
ARANEAE	Lycosidae	*Pardosa prativaga*		LC			X			
ARANEAE	Lycosidae	*Pardosa purbeckensis*		NE			X	X		X
ARANEAE	Lycosidae	*Pirata piraticus*		LC		X		X		X

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
ARANEAE	Lycosidae	*Trochosa ruricola*		LC			X	X		X
ARANEAE	Philodromidae	*Philodromus cespitum*		LC		X			X	
ARANEAE	Philodromidae	*Tibellus oblongus*		LC		X				
ARANEAE	Tetragnathidae	*Pachygnatha degeeri*		LC			X			X
ARANEAE	Tetragnathidae	*Tetragnatha extensa*		LC		X			X	
ARANEAE	Theridiidae	*Enoplognatha ovata*		LC					X	
COLEOPTERA	Anthicidae	*Anthicus antherinus*		LC				X		X
COLEOPTERA	Anthicidae	*Cordicollis instabilis*		LC	NS			X		X
COLEOPTERA	Anthicidae	*Cyclodinus constrictus*		LC	NS	X	X	X		X
COLEOPTERA	Anthicidae	*Omonadus bifasciatus*		LC	NS			X		X
COLEOPTERA	Apionidae	*Aspidapion aeneum*		NE					X	X
COLEOPTERA	Apionidae	*Aspidapion radiolus*		NE			X		X	

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
COLEOPTERA	Apionidae	*Diplapion confluens*		NE			X			
COLEOPTERA	Apionidae	*Ischnopterapion virens*		NE		X	X			X
COLEOPTERA	Apionidae	*Malvapion malvae*		NE			X		X	
COLEOPTERA	Apionidae	*Omphalapion hookerorum*		NE			X			
COLEOPTERA	Apionidae	*Pseudapion rufirostre*		NE			X		X	
COLEOPTERA	Apionidae	*Stenopterapion tenue*		NE						X
COLEOPTERA	Cantharidae	*Cantharis lateralis*		LC		X				
COLEOPTERA	Cantharidae	*Cantharis rufa*		LC		X				
COLEOPTERA	Cantharidae	*Rhagonycha fulva*		LC				X	X	
COLEOPTERA	Carabidae	*Acupalpus parvulus*		LC			X			
COLEOPTERA	Carabidae	*Agonum marginatum*		LC		X	X			X
COLEOPTERA	Carabidae	*Amara aenea*		LC					X	X

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
COLEOPTERA	Carabidae	*Amara convexior*		LC			X			
COLEOPTERA	Carabidae	*Amara plebeja*		LC			X			
COLEOPTERA	Carabidae	*Amara similata*		LC			X	X		
COLEOPTERA	Carabidae	*Anisodactylus poeciloides*		LC	NS, S41	X	X	X		X
COLEOPTERA	Carabidae	*Bembidion articulatum*		LC				X		
COLEOPTERA	Carabidae	*Bembidion ephippium*		LC	NS	X		X		X
COLEOPTERA	Carabidae	*Bembidion iricolor*		LC	NS	X	X			X
COLEOPTERA	Carabidae	*Bembidion lunulatum*		LC			X	X		X
COLEOPTERA	Carabidae	*Bembidion minimum*		LC		X	X	X		X
COLEOPTERA	Carabidae	*Bembidion normannum*		LC	NS	X	X	X		X
COLEOPTERA	Carabidae	*Bembidion properans*		LC						X
COLEOPTERA	Carabidae	*Bembidion quadrimaculatum*		LC		X				

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
COLEOPTERA	Carabidae	*Bembidion varium*		LC		X	X	X		X
COLEOPTERA	Carabidae	*Brachinus crepitans*	Bombardier Beetle	LC	NS	X	X			
COLEOPTERA	Carabidae	*Dicheirotrichus obsoletus*		LC	NS	X				
COLEOPTERA	Carabidae	*Dyschirius nitidus*		LC	NS	X				X
COLEOPTERA	Carabidae	*Dyschirius salinus*		LC	NS	X		X		X
COLEOPTERA	Carabidae	*Elaphrus riparius*		LC						X
COLEOPTERA	Carabidae	*Harpalus affinis*		LC			X		X	X
COLEOPTERA	Carabidae	*Harpalus rufipes*		LC			X			X
COLEOPTERA	Carabidae	*Loricera pilicornis*		LC		X	X	X		X
COLEOPTERA	Carabidae	*Microlestes maurus*		LC				X		
COLEOPTERA	Carabidae	*Microlestes minutulus*		LC				X		
COLEOPTERA	Carabidae	*Nebria salina*		LC		X				

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
COLEOPTERA	Carabidae	*Ophonus ardosiacus*		LC			X			X
COLEOPTERA	Carabidae	*Poecilus cupreus*		LC						X
COLEOPTERA	Carabidae	*Pogonus chalceus*		LC		X	X	X		X
COLEOPTERA	Carabidae	*Pterostichus diligens*		LC		X				
COLEOPTERA	Carabidae	*Pterostichus longicollis*		LC	NS			X		X
COLEOPTERA	Carabidae	*Pterostichus macer*		LC				X		
COLEOPTERA	Carabidae	*Stenolophus mixtus*		LC						X
COLEOPTERA	Carabidae	*Stenolophus teutonus*		LC	NS		X			
COLEOPTERA	Carabidae	*Syntomus foveatus*		LC				X		
COLEOPTERA	Carabidae	*Trechus quadristriatus*		LC				X		
COLEOPTERA	Cerambycidae	*Pseudovadonia livida*		LC				X	X	
COLEOPTERA	Chrysomelidae	*Aphthona euphorbiae*		LC					X	

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
COLEOPTERA	Chrysomelidae	*Bruchidius imbricornis*		NA		X			X	X
COLEOPTERA	Chrysomelidae	*Bruchidius varius*		NA					X	
COLEOPTERA	Chrysomelidae	*Cassida nobilis*		LC	NS		X			
COLEOPTERA	Chrysomelidae	*Cassida vittata*		LC		X	X			
COLEOPTERA	Chrysomelidae	*Chaetocnema concinna*		LC						X
COLEOPTERA	Chrysomelidae	*Cryptocephalus fulvus*		LC					X	
COLEOPTERA	Chrysomelidae	*Longitarsus gracilis*		LC					X	X
COLEOPTERA	Chrysomelidae	*Longitarsus succineus*		LC			X		X	
COLEOPTERA	Chrysomelidae	*Neocrepidodera transversa*		LC						X
COLEOPTERA	Chrysomelidae	*Phyllotreta atra*		LC					X	
COLEOPTERA	Chrysomelidae	*Phyllotreta cruciferae*		LC	NS		X		X	
COLEOPTERA	Chrysomelidae	*Phyllotreta nigripes*		LC			X	X		

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
COLEOPTERA	Chrysomelidae	*Phyllotreta undulata*		LC			X		X	
COLEOPTERA	Chrysomelidae	*Podagrica fuscicornis*		LC	NS	X			X	
COLEOPTERA	Chrysomelidae	*Psylliodes chrysocephala*		LC					X	
COLEOPTERA	Coccinellidae	*Adalia bipunctata*	2-spot ladybird	NE					X	
COLEOPTERA	Coccinellidae	*Coccidula rufa*		NE		X				X
COLEOPTERA	Coccinellidae	*Coccinella septempunctata*	7-spot ladybird	NE		X	X	X	X	
COLEOPTERA	Coccinellidae	*Hippodamia variegata*	Adonis' ladybird	NE	NS(Nb)		X	X		X
COLEOPTERA	Coccinellidae	*Psyllobora 22-punctata*	22-spot ladybird	NE					X	
COLEOPTERA	Coccinellidae	*Rhyzobius litura*		NE			X		X	
COLEOPTERA	Coccinellidae	*Tytthaspis sedecimpunctata*	16-spot ladybird	NE		X		X	X	X
COLEOPTERA	Corylophidae	*Orthoperus brunnipes*		NE	RDB3					X

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
COLEOPTERA	Curculionidae	*Bagous argillaceus*		NE	RDB2			X		X
COLEOPTERA	Curculionidae	*Bagous tempestivus*		NE	NS(Nb)					X
COLEOPTERA	Curculionidae	*Ceutorhynchus contractus*		NE		X				
COLEOPTERA	Curculionidae	*Ceutorhynchus erysimi*		NE					X	
COLEOPTERA	Curculionidae	*Ceutorhynchus obstrictus*		NE			X		X	
COLEOPTERA	Curculionidae	*Ceutorhynchus pyrrhorhynchus*		NE					X	
COLEOPTERA	Curculionidae	*Cosmobaris scolopacea*		NE	RDB3		X			
COLEOPTERA	Curculionidae	*Hypera postica*		NE		X	X		X	
COLEOPTERA	Curculionidae	*Lixus scabricollis*		NE	RDBK				X	
COLEOPTERA	Curculionidae	*Mecinus pascuorum*		NE			X		X	
COLEOPTERA	Curculionidae	*Neliocarus nebulosus*		NE			X			
COLEOPTERA	Curculionidae	*Scolytus mali*		NE	NS(Nb)	X				

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
COLEOPTERA	Curculionidae	*Sibinia arenariae*		NE	NS(Nb)	X	X	X	X	X
COLEOPTERA	Curculionidae	*Sitona hispidulus*		NE		X	X			
COLEOPTERA	Curculionidae	*Sitona humeralis*		NE		X				
COLEOPTERA	Curculionidae	*Sitona lepidus*		NE		X				
COLEOPTERA	Curculionidae	*Trichosirocalus troglodytes*		NE			X			
COLEOPTERA	Curculionidae	*Tychius picirostris*		NE		X	X	X	X	X
COLEOPTERA	Dermestidae	*Anthrenus verbasci*		NA					X	
COLEOPTERA	Dytiscidae	*Agabus conspersus*		LC	NS	X				X
COLEOPTERA	Dytiscidae	*Hygrotus confluens*		LC						X
COLEOPTERA	Dytiscidae	*Hygrotus impressopunctatus*		LC		X				
COLEOPTERA	Dytiscidae	*Hygrotus parallellogrammus*		LC	NS					X

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
COLEOPTERA	Dytiscidae	*Rhantus frontalis*		LC	NS					X
COLEOPTERA	Elateridae	*Agriotes acuminatus*		NE		X				
COLEOPTERA	Elateridae	*Agriotes sputator*		NE						X
COLEOPTERA	Geotrupidae	*Geotrupes spiniger*		LC			X	X		
COLEOPTERA	Helophoridae	*Helophorus brevipalpis*		LC				X		X
COLEOPTERA	Helophoridae	*Helophorus minutus*		LC				X		X
COLEOPTERA	Heteroceridae	*Heterocerus obsoletus*		LC	NS			X		X
COLEOPTERA	Histeridae	*Margarinotus ventralis*		LC			X	X		
COLEOPTERA	Histeridae	*Onthophilus striatus*		LC			X			
COLEOPTERA	Histeridae	*Saprinus aeneus*		LC	NS		X			
COLEOPTERA	Hydraenidae	*Aulacochthebius exaratus*		NT	NR			X		
COLEOPTERA	Hydraenidae	*Ochthebius marinus*		LC				X		X

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
COLEOPTERA	Hydrophilidae	*Berosus affinis*		LC						X
COLEOPTERA	Hydrophilidae	*Berosus fulvus*		VU	NR	X				X
COLEOPTERA	Hydrophilidae	*Cercyon impressus*		LC			X	X		
COLEOPTERA	Hydrophilidae	*Cercyon lateralis*		LC			X			
COLEOPTERA	Hydrophilidae	*Cercyon marinus*		LC						X
COLEOPTERA	Hydrophilidae	*Cercyon melanocephalus*		LC			X			X
COLEOPTERA	Hydrophilidae	*Cercyon pygmaeus*		LC			X			
COLEOPTERA	Hydrophilidae	*Cercyon quisquilius*		LC			X	X		
COLEOPTERA	Hydrophilidae	*Cercyon terminatus*		LC			X			
COLEOPTERA	Hydrophilidae	*Cercyon tristis*		LC			X			
COLEOPTERA	Hydrophilidae	*Cryptopleurum crenatum*		NE	NS(Nb)		X	X		X
COLEOPTERA	Hydrophilidae	*Cryptopleurum minutum*		NE			X	X		X

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
COLEOPTERA	Hydrophilidae	*Cymbiodyta marginellus*		LC						X
COLEOPTERA	Hydrophilidae	*Enochrus bicolor*		LC	NS	X		X		
COLEOPTERA	Hydrophilidae	*Limnoxenus niger*		NT	NS					X
COLEOPTERA	Hydrophilidae	*Sphaeridium bipustulatum*		NE			X	X		
COLEOPTERA	Hydrophilidae	*Sphaeridium scarabaeoides*		NE			X			
COLEOPTERA	Latridiidae	*Corticarina minuta*		NE		X	X	X		X
COLEOPTERA	Latridiidae	*Enicmus transversus*		NE			X			X
COLEOPTERA	Malachiidae	*Cordylepherus viridis*		LC					X	
COLEOPTERA	Malachiidae	*Malachius bipustulatus*		LC					X	
COLEOPTERA	Monotomidae	*Monotoma brevicollis*		NE				X		
COLEOPTERA	Nitidulidae	*Meligethes ruficornis*		NE			X		X	X
COLEOPTERA	Oedemeridae	*Oedemera lurida*		LC					X	X

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
COLEOPTERA	Oedemeridae	*Oedemera nobilis*		LC					X	X
COLEOPTERA	Phalacridae	*Olibrus aeneus*		LC			X		X	X
COLEOPTERA	Phalacridae	*Phalacrus fimetarius*		LC		X				
COLEOPTERA	Pselaphidae	*Brachygluta helferi*		NE			X	X		
COLEOPTERA	Scarabaeidae	*Amphimallon solstitiale*	Summer Chafer	LC			X			
COLEOPTERA	Scarabaeidae	*Aphodius ater*		LC			X		□	
COLEOPTERA	Scarabaeidae	*Aphodius contaminatus*		LC				X		
COLEOPTERA	Scarabaeidae	*Aphodius fimetarius*		LC			X	X		X
COLEOPTERA	Scarabaeidae	*Aphodius foetens*		LC			X	X		X
COLEOPTERA	Scarabaeidae	*Aphodius foetidus*		LC			X	X		X
COLEOPTERA	Scarabaeidae	*Aphodius plagiatus*		LC	NS		X			
COLEOPTERA	Scarabaeidae	*Aphodius rufipes*		LC			X	X		X

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
COLEOPTERA	Scarabaeidae	*Aphodius rufus*		LC			X			X
COLEOPTERA	Scarabaeidae	*Onthophagus medius*		LC	NS		X	X		X
COLEOPTERA	Scirtidae	*Cyphon coarctatus*		LC						X
COLEOPTERA	Scraptiidae	*Anaspis pulicaria*		LC					X	
COLEOPTERA	Silphidae	*Silpha tristis*		NE			X			
COLEOPTERA	Staphylinidae	*Achenium depressum*		NE			X			X
COLEOPTERA	Staphylinidae	*Acrolocha sulcula*		NE			X	X		X
COLEOPTERA	Staphylinidae	*Aleochara bipustulata*		NE					X	
COLEOPTERA	Staphylinidae	*Aleochara intricata*		NE			X	X		
COLEOPTERA	Staphylinidae	*Aleochara lanuginosa*		NE			X	X	X	X
COLEOPTERA	Staphylinidae	*Aloconota gregaria*		NE				X		X
COLEOPTERA	Staphylinidae	*Anotylus inustus*		LC			X	X		

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
COLEOPTERA	Staphylinidae	*Anotylus nitidulus*		LC				X		X
COLEOPTERA	Staphylinidae	*Anotylus rugosus*		LC		X		X		X
COLEOPTERA	Staphylinidae	*Anotylus sculpturatus*		LC			X	X		
COLEOPTERA	Staphylinidae	*Anotylus tetracarinatus*		LC			X	X		
COLEOPTERA	Staphylinidae	*Atheta atramentaria*		NE			X	X		
COLEOPTERA	Staphylinidae	*Atheta longicornis*		NE				X		
COLEOPTERA	Staphylinidae	*Autalia rivularis*		NE			X	X		
COLEOPTERA	Staphylinidae	*Bledius spectabilis*		LC		X	X	X		X
COLEOPTERA	Staphylinidae	*Carpelimus erichsoni*		LC				X		X
COLEOPTERA	Staphylinidae	*Cilea silphoides*		NE			X	X		
COLEOPTERA	Staphylinidae	*Dochmonota clancula*		NE	NS(Nb)			X		
COLEOPTERA	Staphylinidae	*Drusilla canaliculata*		NE				X		X

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
COLEOPTERA	Staphylinidae	*Gabrius breviventer*		LC				X		
COLEOPTERA	Staphylinidae	*Gabrius piliger*		LC				X		
COLEOPTERA	Staphylinidae	*Gnypeta carbonaria*		NE				X		
COLEOPTERA	Staphylinidae	*Gyrohypnus fracticornis*		LC			X	X		X
COLEOPTERA	Staphylinidae	*Megalinus glabratus*		LC			X	X		X
COLEOPTERA	Staphylinidae	*Nehemitropia sordida*		NE			X	X		
COLEOPTERA	Staphylinidae	*Ocypus brunnipes*		LC			X			
COLEOPTERA	Staphylinidae	*Ocypus olens*		LC		X	X			
COLEOPTERA	Staphylinidae	*Ontholestes murinus*		LC			X	X	X	X
COLEOPTERA	Staphylinidae	*Ontholestes tessellatus*		LC				X		
COLEOPTERA	Staphylinidae	*Oxytelus piceus*		LC	NS			X		
COLEOPTERA	Staphylinidae	*Phacophallus pallidipennis*		NA						X

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
COLEOPTERA	Staphylinidae	*Philonthus albipes*		LC				X		
COLEOPTERA	Staphylinidae	*Philonthus cognatus*		LC				X	X	X
COLEOPTERA	Staphylinidae	*Philonthus confinis*		LC	NR		X	X		X
COLEOPTERA	Staphylinidae	*Philonthus intermedius*		LC			X			X
COLEOPTERA	Staphylinidae	*Philonthus parvicornis*		LC			X	X		
COLEOPTERA	Staphylinidae	*Philonthus quisquiliarius*		LC				X		X
COLEOPTERA	Staphylinidae	*Philonthus sanguinolentus*		LC			X	X		X
COLEOPTERA	Staphylinidae	*Platystethus alutaceus*		LC			X	X		X
COLEOPTERA	Staphylinidae	*Platystethus cornutus*		LC				X		X
COLEOPTERA	Staphylinidae	*Platystethus nitens*		LC			X			X
COLEOPTERA	Staphylinidae	*Quedius levicollis*		LC				X		
COLEOPTERA	Staphylinidae	*Rugilus orbiculatus*		LC			X			

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
COLEOPTERA	Staphylinidae	*Sepedophilus nigripennis*		LC				X		
COLEOPTERA	Staphylinidae	*Tachinus rufipes*		LC						X
COLEOPTERA	Staphylinidae	*Tachyporus nitidulus*		LC			X			
COLEOPTERA	Staphylinidae	*Tinotus morion*		NE				X		X
COLEOPTERA	Staphylinidae	*Xantholinus longiventris*		LC			X			X
COLEOPTERA	Tenebrionidae	*Lagria hirta*		LC				X	X	X
DERMAPTERA	Forficulidae	*Forficula auricularia*	Common Earwig	LC			X		X	X
DIPTERA	Asilidae	*Leptogaster cylindrica*		LC		X	X		X	
DIPTERA	Asilidae	*Machimus atricapillus*		LC					X	
DIPTERA	Conopidae	*Thecophora atra*		NE			X			
DIPTERA	Opomyzidae	*Geomyza tripunctata*		NE					X	
DIPTERA	Scathophagidae	*Scathophaga stercoraria*		NE			X			

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
DIPTERA	Sepsidae	*Sepsis fulgens*		NE			X			X
DIPTERA	Stratiomyidae	*Chloromyia formosa*		LC			X		X	X
DIPTERA	Stratiomyidae	*Microchrysa flavicornis*		LC			X	X		
DIPTERA	Stratiomyidae	*Nemotelus notatus*		LC		X	X			X
DIPTERA	Stratiomyidae	*Nemotelus uliginosus*		LC		X	X		X	
DIPTERA	Stratiomyidae	*Pachygaster atra*		LC			X			
DIPTERA	Stratiomyidae	*Pachygaster leachii*		LC			X			
DIPTERA	Stratiomyidae	*Stratiomys singularior*		LC						X
DIPTERA	Syrphidae	*Eristalinus aeneus*		LC		X		X		X
DIPTERA	Syrphidae	*Eristalis pertinax*		LC				X		
DIPTERA	Syrphidae	*Eristalis tenax*		LC					X	
DIPTERA	Syrphidae	*Platycheirus manicatus*		LC					X	

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
DIPTERA	Syrphidae	*Sphaerophoria rueppellii*		LC					X	
DIPTERA	Tabanidae	*Haematopota bigoti*		LC	NS					X
DIPTERA	Tabanidae	*Tabanus autumnalis*		LC						X
DIPTERA	Tachinidae	*Eriothrix rufomaculata*		NE				X	X	
DIPTERA	Tachinidae	*Gymnosoma rotundatum*		NE	RDB3				X	
DIPTERA	Tephritidae	*Campiglossa misella*		NE			X		X	X
DIPTERA	Tephritidae	*Campiglossa plantaginis*		NE		X	X	X	X	X
DIPTERA	Tephritidae	*Oxyna parietina*		NE				X		
DIPTERA	Tephritidae	*Sphenella marginata*		NE			X			
DIPTERA	Tephritidae	*Tephritis divisa*		NE					X	
DIPTERA	Tephritidae	*Terellia tussilaginis*		NE		X				
DIPTERA	Tephritidae	*Urophora stylata*		NE			X			

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
DIPTERA	Therevidae	*Thereva nobilitata*		LC				X		
DIPTERA	Tipulidae	*Nephrotoma flavescens*		NE					X	
DIPTERA	Tipulidae	*Pilaria discicollis*		NE						X
DIPTERA	Ulidiidae	*Ceroxys urticae*		NE		X				
DIPTERA	Ulidiidae	*Melieria omissa*		NE		X				
DIPTERA	Ulidiidae	*Melieria picta*		NE	pNS	X	X			X
HEMIPTERA	Anthocoridae	*Orius laevigatus*		NE						X
HEMIPTERA	Anthocoridae	*Orius niger*		NE					X	
HEMIPTERA	Coreidae	*Coriomeris denticulatus*	Denticulate Leatherbug	LC					X	
HEMIPTERA	Cydnidae	*Tritomegas sexmaculatus*	Rambur's Pied Shieldbug	NA					X	
HEMIPTERA	Lygaeidae	*Cymus melanocephalus*		NE		X				

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
HEMIPTERA	Lygaeidae	*Metopoplax ditomoides*		NE				X		
HEMIPTERA	Lygaeidae	*Nysius huttoni*		NE		X			X	
HEMIPTERA	Lygaeidae	*Nysius senecionis*		NE			X		X	
HEMIPTERA	Lygaeidae	*Peritrechus nubilus*		NE				X		
HEMIPTERA	Lygaeidae	*Raglius alboacuminatus*		NE	NS(Nb)		X	X	X	X
HEMIPTERA	Lygaeidae	*Stygnocoris fuligineus*		NE		X				
HEMIPTERA	Miridae	*Amblytylus nasutus*		NE						X
HEMIPTERA	Miridae	*Closterotomus norwegicus*		NE		X	X	X	X	X
HEMIPTERA	Miridae	*Liocoris tripustulatus*		NE					X	
HEMIPTERA	Miridae	*Lygus maritimus*		NE			X	X		
HEMIPTERA	Miridae	*Lygus pratensis*		NE	RDB3		X	X	X	
HEMIPTERA	Miridae	*Lygus rugulipennis*		NE			X		X	X

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
HEMIPTERA	Miridae	*Macrotylus horvathi*		NE			X		X	
HEMIPTERA	Miridae	*Megaloceroea recticornis*		NE		X				
HEMIPTERA	Miridae	*Megalocoleus molliculus*		NE			X			
HEMIPTERA	Miridae	*Megalocoleus tanaceti*		NE						X
HEMIPTERA	Miridae	*Miridius quadrivirgatus*		NE		X			X	
HEMIPTERA	Miridae	*Notostira elongata*		NE		X			X	
HEMIPTERA	Miridae	*Orthops kalmii*		NE					X	X
HEMIPTERA	Miridae	*Orthotylus flavosparsus*		NE					X	
HEMIPTERA	Miridae	*Orthotylus moncreaffi*		NE		X	X		X	
HEMIPTERA	Miridae	*Orthotylus rubidus*		NE	RDB3	X	X			X
HEMIPTERA	Miridae	*Pithanus maerkelii*		NE		X				
HEMIPTERA	Miridae	*Plagiognathus arbustorum*		NE			X			

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
HEMIPTERA	Miridae	*Plagiognathus chrysanthemi*		NE			X		X	
HEMIPTERA	Miridae	*Stenodema calcarata*		NE		X	X		X	X
HEMIPTERA	Miridae	*Stenodema laevigata*		NE			X			
HEMIPTERA	Miridae	*Stenotus binotatus*		NE		X				
HEMIPTERA	Miridae	*Trigonotylus ruficornis*		NE		X	X			
HEMIPTERA	Nabidae	*Himacerus mirmicoides*		NE					X	
HEMIPTERA	Nabidae	*Nabis ferus*		NE		X	X			
HEMIPTERA	Pentatomidae	*Dolycoris baccarum*	Hairy Shieldbug	LC					X	
HEMIPTERA	Saldidae	*Halosalda lateralis*		LC	NS	X	X			
HEMIPTERA	Saldidae	*Saldula palustris*		LC	NS	X	X	X		
HEMIPTERA	Saldidae	*Saldula pilosella*		LC	NS	X		X		X
HEMIPTERA	Saldidae	*Saldula saltatoria*		LC			X	X	X	X

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
HEMIPTERA	Scutelleridae	*Eurygaster testudinaria*	Tortoise Shieldbug	LC					X	
HEMIPTERA	Tingidae	*Kalama tricornis*		NE		X	X			X
HEMIPTERA	Aphrophoridae	*Neophilaenus campestris*		NE			X		X	X
HEMIPTERA	Aphrophoridae	*Philaenus spumarius*	Common Froghopper	NE			X	X	X	
HEMIPTERA	Cicadellidae	*Anaceratagallia ribauti*		NE			X	X	X	
HEMIPTERA	Cicadellidae	*Anoscopus serratulae*		NE		X	X			
HEMIPTERA	Cicadellidae	*Aphrodes makarovi*		NE		X				X
HEMIPTERA	Cicadellidae	*Athysanus argentarius*		NE		X				
HEMIPTERA	Cicadellidae	*Balclutha punctata*		NE					X	
HEMIPTERA	Cicadellidae	*Conosanus obsoletus*		NE		X				
HEMIPTERA	Cicadellidae	*Deltocephalus pulicaris*		NE			X		X	X
HEMIPTERA	Cicadellidae	*Euscelis incisus*		NE			X	X	X	

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
HEMIPTERA	Cicadellidae	*Macrosteles sordidipennis*		NE	NS(Nb)	X	X			
HEMIPTERA	Cicadellidae	*Macrosteles viridigriseus*		NE			X			
HEMIPTERA	Cicadellidae	*Paramesus obtusifrons*		NE		X				
HEMIPTERA	Cicadellidae	*Psammotettix helvolus*		NE		X			X	
HEMIPTERA	Cicadellidae	*Psammotettix putoni*		NE		X				
HEMIPTERA	Cicadellidae	*Streptanus sordidus*		NE			X			
HEMIPTERA	Cixiidae	*Pentastiridius leporinus*		NE	NS(Nb)	X	X			
HEMIPTERA	Delphacidae	*Javesella pellucida*		NE			X			
HEMIPTERA	Delphacidae	*Muirodelphax aubei*		NE		X			X	
HYMENOPTERA	Andrenidae	*Andrena flavipes*	Yellow-legged Mining Bee	NE		X	X		X	X
HYMENOPTERA	Andrenidae	*Andrena labialis*	Large Meadow Mining Bee	NE		X	X		X	

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
HYMENOPTERA	Andrenidae	*Andrena minutula*	Common Mini-miner	NE					X	X
HYMENOPTERA	Andrenidae	*Andrena semilaevis*	Shiny-margined Mini-miner	NE					X	
HYMENOPTERA	Apidae	*Bombus humilis*	Brown-banded Carder Bee	NE	S41		X			X
HYMENOPTERA	Apidae	*Bombus lapidarius*	Red-tailed Bumble Bee	NE			X	X		
HYMENOPTERA	Apidae	*Bombus pascuorum*	Common Carder Bee	NE			X			
HYMENOPTERA	Apidae	*Bombus sylvarum*	Shrill Carder Bee	NE	NS(Nb), S41		X		X	X
HYMENOPTERA	Apidae	*Bombus terrestris*	Buff-tailed Bumblebee	NE			X			
HYMENOPTERA	Apidae	*Ceratina cyanea*	Blue Carpenter Bee	NE	RDB3				X	
HYMENOPTERA	Apidae	*Nomada fucata*	Painted Nomad Bee	NE	NS(Na)		X			
HYMENOPTERA	Chalcidae	*Chalcis biguttata*		NE		X				
HYMENOPTERA	Chrysididae	*Hedychridium roseum*		NE					X	

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
HYMENOPTERA	Colletidae	*Colletes similis*	Bare-saddled Colletes	NE			X			
HYMENOPTERA	Colletidae	*Hylaeus communis*	Common Yellow-face Bee	NE			X			
HYMENOPTERA	Colletidae	*Hylaeus dilatatus*	Chalk Yellow-face Bee	NE					X	
HYMENOPTERA	Crabronidae	*Cerceris quinquefasciata*	Five-banded Weevil Wasp	NE	RDB3, S41				X	
HYMENOPTERA	Crabronidae	*Cerceris rybyensis*		NE					X	
HYMENOPTERA	Crabronidae	*Ectemnius continuus*		NE				X		
HYMENOPTERA	Crabronidae	*Entomognathus brevis*		NE					X	
HYMENOPTERA	Eumenidae	*Ancistrocerus gazella*		NE				X	X	
HYMENOPTERA	Formicidae	*Formica cunicularia*		NE				X	X	
HYMENOPTERA	Formicidae	*Formica fusca*		NE		X		X	X	
HYMENOPTERA	Formicidae	*Lasius niger*		NE		X	X	X		X

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
HYMENOPTERA	Formicidae	*Myrmica scabrinodis*		NE		X	X		X	
HYMENOPTERA	Formicidae	*Ponera coarctata*		NE	NS(Nb)		X	X		
HYMENOPTERA	Halictidae	*Lasioglossum malachurum*	Sharp-collared Flower Bee	NE	NS(Nb)	X	X	X		X
HYMENOPTERA	Halictidae	*Lasioglossum minutissimum*	Least Furrow Bee	NE					X	
HYMENOPTERA	Halictidae	*Lasioglossum morio*	Green Furrow Bee	NE					X	
HYMENOPTERA	Halictidae	*Lasioglossum pauxillum*	Lobe-spurred Furrow Bee	NE	NS(Na)	X	X		X	
HYMENOPTERA	Halictidae	*Sphecodes crassus*	Swollen-thighed Blood Bee	NE	NS(Nb)				X	X
HYMENOPTERA	Halictidae	*Sphecodes rubicundus*	Red-tailed Blood Bee	NE	NS(Na)	X				
HYMENOPTERA	Megachilidae	*Anthidium manicatum*	Wool Carder Bee	NE					X	
HYMENOPTERA	Melittidae	*Dasypoda hirtipes*	Pantaloon Bee	NE	NS(Nb)		X			
HYMENOPTERA	Tenthredinidae	*Pachynematus kirbyi*		NE			X			

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
HYMENOPTERA	Tenthredinidae	*Pachynematus lichtwardti*		NE			X			
LEPIDOPTERA	Crambidae	*Chrysoteuchia culmella*		NE			X		X	
LEPIDOPTERA	Crambidae	*Crambus perlella*		NE		X				
LEPIDOPTERA	Hesperiidae	*Ochlodes sylvanus*	Large Skipper	LC					X	
LEPIDOPTERA	Hesperiidae	*Thymelicus lineola*	Essex Skipper	LC					X	
LEPIDOPTERA	Incurvariidae	*Nemophora fasciella*	Horehound Long-horn	NE	NS(Na), S41		X		X	
LEPIDOPTERA	Lycaenidae	*Polyommatus icarus*	Common Blue	LC					X	
LEPIDOPTERA	Nymphalidae	*Coenonympha pamphilus*	Small Heath	VU	S41		X	X	X	X
LEPIDOPTERA	Nymphalidae	*Lasiommata megera*	Wall	EN	S41				X	
LEPIDOPTERA	Nymphalidae	*Maniola jurtina*	Meadow Brown	LC					X	
LEPIDOPTERA	Nymphalidae	*Melanargia galathea*	Marbled White	LC				X	X	
LEPIDOPTERA	Nymphalidae	*Vanessa cardui*	Painted Lady	LC			X	X		

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
LEPIDOPTERA	Pieridae	*Pieris brassicae*	Large White	LC					X	
LEPIDOPTERA	Pyralidae	*Homoeosoma sinuella*		NE			X		X	
LEPIDOPTERA	Tortricidae	*Celypha striana*		NE			X			
LEPIDOPTERA	Tortricidae	*Dichrorampha petiverella*		NE			X		X	
LEPIDOPTERA	Tortricidae	*Endothenia oblongana*		NE					X	
LITHOBIOMORPHA	Lithobiidae	*Lithobius forficatus*		LC			X	X		X
NEUROPTERA	Chrysopidae	*Chrysoperla carnea*		NE			X		X	
ODONATA	Coenagriidae	*Ischnura elegans*	Blue-tailed Damselfly	LC		X				
OPILIONES	Phalangiidae	*Mitopus morio*		NE						X
OPILIONES	Phalangiidae	*Opilio parietinus*		NE						X
OPILIONES	Phalangiidae	*Opilio saxatilis*		NE		X				X
ORTHOPTERA	Acrididae	*Chorthippus parallelus*	Meadow Grasshopper	LC		X	X	X	X	X

Order	Family	Scientific name	English name	IUCN Status	GB Rarity Status	Compartment				
						1	2	3	4	5
ORTHOPTERA	Conocephalidae	*Conocephalus dorsalis*	Short-winged Conehead	LC		X				
ORTHOPTERA	Phaneropteridae	*Leptophyes punctatissima*	Speckled Bush Cricket	LC					X	

Appendix 2: Invertebrate Status Codes

The new IUCN status codes

Many British invertebrate species have been assigned a formal status code. These codes are paramount in the definition of noteworthy species and accordingly, it is necessary to explain them here.

Natural England has recently instigated a new programme of invertebrate status reviews, in which species are assessed according to universally accepted criteria set by the International Union for the Conservation of Nature (IUCN) (IUCN 2012a, 2012b, 2014). In contrast to previous status assessments, which focussed largely on absolute rarity, the IUCN approach places each species into a threat category that also takes historic population trends into account. Species qualifying for a threat status (Critically Endangered, Endangered or Vulnerable) are those that are not only rare, but also have a history of decline or extreme population fluctuations. Species not assigned to a threat category are categorised as Near Threatened, Least Concern, Data Deficient or Not Applicable.

As of 2016, a total of almost 4000 species have been reviewed in accordance with IUCN guidelines. All of these belong to groups that have readily available identification keys, active recorders and a history of recording. Progress with the IUCN invertebrate status review programme has recently been afforded a very useful summary (Webb & Brown, 2016).

A key to the IUCN status codes is given below and summarised in Fig. 1. (IUCN., 2001)

REGIONALLY EXTINCT (RE)
A taxon is Extinct when there is no reasonable doubt that the last individual has died.

CRITICALLY ENDANGERED (CR)
A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Table 8). Critically Endangered species that are likely to be Extinct, but for which confirmation is still required are reported as Critically Endangered (Possibly Extinct), abbreviated as CR(PE).

ENDANGERED (EN)
A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Table 8).

VULNERABLE (VU)
A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Table 8).

NEAR THREATENED (NT)
A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

LEAST CONCERN (LC)
A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

DATA DEFICIENT (DD)
A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate.

NOT EVALUATED (NE)
A taxon is Not Evaluated when it is has not yet been evaluated against the criteria.

NOT APPLICABLE (NA)

This category is typically used for introduced non-native species whether this results from accidental or deliberate importation. It may also be used for recent colonists (or attempted colonists) responding to the changing conditions available in Britain as a result of human activity and/or climate change. The IUCN regard 1500 as the cut-off date after which a species is classed as ‘non-native’.

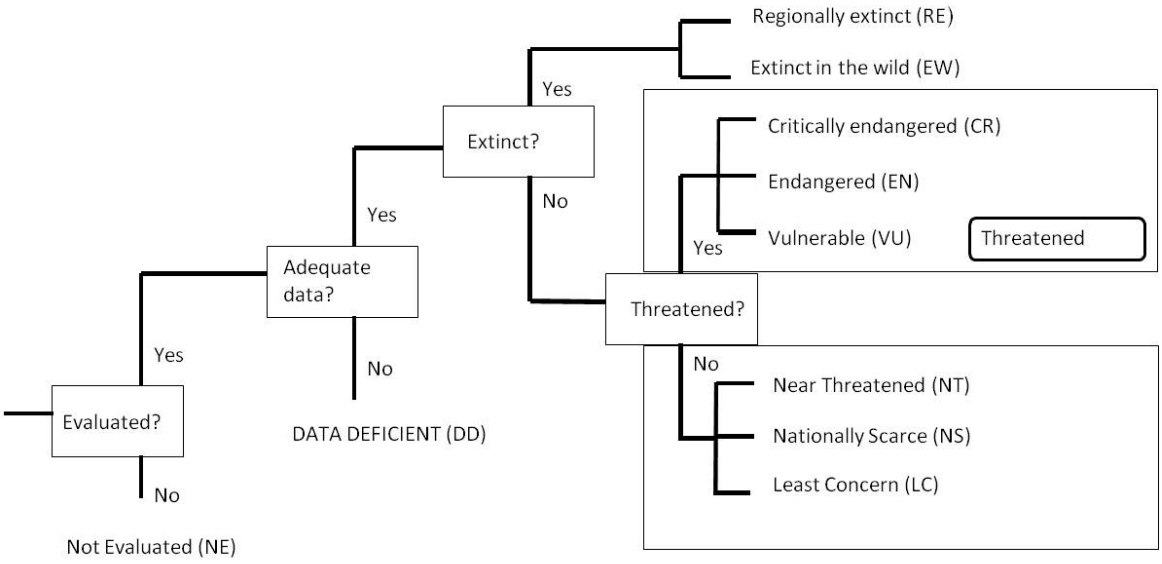

Fig. 1. Hierarchical relationships of the categories (IUCN., 2001) (CC BY Creative Commons Image)

Taxa listed as Critically Endangered, Endangered or Vulnerable are defined as Threatened (Red List) species. For each of these threat categories there is a set of five main criteria A-E, with a number of sub-criteria within A, B and C (and an additional sub-criterion in D for the Vulnerable category), and one of which qualifies a taxon for listing at that level of threat. The qualifying thresholds within the criteria A-E differ between threat categories and are summarised in Table 8.

Table 8. Summary of the thresholds for the IUCN Criteria (IUCN., 2001)

Criterion	Main thresholds		
	Critically Endangered	Endangered	Vulnerable
A. Rapid decline	>80% over 10 years or 3 generations in past or future	>50% over 10 years or 3 generations in past or future	>30% over 10 years or 3 generations in past or future

Criterion	Main thresholds		
	Critically Endangered	Endangered	Vulnerable
B. Small range + fragmented, declining or fluctuating	Extent of occurrence <100 km^2 or area of occupancy <10 km^2 + two of the following: - severely fragmented or only a single location - continuing decline - extreme fluctuations	Extent of occurrence <5,000 km^2 or area of occupancy <500 km^2 + two of the following: - severely fragmented or no more than 5 locations - continuing decline - extreme fluctuations	Extent of occurrence 20,000 km^2 or area of occupancy <2,000 km^2 + two of the following: - severely fragmented or no more than 10 locations - continuing decline - extreme fluctuations
C. Small population and declining	<250 mature individuals, population declining	<2,500 mature individuals, population declining	<10,000 mature individuals, population declining
D. Very small population	<50 mature individuals	<250 mature individuals	D1. <1,000 mature individuals
D2. Very small area of occupancy	Not applicable	Not applicable	D2. <20 km^2 or 5 or fewer locations
E. Quantifiable probability of extinction	>50% within 10 years or three generations	>20% within 20 years or five generations	>10% within 100 years

Current GB rarity codes (IUCN assessed species)

The IUCN reviews also provide an assessment of rarity, based purely on the number of hectads (10km x 10km squares) in which any given species occurs. Two categories are defined:

Nationally Rare (NR)

Species recorded from between 1 and 15 hectads within a given date class when there is reasonable confidence that exhaustive recording would not find them in more hectads.

Nationally Scarce (NS)

Species recorded from between 16 and 100 hectads within a given date class when there is reasonable confidence that exhaustive recording would not find them in more hectads.

Broadly speaking, the Nationally Rare category is equivalent to the Red Data Book categories used by Shirt (1987) and Bratton (1991), namely: Endangered (RDB1), Vulnerable (RDB2), Rare (RDB3) and Insufficiently Known (RDBK). The Nationally Scarce category is directly equivalent to the combined Nationally Notable A (Na) and Nationally Notable B (Nb) categories introduced by the Nature Conservancy Council (Ball, 1986).

Current GB rarity codes (Non-IUCN assessed species)

For species not yet evaluated against the IUCN criteria, the most recent conservation status assessment is given, as specified by the Red Data Book categories (Shirt, 1987; Bratton, 1991) and Nationally Notable categories (Ball, 1986):

RDB1 (Endangered)

Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. These include:

- Species known from only a single locality since 1970.
- Species restricted to habitats that are especially vulnerable.
- Species which have shown a rapid and continuous decline in the last 20 years and are now estimated to exist in 5 or fewer localities.
- Species believed extinct but which would need protection if re-discovered.

RDB2 (Vulnerable)

Taxa believed likely to move into the Endangered category in the near future if the causal factors continue operating. These include:

- Species declining throughout their range.
- Species in vulnerable habitats.
- Species whose populations are low.

RDB3 (Rare)

Taxa with small populations which are not at present endangered or vulnerable but which are at risk. These include:

- Species which are estimated to occur in 15 or fewer localities.

RDBK (Insufficiently known)

Taxa suspected to fall within the RDB categories but which are insufficiently known to enable placement.

RDBi (Indeterminate)

Taxa believed to qualify as either RDB1, RDB2 or RDB3 but which cannot be reliably placed into any category.

pRDB (Provisional)

The prefix ‘p’ before any Red Data Book category implies that the grading is provisional., pending the publication of a future edition of the Red Data Book.

Nationally Scarce species are those falling within the Nationally Notable categories introduced by Ball (1986). They are species that are estimated to occur within the range of 16 to 100 ten-kilometre squares of the British National Grid system since 1970. Notable species are subdivided as follows:

NS (Na)

Species estimated to occur within the range of 16 to 30 10-kilometre squares of the National Grid System, or for less well-recorded groups, within seven or fewer vice counties.

NS (Nb)

Species estimated to occur within the range 31 to 100 10-kilometre squares of the National Grid System, or for less well-recorded groups, between eight and 20 vice counties.

NS (N)

Species which are estimated to occur in 16 to 100 10 km squares in Great Britain. The subdividing of this category into Nationally Scarce A and Nationally Scarce B has not been attempted for some species because of either the degree of recording that has been carried out in the group to which the species belongs, or because there is some other reason why it is not possible to be so exact.

Recent provisional status assessments

Certain poorly recorded Dipteran groups have been subject to recent status assessment which is not based on comparisons of hectad data over two time periods (Falk et. al, 2016). This review uses IUCN status terminology with the added prefix ‘p’ (e.g. pVulnerable and pNationally Scarce) to indicate that these are provisional assessments based on data which would be insufficient for a formal IUCN status review. The category ‘Data Deficient’ (DD) is included).

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