The Lake Lothing (Lowestoft) Third Crossing Order 201[*]

Lake Lothing THIRD CROSSING

Document 6.3: Environmental Statement Volume 3 Appendices

Appendix 11G

Invertebrate Survey

Author: Suffolk County Council

Commissioned by
Mouchel I WSP
Three White Rose Office Park
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TRINITY HOUSE BROWNFIELD AREA LAKE LOTHING, LOWESTOFT

INVERTEBRATE SURVEY REPORT

Report number: CPA 17019

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1 INTRODUCTION AND METHODOLOGY

1.1 Introduction

1.1.1 **Colin Plant Associates (UK)** were commissioned by **Mouchel Ltd.** in May 2017 to undertake an invertebrate survey of Trinity House Brownfield Area, Lake Lothing, Lowestoft.

1.1.2 A previous assessment made by Colin Plant Associates (UK) on 18th April 2017 identified the habitats present as broadly fitting the criteria for Open Mosaic Habitat on Previously Developed Land (OMH). This is now a UK Biodiversity Action Plan (BAP) habitat and is frequently of great importance to invertebrates. Between 12% and 15% of all Nationally Rare and Nationally Scarce invertebrates are recorded from OMH sites, including 30 Species of Principal Importance.

1.1.3 The site is small (0.5 ha) and contains a mosaic of habitats, including bare and sparsely vegetated ground, semi-improved grassland and extensive stands of Common Gorse *Ulex europaeus* that cover much of the site.

1.1.4 The topography is varied and includes a sparsely vegetated embankment along the western margin in which bare sand and gravel is present at the soil surface.

1.1.5 A diverse herbaceous flora is present including various potential invertebrate host plants such as Common Bird's-foot Trefoil *Lotus corniculatus*, Black Medick *Medicago lupulina*, Lucerne *Medicago sativa*, Hare's-foot Clover *Trifolium arvense* and Common Toadflax *Linaria vulgaris*.

1.1.6 The site is known to support one Species of Principal Importance, the Five-banded Weevil Wasp *Cerceris quinquefasciata*, which features prominently on the information board.

1.1.7 The preliminary assessment recommended three days of survey effort between May and July to determine the broad nature of the invertebrate assemblages present and to inform appropriate mitigation in the eventuality of habitat loss due to development. This seasonal coverage coincides with the peak season for aculeate Hymenoptera, including the flight season of the Five-banded Weevil Wasp, *Cerceris quinquefasciata*. This level of survey is in accordance with the minimum specified by Natural England guidelines.

1.2 Survey Constraints

1.2.1 No survey constraints to report.

1.3 Methodology

1.3.1 Invertebrate sampling visits were made on 26th May, 22nd June and 31st July 2017. We regard this as adequate coverage for the site in question.

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

1.3.3 Terrestrial 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.

Beating. A cloth tray, held on a folding frame, is positioned below branches of trees or bushes that are then sharply tapped with a stick to dislodge insects. This technique is effective in obtaining arboreal species, including many beetle groups, true bugs, caterpillars of Lepidoptera, spiders and others.

Suction Sampling. A garden vacuum with a mesh bag fitted inside the inlet pipe is used to collect samples from low vegetation and the ground surface by suction. The sample is then everted into a large net bag or white trays for examination. The advantage of suction sampling is that it quickly collects strongly ground dwelling species which do not fly or ascend the vegetation readily, as well as species which live in deep, structurally complex habitats such as dense grass tussocks and reed beds, which are difficult to sample by other methods. It is particularly productive for certain groups of beetles, true bugs and spiders.

Grubbing/hand searching. Important host plants may be searched by hand. This is particularly useful for species that 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, 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.

2 INVERTEBRATE SPECIES

2.1 Summary

2.1.1 Appendix 1 details the complete list of terrestrial insect taxa encountered during the survey; a total of 207 species was recorded. The list is annotated with formal conservation status codes that are explained in Appendix 2.

2.1.2 The list is also annotated with the primary ecological associations of each species, where known. This allows species with differing habitat affinities to be immediately discerned.

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: *http://jncc.defra.gov.uk/page-5169*.

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

Five-banded Weevil Wasp *Cerceris quinquefasciata* S41 RDB3 is a medium-sized yellow and black solitary wasp that 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 confined to southern and eastern England and is found mainly 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 other scattered 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. A single female *C. quinquefasciata* was found in association with exposed sand close to the western embankment during the June visit (Fig. 1) and another in the same location during the July visit.

Fig. 1. The area of exposed sandy soil where *C. quinquefasciata* was recorded.

Small Heath *Coenonympha pamphilus* NT S41 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 is formally regarded as being "Near Threatened". 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. Several butterflies were recorded throughout the site.

Former UK Biodiversity Action Plan (UK BAP) "Research only" moth species

2.2.6 The original list of UK Biodiversity Action Plan Priority Species of butterflies and moths was divided into two sections. In the first, a total of 81 species are afforded the status of UK BAP Priority

Species; none of these are recorded in the surveyed area and none are likely to be present. The second section is a list of 69 species that have declined in population strength by a significant amount in the past 25 years. These were defined as "not yet rare" and were flagged as UK BAP species "**for research only**".

2.2.7 It is unfortunate that this "Research Only" list has been incorporated into the current priority listing process and that these species are now, therefore, of statutory interest. Some bodies now specifically recommend that these species are excluded from an appraisal of Section 41 and Section 42 species and this is a view with which we fully agree. Unfortunately, the species are not listed separately so that non-specialists are unable to discern them.

2.2.8 At the site under discussion here we have recorded one such "Research Only" moth species:

Cinnabar *Tyria jacobaeae* S41 is a moth found in various open and disturbed habitats, the larvae feeding on ragworts *Senecio* species, especially Common Ragwort *S. jacobaea*. It is widespread throughout much of England and Wales, although rather local and mainly coastal in the southern half of Scotland. Several larvae were recorded on ragwort during the July visit.

Nationally Rare / Red Data Book species

2.2.9 The following 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 present survey (see Appendix 2):

***Lygus pratensis* RDB3** is a true bug that feeds on various species of Asteraceae. 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. Several were swept from tall ruderal vegetation.

Nationally Scarce Species

2.2.10 The following Nationally Scarce species were recorded by the present survey (see Appendix 2):

***Alydus calcaratus* NS** is a true bug found in various open habitats including heathland, sand dunes, coastal cliffs and brownfield sites, but the ecology of this species remains poorly understood. Nymphs resemble ants and the species is presumably myrmecophilous. Adults are probably phytophagous, but there are no clear food plant associations. It is a local species in southern and central England and parts of Wales. Several adults were recorded in sparsely vegetated grassland during the June and July visits.

Cryptic Leatherbug *Bathysolen nubilus* NS is a true bug found in sparsely vegetated habitats on sand or chalk. Adults and larvae are strongly ground dwelling and associated with medicks, particularly Black Medick *Medicago lupulina*. It is a local species in southern England and East Anglia. Several adults were swept from sparsely vegetated ground during the July visit.

***Amara montivaga* NS** is a ground beetle found in various dry, open, sparsely vegetated habitats on sandy or chalky soils. It is a very local species outside southeast England and absent from much of Wales, northern England and Scotland. A single example was found on exposed sand on the western embankment during the June visit.

***Protapion filirostre* NS (Nb)** is a small ground dwelling weevil associated with medicks and lucerne, in particular Black Medick *Medicago lupulina*. Found locally in southern and central England in dry

grasslands and sparsely vegetated early successional habitats, often on calcareous soils. A single adult was swept from swept from sparsely vegetated ground during the July visit.

Protapion dissimile **NS (Nb)** is a small ground dwelling weevil associated with Hare's-foot Clover *Trifolium arvense* in dry, sandy habitats, the larvae developing in the flower heads. It is a local species in England and Wales. Several adults were swept from swept from sparsely vegetated ground during the July visit.

Glocianus punctiger **NS (Nb)** is a weevil associated with various dandelions including *Taraxacum officinale*, the larvae feeding in the receptacles of flowers. Found in various open disturbed habitats, including grasslands, field margins and brownfield sites. It is widespread but local in England and Wales. An adult was swept from areas of semi-improved grassland during May.

Curculio rubidus **NS (Nb)** is a weevil associated with birches *Betula*, usually in open situations on heathland, breckland and in acid grassland. A local species confined to southeast and central England. There is no suitable breeding habitat for this species on site and the record presumably relates to a dispersing individual.

Tychius pusillus **NS (Nb)** is a weevil associated with clovers, in particular Lesser Trefoil *Trifolium dubium*, the larvae feeding in the flower heads and pupating in the soil. Found in various open disturbed habitats, including grassland, field margins, roadside verges and sandpits. Although it can sometimes be found in abundance, its range is restricted to southern England. An adult was recorded by suction sampling during the May visit.

Plateumaris bracata **NS** is a leaf beetle associated with Common Reed *Phragmites australis* at the edge of standing water. Adults feed on young leaf shoots, larvae on rhizomes. It is a very local species in central and southern England. The main strongholds are the Norfolk Broads and Somerset Levels. A single adult was recorded on 22nd June during a period of very warm weather. There is no suitable breeding habitat for this species on site and the record presumably relates to a wandering individual from the extensive areas of reed bed present in the wider landscape.

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. Several were observed on the sparsely vegetated ground.

Large Gorse Mining Bee *Andrena bimaculata* **NS (Nb)** is a ground-nesting solitary bee, found widely but locally across southern and central England on lowland heathland and in other habitats with sparsely vegetated sandy soils. The spring generation is often particularly associated with Gorse as a pollen source. This species was in association with exposed sand close to the western embankment during the May visit.

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 very local inland and in the west of its range. This species was found in association with exposed sand close to the western embankment during the June visit.

Lasius brunneus **NS (Na)** is an ant that nests in mature trees, in particular oaks, although nests have also been found in stumps, hedgerows and timber-framed buildings. The species is much more widespread than it was historically and is now found throughout central and southern England. It

probably no longer warrants a conservation status. This species was recorded on the woodpile and is rather an unexpected site record given that no mature trees are present.

2.3 The overall invertebrate community

2.3.1 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 the remaining species.

2.3.2 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 www.brc.ac.uk/pantheon. 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.

2.3.3 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.

2.3.4 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.

2.3.5 The Pantheon assemblage types are defined by lists of characteristic species that are generally found together in nature and are termed 'Habitats' (previously known as 'Broad Assemblage Types' (BATs) in ISIS).

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

2.3.7 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. The use of SATs is restricted to Natural England Common Standards Monitoring on SSSIs.

2.3.8 Pantheon provides the following scoring systems for Habitats, Resources and SATs:

- A total count of species in each category.
- The number of species represented in each category that have a conservation status.
- The number of species belonging to each category as a percentage of the total number of species belonging to each category.
- A Species Quality Index (SQI) score is given 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 is equal to the sum of all SQS scores

divided by the number of species. This score is then multiplied by 100 to give a 3-figure value without decimal places (e.g. 100 rather than a 1.00).

2.4 Pantheon output

Table 1. Pantheon Habitat scores

Broad biotope	Habitat	No. of species	% representation	SQI	Species with conservation status	Conservation status
open habitats	tall sward & scrub	107	4	106	2	Nb|Section 41 Priority Species - research only
open habitats	short sward & bare ground	63	5	149	10	RDB 3|Nb|Nb|NS|NS|Nb|NS|Nb|Nb|NT|Section 41 Priority Species|Section 41 Priority Species
tree-associated	arboreal	6	<1	N/A	1	Nb
tree-associated	decaying wood	3	<1	N/A	1	Na
tree-associated	shaded woodland floor	2	<1	N/A		
wetland	peatland	2	<1	N/A	1	NS
wetland	marshland	1	<1	N/A		

2.4.1 Table 1 shows the Pantheon habitat scores for the site.

2.4.2 As expected for a site lacking tree cover, the vast majority of species recorded were associated with open habitats.

2.4.3 Within this broad biotope, more species were associated with tall sward and scrub than with short sward and bare ground.

2.4.4 However, the highest SQI score corresponded to 'short sward and bare ground' (SQI = 149), suggesting that the invertebrate assemblage associated with this type of habitat has the highest conservation value.

2.4.5 Natural England suggest that an SQI score of 150 is the approximate threshold corresponding to a 'good' site which supports a regionally important invertebrate fauna.

3 DISCUSSION AND RECOMMENDATIONS

3.1 Overview

3.1.1 Many recently disturbed sites in southeast England are well known to support a higher than usual invertebrate interest. For example, the nationally important Thames Terrace invertebrate fauna found in the East Thames corridor is associated with a unique combination of climatic, geographic, geological and ecological factors, which have only been recognised in recent years.

3.1.2 The invertebrate fauna present on the Trinity House Brownfield Area is close to being regarded as regionally important on the basis of the assemblage dependent on bare ground and short sward habitat.

3.1.3 However, given the small size of the site and the limited nature of the OMH resource present, we believe that the populations of associated bare ground invertebrates are likely to be small and highly vulnerable to habitat loss and changes in habitat quality.

3.1.4 In particular, the extent of suitable nesting habitat for the Five-banded Weevil Wasp *Cerceris quinquefasciata* and other aculeate Hymenoptera is restricted to the western edge of the site comprising the embankment and adjacent area shown in Fig. 1.

3.1.5 Much of the central and southern section of the site is occupied by Common Gorse *Ulex europaeus*. This is a valuable resource for invertebrates, providing an important pollen and nectar resource, as well as shelter and overwintering sites and also acting as a direct food source for numerous species. The current survey recorded eight species that feed on the foliage (see Appendix 1).

3.2 Recommendations

3.2.1 However, the stands of gorse referenced in 3.1.5 are dense and are beginning to dominate the site. We recommend that rotational clearance of areas of gorse would be the best way of increasing the amount of bare ground present and maintaining the OMH resource.

3.2.2 Existing early-successional habitat should be maintained by periodic scraping to reset succession, in the absence of any other physical disturbance such as rabbit grazing. This would extend its value to ground-dwelling invertebrates in the longer term.

4 REFERENCES CITED IN THE PREPARATION OF THIS REPORT AND APPENDICES

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APPENDIX 1: TERRESTRIAL INVERTEBRATE SPECIES RECORDED

National status codes are explained in Appendix 2.

Group / species	English name	IUCN Status	GB rarity Status	Associations / Ecology
ARANEAE	**SPIDERS**			
Araneidae				
Araneus diadematus	Garden Spider	LC		bushes, trees and man-made structures in gardens, also woodland edges. Widespread throughout Britain
Araneus quadratus		LC		tall grassland and low scrub. Widespread and common.
Argiope bruennichi	Wasp Spider	LC		in tall, unmanaged grassland. Southern and central England.
Lycosidae				
Arctosa perita		LC		dry heaths and sandy places. Widespread but local.
Pardosa palustris		LC		in dry habitats. Common and widespread throughout much of Britain
Philodromidae				
Philodromus aureolus		LC		on trees and bushes. Common and widespread throughout much of Britain
Philodromus cespitum		LC		on trees and bushes. Common and widespread throughout much of Britain
Salticidae				
Heliophanus flavipes		LC		on low vegetation on rough, open ground. Widespread and common in southern England, but scarce in the north.
Thomisidae				
Xysticus cristatus		LC		on the ground or in low vegetation. Common and widespread throughout much of Britain
COLEOPTERA	**BEETLES**			
Apionidae	**Weevils (part)**			
Exapion ulicis		NE		Widely distributed and often very abundant on gorse across Britain
Holotrichapion pisi		NE		in vegetative buds of Medicago sp. Mainly southern species
Ischnopterapion loti		NE		on Lotus corniculatus and Lotus tenuis in various habitats. Common and widespread
Protapion apricans		NE		in seed heads of red clovers - various Trifolium spp. Very common
Protapion assimile		NE		in flowerheads of Trifolium spp. throughout Britain
Protapion dissimile		NE	NS(Nb)	on Trifolium arvense in sandy habitats. Local in England and Wales
Protapion filirostre		NE	NS(Nb)	Local in southern England in dry, open habitats on medicks.
Protapion trifolii		NE		in flowerheads of Trifolium spp., especially T. pratense. Widespread in England and Wales
Cantharidae	**Soldier beetles**			
Cantharis rustica		LC		various lowland grasslands. Predatory. Widespread throughout Britain

Carabidae	**Ground beetles**			
Amara aenea		LC		in dry grasslands, gardens, dunes and waste land
Amara lunicollis		LC		in most open or semi-open habitats, especially if well drained though not too dry
Amara montivaga		LC	NS	in open, sandy or chalky sites with ruderal vegetation
Amara ovata		LC		in open, dry fields and gardens
Amara tibialis		LC		in sand pits, dry heaths, dunes and welldrained open ground
Bembidion properans		LC		on dry, open clay soils
Curtonotus aulicus		LC		in almost all open. Dry habitats where there is harbaceous vegetation and seed
Harpalus latus		LC		in dry grasslands and upland heaths
Harpalus rufipes		LC		in open, dry situations on light soils, especially arable fields
Microlestes minutulus		LC		on sandy and gravelly soils, often in open situations
Paradromius linearis		LC		in dry grasslands, arable fields and dunes
Cerambycidae	**Longhorn beetles**			
Clytus arietis		NE		larvae in dead branches of deciduous treees; adult a wasp mimic; visits fllowers
Chrysomelidae	**Leaf beetles**			
Bruchidius varius		NA		Various habitats; adults feed mainly on pollen of clovers, larvae probably within clover seeds
Bruchus rufimanus		LC		Various habitats; adults feed on pollen of various plants, larvae develop within seeds of bean plants
Bruchus rufipes		LC		Various habitats; adults feed on pollen of various plants (mainly Fabaceae), larvae develop within seeds of host plants
Longitarsus flavicornis		LC		Various habitats; adults feed on the leaves of ragworts Senecio, larvae develop at the roots
Longitarsus pratensis		LC		Wide range of habitats; adults and larvae feed on leaves of plantains Plantago
Phyllotreta atra		LC		Wide range of habitats; adults feed on the leaves of many Brassicaceae, larvae feed on the roots
Phyllotreta nigripes		LC		Wide range of habitats; adults feed on the leaves of many Brassicaceae, larvae feed on the roots
Plateumaris bracata		LC	NS	on Common Reed in wetlands. Very local in central and southern England.
Sphaeroderma testaceum		LC		Wide range of habitats; adults feed on leaves of Asteraceae especially thistles Cirsium and Carduus, larvae mine leaves
Coccinellidae	**Ladybirds**			
Coccinella septempunctata	7-spot ladybird	NE		a ubiquitous species
Exochomus quadripustulatus	Pine ladybird	NE		not restricted to pine, common on a variety of plants in all habitats including urban
Hippodamia variegata	Adonis' ladybird	NE	NS(Nb)	a coastal species, inhabiting dune systems, but increasingly on dry inland sites
Propylea 14-punctata	14-spot ladybird	NE		a ubiquitous species
Psyllobora 22-punctata	22-spot ladybird	NE		on low vegetation in grassland habitats - feeds on mildews on leaves
Scymnus frontalis		NE		on low plants in heathland and other dry habitats

				on chalky or sandy soils
Curculionidae	**Weevils (part)**			
Andrion regensteinense		NE		on flowers and foliage of gorse and broom. Widespread and locally common.
Anthonomus rubi		NE		Develops in fruits of bramble, raspberry and strawberry. Widespread and common.
Ceutorhynchus obstrictus		NE		on a range of Brassicaceae. Widely distributed and common.
Ceutorhynchus pallidactylus		NE		on a range of Brassicaceae. Widely distributed and common.
Ceutorhynchus typhae		NE		on a range of Brassicaceae. Widely distributed and common.
Curculio rubidus		NE	NS(Nb)	on birch. Local in south-east and central England
Glocianus punctiger		NE	NS(Nb)	various open habitats on Taraxacum spp. Local in southern Britain
Hypera nigrirostris		NE		on Trifolium, usually T. pratense. Common throughout Britain.
Hypera postica		NE		favours black meddick Medicago lupulina in open habitats. Widespread in England and Wales
Hypera venusta		NE		on Anthyllis vulneraria and species of Ulex. Widespread in England and Wales, local further north
Mecinus pascuorum		NE		on Plantago lanceolata. Widespread and often common.
Mecinus pyraster		NE		feeds on common species of plantain in grassy places. Widespread and common.
Otiorhynchus ovatus		NE		on the ground at the roots of various plants in fairly dry places. Widely distributed and generally fairly common.
Rhinoncus pericarpius		NE		on knotgrass and docks in dry situations. Widespread in England and Wales, local further north
Rhinusa antirrhini		NE		in flowers of toadflax. Local throughout Britain
Sitona hispidulus		NE		on various leguminous plants, including clovers. Widespread in England and Wales, local further north
Sitona humeralis		NE		various open habitats, primarily associated with Medicago species. Local in England and Wales
Sitona lepidus		NE		associated with leguminous plants, including clovers. Widespread in England and Wales, local further north
Sitona lineatus		NE		on most species of leguminosae mainly in grassland. Very common and widespread
Sitona sulcifrons		NE		on various legumes including red clover Trifolium pratense. Widespread throughout Britain
Trichosirocalus troglodytes		NE		on ribwort plantain Plantago lanceolata. Widespread and common throughout much of Britain
Tychius picirostris		NE		in grassy places on white clover Trifolium repens. Widespread in England and Wales, local further north
Tychius pusillus		NE	NS(Nb)	various open habitats on clovers. Local in southern England
Elateridae	**Click beetles**			
Agriotes sputator		NE		larvae develop in grass roots. Common in the south; local north of the Midlands.

Histeridae				
Kissister minimus		NE		at plant roots (often Sheep's Sorrel Rumex acetosella) on dry sandy or stony soils
Kateretidae				
Brachypterolus pulicarius		NE		in the flowers of common toadflax, feeding on the pollen. Common and widespread.
Malachiidae	**Malachite beetles**			
Anthocomus rufus		LC		Associated with areas of fen vegetation, and the adults are said to live on late-flowering sedges.
Cordylepherus viridis		LC		Adults feed on pollen and nectar; larvae in dead stems. Widespread in England; coastal in Wales
Mordellidae				
Mordellistena pumila		LC		in various open habitats, larvae devoping in thistles. Widespread in southern Britain
Nitidulidae				
Meligethes aeneus		NE		A small pollen beetle. Very common species, feeding in a very wide variety of Brassicaceae
Oedemeridae				
Oedemera lurida		LC		The larvae develop in the old stems of various plants. Widespread and common throughout England and Wales
Oedemera nobilis		LC		The larvae develop in the old stems of various plants. Widespread and common throughout England and Wales
Phalacridae				
Olibrus affinis		NE		larvae develop on various composites, particularly Tragopogon and Hypochaeris, adults feeding on pollen. Primarily southern
Rynchitidae	**Weevils (part)**			
Tatianaerhynchites aequatus		NE		on roasaceous shrubs including hawthorn and blackthorn, larvae in fruits. Widespread in southern Britain
Staphylinidae	**Rove beetles**			
Gyrohypnus angustatus		NE		in leaf litter, under stones and in ants' nests. Widespread and common.
Stenus nanus		NE		a wide variety of open dry habitats including dunes, grassland, grassy heaths and gardens
Stenus ossium		NE		damp habitats in, grassland, dunes, and marshy but rarely in very wet areas
DIPTERA	**FLIES**			
Asilidae	**Robber flies**			
Leptogaster cylindrica		NE		predatory; dry grassland, larvae in sandy soil. Widespread in southern Britain
Sciomyzidae	**Snail-killing flies**			
Pherbellia cinerella		NE		in grasslands and wetlands, larvae are parasitoids of snails. Widespread throughout Britain.
Stratiomyidae	**Soldier flies**			
Chloromyia formosa		NE		woods, hedges, parks and gardens, larvae in rotting vegetable matter in damp soil, rotting bark and leaf litter. Widespread throughout much of Britain
Syrphidae	**Hoverflies**			
Eupeodes corollae		LC		gardens, grassland, hedgerows and woodland edge. Larvae predatory on aphids. Widespread

				throughout Britain
Melangyna umbellatarum		LC		woodland rides and scrubby grassland, larvae predatory on aphids. Widespread in southern Britain
Melanostoma mellinum		LC		grassy places throughout Britain. The larvae are predatory on aphids.
Melanostoma scalare		LC		grassy places throughout Britain but scarce in the uplands. The larvae feed on aphids.
Paragus haemorrhous		LC		short grassland and sparsely vegetated, dry situations, larvae are predatory on aphids. Widespread throughout southern Britain
Pipizella viduata		LC		various dry habitats, associated with various root aphids. Widespread throughout Britain
Platycheirus angustatus		LC		wet grassland and marshes, larvae predatory on aphids. Widespread throughout Britain
Platycheirus clypeatus		LC		damp grassland, marshes and bogs, alrvae are predatory on aphids. Widespread and common throughout Britain
Sphaerophoria scripta		LC		various grasslands, larvae feeding on aphids on herbaceous plants. Widespread in southern Britain
Syritta pipiens		LC		various habitats including urban areas, larvae develop in rotting organic matter. Widespread throughout Britain
Volucella bombylans		LC		various habitats, larvae scavenge in the nests of social wasps. Widespread throughout Britain
Tachinidae				
Eriothrix rufomaculata		NE		various grassland habitats, parasitic on the crambid moth Crysoteuchia culmella. Generally distributed and very common.
Tephritidae	**Picture-winged flies**			
Campiglossa misella		NE		open habitats, larvae in the flowering spike of Artemesia vulgaris. Widespread throughout Britain
Chaetorellia jaceae		NE		various grasslands, larvae in the flower-heads of Centaurea nigra and probably C. debeauxii. Widespread in southern and central England
Sphenella marginata		NE		open habitats, larvae in the flowerheads of Senecio species. Local
Tephritis divisa		NE		open habitats, larvae in the flower head of Picris echioides. Southern England
Tephritis formosa		NE		open habitats, larvae in a swelling in the capitula of Sonchus species. Southern Britain
Tephritis vespertina		NE		various open habitats, larvae form a gall in the flower head of Hypochoeris radicata. Throughout Britain
Urophora quadrifasciata		NE		various grasslands, larvae develop in the flower head of Centaurea nigra and probably C. debeauxii. Southern Britain
Urophora stylata		NE		various grasslands, larvae in a gall formed in the flower head of thistles. Widespread in southern Britain
Thereva bipunctata		NE		coastal dunes and inland sands. Widespread throughout Britain
Tipulidae	**Craneflies**			
Nephrotoma flavescens		NE		dry, open grasslands, larvae feeding on roots. Widespread throughout Britain

Ulidiidae				
Herina lugubris		NE		various habitats including dunes, dry calcareous grassland, cliff seepages, woodland rides and acidic marsh. More common in the south.
HEMIPTERA	**TRUE BUGS**			
Aphrophoridae	**Froghoppers**			
Neophilaenus campestris		NE		on grasses in dry open habitats.
Neophilaenus lineatus		NE		on grasses in a wide range of habitats.
Philaenus spumarius	Common Froghopper	NE		Ubiquitous on a very wide range of herbaceous plants
Cicadellidae	**Leafhoppers**			
Anaceratagallia ribauti		NE		Strongly ground-dwelling. In dry grasslands on various herbs including Plantago
Eupelix cuspidata		NE		strongly terrestrial. In dry grasslands
Euscelis incisus		NE		on various grasses in a wide range of situations
Delphacidae	**Planthoppers**			
Javesella pellucida		NE		on grasses in a wide range of situations
Alydidae				
Alydus calcaratus		LC	NS	Various open habitats. Local in England and parts of Wales
Anthocoridae	**Flower bugs**			
Orius niger		NE		Predatory species, on various trees and herbaceous species
Berytidae	**Stilt bugs**			
Berytinus minor		NE		Polyphagous on a range of herbaceous plants
Coreidae	**Leatherbugs**			
Bathysolen nubilus	Cryptic Leatherbug	LC	NS	Sparsely-vegetated habitats, associated with Black Medick
Coreus marginatus	Dock Bug	LC		Grasslands and ruderal habitats, feeding principally on Rumex, but other species of Polygonaceae are also used
Coriomeris denticulatus	Denticulate Leatherbug	LC		Mainly ground-dwelling. Sparsely-vegetated dry grasslands and ruderal habitats, principally on Medicago and other legumes
Syromastus rhombeus	Rhombic Leatherbug	LC		Dry grasslands and ruderal habitats on Carophyllaceae, including Spergula, Arenaria, Cerastium, Stellaria and Silene
Lygaeidae	**Ground bugs**			
Cymus claviculus		NE		On various rushes and sedges, in particular Juncus bufonius
Ischnodemus sabuleti		NE		Polyphagous on a range of grasses
Kleidocerys resedae		NE		On Betula, Alnus and occasionally Rhododendron
Megalonotus chiragra		NE		Strongly ground-dwelling. Dry grasslands and sparsely vegetated habitats.
Stygnocoris fuligineus		NE		Strongly ground-dwelling. Dry grasslands, probably polyphagous.
Miridae	**Plant bugs**			
Adelphocoris lineolatus		NE		On a range of Fabaceae in dry and damp grasslands. Adults also feed on Asteraceae
Asciodema obsoleta		NE		On Ulex europaeus

Calocoris roseomaculatus		NE		On a range of Fabaceae and Asteraceae in dry, open habitats on chalky and sandy soils
Capsus ater		NE		Dry grassland, polyphagous on a range of grasses
Closterotomus norwegicus		NE		Polyphagous on various herbaceous plants in various open habitats
Leptopterna dolabrata		NE		Ubiquitous in various grassland habitats and polyphagous on a range of grass species
Lopus decolor		NE		Dry grasslands, probably polyphagous on a range of grass species
Lygus pratensis		NE	RDB3	In dry open habitats on a range of Asteraceae
Megaloceroea recticornis		NE		In dry grasslands; polyphagous on a range of grass species
Notostira elongata		NE		Polyphagous on various grasses
Orthops basalis		NE		On various species of Apiaceae
Orthops campestris		NE		On various species of Apiaceae
Phytocoris varipes		NE		Dry grasslands, polyphagous on a range of grasses and herbaceous plants
Platycranus bicolor		NE		On Ulex europaeus
Stenodema calcarata		NE		Polyphagous on various grasses
Stenodema laevigata		NE		Polyphagous on various grasses
Stenotus binotatus		NE		Polyphagous on various grasses
Nabidae	**Damsel bugs**			
Himacerus mirmicoides		NE		Strongly ground-dwelling. Predatory species in a range of dry, open habitats, often with sparse vegetation
Pentatomidae	**Shieldbugs**			
Aelia acuminata	Bishop's Mitre Shieldbug	LC		Dry grasslands, polyphagous on a range of grass species
Piezodorus lituratus	Gorse Shieldbug	LC		On woody Fabaceae in a variety of open habitats, particularly Ulex and Genista
Rhopalidae				
Chorosoma schillingi		LC		Dry grasslands and sand dunes, polyphagous on grasses
Stictopleurus punctatonervosus		NA		Ruderal habitats, polyphagous on a range of composites
HYMENOPTERA				
Andrenidae	**Bees (part)**			
Andrena bimaculata		NE	NS(Nb)	Widespread but local across southern and central England on lowland heathland and in other habitats with sparsely vegetated sandy soils
Andrena flavipes		NE		various habitats on light soils; nesting in large but very compact aggregations in the groud. Double brooded. Locally common in southern Britain.
Andrena minutula		NE		nests in the ground in a range of open, particularly disturbed, sites. Double brooded. Widespread and common.
Andrena scotica		NE		nests in soil in a wide variety of habitats. Widespread throughout Britain.
Apidae	**Bees (part)**			
Bombus lapidarius		NE		Various habitats, nesting underground. Very widespread and common throughout Britain.
Bombus pascuorum		NE		Various habitats, nesting under dense vegetation.

				Very common and widespread throughout Britain.
Nomada goodeniana		NE		cuckoo bee of various species of Andrena, including A. nigroaenea. Common and widely distributed.
Halictidae	**Bees (part)**			
Halictus tumulorum		NE		a ground-nesting species, exploiting various habitats on light soils. Widespread and common.
Lasioglossum leucozonium		NE		favours sandy habitats such as dunes and heaths, nesting on bare slopes or paths. Widespread but local in southern Britain.
Sphecodes monilicornis		NE		cuckoo bee of Halictus rubicundus, Lasioglossum calceatum and L. albipes. Widespread but local in southern Britain.
Sphecodes pellucidus		NE		cuckoo bee of Andrena barbilabris. Widespread but local throughout England and Wales
Sphecodes puncticeps		NE		cuckoo bee of various Lasioglossum species. Widespread but local in southern and central England.
Megachilidae	**Bees (part)**			
Coelioxys conoidea		NE		cuckoo bee of Megachile maritima. Mainly coastal in southern England and south Wales
Osmia bicornis		NE		various habitats including urban areas and gardens, nesting in holes. Widespread throughout Britain.
Osmia caerulescens		NE		various habitats including urban areas, nesting in holes. Widespread but local in southern Britain.
Melittidae	**Bees (part)**			
Dasypoda hirtipes		NE	NS(Nb)	various open habitats on sandy soils. Local in southern Britain and predominantly coastal
Crabronidae	**Wasps (part)**			
Cerceris arenaria		NE		sandy habitats, nesting in the soil and stocking the burrow with weevils. Widespread in southern Britain
Cerceris quinquefasciata	Five-banded Weevil Wasp	NE	RDB3, S41	various open habitats on sandy soils. Rare in southern and eastern England.
Cerceris ruficornis		NE		sandy soils, nest stocked with weevils. Local on lowland and coastal heaths of southern England
Entomognathus brevis		NE		open sandy habitats, nesting in soil and stocking the burrow with chrysomelid beetles. Local in southern England
Harpactus tumidus		NE		various sandy habitats, nesting in soil and stocking the burrow with leafhopppers and froghoppers. Widespread but local
Pemphredon inornata		NE		various habitats, nest in dead wood and stems. Prey aphids. Widespread but local in Britain
Tachysphex pompiliformis		NE		various open habitats, nests in dry sandy soil. Prey grasshopper nymphs. Widespread in much of Britain
Sphecidae	**Wasps (part)**			
Ammophila sabulosa		NE		various dry open habitats, nesting in the gound and stocking the burrow with caterpillars. Locally common in southern Britain
Tiphiidae	**Wasps (part)**			
Tiphia femorata		NE		various open habitats on light soils. Stocks nest with larvae of scarabaeid beetles. Locally common in southern Britain
Pompilidae	**Spider-hunting**			

	wasps			
Arachnospila anceps		NE		sandy habitats, stocks the nest with ground-dwelling spiders. Widespread in southern England and occurring north to Scotland.
Formicidae	**Ants**			
Formica fusca		NE		various open habiats. Common throughout southern Britain, but rare in Scotland.
Lasius brunneus		NE	NS(Na)	nests in mature trees, in particular oaks. Mainly central and southern England.
Lasius niger		NE		numerous habitats including gardens. Widely distributed, but absent from some parts of Scotland.
Ichneumonidae				
Ichneumon sarcitorius		NE		
Cephidae	**Sawflies (part)**			
Cephus spinipes		NE		Common in southern England but much more scarce in the north. The larvae are stem borers of various common grasses.
Tenthredinidae	**Sawflies (part)**			
Athalia cordata		NE		Larvae on Ajuga reptans, Antirrhinum and Plantago sp. One of the commnest sawflies throughout Britain.
Athalia rosae		NE		Larvae periodically a pest of turnips, radish and other Cruciferae. Population fluctuates but commonest in southern Britain.
Tenthredopsis coqueberti		NE		
ISOPODA				
Armadillidiidae	**Woodlice**			
Armadillidium vulgare		LC		In most habitats in south-eastern England but more restricted further north.
LEPIDOPTERA	**Butterflies & Moths**			
Coleophoridae				
Coleophora trifolii		NE		various open habitats, larvae feed on Ribbed Melilot. Widespread in England
Crambidae				
Crambus lathoniellus		NE		various grasslands, larvae feed on grasses. Widespread throughout Britain
Eudonia pallida		NE		Frequents marshes, fens and bogs, the larva possibly feeding on mosses or lichens. Widely distributed in Britain.
Erebidae				
Tyria jacobaeae	Cinnabar	NE	S41	various open habitats; larvae on ragworts. Widespread througout much of Britain
Glyphipterigidae				
Glyphipterix simpliciella	Cocksfoot Moth	NE		Grasslands, larvae feed on Dactylis glomerata. Adults visit buttercups. Widespread throughout Britain
Hesperiidae				
Thymelicus lineola	Essex Skipper	LC		various open habitats, larvae feed on grasses, Widespread in southeast and central England
Lycaenidae				

Callophrys rubi	Green Hairstreak	LC		various open habitats on acid and calcarerous soils. Larvae feed on numerous plants including Ulex, Lotus and Helianthemum. Local throughout Britain
Polyommatus icarus	Common Blue	LC		various open habitats. larvae feed on various herbaceous legumes. Widespread throughout Britain
Nymphalidae				
Aglais io	Peacock	LC		various habitats, larvae feed on Urtica dioca. Widespread throughout Britain
Coenonympha pamphilus	Small Heath	NT	S41	various open habitats; larvae on fine-leaved grasses. Widespread throughout Britain.
Maniola jurtina	Meadow Brown	LC		various grasslands, very common throughout Britain
Pieridae				
Pieris brassicae	Large White	LC		various habitats, larvae feed on Brassicaceae. Widespread throughout Britain
Pyralidae				
Homoeosoma sinuella		NE		various dry open habitats, larvae feeding in the roots of plantains. Southern and central England and south Wales
Tortricidae				
Cydia ulicetana		NE		larvae feed on Gorse. Widespread throughout Britain
Endothenia marginana		NE		Larvae on Betonica, Galeopsis, Pedicularis or Rhinanthus, feeding on the seeds. Widespread and locally abundant.
Grapholita compositella		NE		grassland, larvae feed on the leaves, flower-heads and in the stem of Trifolium species.Widespread in England and Wales
Zygaenidae				
Zygaena filipendulae	Six-spot Burnet	NE		various open habitats; larvae on Lotus corniculatus. Widespread and common in England and Wales, coastal in Scotland.
NEUROPTERA	**LACEWINGS**			
Chrysopidae				
Chrysoperla carnea		NE		various habitats including gardens. Larvae are active predators on the foliage of shrubs and trees. Widespread throughout Britain
ORTHOPTERA	**GRASSHOPPERS & BUSHCRICKETS**			
Acrididae				
Chorthippus albomarginatus	Lesser Marsh Grasshopper	LC		various dry and damp grassland habitats. Largely southern and eastern in distribution.
Chorthippus brunneus	Field Grasshopper	LC		various dry grasslands. Generally common over the whole of Britain.
Chorthippus parallelus	Meadow Grasshopper	LC		all types of moderately long grassland, particularly in moister areas. Very widely distributed and common.
Conocephalidae				
Conocephalus discolor	Long-winged Conehead	LC		Usually in long grassland. Historically scarce but now widespread in southern and central England.
Phaneropteridae				
Leptophyes punctatissima	Speckled Bush Cricket	LC		on low vegetation in woodland edges, scrub, hedges and gardens. Widespread throughout England and Wales.

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.

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 1). 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 1).
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 1).
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'.

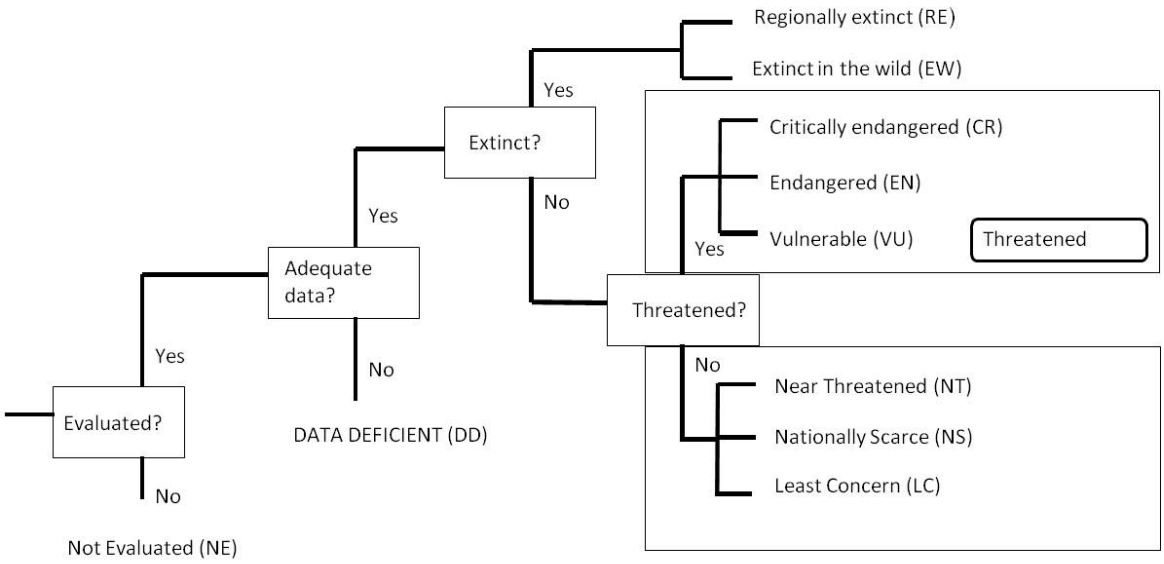

Fig. 1. Hierarchical relationships of the categories

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 1.

Table 1. Summary of the thresholds for the IUCN Criteria

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
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			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

Curent 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).

Curent 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 that 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 that are not at present endangered or vulnerable but which are at risk. These include:

- Species that 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 that is believed to qualify as either RDB1, RDB2 or RDB3 but which cannot be reliably placed into any cateogory

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 that are estimated to occur in 16 to 100 10-kilometre 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 a recent status assessment that is not based on comparisons of hectad data over two time periods (Falk et. al, 2016). This review uses IUCN status terminolology with the added prefix 'p' (e.g. pVulnerable and pNationally Scarce) to indicate that these are provisional assessments based on data that would be insufficient for a formal IUCN status review. The category 'Data Deficient' (DD) is included.