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A review of the beetles of Great Britain

The Darkling Beetles and their allies

Species Status No.18

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NATURAL ENGLAND

Foreword

Natural England commission a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

Background

Decisions about the priority to be attached to theconservation of species should be based upon objective assessmsnts of the degree of threat to species. The internationally-recognised approach to undertaking this is by assigning species to one of the IUCN threat categories using the IUCN guidelines.

This report was commissioned to update the national threat status of beetles within selected families. Reviews for other Beetle families as well as for other invertebrate groups will follow.

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Further information
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1.1 Species Status

The Species Status Assessment project initiated by JNCC in 1999 ended in 2008 after a number of reviews (http://jncc.defra.gov.uk/page-3352) were published. However, there remains a need to continue assessing the threat status of species in the UK. A new project, named Species Status, has been created. Its purpose is to provide an up-to-date assessment of the threat status of taxa using the internationally accepted guidelines developed by the International Union for Conservation of Nature (IUCN) (see IUCN, 2012a,b 2013). This publication is the first of a new series of reports which will be produced under this project.

Under the Species Status project, the statutory nature conservation agencies within the UK will be able to produce, initiate and fund Red Lists prepared by non-governmental organisations and other specialists, submitting these reports to JNCC for accreditation (http://jncc.defra.gov.uk/page-1773). Assessments will be produced as Red Lists or as broader National Reviews of particular taxonomic groups (see 1.3). Both types of publication will provide an audit trail of the assessment. The approved threat status data will be used in the JNCC database of species conservation designations (http://jncc.defra.gov.uk/page-3408).

Red lists that are eligible under the JNCC Species Status must have a UK- or GB-wide coverage, follow the IUCN Red List guidelines (IUCN, 2012a,b 2013), be accredited by JNCC and made freely available via the authoring agencies' website.

1.2 The Red List system

The Red List system was initiated by IUCN in 1966 with the publication of the first Mammal Red Data Book. Since then, Red Lists and more detailed Red Data Books, have been published that have dealt with many plants, fungi and animals at global, regional, country, and even local scales. The aim has been to identify those species at greatest risk from extinction and to identify the critical factors responsible, so that action may be taken to improve the chances of these species surviving in the long term.

Comparisons are facilitated by assessing all taxa to the same standards. This is not without difficulty because species have a variety of life and reproductive strategies. Status assessments are prepared on the basis of the best available information for the group concerned, recognising that this will vary according to the intensity of recording and study, the majority of which is carried out by volunteer naturalists.

In Britain, the first published Red Data Book endorsed by a statutory conservation agency was by Perring and Farrell (1977, 2nd edition published 1983), dealing with vascular plants. The Red Data Book for insects, edited by Shirt, was published in 1987, with volumes dealing with other animal and plant groups appearing thereafter. The geographic range has normally been Great Britain, so excluding Northern Ireland as well as the Isle of Man and the Channel Isles. Only one volume has a combined treatment for Britain and Ireland, that by Stewart and Church (1992) for stoneworts, although separate statuses were provided for each geographic entity.

The British Red List of vascular plants has had a full update twice (Wigginton, ed. 1999, Cheffings and Farrell, 2005) both updates following the revised IUCN guidelines (IUCN, 1994, 2001, 2003). The recent Red Lists of British fungi (Boletaceae) (Ainsworth *et al*., 2013), soldier beetles (Alexander 2014), Odonata (Daguet *et al.*, eds, 2008) and butterflies (Fox *et al.* 2010), as well as reviews of Diptera (Falk and Crossley, 2005, Falk and Chandler, 2005), water beetles (Foster, 2010), and lichens and ichenicolous fungi (Woods & Coppins, 2012), have also used the revised IUCN guidelines (http://jncc.defra.gov.uk/page-3352).

1.3 Status assessments other than Red Lists for species in Britain

Conservation assessments that are broader in scope than the traditional Red Data Books and Red Lists have been produced. These assessments add GB-specific categories based on restricted distribution rather than risk. The term Nationally Scarce, originally coined for plants, is applied to species that are known to occur in 16 to 100 ten-km squares (or hectads). Early assessments of invertebrate taxa used the term Nationally Notable and, for some taxa this category was further split into Notable A (Na) for species occurring in 16 to 30 hectads and Notable B (Nb) for those occurring in 31 to 100 hectads.

A further category is that of 'Nationally Rare'. This category is used for species that occur in 15 or fewer hectads in Britain and is used in SSSI designation and Common Standards Monitoring.

The restricted distribution categories have now been standardised to Nationally Rare and Nationally Scarce without further subdivision. The GB system of assessing **rarity** based solely on distribution is used alongside the IUCN criteria which, although they also use measures of geographical extent, are concerned with assessing **threat**.

Publications that compile information about Red List species are known as Red Data Books and usually cover broad taxonomic groups (e.g. insects). Publications that include information about both Red Listed and Nationally Rare and Scarce species are known as National Reviews. Both types of publication can contain individual species accounts that include information about their biology, distribution and status as well as threats to the species and their conservation needs.

1.4 Species Status Assessment and conservation action

Sound decisions about the priority to attaced to conservation action for any species should primarily be based upon objective assessmsnts of the degree of threat to the survival of a species. This is conventionally done by assigning the species to one of the IUCN threat categories. This assessment of threats to survival should be separate and distinct from the subsequent process of deciding which species require action and what activities and resources should be allocated.

When making decisions as to which species should be treated as priorities for conservation action, factors to be considered other than IUCN threat category include: the likely chances of recovery being achieved; the cost of achieving recovery (and whether sources of funding are available or likely to be available); the benefits to other threatened species of a recovery programme; the fit of a recovery programme with other conservation activities (including conservation actions to be taken for habitats); the likely gains for the profile of conservation; and the relationship and fit between national and international obligations. Under the UK Biodiversity Action Pan a list of priority species has been identified as a focus for conservation effort. In England, this list has been superseded by the Section 41 list of the NERC Act (2006). In addition, certain species are legally protected in Great Britain under legislation such as the Wildlife and Countryside Act 1981, and British wildlife legislation is overlaid by international directives such as the Habitats Directive (Directive 92/42/EEC). Threat assessments and rarity assessments also underlie the criteria used for protected site selection and qualifying species can then be considered as protected interest features on the site.

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2 Introduction to the beetle reviews

Beetles are important as ecological indicators, much more refined than most plants, due to the dependency of many species on complex factors such as vegetation structure. They are also found in a much wider range of habitats than some of the more popular groups of insects such as butterflies, dragonflies and bumblebees.Monitoring their status and abundance thus provides a very useful indication of ecological health, in a way that monitoring the plants, birds, bats or other insect groups, , for example, does not.

2.1 Taxa considered in this review

The selection of taxa to be included in this review was primarily based on some of the families which have been the subject of a British national recording scheme, as coordinated by the Biological Records Centre. The work of these schemes variously includes the collation of information from the following data sources:

- Historic records
    - As published in the national journals (and in some cases also local journals);
    - Published county reviews;
    - Voucher specimens available through national and local museums.
- Modern records, arising from the recording activity of the Coleoptera recording community.

By focusing on the work of recording schemes it was possible to compare and contrast the modern data with the historic data in a way that has not been possible in the past. It was important to remain fully aware, however, of the variation in recorder effort – both regionally and in time and this has been taken into account by the reviewer. The taxa selected for this review are accordingly shown in Table 1:

Table 1. Beetle taxa review in this study

Superfamily	**Family**	**Species**	**Name of Recording Scheme**
Tenebrionoidea	Mycetophagidae	15	Part of the Heteromera & Cleroidea Recording Scheme (no longer active); recently partly reactivated as the Tenebrionoidea Recording Scheme, although the latter does not include the Ciidae.
	Tetratomidae	4	
	Melandryidae	17	
	Mordellidae	17	
	Ripiphoridae	1	
	Colydiidae	12	
	Tenebrionidae	47	
	Oedemeridae	10	
	Meloidae	10	
	Mycteridae	1	
	Pythidae	1	
	Pyrochroidae	3	
	Salpingidae	11	
	Anthicidae	13	
	Aderidae	3	
	Scraptiidae	14	
		180	Total species covered by this review

The area covered in this review is Great Britain (i.e. England, Scotland and Wales only). While Northern Ireland forms part of the United Kingdom, the recent trend has been for that area working with the Irish Republic over whole-Ireland reviews. The Isle of Man and the Channel Islands are also not included.

Beetle names follow Duff (2012a) and plant names Stace (1997). It should be borne in mind that earlier reviews will have used earlier checklists, and that nomenclature will therefore be somewhat different.

2.2 Previous reviews

2.2.1 British Red Data Books: 2. Insects (1987)

The first account of threatened British Coleoptera was included in the *British Red Data Books: 2. Insects* (Shirt, 1987) (note that this publication pre-dated the formal IUCN red list treatments). This listed 546 species, some 14% of the total British fauna (c3900).. Data sheets were given for each of the Category 1 (Endangered) and 2 (Vulnerable) species.

Table 2 summarises information provided by Shirt (1987) for the Superfamilies and families covered in the present volume, allowing for taxonomic changes which have occurred since 1987. * Family not covered by the present review.

Table 2. Red List Categories (Shirt, 1987) for species covered in this review

Superfamily & Family	**Category 1 Endangered**	**Category 2 Vulnerable**	**Category 3 Rare**	**Category 5 Endemic**	**Appendix No post 1900 records**
Tenebrionidae					
Mycetophagidae					
Ciidae*			1		
Tetratomidae					
Melandryidae	2	1	2		
Mordellidae			1		
Ripiphoridae					
Colydiidae			2		1
Tenebrionidae	2	2	2		1
Oedemeridae	1	1	1		
Meloidae	1		5		
Mycteridae					1
Pythidae					
Pyrochroidae			1		
Salpingidae					
Anthicidae					
Aderidae			1		
Scraptiidae	1		1		

2.2.2 A review of the scarce and threatened beetles of Great Britain (1992 & 1994)

The *British Red Data Book* volume was followed by the publication of *A review of the scarce and threatened beetles of Great Britain* (Part 1) (Hyman, 1992) and Part 2 (Hyman, 1994) which reviewed the status of all British beetles and presented data sheets for all scarce and threatened terrestrial species. Data sheets for aquatic beetles were not included; the statuses have subsequently been revised and data sheets provided (Foster, 2010).

Table 3 analyses the species coverage by Category for the Superfamilies and families covered in the present volume, allowing for taxonomic changes which have occurred since 1992.
* Family not covered by the present review.

Table 3. Red Data Book and rarity categories (Hyman, 1992) for species covered in this review

Superfamily & Family	**RDB1**	**RDB2**	**RDB3**	**RDBI**	**RDBK**	**Extinct**	**Notable**
Tenebrionoidea							
Mycetophagidae						1	3
Ciidae*			3				4
Tetratomidae							3
Melandryidae	2	1	1				12
Mordellidae							2
Ripiphoridae							
Colydiidae	2		4	1			4
Tenebrionidae	3	2	2				9
Oedemeridae	1	2	1				3
Meloidae	4		1			1	1
Mycteridae						1	
Pythidae							1
Pyrochroidae							2
Salpingidae							4
Anthicidae	1		1				4
Aderidae		1					2
Scraptiidae	1		1		1	1	1

2.2.3 The new review

The IUCN Guidelines (IUCN, 1994), have been updated (IUCN, 2013), **making it necessary** to revise the status of all species. It should be noted that the IUCN criteria for threat categories concentrate on imminent danger of regional extinction which hopefully applies to very few species, whilst the older JNCC criteria for Nationally Rare and Nationally Scarce relates to a small geographic distribution within Great Britain, without taking any account of trends, whether for increase or decline.

In addition, much new information has become available since the publication of Shirt (1987) and Hyman (1992 & 1994). This present volume is therefore one of a series which updates the statuses assigned to British Coleoptera – Water Beetles were the first group to be covered (Foster, 2010). The status assigned to many species by the earlier reviews has now been revised and at the same time the nomenclature has been brought up to date in accordance with the latest checklist (Duff, 2012a). Appendix 1 lists all species assigned to status categories by this review, together with the categories to which these were assigned by previous reviews and shows all the changes that have occurred in both the names of species and status categories.

3 The IUCN threat categories and selection criteria

3.1 The evolution of threat assessment methods

The first, provisional, outline of a new Red List system was published in Mace & Lande (1991). This was followed by a series of revisions, and the first version of the new Red List categories was adopted as the global standard by the IUCN Council in December 1994 (IUCN 1994 vers 2.3). The guidelines were recommended for use also at the national level. In 1995, JNCC endorsed their use as the new national standard for Great Britain, and subsequent British Red Data Books have used these revised IUCN criteria. Following further minor revisions to the IUCN guidelines, the 2001 IUCN Red List Categories and Criteria are now used as the GB standard (IUCN, 2001 vers 3.1; 2013).

Newly established categories was *Critically Endangered* (CR). Whilst the names *Endangered* (EN) and *Vulnerable* (VU) were maintained, they were defined differently from in the original guidelines, and species in one of these threat categories in the old system will not necessarily be in the same category in the new. Most species deemed to be '*Rare'* in the old system have been assigned to the *Near Threatened* (NT) category in the new system, although on the basis of the new criteria, some are now regarded as *Vulnerable*. The *Least Concern* (LC) category represents most other species. Some species are also regarded as either *Nationally Scarce* (NS) or *Nationally Rare* (NR), a status peculiar to Great Britain referred to as the GB Rarity Status (see Sections 3.4 and 4.5).

Taxa that are confidently assumed to be extinct in Great Britain are listed here as Regionally Extinct (RE) to indicate that populations no longer exist within Britain but do occur elsewhere in the world (IUCN 2003). Proving extinction beyond reasonable doubt is difficult for many organisms and especially invertebrates. Species not recorded in Britain since 1900 are typically assumed to now be extinct, while species not recorded since 1950 but known to be especially difficult to find 'on demand' have been tagged as Possibly Extinct (IUCN 2011). This was developed to identify those Critically Endangered species that are likely to be Extinct, but for which confirmation is still required. The Guidelines point out that this is not a new criterion, but a qualifier that is appended to Critically Endangered, such that relevant taxa are reported as Critically Endangered (Possibly Extinct), abbreviated as CR(PE).

In addition, IUCN (2003, updated 2013) has published regional guidelines (applicable to regional, national and local levels) particularly concerned with developing a two-step process, the first with taxa evaluated purely on their status within the region under assessment (IUCN, 2001), the second with how that status might be amended to take into account interaction with populations of the taxon in neighbouring regions.

3.2 Summary of the 2001 categories and criteria

A brief outline of the revised IUCN criteria and their application is given below, a full explanation being available (IUCN, 2001, 2013) and on the IUCN web site (http://www.iucnredlist.org/; www.iucn.org/). The definitions of the categories are given in Figure 1 and the hierarchical relationship of the categories in Figure 2 (see Appendix 1). The category *Extinct in the wild* has not been applied in this review. All categories refer to the status in the GB (not globally).

REGIONALLY EXTINCT (RE)
A taxon is Extinct when there is no reasonable doubt that the last individual has died. In this review the last date for a record is set at fifty years before publication.

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 4).

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 4).

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 4).

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.

Figure 1. Definitions of IUCN threat categories (from IUCN 2001 with a more specific definition for regional extinction)

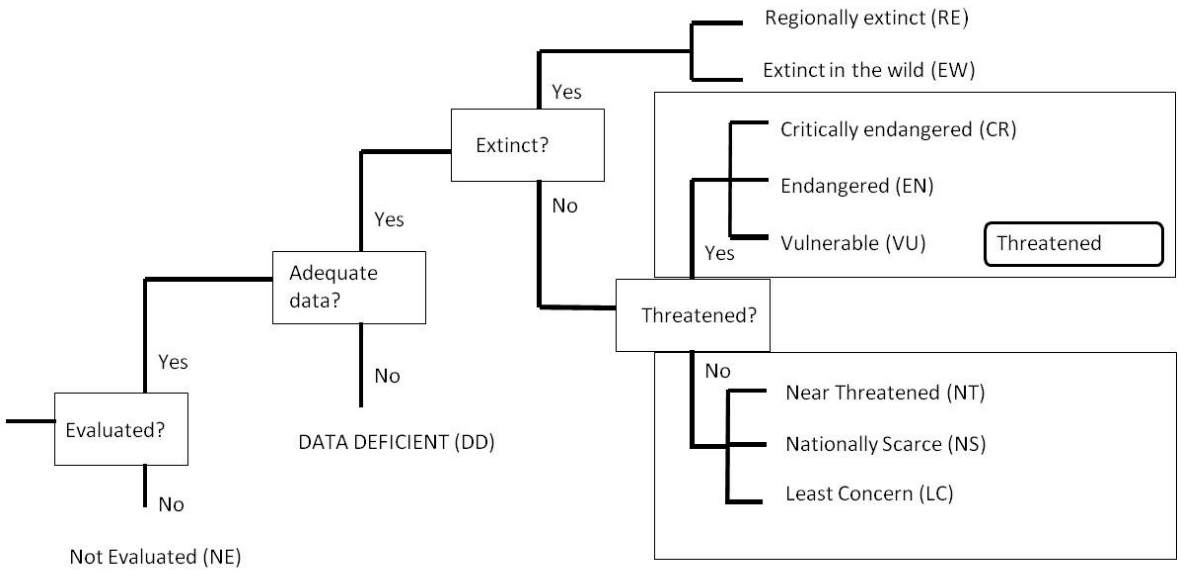

Figure adapted from IUCN (2001)

Figure 2. 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 and conditions 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. They are summarised in Table 4.

Table 4. 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 population	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

Criterion	Main thresholds Critically Endangered	Endangered	Vulnerable
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

The revised IUCN criteria have more quantitative elements than the previous criteria, although these can be difficult to apply where there are limited data on abundance and distribution for the group concerned. However, subjective assessments are still acceptable in certain cases as, for example, in predicting future trends and judging the quality of the habitat – methods involving estimation, inference and projection are emphasised as being acceptable throughout. Inference and projection may be based on extrapolation of current or potential threats into the future (including their rate of change), or of factors related to population abundance or distribution (including dependence on other taxa), so long as these can be reasonably supported. Suspected or inferred patterns in the recent past, present or near future can be based on any of a series of related factors, and these factors should be specified as part of the documentation. Some threats need to be identified particularly early, and appropriate actions taken, because their effects are irreversible or nearly so (IUCN, 2001). Since the criteria have been designed for global application and for a wide range of organisms, it is hardly to be expected that each will be appropriate to every taxonomic group or taxon. Thus a taxon need not meet all the criteria A-E, but is allowed to qualify for a particular threat category on any single criterion. The criteria A, C, D1 and E are rarely appropriate for most beetles.

The guidelines emphasise that a precautionary principle should be adopted when assigning a taxon to a threat category, and this should be the arbiter in borderline cases. The threat assessment should be made on the basis of reasonable judgment, and it should be particularly noted that it is not the worse-case scenario which will determine the threat category to which the taxon will be assigned.

The categorization process should only be applied to wild populations inside their natural range (IUCN, 2001); it should also only be applied to species with a long-term presence in the region, with 1500 AD used as the standard (IUCN, 2003). Taxa deemed to be ineligible for assessment at a regional level are placed in the category of '**Not Applicable (NA)'.** This category is used for species where the evidence suggests that the species concerned are not long-term natives, either the result of accidental importation through trade and travel, or else may be recent colonists (or attempted colonists) responding to the changing conditions available in Britain as a result of human activity and/or climate change. A taxon may also be

NA because it occurs at very low numbers in the region and the population is a very minor part of the global population.

In this Review, **Extent of occurrence** (EOO) is not applied, as an agreed methodology for its measurement in relation to these beetle species is not available. Calculating EOO often requires sophisticated modelling software and there is some doubt as to the value of the output for patchily distributed taxa (i.e. most invertebrates).

Area of occupancy (AOO) is another measure that is difficult to apply to invertebrate records and populations as defined by the IUCN guidelines (IUCN, 2012a,b 2013).

"Area of occupancy is defined as the area within its 'extent of occurrence' which is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats. In some cases (e.g. irreplaceable colonial nesting sites, crucial feeding sites for migratory taxa) the area of occupancy is the smallest area essential at any stage to the survival of existing populations of a taxon. The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the taxon, the nature of threats and the available data. To avoid inconsistencies and bias in assessments caused by estimating area of occupancy at different scales, it may be necessary to standardize estimates by applying a scale-correction factor. It is difficult to give strict guidance on how standardization should be done because different types of taxa have different scale-area relationships." (IUCN, 2012a).

The IUCN have recommended a scale of 4 km^2 (a tetrad) as the reference scale (IUCN, 2013). This needs to be applied with caution and there will be instances where a different scaling is more applicable, or where attempting to apply any scale is extremely difficult. This highlights the importance of peer review and shared expert opinion for making decisions on scale.

3.3 The two-stage process in relation to developing a Red List

The IUCN regional guidelines (IUCN, 2003) indicate that if a given taxon is known to migrate into or out of the region it should be assessed using a two stage approach. Populations in the region under review should firstly be assessed as if they were isolated taxa. They should then be reassessed and can be assigned a higher or a lower category if their status within the region is likely to be affected by emigration or immigration. The extent to which populations of beetles under threat are interdependent within Britain and between Britain and the Continent is uncertain and perhaps controversial. Recruitment from abroad has clearly accounted for the establishment of some newcomers to the British fauna, eg *Mordellistena acuticollis. In this instance, the species is* assessed as being part of the continental population and is therefore deemed to be ineligible for assessment at GB regional level and placed in the category of Not Applicable (NA).

3.4 The use of Near Threatened, Nationally Rare and Nationally Scarce categories

IUCN (2001) recognised the value of a *Near Threatened* category to identify species that need to be kept under review to ensure that they have not become vulnerable to extinction. This category is used for species where a potential threat, natural habitat dependency or range change demand frequent review of status.

At the national level, countries are permitted to refine the definitions for the non-threatened categories and to define additional ones of their own. The *Nationally Rare* category is defined as species recorded from 15 or fewer hectads of the Ordnance Survey national grid in Great Britain. The *Nationally Scarce* category is defined in the same way but the species is recorded from between 16 and 100 hectads since 1980. The Nationally Rare category was formerly known as Red Data Book Categories 1-3 while the Nationally Scarce category was formerly known as Nationally Notable for invertebrates, and was divided into Lists A (species in Great Britain thought to occur between 15 and 30 10km squares) and B (between 31 and 100 10km squares) .This national set of definitions is referred to as the GB Rarity status within this document.

Importantly, neither Nationally Rare or Nationaly Scarce are categories of threat.

4 Methods and sources of information

4.1 Introduction

The most recent published list of scarce and threatened beetles (Hyman & Parsons, 1992 & 1994) was based on the Red Data Book criteria used in the British Insects Red Data Book (Shirt, 1987) with the addition of the category RDB K (Insufficiently Known) after Wells, Pyle & Collins (1983). The original IUCN criteria for assigning threat status used in these publications had the categories Endangered, Vulnerable and rare, which were defined rather loosely and without quantitative thresholds. The application of these categories was largely a matter of judgment, and it was not easy to apply them consistently within a taxonomic group or to make comparisons between groups of different organisms.

4.2 Data sources

The lead author of this Review assessed the status of all the species using the information sources described in this section and the system explained in Sections 3 and 6. During the process he sought the views of a large number of other specialists (see Acknowledgements). The bulk of the data however comes from the Tenebrionoidea Recording Scheme operated by Scotty Dodd and Jonty Denton, supplemented from information posted on the NBN Gateway. It is important to acknowledge the considerable contribution made by all of these recorders. The Recording Scheme data provided an authoritative overview from which to judge the quality of the data obtained via the NBN. For species achieving IUCN or JNCC status, these data were also carefully examined and related to published information and data held by the lead author (available mainly for saproxylics). Records which were judged unreliable were discarded.

5 The assessments

5.1 The data table

The key outcome of this Review is the generation of a table which lists all of the taxa in the beetle families covered. The full table has been produced as a spreadsheet which accompanies this text. Appendix 1 provides an extract of the key data. The columns completed in the full accompanying Excel table are as follows:

Species name

Old BRC number

BRC concept

NBN taxon number

Presence in:

- England
- Scotland
- Wales

Area of occupancy

Total number of hectads occupied for period up to and including 1979

Total number of hectads occupied from period from 1980-2012

Total number of dual hectads where species have been recorded from within the hectad in both date classes (see 5.2 below).

GB IUCN status (2013)

Qualifying criteria

Rationale

Global IUCN status (2010)

GB Rarity status (2013)

Status in Shirt (1987)

Status in Hyman (1986)

Status in Hyman (1992)

Ecological account

Popular synonyms

5.2 Date classes

This Review uses 1980 as the **point of measurement** between old and recent date classes to assess decline as this was judged to be the date most applicable to the data concerned. It was judged that the adoption of a later date would have resulted in far too many species being found to have fewer than 100 hectads in the modern time period. This would obviously have seriously undermined the value of the assessments made. The use of this date has the consequence that Criterion B2b – continuing decline – has to rely heavily on estimation, inference and projection. The IUCN criteria assess declines based on data from the last ten years, but this is clearly not feasible for most invertebrate groups. It is extremely rare that any beetle has been comprehensively surveyed in the past ten years – even with *Malachius aeneus*

survey work has been limited to one group of known sites. The reviewer has needed to assess whether reductions in the Area of Occupancy represent significant decline or lack of data. This will vary considerably between taxonomic groups and for different species within taxonomic groups depending on survey effort. Use of B2b for any taxon therefore demands justification by an explanation of confidence in the rate of decline.

5.3 Evidence of habitat declines

Habitat decline values can be used as a proxy for population declines for species that are strongly associated with specific habitat types. However, it should be acknowledged that quantitative data on a species' habitats are also rarely available, and that the reviewer needs to work with very imperfect data. Invertebrate habitat cannot be assumed to be equivalent to specific vegetation types (Kirby, 1992; Fry & Lonsdale, 1991). The IUCN Guidelines state that: "A continuing decline is a recent, current or projected future decline (which may be smooth, irregular or sporadic) which is liable to continue unless remedial measures are taken. Fluctuations will not normally count as continuing declines, but an observed decline should not be considered as a fluctuation unless there is evidence for this." It is clear then that a full review of the evidence is not essential but that it can be projected, much as the 'population reduction' criterion may rely on 'observed, estimated, inferred, projected or suspected' reduction. The objective is to achieve consensus amongst the appropriate experts on the level of evidence available and to apply it pragmatically.

The following sections address certain key beetle habitat types which support a range of rare and threatened species and provide an overview of the evidence available that demonstrates or suggests significant habitat decline.

5.4 Heartwood decay and hollowing in old trees

In the case of large old and hollowing trees, a precedent is available from the *IUCN Red List of European Saproxylic Beetles* (Nieto & Alexander, 2010) where it was unanimously accepted by experts from across the continent that this precise habitat type is rare and threatened across Europe and that it was therefore reasonable to infer that any beetle completely dependent on this situation is at the very least of Near Threatened status. A decline in large old trees is also acknowledged globally (Eliasson et al, 2002; Hannah et al, 1995; Nilsson, 1997; Gibbons et al, 2008; Lindenmayer et al, 2012a, b). While Britain is one of the very few European countries which still retains large old hollow trees in relatively large there is currently no protection for such trees other than in protected sites, and even in such sites long-term viability is not assured.

There is plentiful evidence for a continued decline in the numbers of veteran trees, both in protected sites and in the wider countryside (see below). Habitat continuity is another key factor which determines presence/absence of these beetle species, mainly due to their dispersal ability, and is a severe limitation on their ability to colonise new sites in an increasingly fragmented treescape (Harding & Rose, 1986; Alexander, 2004).

The requirement for 'evidence for recent, current or projected future decline which is liable to continue unless remedial measures are taken' is very straightforward for the saproxylic beetles which have a specific requirement for the heartwood-decay succession which results in hollowing veteran and ancient trees. While the evidence has not yet been fully collated and

assessed - Natural England is currently considering such a project (S. Perry, pers. comm.) – some aspects of that evidence can be referred to here:

- 20th century declines, many of which are continuing into the 21st century;
- Changing land-use practices;
- There has been a general decline in 'trees outside of woods' (TOWs) as their values as fodder, fuel and structural timbers have gradually been replaced by modern – generally unsustainable – alternatives (Brown & Fisher, 2009);
- FC data (1953 onwards) demonstrate major losses;England suffered a 64% decline in individual trees outside woods between 1980 and 1997, only partly attributed to Dutch elm disease as this was past its peak by then and elm constituted only 19.5% of TOWs;
- Countryside Survey 2009 data indicate a continuing decline.
- Loss of hedgerows and hedgerow trees: Case studies such as Nidderdale (North Yorkshire), Kirton and Falkenham (Suffolk), etc (Muir, 2005);
- Loss of in-field trees – there is strong evidence historically that 'pastures' were rich in trees (Muir, 2005; G. Bathe, pers. comm.);
- Decreasing tree density in historic parklands, many examples apparent from National Trust studies, and also new research by the Crown Estate at Windsor Great Park;
- Imported tree diseases (http://treedisease.co.uk/threats-to-our-trees/);
- Dutch elm disease removed virtually all veteran and ancient elms from the landscape by the end of the 1970s, further denuding agricultural landscapes – an estimated 25 million elm trees lost - there has been insufficient time for replacements from other tree species to develop;
- *Phytophthora* species are becoming an increasing problem especially for sweet chestnut and alder;
- Oaks affected by oak decline, sudden oak death, acute oak decline, etc - so many new diseases that FR are struggling to think up new names for them - which have removed the mid generations in particular, widening gaps in age structures;
- Horse chestnut affected by canker;
- Countless examples of veteran trees continuing to be lost through development – urban and industrial.

Projected future declines:

- Ash – *Chalara* projected to be as damaging to ash in the modern severely depleted landscapes as Dutch elm disease was in the 1970s; wide implications for already devastated landscapes;
- Beech in Windsor Forest – evidence that there are insufficient medium-aged trees to replace the rapidly declining ancient trees (T. Green, pers. comm.);
- Reliance on unproven hypotheses of 'natural' closed canopy original forest to guide conservation management, leading to damaging fashions such as 'minimum intervention' management;
- Caledonian pine forest (see later);
- Poor recruitment of new generations of veteran trees – sensible, sympathetic, tree plantings remain the exception rather than the rule.

Climate change:

- Beech said to be declining along the South Downs & elsewhere due to increased droughting (K. Kirby, A. Whitbread, etc, pers. comm.).

With regard to evidence of losses on 'protected' sites:

- Surveys of Ashtead Common (Surrey) calculate a 1.3% mortality rate per annum from 2003 to 2009 (data from Treework Environmental Practice);
- Burnham Beeches is perhaps the best surveyed old tree site, with considerable long term data available (data also from Treework Environmental Practice):
    - In 1931 there were 1795 oak and beech pollards and by 2007 approx. 76% of the population (1369 trees) were lost – a rate of 1.87% a year.
    - From 1989 to 1999 annual average attrition rates increased to an average of 1.9% for ancient beech, leading to the well documented conservation management programme of the City of London, perhaps the reason for this having these rates reduced to 1.7% per annum subsequently; ancient oak p.a. mortality rates however rose from 1989 (0.35%) to 1999 (1.07%).
    - Recruitment rates are known to be much lower, and so these nationally significant concentrations of ancient trees are both in attrition. The data from other sites, eg Hatfield Forest, provide a very similar picture of long-term attrition (N. Fay, Treework, pers. comm.).

This necessarily superficial review of the evidence makes it clear that the habitat of the heartwood-decay succession beetles has been and still is declining in the wider landscape and in protected sites.

5.5 Caledonian pine forest

Following widespread concerns about the impacts of wild deer on the natural development of new generations of pine trees - and hence on age structures long-term – and compounded by livestock grazing in some cases, there has recently been a concerted effort by Forest Enterprise, Scottish Natural Heritage and RSPB to address the perceived problem. Many Caledonian pine forest sites have accordingly been deer-fenced and livestock removed, eg Black Wood of Rannoch and Glen Feshie. The consequence has been extensive development of young birch and pine, leading to dense thickets of developing saplings, the individual trees being drawn up tall and thin through competition, the trees lacking lateral branch development and the forest floor becoming subject to relatively heavy shade. The resulting conditions are not suitable for the development of future old granny pines of the form which support the richest variety of wood-decay habitats. Open-grown conditions are needed for pine trees to achieve their full potential in terms of crown development and to live on into the granny pine stage. Tall, thin-poled, high forest form pine trees will not be as valuable a habitat resource for beetles.

6 Format of the species accounts

6.1 Information on the species accounts

Species accounts have been prepared for each of the CR, EN, VU and NT species. Previous reviews have also included species accounts for Nationally Rare and Nationally Scarce taxa.

Information on each species is given in a standard form. These data sheets are designed to be largely self-contained in order to enable site managers to compile species-related information on site files; this accounts for some repetition between the species accounts. This section provides context for nine items of information on each of the data sheets and includes a final section discussing taxa which have formerly had red list status but which have been down-graded as part of this re-assessment process.

6.2 The species name

Nomenclature is intended to be as up to date as possible and is based on Duff (2012a). Where the name differs from that used by Shirt (1987) or Hyman (1992 & 1994) the previous name is indicated, with citation of any relevant references. Information is also provided on any older names which have been used in the main identification literature.

6.3 Identification

The latest or most convenient work from which the identity of the species can be determined is stated; both adults and larvae are included wherever possible. The emphasis is on English language publications, and work in other languages is only referred to where no other options are available.

A new reference work on British beetles is under way, but - at the time of writing – only Volume 1: Sphaeriusidae to Silphidae has been published (Duff, 2012b). Otherwise, the most recent full coverage was provided by Joy (1932), which still remains the key work for some families, supported by Hodge and Jones (1995). The fuller coverage of Fowler (1887-1891) and Fowler & Donisthorpe (1913) remain important supplementary accounts. Table 5 lists the most recent identification literature that provides full coverage of the family concerned at time of publication.

Table 5. Identification literature

Family of Tenebrionoidea	Identification reference work
Mycetophagidae	Joy (1932)
Tetratomidae	Buck (1954)
Melandryidae	Buck (1954)
Mordellidae	Batten (1986)
Ripiphoridae	Buck (1954)
Colydiidae	Joy (1932)
Tenebrionidae	Buck (1954) & Brendell (1975)
Oedemeridae	Buck (1954)
Meloidae	Buglife (2013)
Mycteridae	Buck (1954)
Pythidae	Buck (1954)
Pyrochroidae	Buck (1954)
Salpingidae	Buck (1954)
Anthicidae	Telnov (2010)
Aderidae	Buck (1954)
Scraptiidae	Levey (2009)

Larval keys to many families are available in English: Meloidae, Rhipiphoridae, Lagriidae (now included in Tenebrionidae), Synchroidae (*Hallomenus binotatus*, currently in Tetratomidae) and Pyrochroidae (Van Emden, 1943); also Tenebrionidae (van Emden, 1947). Klausnitzer (1978) has generic keys to all families (in German) and also contains useful illustrations of many species.

6.4 Distribution

Records held in the databases of the national species recording scheme form the basis for determining the distribution of each species.

The Tenebrionoidea were included in the former Heteromera & Cleroidea Recording Scheme organised by R.S. Key, but this was discontinued before a provisional atlas became feasible. The collated data were passed to the new Tenebrionoidea Recording Scheme as an Excel Spreadsheet and is not available through the NBN Gateway.

The Watsonian vice-counties (Dandy, 1969) are also indicated, where appropriate.

International distribution is only referred to where a comment on the species' biogeography is considered particularly relevant and where the information is readily accessible.

6.5 Habitat and ecology

This section aims to provide an overview of both the precise habitat requirements of each species – larvae and adults - and the wider landscape context. In many cases current knowledge is inadequate and speculation remains the only option. Information on the life cycle and seasonal patterns is also included.

Separation of where species are found by recorders from the actual habitat preferences of those species is fraught with difficulty. A good example is provided by arboreal beetles which

are often taken by sweep-netting the field layer below after they have fallen from the canopy. Fogging often demonstrates that such species typically occur in greater numbers in the canopy than in the field layer, as one might expect. In the absence of fogging data one can only speculate.

Vegetation structure is well known to be of major importance to invertebrates and yet recorders very rarely note the key features of the situations in which they find the beetles. Comments on structure provided in the following species accounts may be based on a relatively few, often personal, experiences.

Flight and mobility are very important in understanding the use beetles make of habitat mosaics, but little is known about these aspects. Climatic factors are an important influence and will vary across the country – in many beetle species active flight is associated with conditions of relatively high temperatures, relatively high humidity, and little or no air movement. Mobility will naturally be higher under the more continental climatic conditions of southern and eastern Britain than in the cooler north and west. Species on the edge of their European range in Britain may be less mobile than their continental equivalents. Thus, while buprestids can be very active fliers when conditions are favourable, some species appear to be relatively immobile in Britain under present conditions. This can change dramatically, as in the case of *Agrilus biguttatus* which has moved from exhibiting an old forest refugia distribution up until the 1970s and early 1980s, to being common and widespread across a large area of lowland England in a period of little more than a decade.

Considerable emphasis is placed in this review on the importance of relict sites in supporting rare species. This indicates that such species have poor dispersal capacity or that they require a special set of conditions provided only by such sites, or perhaps a combination of the two.

6.6 Status

Status is largely based on range size and both short and long term trends, but association of a species with particular habitats under threat is also taken into account. Counts of hectads known to be occupied since 1990 were used to establish whether or not a species might be considered scarce. The IUCN guidelines (2013) (see Section 3 and Appendix 2) were then used to decide whether such species might also be considered under threat, and to assign a category. Detailed survey data are extremely rare but have been used where available.

Only species which have been assessed as Critically Endangered, Endangered, Vulnerable or Near Threatened are provided with species accounts. The status of other species is summarised in Appendix 1.

The IUCN criteria are not rigid about the need for real data, but allow for expert opinion – ‘estimated, inferred, projected or suspected’ are acceptable reasons – and so some species currently known from fewer than one hundred hectads have been excluded from Nationally Scarce status on this basis. It is appreciated that many species of Coleoptera are not yet recorded from more than one hundred hectads but are expected to be found to occur in more than one hundred when their distribution is better known. *Mycetophagus multipunctatus* has been reported from 57 hectads since 1990 but has been reported from 44 additional hectads in the past; with no evidence to suggest a decline in its range or abundance, it seems reasonable to assume that it does still occur in more than 100 hectads. In contrast, *Pseudotriphyllus*

suturalis has been reported from 62 hectads since 1990, but only an additional 26 hectads in the past, suggesting that Nationally Scarce is appropriate for this species until there is genuine evidence that the species does occur in 100 of more hectads. The number of old hectads lacking modern reports is not a reliable indication of its true status but does enable a projected status to be determined. Expert opinion provides an important back up where the evidence is inadequate.

In conclusion, assessments of status can only be based on current knowledge, which is very unlikely to be comprehensive in the majority of cases, being based on the experience of a limited number of active recorders in each generation. The likely national distribution of each species and trends in population size must, therefore, be extrapolated from the available information so as to arrive at the best estimate of the likely national status of each species.

Beetles lend themselves to preservation as sub-fossils by virtue of their hard body parts. Many studies of organic deposits that can be reliably dated to postglacial times generate valuable information on the history of a particular species in what is now referred to as Britain. Those studies provide irrefutable evidence for long-term presence, but no evidence for absence. The data have been collated and made available by Buckland & Buckland (2006). Information is therefore provided in this section to supplement knowledge of species status.

6.7 Threats

It is those human activities that result in the loss of sites or that change the nature of habitats that are most likely to pose the greatest threats to invertebrate populations. Where specific threats might arise they are mentioned, otherwise the statements attempt to summarise in general terms those activities which are considered most likely to place populations of these beetles at risk.

Particularly threatened are those species that are dependent on veteran and hollow trees for their saproxylic habitats (Nieto & Alexander, 2010). Even in sites with some conservation protection, land management is all too often unsympathetic to specialist saproxylics. Knowledge and understanding of the conservation ecology of veteran trees has expanded considerably in recent years, largely stimulated by a small group of enthusiasts which led to the formation of the Ancient Tree Forum. The first national conferences on the management of veteran trees (Read, 1991 & 1996) resulted and led to the establishment of English Nature's Veteran Tree Project and to the publication of Veteran Trees: A guide to good management (Read, 2000). The latter publication has been up-dated by a supplement (Lonsdale, 2013). A key threat has been excessive felling in the name of 'health and safety'; these aspects have recently been the subject of new guidance (National Tree Safety Group, 2011).

6.8 Management and conservation

Where known sites of conservation interest have the benefit of statutory protection, as, for example, in the case of National Nature Reserves (NNRs) or Sites of Special Scientific Interest (SSSI), this is noted in the information tables. Sites designated as SAC under the European Habitats Directive and SSSI have the potential to provide protection for beetles as long as the conservation interest associated with them is acknowledged, and as long as that interest is effectively translated into site conservation objectives. Loss of suitable habitat continues in undesignated sites. The populations of many beetle species with fragmented

distributions are relicts of previously widespread populations, surviving in small patches of relatively undisturbed habitats after loss of the intervening habitats. For these species it is critical to maintain a chain of protected sites. Other species are more mobile and often rely on dynamic ecological processes operating over areas larger than those normally covered by individual designated sites. Some of these species have benefited from recent changes in the modern landscape, for example the tall herb pioneer community that colonises brownfield sites following abandonment of use. Others, such as the beetle assemblages associated with thermophilic patchwork landscapes, where the small scale intricacies provide local shelter and warmth, have been likely to have been impacted by rigid approaches to flood control and land management.

Preventative measures and positive action designed to maintain populations are suggested where these are known or can reasonably be inferred. Inevitably, in many cases, this section tends to be generalised, identifying practices that have been found to favour those aspects of the habitat with which the species may be associated. It is very rare that a threatened British beetle has been subject to a monitoring scheme but these are referred to where such schemes are known about, although a few species have been investigated in detail as part of the UK Government's Biodiversity Action Plan.

6.9 Published sources

Literature references that refer to the previous conservation status of the species in Britain, or that have contributed information to the Data Sheet, are cited in the text.

6.10 Downgraded species

Down-grading of species should not be seen necessarily as evidence that species status is improving. In many cases the species were graded too highly in the 1992 Review through lack of availability of supporting data. The intervening period has seen a huge increase in recorder effort, targeting species with Nationally Scarce or RDB status – the Review acted as a focus or a 'call to arms', stimulating new recording – and the revised statuses presented here more accurately reflect the status on those species. The 1992 Review should – in many ways - be regarded as a first draft, a first attempt at assessing status. It should also be noted that different criteria were used in this review.

Some species have actually increased their abundances and/or ranges in the intervening 20 year period, as a result.

The following species were included in the earlier reviews (Shirt, 1987; Hyman, 1992 & 1994), but are not included here for the reasons stated in the following table.

Table 6. Species in previous reviews but excluded here

Family & Scientific name	**Shirt1 987**	**Hyman 1992**	**Rationale for exclusion**
Mycetophagidae			
Mycetophagus piceus	-	Nb	Known historically from in excess of 100 hectads and no evidence for a significant decline.
Mordellidae			
Mordellistena brevicauda	-	RDBK	If the host association is correct - a naturalised plant – then the beetle must presumably also be naturalized. Data Deficient.
Mordellistena pygmaeola	-	RDBK	A long-overlooked species, only recently highlighted; two known sites; no ecological information. Data Deficient.
Mordellistena acuticollis	-	RDBK	Data suggests a recent immigrant or importation (Levey, 2002). First noticed in Britain in 1992, from West Kent (Allen, 1995); Earliest known record is from 1985 (Levey, 2002). Spreading in south-east (Hodge, 2002).
Colydiidae			
Cicones undatus	-	RDB1	Naturalised introduction
Langelandia anophthalma	-	RDB3	Originally recorded by Wood (1886) from seed potatoes, these and the underside of logs are the most often recorded situations for this species. Owen proposed that this species might in fact be an established synanthropic alien, since it has almost exclusively been recorded from artificial habitats - also only urban sites. May be more widespread than current records suggest due to its subterranean habits (Denton, 1997). May well be spreading (Mann & Angus, 2002).
Aulonium trisulcus	-	Na	Probably introduced into Britain from the Continent in early 20th century; increased in abundance and range during the period of Dutch elm disease of the 1960s and 1970s, and has subsequently become much rarer again.
Tenebrionidae			
Eledona agricola	-	Nb	Reported from 120 hectads in the period since 1990.

Family & Scientific name	Shirt1 987	Hyman 1992	Rationale for exclusion
Myrmechixenus vaporariorum	-	RDB3	Not generally known to survive minimum outdoor temperatures in Britain.
Scaphidema metallicum	-	Nb	Known historically from in excess of 100 hectads and no evidence for a significant decline.
Prionychus ater			Known historically from 97 hectads and no evidence for a significant decline.
Oedemeridae			
Ischnomera cyanea	-	Nb	Known historically from in excess of 100 hectads and no evidence for a significant decline.
Meloidae			
Meloe violaceus	-	Nb	Reported from 124 hectads in the period since 1990.
Pyrochroidae			
Pyrochroa coccinea		Nb	Reported from 101 hectads in the period since 1990. Probably an introduction; expanding in range.

There are other species that occur in 100 hectads or less, but which the authors believe should not be listed as Nationally Scarce as they are not considered to be native to Britain. Under the IUCN Guidelines they have been assigned 'Not Applicable'. The rationale for these exclusions is given in Table 7.

Table 7. Rationale for not listing species occurring in 100 hectads or fewer

Scientific name	Number of post-1990 hectads	Rationale for exclusion
Mycetophagidae		
Litargus balteatus	6	Native to North America; imported to GB.
Typhaea haagi	3	Very widespread across Africa, Europe, Asia, North and South America. First found in Britain during 1948.
Typhaea stercorea	43	Its strong association with man-made habitats in the more northerly parts of Europe (including Britain) suggests it may not, although long-established, be native there. Sub-fossil material dates from Roman period only.
Eulagius filicornis	11	Native to southern Europe & north Africa (Harrison 1996); now established in southern England, locations suggest an introduction.
Berginus tamarisci	1	Mediterranean species recently established in Surrey.
Melandryidae		
Serropalpus barbatus	1	Associated with alien conifers *Abies alba* and less commonly *Picea abies*. Importation.

Scientific name	Number of post-1990 hectads	Rationale for exclusion
Colydiidae		
Pycnomerus fuliginosus	25	An Australian import.
Aulonium ruficorne	No details	Importation.
Tenebrionidae		
Tenebrio molitor	53	Naturalised introduction.
Tenebrio obscurus	1	Importation.
Alphitobius diaperinus	28	Naturalised introduction.
Alphitobius laevigatus	1	Naturalised introduction.
Tribolium castaneum	16	Naturalised introduction.
Tribolium confusum	2	Naturalised introduction.
Tribolium destructor	0	Naturalised introduction.
Latheticus oryzae	1	Naturalised introduction.
Palorus ratzeburgii	0	Naturalised introduction.
Palorus subdepressus	1	Naturalised introduction.
Uloma culinaris	2	A few isolated records only; presumed to be the result of importations.
Blaps lethifera	0	Naturalised introduction.
Blaps mortisaga	0	Naturalised introduction.
Blaps mucronata	20	Naturalised introduction.
Corticeus fraxini	4	Naturalised introduction.
Corticeus linearis	4	Naturalised introduction.
Alphitophagus bifasciatus	15	Naturalised introduction.
Gnatocerus cornutus	0	Naturalised introduction.
Gnatocerus maxillosus	0	Importation.
Anthicidae		
Omonadus bifasciatus	8	Almost certainly an importation, associated with old dung heaps in the Midlands and East Anglia.
Stricticollis tobias	6	Not native, originated in the East (Hammond, 1974 in Hawksworth)

The status of new arrivals in Britain is very difficult to ascertain. Where this results from a natural colonisation from the near continent, they may be expected to continue to expand and may exceed 100 hectads within the next few decades. Their natural range, or 'area of occurrence' under the IUCN Guidelines expands with them, but they are not long-term residents in Britain and so are excluded from the IUCN categorisation for this reason. The precautionary principle suggests that they should not be afforded a regional conservation status unless the source population itself is threatened, which would seem unlikely in most cases. Climate change may impose such a threat. In many cases there is a strong suspicion that the arrival in Britain is actually a chance importation and imported populations are not normally afforded conservation status.

7 Acknowledgements

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8 Species listed by IUCN status category

In this list the species are given in taxonomic order within status categories.

Regionally Extinct

Mycetophagidae	Mycetophagus fulvicollis Fabricius
Colydiidae	Endophloeus markovichianus (Piller & Mitterpacher)
Tenebrionidae	Lagria atripes Mulsant & Guillebeau
	Myrmechixenus subterraneus Chevrolat
Meloidae	Meloe autumnalis Olivier
	Meloe cicatricosis
	Meloe variegatus
	Scraptia dubia

Critically Endangered (Possibly Extinct)

Melandryidae	Abdera affinis (Paykull)

Vulnerable

Mycetophagidae	Mycetophagus populi Fabricius
Melandryidae	Xylita laevigata (Hellenius)
	Zilora ferruginea (Paykull)
	Melandrya barbata (Fabricius)
Mordellidae	Mordella holomelaena Apfelbeck
	Mordella leucaspis Küster
	Mordellistena nanuloides Ermisch
Tenebrionidae	Pentaphyllus testaceus(Hellwig)
	Omophlus pubescens (Linnaeus)
Oedemeridae	Chrysanthia nigricornis Westhoff
Meloidae	Meloe brevicollis Panzer
	Meloe mediterraneus Müller, J.
	Sitaris muralis (Forster)
Anthicidae	Anthicus angustatus Curtis
	Anthicus bimaculatus (Illiger)
	Anthicus tristis Schmidt
Aderidae	Vanonus brevicornis (Perris)
Scraptiidae	Scraptia fuscula Müller, P.W.J.
	Anaspis bohemica Schilsky

9 Species listed by GB Rarity Status category

Nationally Rare

Tetratomidae	Tetratoma ancora Fabricius
Mycetophagidae	Mycetophagus populi Fabricius
Melandryidae	Abdera affinis (Paykull) - Extinct?
	Abdera triguttata (Gyllenhal)
	Hypulus quercinus (Quensel)
	Melandrya barbata (Fabricius)
	Xylita laevigata (Hellenius)
	Zilora ferruginea (Paykull)
Mordellidae	Mordella holomelaena Apfelbeck
	Mordella leucaspis Küster
	Mordellistena brevicauda (Boheman)
	Mordellistena nanuloides Ermisch
	Mordellistena pseudoparvula Ermisch
	Mordellistena pseudopumila Ermisch
Colydiidae	Orthocerus clavicornis (Linnaeus)
Tenebrionidae	Omophlus pubescens (Linnaeus)
	Pentaphyllus testaceus(Hellwig)
	Platydema violaceum (Fabricius)
Oedmeridae	Chrysanthia nigricornis Westhoff
	Ischnomera caerulea (Linnaeus)
	Ischnomera cinerascens (Pandellé)
	Oedemera virescens (Linnaeus)
Meloidae	Meloe brevicollis Panzer
	Meloe mediterraneus Müller, J.
	Sitaris muralis (Forster)
Pythidae	Pytho depressus (Linnaeus)
Pyrochroidae	Schizotus pectinicornis (Linnaeus)
Salpingidae	Lissodema cursor (Gyllenhal)
	Rabocerus foveolatus (Ljungh)
Anthicidae	Anthicus angustatus Curtis
	Anthicus bimaculatus (Illiger)
	Anthicus flavipes (Panzer)
	Anthicus tristis Schmidt
	Cyclodinus salinus (Crotch)
Aderidae	Vanonus brevicornis (Perris)
Scraptiidae	Scraptia fuscula Müller, P.W.J.
	Anaspis bohemica Schilsky

Nationally Scarce

Mycetophagidae	Pseudotriphyllus suturalis (Fabricius)
	Triphyllus bicolor (Fabricius)
	Mycetophagus quadriguttatus Müller, P.W.J.
Tetratomidae	Hallomenus notatus (Quensel)
	Tetratoma desmarestii Latreille
Melandryidae	Orchesia micans (Panzer)
	Orchesia minor Walker
	Anisoxya fuscula (Illiger)
	Abdera biflexuosa (Curtis)
	Abdera flexuosa (Paykull)
	Abdera quadrifasciata (Curtis)
	Phloiotrya vaudoueri Mulsant
	Osphya bipunctata (Fabricius)
Mordellidae	Tomoxia bucephala Costa, A.
	Variimorda villosa (Schrank)
	Mordellistena humeralis (Linnaeus)
	Mordellistena neuwaldeggiana (Panzer)
	Mordellistena parvula (Gyllenhal)
	Mordellistena variegata (Fabricius)
Colydiidae	Synchita humeralis (Fabricius)
	Synchita separanda (Reitter)
	Cicones variegatus(Hellwig)
	Colydium elongatum (Fabricius)
Tenebrionidae	Bolitophagus reticulatus (Linnaeus)
	Opatrum sabulosum (Linnaeus)
	Helops caeruleus (Linnaeus)
	Xanthomus pallidus(Curtis)
	Crypticus quisquilius (Linnaeus)
	Phaleria cadaverina (Fabricius)
	Corticeus bicolor (Olivier)
	Corticeus unicolor Piller & Mitterpacher
	Diaperis boleti (Linnaeus)
	Prionychus melanarius (Germar)
	Gonodera luperus (Herbst)
	Pseudocistela ceramboides (Linnaeus)
	Mycetochara humeralis (Fabricius)
Oedemeridae	Ischnomera sanguinicollis
	Oedemera femoralis
Meloidae	Meloe rugosus Marsham
Salpingidae	Lissodema denticolle (Gyllenhal)
	Rabocerus gabrieli Gerhardt
	Sphaeriestes ater (Paykull)
	Sphaeriestes reyi (Abeille de Perrin)
Anthicidae	Cordicollis instabilis (Schmidt)

	Cyclodinus constrictus (Curtis)
	Omonadus bifasciatus (Rossi)
Aderidae	Aderus populneus (Creutzer in Panzer)
	Euglenes oculatus (Paykull)
Scraptiidae	Scraptia testacea Allen
	Anaspis thoracica (Linnaeus)
	Anaspis costai Emery

10 Taxonomic list of Red Data Book and Nationally Scarce species

Table 8. Taxonomic list of Red Data Book and Nationally Scarce species

Scientific name	Shirt 1987	Hyman 1992	This review (GB Rarity Status)	This review (IUCN Status)
Mycetophagidae				
Pseudotriphyllus suturalis (Fabricius)			Nationally Scarce	
Triphyllus bicolor (Fabricius)			Nationally Scarce	
Mycetophagus fulvicollis Fabricius		Extinct		Extinct
Mycetophagus piceus (Fabricius)		Nb		-
Mycetophagus populi Fabricius		Na	Nationally Rare	Vulnerable
Mycetophagus quadriguttatus Müller, P.W.J.		Na	Nationally Scarce	
Tetratomidae				
Hallomenus notatus (Quensel)		Nb	Nationally Scarce	
Tetratoma ancora Fabricius		Nb	Nationally Rare	
Tetratoma desmarestii Latreille		Na	Nationally Scarce	
Melandryidae				
Orchesia micans (Panzer)		Nb	Nationally Scarce	
Orchesia minor Walker		Nb	Nationally Scarce	
Anisoxya fuscula (Illiger)	RDB3	Na	Nationally Scarce	
Abdera affinis (Paykull)	RDB1	RDB1	Nationally Rare/Extinct?	Critically Endangered (presumed extinct)
Abdera biflexuosa (Curtis)		Nb	Nationally Scarce	
Abdera flexuosa (Paykull)		Nb	Nationally Scarce	
Abdera quadrifasciata (Curtis)		Na	Nationally Scarce	
Abdera triguttata (Gyllenhal)		Na	Nationally Rare	
Phloiotrya vaudoueri Mulsant		Nb	Nationally Scarce	
Xylita laevigata (Hellenius)		Na	Nationally Rare	Vulnerable
Hypulus quercinus (Quensel)	RDB2	RDB2	Nationally Rare	
Zilora ferruginea (Paykull)		Nb		Vulnerable
Melandrya barbata (Fabricius)	RDB1	RDB1		Vulnerable
Melandrya caraboides (Linnaeus)		Nb		-
Conopalpus testaceus (Olivier)		Nb		-

Scientific name	Shirt 1987	Hyman 1992	This review (GB Rarity Status)	This review (IUCN Status)
Osphya bipunctata (Fabricius)	RDB3	RDB3	Nationally Scarce	
Mordellidae				
Tomoxia bucephala Costa, A.	RDB3	Na	Nationally Scarce	
Mordella holomelaena Apfelbeck		RDBK	Nationally Rare	Vulnerable
Mordella leucaspis Küster		RDBK	Nationally Rare	Vulnerable
Variimorda villosa (Schrank)		Nb	Nationally Scarce	
Mordellistena brevicauda (Boheman)		RDBK	Nationally Rare	Data Deficient
Mordellistena humeralis (Linnaeus)		RDBK	Nationally Scarce	
Mordellistena neuwaldeggiana (Panzer)		RDBK	Nationally Scarce	
Mordellistena parvula (Gyllenhal)		RDBK	Nationally Scarce	
Mordellistena pseudoparvula Ermisch		RDBK	Nationally Rare	
Mordellistena pseudopumila Ermisch		RDBK	Nationally Rare	
Mordellistena pygmaeola Ermisch		RDBK	Nationally Rare	Data Deficient
Mordellistena secreta Horák			Nationally Rare	Data Deficient
Mordellistena variegata (Fabricius)			Nationally Scarce	
Mordellistena acuticollis Schilsky		RDBK		-
Mordellistena nanuloides Ermisch		RDBK	Nationally Rare	Vulnerable
Colydiidae				
Orthocerus clavicornis (Linnaeus)		Nb	Nationally Rare	
Synchita humeralis (Fabricius)		Nb	Nationally Scarce	
Synchita separanda (Reitter)	RDB3	RDB3	Nationally Scarce	
Cicones undatus Guérin-Méneville		RDB1		-
Cicones variegatus (Hellwig)		Na	Nationally Scarce	
Endophloeus markovichianus (Piller & Mitterpacher)	Appendix	RDB1		Extinct
Langelandia anophthalma Aubé		RDB3		-
Colydium elongatum (Fabricius)	RDB3	RDB3	Nationally Scarce	
Aulonium trisulcus (Geoffroy in Fourcroy)		Na		-

Scientific name	Shirt 1987	Hyman 1992	This review (GB Rarity Status)	This review (IUCN Status)
Tenebrionidae				
Lagria atripes Mulsant & Guillebeau		RDB1		Extinct
Bolitophagus reticulatus (Linnaeus)	RDB3	RDB3	Nationally Scarce	
Eledona agricola (Herbst)		Nb		-
Opatrum sabulosum (Linnaeus)		Nb	Nationally Scarce	
Helops caeruleus (Linnaeus)		Nb	Nationally Scarce	
Xanthomus pallidus (Curtis)		Nb	Nationally Scarce	
Crypticus quisquilius (Linnaeus)		Nb	Nationally Scarce	
Phaleria cadaverina (Fabricius)			Nationally Scarce	
Myrmechixenus subterraneus Chevrolat		RDBI		Extinct
Myrmechixenus vaporariorum Guérin-Méneville		RDB3		-
Corticeus bicolor (Olivier)			Nationally Scarce	
Corticeus unicolor Piller & Mitterpacher	RDB3	RDB3	Nationally Scarce	
Scaphidema metallicum (Fabricius)		Nb		-
Pentaphyllus testaceus (Hellwig)			Nationally Rare	Vulnerable
Platydema violaceum (Fabricius)	RDB1	RDB1	Nationally Rare	
Diaperis boleti (Linnaeus)	RDB2	RDB2	Nationally Scarce	
Prionychus ater (Fabricius)		Nb		-
Prionychus melanarius (Germar)	RDB2	RDB2	Nationally Scarce	
Gonodera luperus (Herbst)			Nationally Scarce	
Pseudocistela ceramboides (Linnaeus)		Nb	Nationally Scarce	
Mycetochara humeralis (Fabricius)		Na	Nationally Scarce	
Omophlus pubescens (Linnaeus)	RDB1	RDB1	Nationally Rare	Vulnerable
Oedemeridae				
Chrysanthia nigricornis Westhoff	RDB1	RDB1	Nationally Rare	Vulnerable
Ischnomera caerulea (Linnaeus)		RDB3	Nationally Rare	
Ischnomera cinerascens (Pandellé)	RDB2	RDB2	Nationally Rare	
Ischnomera cyanea (Fabricius)		Nb		-
Ischnomera sanguinicollis (Fabricius)		Nb	Nationally Scarce	

Scientific name	Shirt 1987	Hyman 1992	This review (GB Rarity Status)	This review (IUCN Status)
Oedemera femoralis (Olivier)		Nb	Nationally Scarce	
Oedemera virescens (Linnaeus)	RDB3	RDB2	Nationally Rare	
Meloidae				
Meloe autumnalis Olivier	RDB3	RDB1		Extinct
Meloe brevicollis Panzer	RDB3	RDB1	Nationally Rare	Vulnerable
Meloe cicatricosis Leach	RDB3	RDB1		Extinct
Meloe mediterraneus Müller, J.		Extinct	Nationally Rare	Vulnerable
Meloe rugosus Marsham	RDB3	RDB3	Nationally Scarce	
Meloe variegatus Donovan	RDB3	Extinct		Extinct
Meloe violaceus Marsham		Nb		-
Sitaris muralis (Forster)	RDB1	RDB1	Nationally Rare	Vulnerable
Mycteridae				
Mycterus curculioides (Fabricius)	Appendix	Extinct		-
Pythidae				
Pytho depressus (Linnaeus)		Na	Nationally Rare	
Pyrochroidae				
Pyrochroa coccinea (Linnaeus)		Nb		-
Schizotus pectinicornis (Linnaeus)	RDB3	Na	Nationally Rare	
Salpingidae				
Lissodema cursor (Gyllenhal)		Na	Nationally Rare	
Lissodema denticolle (Gyllenhal)		Nb	Nationally Scarce	
Rabocerus foveolatus (Ljungh)		Na	Nationally Rare	
Rabocerus gabrieli Gerhardt		Nb	Nationally Scarce	
Sphaeriestes ater (Paykull)			Nationally Scarce	
Sphaeriestes reyi (Abeille de Perrin)			Nationally Scarce	
Anthicidae				
Anthicus angustatus Curtis		Nb	Nationally Rare	Vulnerable
Anthicus bimaculatus (Illiger)		Na	Nationally Rare	Vulnerable
Anthicus flavipes (Panzer)		RDB3	Nationally Rare	
Anthicus tristis Schmidt		RDB1	Nationally Rare	Vulnerable
Cordicollis instabilis (Schmidt)			Nationally Scarce	
Cyclodinus constrictus (Curtis)			Nationally Scarce	
Cyclodinus salinus (Crotch)		Na	Nationally Rare	
Omonadus bifasciatus (Rossi)		Nb	Nationally Scarce	
Aderidae				
Aderus populneus (Creutzer in Panzer)		Nb	Nationally Scarce	

Scientific name	Shirt 1987	Hyman 1992	This review (GB Rarity Status)	This review (IUCN Status)
Euglenes oculatus (Paykull)		Nb	Nationally Scarce	
Vanonus brevicornis (Perris)	RDB3	RDB2	Nationally Rare	Vulnerable
Scraptiidae				
Scraptia dubia (Olivier)		Extinct		Extinct
Scraptia fuscula Müller, P.W.J.		RDB1	Nationally Rare	Vulnerable
Scraptia testacea Allen		RDB3	Nationally Scarce	
Anaspis bohemica Schisky		RDBK	Nationally Rare	Vulnerable
Anaspis thoracica (Linnaeus)		Na	Nationally Scarce	
Anaspis costai Emery			Nationally Scarce	

11 Criteria used for assigning species to threatened categories (see Appendix 2 for criteria and categories)

Table 9. Criteria used for assigning species to threatened categories

Scientific name	Status	Criteria used
Mycetophagidae		
Mycetophagus populi Fabricius	Vulnerable	B2, a, b iii
Melandryidae		
Abdera affinis (Paykull)	Critcially Endangered (Presumed extinct)	B2, a, b ii & iii
Xylita laevigata (Hellenius)	Vulnerable	D2
Zilora ferruginea (Paykull)	Vulnerable	D2
Melandrya barbata (Fabricius)	Vulnerable	D2
Mordellidae		
Mordella holomelaena Apfelbeck	Vulnerable	D2
Mordella leucaspis Küster	Vulnerable	D2
Mordellistena nanuloides Ermisch	Vulnerable	D2
Tenebrionidae		
Pentaphyllus testaceus (Hellwig)	Vulnerable	D2
Omophlus pubescens (Linnaeus)	Vulnerable	D2
Oedemeridae		
Chrysanthia nigricornis Westhoff	Vulnerable	D2
Meloidae		
Meloe brevicollis Panzer	Vulnerable	D2
Meloe mediterraneus Müller, J.	Vulnerable	D2
Sitaris muralis (Forster)	Vulnerable	D2
Anthicidae		
Anthicus angustatus Curtis	Vulnerable	D2
Anthicus bimaculatus (Illiger)	Vulnerable	B2, a, b iii
Anthicus tristis Schmidt	Vulnerable	D2
Aderidae		
Vanonus brevicornis (Perris)	Vulnerable	B2, a, b iii
Scraptiidae		
Scraptia fuscula Müller, P.W.J.	Vulnerable	B2, a, b iii
Anaspis bohemica Schilsky	Vulnerable	D2

12 The data sheets

The data sheets are given in alphabetical order by scientific name within each family. Individual species can be found by looking up the generic or specific names (including synonyms used in Shirt (1987) and Hyman (1992) in the index.

MYCETOPHAGUS POPULI

A hairy fungus beetle **VULNERABLE** B2, a, b iii

Order COLEOPTERA Family MYCETOPHAGIDAE

Mycetophagus populi Fabricius, 1798

Identification The adult is keyed in Joy (1932); larval keys in English are not available.

Distribution Known from just 21 historical hectads, mainly central England, but also a single locality in southern Scotland. Reports since 1990 are: Greys Court Park, Oxfordshire, 2007 (A.P. Foster, pers.comm.); Peopleton, Worcestershire, 2001 (Whitehead, 2005); Mark Ash Wood, New Forest SSSI, South Hampshire, 1999 (LIFE Project data); Studley Park, Mid-West Yorkshire, 1998 (Alexander, 1999 & 2002); Snowshill, East Gloucestershire, 1997 (Whitehead, 1999); Welwyn Garden City, Hertfordshire, 1997 (James, 2002); Pamber Forest, North Hampshire, 1994 (Hampshire Biological Information Centre).

Also relatively recent reports from: Calke Park NNR, Derbyshire, 1986 & 1987 (Johnson, 2008); South Wood, Corby, Northamptonshire ,1986 (Drane, 1990); Dorvel Wood, Sapperton, East Gloucestershire, 1984 (Alexander, 1987); Icklingham Plains, East Suffolk, 1980s (H. Mendel); Mallard Wood, New Forest SSSI, South Hampshire, 1967 (Appleton, 2004); and Hamilton High Parks SSSI, Lanarkshire, 1960 (Crowson, 1960). Older records from: South Devon ('Paignton'), South Essex (Epping Forest), Oxfordshire (near Water Eaton), West Norfolk (Harleston), Herefordshire (Moccas Park), Staffordshire ('Burton-on-Trent'), South Lincolnshire (Nocton), Leicestershire, Nottinghamshire (Sherwood Forest), and South Yorkshire ('Leeds' and 'Weeton').

Habitat and ecology The larvae probably develop within fungal mycelia within decaying wood, although the favoured situations and conditions are not known in Britain. In France, however, larvae are known to develop in small pockets of white-rot (probably caused by the bracket fungus *Polyporus squamosus*) in living trees at two to six metres above the ground and have been found in a diverse range of broad-leaved trees (*Fagus*, *Populus*, *Ulmus*) but with a preference for *Fagus* (Dodelin, pers. comm.). Adults are most often found during winter and spring and so may not have been in typical breeding habitat at the time – soft decaying wood of ash, beech, wych elm and apple have been reported - and are attracted to freshly exposed sap when they become active again in late April and May (Crowson,1960; Alexander, 2002). Very few records have been reported during the summer period, which is consistent with them being in rot-pockets high up on living trees. Sites include the remnants of medieval forests, historic parklands, ancient woodlands, traditional orchards, and (possibly) the Cotswold ash pollard landscape (Whitehead, 1999) – all classic localities for Britain's old growth fauna (Alexander, 2004). It is regarded as an indicator species for high quality forests in France (Brustel, 2004). One of the most recent British reports is however an

oddity – 'from fungus on planted silver maple street tree' in Welwyn Garden City, Hertfordshire, mid November (James, 2002), presumably a beetle feeding up before finding an overwintering site.

Status Fowler (1889) regarded this beetle as 'rare' and only lists three localities. Few additional localities have been discovered in the intervening 125 years. No sub-fossil specimens have been found (Buckland & Buckland, 2006) but the species is generally regarded as native. IUCN criteria satisfied are based on the area of occupancy (less than 7 tetrads), with severely fragmented populations (7 localities scattered across a very large area of Britain), and projected continuing decline in area, extent and quality of habitat. No information is available on current population trends. The veteran tree habitat continues to be very vulnerable to damaging changes in land use at landscape scale.

Threats Loss of veteran trees across the wider landscape, through development, tidiness and public safety reasons, as well as declining veteran tree populations within more protected SSSI and NNR; lack of new generations of trees, veterans of the future.

Management and Conservation The species appears to require open landscapes with populations of open-grown veteran broad-leaved trees, with lateral branching well-developed such that *Polyporus squamosus* is able to exploit broken branch stubs. Just one of the sites reported in the last 25 years (New Forest SSSI) has any legal protection other than through BAP Priority Habitat status in some others. Other sites where it has been found in recent decades include a few with NNR and SSSI status. No monitoring schemes are known to be in operation.

Published sources Alexander (1987, 1999 & 2002), Appleton (2004), Brustel (2004), Buckland & Buckland (2006), Crowson (1960), Dodelin (2006), Drane (1990), Fowler (1889), James (2002), Johnson (2008), Joy (1932), Whitehead (1999 & 2005).

ABDERA AFFINIS

A false darkling beetle

CRITICALLY ENDANGERED (POSSIBLY EXTINCT) B2, a, b ii & iii

Order COLEOPTERA

Family MELANDRYIDAE

Abdera affinis (Paykull, 1799). Formerly known as *Carida affinis*.

Identification The adult is keyed by Buck (1954); no larval keys are available in English.

Distribution Added to the British list from 'Strathspey' by C.G. Lamb in July 1905, and subsequently by Yerbury (Fowler & Donisthorpe, 1913). No further records were known to Welch (1987) but a record for 'Nethy Bridge' dated 1909 and recorded by T.G. Bishop has since been found. This is presumably the 'Strathspey' locality of Lamb and Yerbury, and where collectors would have focused their efforts at the time. Hyman (1992) refers to it having been recorded in mid-Perthshire in 1982, but the source of this information is not known. Unless this record can be authenticated it should be treated with caution.

Habitat and ecology Larvae develop in *Inonotus radiatus*, *I. obliquus* & more rarely *Phellinus igniarius* (D. Telnov, pers. comm.); mainly *I. radiatus* in Germany, but also other bracket fungi (www.kerbtier.de). These are heartwood decay fungi specializing in broad-leaved trees: *I. radiatus* on dead stems of alder, birch and other trees, *I. obliquus* on living birch trunks, and the *Phellinus* on willow and other trees. The Strathspey specimens came from 'in fungus on trees'.

Status No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native. The species is known from just one locality and possibly not found for 100 years. IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (less than 1 tetrad) . The species is probably difficult to find however and may still be extant.

Threats None obvious, unless it requires open conditions, in which case it might be threatened through canopy closure.

Management and Conservation Most remnants of Caledonian forest are now protected from development but are being subjected to rapid structural changes through removal of grazing.

Published sources Buck (1954); Buckland & Buckland (2006); Fowler & Donisthorpe (1913); Hyman (1992); Welch (1987).

MELANDRYA BARBATA

A false darkling beetle **VULNERABLE** D2

Order COLEOPTERA Family MELANDRYIDAE

Melandrya barbata (Fabricius, 1787)

Identification The adult is keyed by Buck (1954); no larval keys are available in English.

Distribution Best known from the New Forest, South Hampshire, but also known from: Darenth Wood, West Kent (Victoria County History); Stratfield Turgis, North Hampshire, 1914 (Levey, 2001); and Chiddingfold Forest, 1971 (Allen, 1973). New Forest records date from 1823, and there have been many records up until 1990 and 1992. Reports from Berkshire and Oxfordshire appear to be errors, or at least have not been verified by vouchers.

Habitat and ecology The larvae develop in decaying wood (Buck, 1954) although the type of decay and size of the wood is not recorded; reports mention beech in particular as well as oak, although these relate to adults rather than larval habitat. Adults have been found active from 21st May until 12th June; evening flight has been noted and the main activity period may be nocturnal. An adult has also been found in the autumn although the situation and circumstances were not noted. The New Forest records appear to include both the open wood pastures and inclosures.

Status No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native. 'One of the rarest of the British beetles; I only know of three specimens' (Fowler, 1891). While it has continued to be found in the New Forest, on rare occasions, and it has been found at three other locations, it remains an extreme rarity. IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (it is difficult to assess the extent of occupied habitat in the New Forest but certainly less than 20 km^2 and probably not much more than this even if the other 3 locations were included with severely fragmented populations (known historically from just 3 other localities, none providing records since 1971). No information is available on current population trends. The veteran tree habitat continues to be very vulnerable to damaging changes in land use at landscape scale. Red List or rare throughout much of its European range.

Threats Loss of large old trees, trunks, stumps, etc; canopy closure and minimum intervention, which lead to development of younger stands through canopy competition; lack of livestock grazing, which diversifies stand structure and favours the beetle.

Management and Conservation The New Forest is an SSSI and National Park but land management is not under strict control; a long and dynamic history of livestock grazing has been instrumental in maintaining the saproxylic habitats of the forest; timber exploitation remains an issue. *Melandyra barbata* is currently a Priority Species under the UK BAP but no conservation plan has been developed and no conservation action taken. The most urgent needs are: i) Clarification of ecology – larval hosts, size & condition of wood; ii) Identify key conservation management requirements; iii) Identify where main populations are in New Forest and Chiddingfold Forest; iv) Establish monitoring protocol for old trees, to identify population trends in known sites; v) establish a monitoring protocol for the beetle once the above are in place.

Published sources Alexander (2002); Allen (1973); Buck (1954); Buckland & Buckland (2006); Fowler (1891); Levey (2001).

XYLITA LAEVIGATA

A false darkling beetle **VULNERABLE** D2

Order COLEOPTERA Family MELANDRYIDAE

Xylita laevigata (Hellenius, 1786)

Identification The adult is keyed by Buck (1954); no larval keys are available in English.

Distribution Confined to the Caledonian pine forest areas - known from Speyside, Glenfinnan, Black Wood of Rannoch, and a few other localities.

Habitat and ecology Develops in decaying wood of coniferous trees. A larva taken from a very rotten standing Scots pine in June 1986 produced an adult in July (Owen, 1990); unfortunately neither girth size nor tree density was recorded.

Status Rare (Fowler, 1891). No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native. IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (less than 4 tetrads) with severely fragmented populations within Scotland (known historically from 14 localities but only from 4 of these since 1990).

Threats Changes in gross forest structure, particularly the trend towards dense stands of young close-grown pine.

Management and Conservation Little is known of the ecology of this beetle but pine forest species tend to favour an open structure, with open-grown pine trees developing the widest potential variety of saproxylic habitats. While the remnant areas of Caledonian pine forest are now well-protected from development, they are subject to dramatic changes in grazing pressure with consequent gross changes in forest structure. No monitoring schemes are known to be in operation.

Published sources Alexander (2002); Buck (1954); Buckland & Buckland (2006); Fowler (1891); Owen (1990).

ZILORA FERRUGINEA

A false darkling beetle **VULNERABLE** D2

Order COLEOPTERA Family MELANDRYIDAE

Zilora ferruginea (Paykull, 1798)

Identification The adult is keyed by Buck (1954); no larval keys are available in English.

Distribution Caledonian pine forest, and until recently only known from a very restricted area of Speyside and Deeside. First discovered in Britain at Braemar in June, 1871 (Fowler, 1891). Discovered in Shieldaig Woods SSSI, West Ross in 2010.

Habitat and ecology In the small bracket fungus *Trichaptum abietinum* (Buck, 1954) which is a common and widespread species which develops at the base of dead Scots Pine *Pinus sylvestris* stems and on stumps. One was reared from a pupa found beneath bark on rotting pine (Alexander, 1990), although the girth size and forest structure were not noted. One has subsequently been seen on a large cut pine stump in open mature pine forest in Glen More (Alexander, pers. obs.).

Status Extremely local (Fowler, 1891). No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native. IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (less than 2 tetrads) with severely fragmented populations (known historically from 7 localities but only from 2 of these since 1990).

Threats Changes in gross forest structure, particularly the trend towards dense stands of young close-grown pine.

Management and Conservation Little is known of the ecology of this beetle but pine forest species tend to favour an open structure, with open-grown pine trees developing the widest potential variety of saproxylic habitats. While the remnant areas of Caledonian pine forest are now well-protected from development, they are subject to dramatic changes in grazing pressure with consequent gross changes in forest structure. No monitoring schemes are known to be in operation.

Published sources Alexander (1990; 2002); Buck (1954); Buckland & Buckland (2006); Fowler (1891).

MORDELLA HOLOMELAENA

A tumbling flower beetle **VULNERABLE D2**

Order COLEOPTERA Family MORDELLIDAE

Mordella holomelaena Apfelbeck, 1914. Formerly confused with *M. leucaspis* within *M. aculeata* sensu auctt. Brit. partim non Linnaeus, 1758.

Identification The adult '*Mordella aculeata'* is keyed in Buck (1954) but this name includes both *holomelaena* and *leucaspis*, the two distinguished in Britain by Batten (1986).

Distribution Mainly known from Kent westwards to Somerset, Gloucestershire and Herefordshire, with outlying records from Huntingdonshire and South Lancashire.

Habitat and ecology Larvae of mordellids have been recorded both from rotting wood and plant stems (Buck, 1954). The adult is typically found at blossom between June 1st and August 26th but an adult *Mordella* '*aculeata'* has also been found 'under bark' on 16th May (Lewis & Coles, in Scott, 1960). Most – but not all - records come from woodland glades; others appear to be from chalk downland.

Status No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native. IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (less than 4 tetrads = 16 km^2) with severely fragmented populations throughout England (known historically from 20 localities but only from 4 of these since 1990).

Threats Impossible to assess without greater understanding of its ecology. Cutting of glade, ride-side and woodland-edge vegetation is likely to be damaging.

Management and Conservation Some of the sites are within SSSI.

Published sources Batten (1986); Buck (1954); Hyman (1992); Scott (1960).

MORDELLA LEUCASPIS

A tumbling flower beetle **VULNERABLE D2**

Order COLEOPTERA Family MORDELLIDAE

Mordella leucaspis Küster, 1849. Formerly overlooked within *M. aculeata* sensu auctt. Brit. partim non Linnaeus, 1758.

Identification The adult '*Mordella aculeata'* is keyed in Buck (1954) but this name includes both *holomelaena* and *leucaspis*, the two distinguished in Britain by Batten (1986).

Distribution Only known from three specimens: Treago, Herefordshire (R.W. Lloyd); Salisbury Plain, South Wiltshire (P. Harwood) - both very old voucher specimens, referred to in Batten (1986); and Frome St Quintin, Dorset (1987, C.M. Drake). Central Europe & Mediterranean.

Habitat and ecology Larvae of mordellids have been recorded both from rotting wood and plant stems (Buck, 1954); no information is currently available on the ecology of this particular species.

Status No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native. IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (less than 1 tetrad) with severely fragmented historical populations (known historically from 3 localities and most recently in 1987).

Threats Impossible to assess without greater understanding of its ecology.

Management and Conservation No information available.

Published sources Batten (1986); Buck (1954); Hyman (1992).

MORDELLISTENA NANULOIDES

A tumbling flower beetle **VULNERABLE D2**

Order COLEOPTERA Family MORDELLIDAE

Mordellistena nanuloides Ermisch, 1967

Identification The adult is keyed in Levey (2002); no larval keys are available in English.

Distribution A rarely found species known from the Thames and Solent Estuaries: East Kent, West Sussex and South Hampshire. It may well occur in other coastal areas (Levey, 2002). Best known around the Isle of Sheppey, East Kent (Batten, 1986), eg Isle of Sheppey, GC Champion coll. & Sheerness , Tomlin coll. Discovered at West Wittering, West Sussex, 14 July 1971, and Portsdown, South Hampshire, 9 July 1991.

Habitat and ecology The host-plant is sea wormwood *Artemisia maritima* (Levey, 2002). Very little else appears to be known about the species.

Status No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native. IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (known from less than 2 tetrads in the period since 1990) with severely fragmented populations throughout southern England (known historically from just 2 areas and with post 1990 records from both).

Threats Coastal development.

Management and Conservation Stands of sea wormwood are presumably widespread along these estuarine areas and the areas are also presumably subject to much legal protection, some being within SSSI and SAC. However, nothing is known about the extent of the beetle colonies, nor any relationships with the plant dynamics. No monitoring scheme is in operation.

Published sources Batten (1986); Buckland & Buckland (2006); Levey (2002).

OMOPHLUS PUBESCENS

A darkling beetle **VULNERABLE D2**

Order COLEOPTERA Family TENEBRIONIDAE

Omophlus pubescens (Linnaeus, 1758). Formerly known as *O. rufitarsis* (Leske, 1785).

Identification The adult is keyed by Buck (1954); no larval keys are available in English.

Distribution Weymouth, where it has been taken in some numbers on and near Chesil Beach (Fowler, 1891); there is a specimen in the O'Mahony collection labeled "New Forest" but this is probably erroneous (Buck, 1954). Up until 1989, the beetle was last reported in 1926, although a pupa was found in the 1960s. Found in fair numbers by a number of Coleopterists in early June 1989 and subsequently seen by AJ Allen (pers. comm.), eg many 6th June 1997.

Habitat and ecology The adult is believed to feed on the pollen of sea thrift *Armeria maritima* and has been taken by sweep-netting the flowers. A pupa has been found under a stone at the roots of thrift; the larvae presumably are root-feeders. Cooter (1990) also reported finding two under wet seaweed at the edge of tidal pools in the salt-marsh area forming the southernmost extension of East Fleet between Chesil Beach and the A354 Weymouth to Portland road. AJ Allen (pers.comm.) suspects it has a very short adult season.

Status No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native. IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (less than 1 tetrad) known historically from just the one area.

Threats None obvious.

Management and Conservation The Fleet SSSI and SAC includes much of Chesil Beach. The species presumably has a preference for thrift plants growing scattered over coastal shingle, with limited competition from other plant species, and may therefore be dependent on natural disturbance of the shingle to maintain suitably open conditions. Reports of the species all come from the east end of the SSSI and it might be very informative for a search to be commissioned throughout the length of the beach, in order to help clarify some aspects of its distribution, especially targeting the larvae in order to clarify their associations with the pattern of vegetation. No monitoring scheme is currently in operation.

Published sources Buck (1954); Buckland & Buckland (2006); Cooter (1990); Fowler (1891).

PENTAPHYLLUS TESTACEUS

A darkling beetle **VULNERABLE**

Order COLEOPTERA Family TENEBRIONIDAE

Pentaphyllus testaceus (Hellwig, 1792)

Identification The adult is keyed by Brendell (1975); larvae are keyed by van Emden (1947).

Distribution Until recently, only known as British on the basis of one found in a decaying fruiting body of '*Polyporus squamosus'* placed as a trap in the hollow trunk of a partially decayed oak in a hedgerow in fields at Crouch End, Hornsey, North London, June 1876 (Janson, 1903) – a rural area at the time (Brendell, 1975). Discovered in Windsor Great Park in 2001 and Langley Park in 2006 (Hammond, 2007).

Habitat and ecology Develops in large volumes of red-rotten wood retaining its integrity and some moisture, with abundant sheets of *Laetiporus sulphureus* mycelia along fracture lines; freshly exposed heartwood of recently fallen oak trees or major boughs – appears to require a stable environment in which humidity levels are unvarying and a supply of its fungal food is long-lasting. It is stated to feed on fungal spores and hyphae (Koch, 1989). adults found all year round, with tenerals noted in April; apparently constantly full-winged although none has ever been taken in flight traps; clearly dispersal flights must be few, and probably only when the habitat has been disturbed by fracture of the trunk with consequent drying. With conditions within the decayed heartwood of an oak remaining sufficiently constant, it seems probable that some populations might persist within a single tree for many, even hundreds of years.

Status It could be argued that the 1876 example was not native to Britain, but to account for the presence of a non-pest species in Hornsey at that date would be difficult. Hammond (2007) comments that the recent finds constitute compelling evidence that it is an established British species. There appears to be a substantial breeding population at Windsor. Its apparently specialized habitat requirements, coupled with its highly reclusive habits are likely to make the species very difficult to find, lending some support to the view that it is a long-established but overlooked British species. Hammond (loc cit) concluded that it may be truly native. IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (less than 3 tetrads) with severely fragmented populations (known from just 2 localities). No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native.

Threats Loss of ancient oaks with red-rotten heartwood, by clearance and removal, for firewood, tidiness, etc; lack of new generations of future red-rotten oaks – it takes around 150 – 200 years before oaks begin to develop heartwood decay, and the large volumes of red-rot required will take even longer to be produced. Concentrations of ancient oaks are likely to be important to maintain population viability, so even the loss of single trees may have long-term consequences.

Management and Conservation Windsor Great Park forms part of a SSSI and SAC and is widely acknowledged as containing one of Britain's most important concentrations of ancient oaks. It is owned and managed by The Crown Estate. Langley Park is a Country Park but has no legal protection for its ancient oaks. No monitoring schemes are known to be in operation.

Published sources Brendell (1975); Buckland & Buckland (2006); van Emden (1947); Hammond (2007); Janson (1903); Koch (1989).

CHRYSANTHIA NIGRICORNIS

A beetle **VULNERABLE** D2

Order COLEOPTERA Family OEDEMERIDAE

Chrysanthia nigricornis Westhoff, 1881

Identification The adult is described and illustrated by Skidmore (1973); no larval keys are available in English.

Distribution Only known in Britain from Glen Tanar, Aberdeenshire, where it has been known since 1971; most recently reported in 2000.

Habitat and ecology Larvae have been found in soft, white-rotten, heartwood of an old pine Pinus branch (5cm thick) lying beneath tufts of moss and heather (Welch, 1987). Three were swept from heather in open pine forest and pupae/larvae were found in fallen pine branches under tufts of moss & heather, 26th August 1971 (Skidmore, 1973). Reared from pine branch containing larvae collected August 1990, adult emerged July 1991 (Owen & Mendel, 1992). Adults are active from June through to September on the Continent, and very frequently found at the flowers of composites (Lyneborg, 1977).

Status No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native. IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (less than 1 tetrad) (known historically from just the one site).

Threats Changes in gross forest structure, particularly the trend towards dense stands of young close-grown pine – the site is described as open pine forest by the recorders. Over-grazing may also be a threat as the adults appear to have a requirement for blossom in the field layer, eg umbels and composites

Management and Conservation Glen Tanar is an SSSI. The species appears to develop in substantial well-rotted fallen pine branches while the adults are attracted to blossom in open sunny situations. This suggests that site management should aim to provide open forest conditions and to encourage the development of large open-grown pines with good lateral branching. Dense stands of young pine are unlikely to provide suitable habitat. No monitoring scheme is in operation other than standard Site Condition Monitoring.

Published sources Buckland & Buckland (2006); Lyneborg (1977); Owen & Mendel (1992); Skidmore (1973); Welch (1987).

MELOE BREVICOLLIS

A beetle **VULNERABLE** D2

Order COLEOPTERA Family MELOIDAE

Meloe brevicollis Panzer, 1793

Identification The adult is described in Buglife (2013). Larval keys are provided by van Emden (1943) although *mediterraneus* is not covered.

Distribution Currently known from just two populations: South Devon and Coll, Mid Ebudes; but formerly also known in: West Penwith, West Cornwall; Bodmin Moor and north coast of East Cornwall; Isle of Wight; South Hampshire; East Sussex; East & West Kent; Surrey; Berkshire; Merionethshire; Derbyshire.

Found on the South Devon coast between Bolt Head and Bolt Tail in April 2006. Colony in a fairly small area, either in fairly short turf or near the edge of small earth scrapes (rabbits), or occasionally below bushes of Ulex europaeus. Several were observed eating leaves of *Taraxacum officinale* (Heckford & Beavan, 2011). Joy (1902) records that 'this April 1902 I took one specimen on the top of the cliff, Bolt Tail'. This suggests that the species has remained undetected in this area since then and has not arrived from another undetected locality. JH Keys found one on a pathway beyond Uppaton, leading to Watersmeet on 25 June 1902 (Walkham Valley).

Discovered on Coll on 29th June 2009, in a sand dune system on the west coast near Tràigh Hogh, part of an RSPB Reserve, and also reported from near Sorisdale, over 11km to the north-east; subsequently found on four sites in June 2010 (Heckford & Beavan, 2011)

Prior to the recent discoveries the most recent records were from West Cornwall: Portheras Cove, Pendeen, on cliff, 23 June 1951, R.T. Bannister; Nangellan [Nanjulian], St Just, on grass on cliff top, 6 June 1946, R.T. Bannister. It had also been reported from East Cornwall: "I have an example (also ex Jansen) with the data "Millhook/24.5.1919/EO Armytage." The locality is near Bude (Allen, 1962) i.e. Millook, a well known Large Blue site at the end of the 19th C. Also known on the moors above Liskeard (Allen, 1962).

Habitat and ecology Adults are active in the spring from late March to June, and the triungulin larvae are usually found in June. Thought to favour Hawkbits *Leontodon* as food plants but are occasionally found on other plants such as soft grasses. All known sites are on the coast, on wildflower-rich cliff-top grasslands and machair dunes (Species Management Sheet, Buglife, 2012). Triungulin were found on male *Colletes floralis* at Cahore Dunes in County Wexford on 28th June 2006 - the question of whether or not triungulins could be transported on bees flying across to Ireland from Britain or the continent was expressed by Telfer (2009).

Status No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native. IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (less than 4 tetrads) with severely fragmented populations (currently known from just four sites on Coll and one in South Devon).

Threats Relationship with coastal grazing and scrub development is unclear.

Management and Conservation The South Devon site is within an SSSI, owned and managed by The National Trust; the Coll sites lie within an RSPB Reserve. Details of current management practices are not known at present, but light to moderate rough grazing is presumably required in order to maintain the sward in suitable condition, while overgrazing has the potential to be damaging by eliminating flower development for the host bees. No monitoring schemes appear to have been established although the South Devon site is regularly visited by recorders.

Published sources Allen (1962); Buckland & Buckland (2006); Buglife (2012 & 2013); van Emden (1943); Heckford & Beavan (2011); Joy (1902); Telfer (2009).

MELOE MEDITERRANEUS

A beetle **VULNERABLE D2**

Order COLEOPTERA Family MELOIDAE

Meloe mediterraneus Müller, J., 1925

Identification The adult is described in Buglife (2013). Larval keys are provided to *Meloe* species by van Emden (1943) although *mediterraneus* is not covered.

Distribution

The status of Meloe mediterraneus in the British Isles has been a mystery since the 1990s. 19th Century specimens taken from England were discovered in the Natural History Museum collection. The beetle was then given the status RDB Extinct in Hyman and Parsons (1994). These historic records are from just two sites Margate in Kent where the beetle was last recorded in 1906 and Southend, Essex in 1873.

Currently known from the South Devon coast between Bolt Head and Bolt Tail where it was re-discovered in autumn 2012(Buglife, 2013).

Habitat and ecology Adults are nocturnally active and are found from September to April on coastal grasslands.

Status No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native. IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (less than 1 tetrad) with severely fragmented populations (currently known from a small site in South Devon).

Threats Relationship with coastal grazing and scrub development is unclear.

Management and Conservation The South Devon site is within an SSSI, owned and managed by The National Trust. Details of current management practices are not known at present, but light to moderate rough grazing is presumably required in order to maintain the sward in suitable condition, while overgrazing has the potential to be damaging by eliminating flower development for the host bees. No monitoring schemes appear to have been established although the South Devon site is regularly visited by recorders.

Published sources Buckland & Buckland (2006); Buglife (2013); van Emden (1943).

SITARIS MURALIS

A beetle **VULNERABLE D2**

Order COLEOPTERA Family MELOIDAE

Sitaris muralis (Forster, 1771). Formerly known as *Apalus muralis* sensu auctt. Brit. non Fabricius, 1775

Identification The adult is keyed in Buck (1954); no larval key is available in English.

Distribution Scattered reports across southern England; only two reports in last 25 years:

Brockenhurst, August 2010, old damaged brick wall (built late 19th C), single males on 13th, 20th & 24th (found in the New Forest in 1947 according to D.J. Mann); and Welling, Kent, in 2000 and 2001 (Allen, 2001). Well known in Oxford from 1906 to the mid 1940s, but the habitat is now destroyed (Hyman, 1992). Reported from Wheatley, Oxfordshire, 1969.

Habitat and ecology Parasitic on bees of the genera *Anthophora* and *Osmia* (Buck, 1954), mostly in old walls, where the larvae feed on the brood in the bee's nest; chiefly associated with *Anthophora plumipes* and *A, retusa* but also reported from *Bombus terrestris* (Welch, 1987). The host species are generally cavity nesters and will also nest, to a greater or lesser degree depending on the species, in other more natural substrates if the conditions are suitable, such as cavities in dead wood, earth banks and cliffs. Brick walls are often utilised by these bees as degraded mortar provides suitable nesting niches in a favourable environment, e.g. a sunny brick, stone or cob wall.

Status A difficult species to detect due to the likelihood of urban sites being hidden from general view and often on private land with no public access, plus the short lifespan and relative inactivity of adults, which apparently seldom move far from the host bee nest (Brock, 2010). IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (less than 1 tetrad) with severely fragmented populations (only two reports in past 25 years). No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native.

Threats Development, ie destruction of the occupied brick wall nest sites.

Management and Conservation Primarily found in urban sites and so difficult to conserve effectively.

Published sources Allen (2001); Brock (2010); Buck (1954); Buckland & Buckland (2006); Hyman (1992).

ANTHICUS ANGUSTATUS

A beetle **VULNERABLE D2**

Order COLEOPTERA Family ANTHICIDAE

Anthicus angustatus Curtis, 1838

Identification The adult is keyed in Buck (1954) and Telnov (2010); no larval keys are available in English.

Distribution SW England (East Cornwall, South Devon & Dorset), central southern (Isle of Wight, West & East Sussex), Middlesex, South Lancashire. A western European species, otherwise only known from Ireland, France and Spain (Telnov, 2010). Only two modern records however: Durdle Door, Dorset, 1998 (Owen, 1999) and Tower Hamlets, London, one on eco-roof, 2002 (Jones, 2004). Old Devon records are Slapton Ley (Champion} and Bigbury Bay (Keys) in the south, and Braunton Burrows, North Devon.

Habitat and ecology Found on sandy shores and salt marshes, in or on bare sand with sparse or no vegetation; adults and larvae are saprophagous feeding on decaying plant material; adults are active from May to September (Telnov, 2010).

Status Rare (Fowler, 1891), although he was only aware of sites in the south-east of England and Bristol. It has now been found in 8 vice-counties but records are mostly very old. IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (less than 2 tetrads) with severely fragmented populations (recent reports from just one viable site and one specimen in transit). No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native.

Threats Beach cleaning operations, for tourism; coastal development.

Management and Conservation It is important that large sandy beaches are not damaged by beach ‘cleaning’ operations which remove the strandline seaweed habitat. Many potential sites are designated SSSI. No monitoring schemes are in operation.

Published sources Buck (1954); Buckland & Buckland (2006); Fowler (1891); Jones (2004); Owen (1999); Telnov (2010).

ANTHICUS BIMACULATUS

A beetle **VULNERABLE** B2, a, b iii

Order COLEOPTERA Family ANTHICIDAE

Anthicus bimaculatus (Illiger, 1801)

Identification The adult is keyed in Buck (1954) and Telnov (2010).

Distribution East Kent & East Sussex; East and West Norfolk; North Devon; Cheshire & South Lancashire; Anglesey & Glamorgan (Telnov, 2010). Records since 1990 only from East Sussex, East Norfolk, North Devon, North Lincolnshire, South Lancashire, and Glamorganshire.

Habitat and ecology Psammophilous species of dry sandy habitats, such as sand hills, sea shores and near water bodies; adults and larvae are saprophagous; adults are active from April to August (Telnov, 2010). In the 1960s and 1980s it was taken regularly in pitfall traps at Newborough Warren, Anglesey, in some cases up to 1.5km inland. Since 2007 repeated attempts to find it in the same places have failed. The areas where it was originally found are now much more heavily vegetated than previously and this may be the reason behind its apparent demise. J. Thomas informed us that in the 1970s he could find the species commonly on the Lancashire dunes at night (Denton & Loxton, 2012).

Status Regarded by Fowler (1891) as very rare. At that time it was only known from the Lancashire and Cheshire sand dunes; it is now known to be more widespread but still only known from 13 hectads and only six of these since 1990. IUCN criteria satisfied are based on the area of occupancy (less than 6 tetrads), with severely fragmented populations (the 6 recent localities scattered across a very large area of Britain), and evidence for decline due to increasing stabilization of its dry open sandy habitats with consequent vegetation expansion. In addition to its documented decline at Newborough Warren NNR the site at The Crumbles near Eastbourne, East Sussex has also become much smaller and the population may have been lost as a result (AJ Allen, pers. comm.). No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native.

Threats Progressive stabilization of coastal dunes, and succession from bare sand to grassland and scrub; coastal development.

Management and Conservation Conservation action needs to ensure the natural dynamism of coastal sand dunes is maintained, that renewal of suitable areas of open sand is more or less constant. Despite being a NNR, the species appears to have disappeared from Newborough Warren nonetheless. The Crumbles site has also been reduced in extent in recent years. The other known sites are SSSI.

Published sources Buck (1954); Buckland & Buckland (2006); Denton & Loxton (2012); Fowler (1891); Telnov (2010).

ANTHICUS TRISTIS

A beetle **VULNERABLE D2**

Order COLEOPTERA Family ANTHICIDAE

Anthicus tristis Schmidt, 1842

Identification The adult is keyed in Buck (1954) and Telnov (2010); no larval keys are available in English.

Distribution SW England: East Cornwall, South Devon, Dorset, South Hampshire, Isle of Wight; the subspecies *schaumii* Wollaston is effectively confined to the western European seaboard of Britain, France, Spain, Portugal & Morocco (Telnov, 2010). The only modern records are from Dorset: Weymouth (1992, J Owen), Portland Harbour (2001, J Denton) and Ferrybridge, 1996 and 1997 (AJ Allen, pers. comm.). Formerly locally common on the Chesil Beach (Hyman, 1992) – the localities mentioned above all lie at the extreme east end of this shingle feature. The other vice-counties relate to old records: the only Cornwall record is from Portscatho in 1897 (Champion) and the South Hampshire record is from Lymington Salterns (Blatch) record in Fowler (1891).

Habitat and ecology Sea shore and sand dunes; adults are active March to October (Telnov, 2010); saltmarshes (Fowler, 1891); coastal shingle and sandy expanses at the edge of saltmarshes (H yman, 1992). Allen (pers. comm.) finds it under dry dog dung or wood lying on the beach.

Status Difficult to assess as there are large gaps in the recording from individual sites, eg the Chesil Beach population was recorded in 1926 and then not again until 1989. The same situation presumably applies at other historic sites. However recent confirmation has only come from the Chesil/Portland/Weymouth area. IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (less than 1 tetrad) with severely fragmented populations within the South West of England (currently known from 2 localities, although perhaps the same continuous site). No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native.

Threats Coastal developments; compaction and erosion of coastal shingle; beach cleaning operations.

Management and Conservation The area appears to be within the Chesil and Fleet SSSI. The species is presumably dependent on natural coastal processes of shingle deposition and erosion, vegetation development on stabler areas, and natural strandline deposition.

Published sources Buck (1954); Buckland & Buckland (2006); Denton (2002); Fowler (1891); Hyman (1992); Owen (1999); Telnov (2010).

VANONUS BREVICORNIS

A beetle **VULNERABLE** B2, a, b iii

Order COLEOPTERA Family ADERIDAE

Vanonus brevicornis (Perris, 1868). Formerly known as *Aderus brevicornis*.

Identification The adult is keyed in Buck (1954); no larval keys are available in English.

Distribution A notably small number of records scattered across southern and eastern England, from South Devon, South Hampshire (New Forest), East Sussex (Buxted Park area), West Sussex, East Kent, Berkshire (Windsor Great Park and Cothill Fen), Bedfordshire and West Suffolk (Ickworth Park).

Habitat and ecology The larvae inhabit red-rotten heartwood in various broad-leaved trees; the adults may be found by beating the foliage of the host tree; dispersing adults may be found in other decay situations (Buck, 1954). Adults are active for 8-10 weeks in late summer; they have been found active on the ground surface near to a moss-covered tree stump in June and July; they are attracted to soft annual bracket fungi for feeding (Harrison, 2011; Allen, 2012) and also to light (Chuter, 2008). Open-grown trees are required, where space enables full development of the tree canopy and extended life-spans, enabling the development of advanced heartwood decay in the trunk and main limbs, with relatively warm temperatures promoted by sun-lit trunks.

Status Extremely rare (Fowler, 1891) and still the case. IUCN criteria satisfied are based on the geographic range restricted in area of occupancy (less than 6 tetrads) with severely fragmented populations (currently known from 6 localities across SE England, formerly from another 4) and projected continuing decline in area, extent and quality of habitat. No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native.

Threats Declining availability of suitable host trees, through a wide variety of pressures: changing land-use and development generally; lack of new generations coming on; imported diseases; canopy closure; etc.

Management and Conservation The New Forest and Cothill Fen are both SSSI but the majority of known sites have limited protection. The key management requirements are for promotion of large concentrations of open-grown trees – at landscape scale - and a diverse age structure.

Published sources Allen (2012); Buck (1954); Buckland & Buckland 92006); Chuter (2008); Fowler (1891); Harrison (2011).

SCRAPTIA FUSCULA

A beetle **VULNERABLE** B2, a, b iii

Order COLEOPTERA Family SCRAPTIIDAE

Scraptia fuscula Müller, P.W.J., 1821

Identification The adult is keyed by Buck (1954), but in greater detail by Allen (1940) and Levey (2009) – eye size and antennal length seem to be the best characters to separate this species from *S. testacea* (Barclay, 2001); no larval keys are available in English.

Distribution The majority of records are from the wider historic area of Windsor Forest and Great Park, including Silwood Park, and other neighbouring areas, in Buckinghamshire (Telfer, 2011 & A.P. Foster, 2001) and Surrey, but there is an apparently reliable record also from Brockworth Park – the remnants of a medieval deer park in East Gloucestershire (Allen, 2001). It has also been found in Richmond Park, Surrey (Barclay, 1998). The record from Ripley, Surrey '*nigricans* on flowers in gardens' (Stephens, 1839) is doubted by Allen (2001) due to the association with flowers. The other counties given in Buck (1954) are believed to relate to *testacea* (Allen, 2001). There is an unconfirmed record from Moccas Park, Herefordshire (J. Cooter, pers. comm.).

Habitat and ecology Larvae develop in relatively soft rotten heartwood of oak *Quercus* (Alexander, 2002); larvae occur under the bark of trees and have been reared on dead insects (Levey, 2009). The adults tend to be found by beating the branches of ancient oaks with advanced heart-rot development, often with colonies of Brown Tree Ant *Lasius brunneus*. Allen (2001) states that the ecological data provided by Donisthorpe (1940) relate to *testacea* rather than *fuscula*. Males appear rarer and far shorter-lived than females, which in some years may persist as late as early August (Allen, 2001).

Status About 1942, the true *S. fuscula* was first detected in Windsor Great Park, on one fairly old oak near the north-west perimeter of the area, where specimens could usually be obtained in season (June/July). Towards the close of the decade a marked expansion took place, the species having apparently spread either from this tree or from elsewhere to other parts of the park. After that, for a number of years, *fuscula* was the one more often met with, *testacea* being decidedly hard to find; but by the 1970s, and onwards, there was no difference in frequency. They were, however, seldom if ever found together on the same tree (Allen, 2001). The trend over the last few decades appears therefore to be one of increasing population size, with the discovery of probably overlooked populations farther afield. However, the host veteran trees are known to be in long-term decline nationally and probably locally. IUCN criteria satisfied are based on the geographic range restricted in area of occupancy (less than 6 tetrads) with severely fragmented populations (currently known from 6 localities across central southern England) and projected continuing decline in area, extent and quality of habitat. No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native.

Threats Loss of veteran trees and decaying stumps; structural changes resulting from changing land management practices; poor recruitment of new generations of trees.

Management and Conservation Windsor Forest & Great Park and Richmond Park are both SSSI and SAC. However, the species remains vulnerable to age structure problems in particular, especially the need for future veteran trees to be developing at an adequate rate and in adequate numbers.

Published sources Alexander (2002); Allen (1940 & 2001); Barclay (1998 & 2001); Buck (1954); Buckland & Buckland (2006); Donisthorpe (1940); Foster (2001); Levey (2009); Stephens (1839); Telfer (2011).

ANASPIS BOHEMICA

A beetle **VULNERABLE D2**

Order COLEOPTERA Family SCRAPTIIDAE

Anaspis bohemica Schilsky, 1898

Identification The adult is keyed by Levey (2009); no larval keys are available in English.

Distribution Known in Britain only from three areas of the Scottish Highlands, all native pinewoods: Speyside, Rannoch, and Kinlochewe, 2007 (Levey, 2008). Mainly boreo-montane on Continent.

Habitat and ecology Adults have been beaten from dead pine *Pinus* branches, and at male pine and broom *Cytisus* blossom; larvae likely to be associated with conifers, developing in dead branches; adult June and July (Levey 2009).

Status Only known from three areas of Caledonian pine forest although likely to occur in other examples of the habitat. IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (less than 3 tetrads) with severely fragmented populations (currently known from 3 localities). No sub-fossil remains have yet been found in Britain (Buckland & Buckland, 2006), but current understanding suggests a long-term native.

Threats Unclear, as Caledonian pine forest areas appear to be well protected, in general terms, and the species' requirements do not appear particularly exacting.

Management and Conservation Most of the sites have a degree of protection, either as SSSI or nature reserves. The dead pine branch habitat is almost certainly self-maintaining, through natural storm damage and eventual collapse of trees from old age.

Published sources Buckland & Buckland (2006); Levey (2008 & 2009).

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Appendix 1. A complete listing of all species reviewed, namely those in the families Aderidae, Anthicidae, Colydiidae, Melandryidae, Meloidae, Mordellidae, Mycetophagidae, Mycteridae, Oedemeridae, Pyrochroidae, Pythidae, Ripiphoridae, Salpingidae, Scraptiidae, Tenebrionidae & Tetratomidae

Table A.

Species Name	GB IUCN Status (2013)	Qualifying Criteria	Rationale	JNCC Status 2013	Current European IUCN status	Presence in England	Presence in Scotland	Presence in Wales	AoO (hectads) <1989	AoO (hectads) 1990-2011	Dual Hectads
Mycetophagidae											
Pseudotriphyllus suturalis	LC			NS	NT	E	S	W	26	62	10
Triphyllus bicolor	LC			NS	LC	E	S	W	18	53	4
Litargus balteatus	NA		Native to North America; imported into GB.	Naturalised	NA	E			2	6	0
Litargus connexus	LC		Under-recorded. Likely to be in excess of 100 hectads.		LC	E	S	W	79	82	13
Mycetophagus atomarius	LC				LC	E	S	W	40	105	15

Mycetophagus fulvicollis	RE		Subfossil records are known so a long-established native species does appear feasible. Single record in 1870 so best regarded as Regionally Extinct.	Extinct	RE		S		1		
Mycetophagus multipunctatus	LC		Under-recorded. Likely to be in excess of 100 hectads.		LC	E	S	W	44	57	13
Mycetophagus piceus	LC		Under-recorded. Likely to be in excess of 100 hectads.		LC	E	S	W	34	77	11
Mycetophagus populi	VU	B2, a, b iii	IUCN criteria satisfied are based on the area of occupancy, with severely fragmented populations , and projected decline in area, extent and quality of habitat.	NR	LC	E	S		15	6	0
Mycetophagus quadriguttatus	LC			NS	LC	E	S		5	21	0
Mycetophagus quadripustulatus	LC				LC	E	S	W	151	117	36
Typhaea haagi	NA		Very widespread across Africa, Europe, Asia, North and South America. First found in Britain during 1948.		NA	E			1	3	
Typhaea stercorea	NA		Its strong association with man-made habitats in the more northerly parts of Europe suggests it may not, although long-established, be native there. Sub-fossil material dates from Roman period only.		NA	E	S	W	99	43	8

Eulagius filicornis	NA		Native to southern Europe & north Africa ; now established in southern England, although locations suggest an introduction.	Non-native	DD	E			0	11	0
Berginus tamarisci	NA		Mediterranean species recently established in Surrey.	Non-native	NA	E			0	1	0
Tetratomidae											
Hallomenus notatus	LC			NS		E	S	W	54	42	7
Tetratoma ancora	LC		No evidence for real decline in available habitat; more likely under-recording.	NR		E	S	W	22	12	1
Tetratoma desmarestii	LC			NS		E	S	W	23	24	3
Tetratoma fungorum	LC		Under-recorded. Likely to be in excess of 100 hectads.			E	S	W	129	85	38
Melandryidae											
Orchesia micans	LC			NS		E	S	W	48	47	3
Orchesia minor	LC			NS		E	S	W	37	44	5
Orchesia undulata	LC					E	S	W	107	122	31
Anisoxya fuscula	LC			NS		E		W	18	32	2
Abdera affinis	CR (PE)	B2 a b ii & iii	Found in one small area of Speyside in 1906 and subsequently; reputedly discovered in mid Perthshire in 1982 although this not mentioned in 1987 RDB.	NR/Extinct?			S		1	0	0
Abdera biflexuosa	LC			NS		E		W	11	43	3
Abdera flexuosa	LC			NS		E	S	W	27	40	3

Abdera quadrifasciata	LC			NS	E		W	10	26	2
Abdera triguttata	LC		Rare; in the Dee and Moray districts. With no evidence for any decline, and the increase in locations, it does not meet IUCN criteria for Threatened status.	NR	E	S		7	4	0
Phloiotrya vaudoueri	LC			NS	E			19	22	5
Serropalpus barbatus	NA			Non-native	E				1	
Xylita laevigata	VU	D2	IUCN criteria satisfied are based on the restricted population: geographic range restricted in area of occupancy (less than 4 tetrads) with severely fragmented populations.	NR		S		11	3	1
Hypulus quercinus	LC			NR	E	S	W	11	11	1
Zilora ferruginea	VU	D2	IUCN criteria satisfied are based on the restricted population: geographic range restricted in area of occupancy with severely fragmented populations.	NR		S		6	1	0
Melandrya barbata	VU	D2	IUCN criteria satisfied are based on the restricted population: geographic range restricted in area of occupancy (it is difficult to assess the extent of occupied habitat in the New Forest but certainly less than 20 km^2) with severely fragmented populations.	NR	E			3	1	0

Melandrya caraboides	LC		Under-recorded. Likely to be in excess of 100 hectads.		E	S	W	77	50	10
Conopalpus testaceus	LC		Under-recorded. Likely to be in excess of 100 hectads.		E		W	41	75	7
Osphya bipunctata	LC			NS	E			12	18	4
Mordellidae										
Tomoxia bucephala	LC			NS	E			14	33	5
Mordella holomelaena	VU	D2	IUCN criteria satisfied are based on the restricted population: geographic range restricted in area of occupancy with severely fragmented populations.	NR	E	S	W	16	4	0
Mordella leucaspis	VU	D2	IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy with severely fragmented populations.	NR	E			3	0	0
Variimorda villosa	LC			NS	E		W	19	41	4
Mordellistena brevicauda	DD		Very local; London and the south-eastern counties (Fowler, 1891). Its current range is somewhat more extensive and the beetle may have spread into Berkshire and Buckinghamshire. If the host association is correct - a naturalised plant – then the beetle must presumably also be naturalized. Data Deficient	NR	E			7	7	4

		appears to be the most sensible status for the time being.						
Mordellistena humeralis	LC		NS	E		17	15	1
Mordellistena neuwaldeggiana	LC		NS	E	W	19	54	1
Mordellistena parvula	LC		NS	E	W	2	22	0
Mordellistena pseudoparvula	LC	Although there are only a few widely scattered records, it is suggested that the species may actually be quite widely distributed in East Anglia and south-east England, since it is difficult to find even in sites where it is known to occur (Hodge, 1999).	NR	E		1	7	0
Mordellistena pseudopumila	LC	Although apparently restricted population, with its geographic range restricted in area of occupancy and with severely fragmented populations, the species has been identified from at least six vice counties in the last 25 years, suggesting that it is more overlooked than rare and threatened.	NR	E		2	4	0
Mordellistena pumila	LC	Under-recorded. Likely to be in excess of 100 hectads.		E	W	22	50	5
Mordellistena pygmaeola	DD	A long-overlooked species, only recently highlighted; two known sites; no ecological information.	NR	E		0	2	0

Mordellistena secreta	DD		Only relatively recently described, and known from just two British sites so far (Levey, 1999); known from many eastern European countries but not the west , suggesting an importation .	NR	E			1	1	0
Mordellistena variegata	LC			NS	E			6	41	3
Mordellistena acuticollis	NA		Data suggests a recent immigrant or importation . First noticed in Britain in 1992, from West Kent (Allen, 1995); Earliest known record is from 1985 (Levey, 2002). Spreading in south-east (Hodge, 2002).	Non-native	E			1	19	0
Mordellistena nanuloides	VU	D2	IUCN criteria satisfied are based on the restricted population: geographic range restricted in area of occupancy (known from less than 2 tetrads in the period since 1990) with severely fragmented populations.	NR	E			0	2	0
Mordellochroa abdominalis	LC		Under-recorded. Likely to be in excess of 100 hectads.		E		W	15	75	8
Ripiphoridae										
Metoecus paradoxus	LC		Under-recorded. Likely to be in excess of 100 hectads.		E	S	W	85	33	7
Colydiidae										
Pycnomerus fuliginosus	NA			Naturalised	E			7	25	5

Orthocerus clavicornis	LC	Although has clearly declined through the 20th Century, probably at least partly through development, there is no evidence that this decline is continuing.	NR	E	S	W	10	6	1
Synchita humeralis	LC		NS	E	S		31	19	4
Synchita separanda	LC	Currently expanding its range in response to sooty bark disease of sycamore.	NS	E			11	11	6
Cicones undatus	LC		Naturalised	E			1	15	1
Cicones variegatus	LC		NS	E		W	25	15	6
Bitoma crenata	LC			E	S	W	115	126	36
Endophloeus markovichianus	RE	Only ever known from the New Forest, between 1862 and 1927.	Extinct	E			1	0	0
Langelandia anophthalma	NA	Originally recorded by Wood (1886) from seed potatoes. Owen proposed that this species might in fact be an established synanthropic alien, since it has almost exclusively been recorded from artificial habitats.		E			3	5	1
Colydium elongatum	LC		NS	E		W	12	26	6
Aulonium ruficorne	NA	Importation	Non-native	E					
Aulonium trisulcus	NA	Probably introduced into Britain from the Continent in early 20th century; increased in abundance and range during the period of Dutch elm disease of the 1960s	Naturalised	E		W	33	4	1

		and 1970s, and has subsequently become much rarer again.							
Tenebrionidae									
Lagria atripes	RE	It seems likely that the species colonized southern England from the near Continent temporarily and then became extinct.		E			5	0	0
Lagria hirta	LC			E	S	W	183	352	92
Bolitophagus reticulatus	LC		NS		S		1	29	2
Eledona agricola	LC			E	S	W	77	120	29
Tenebrio molitor	NA	Under-recorded. Likely to be in excess of 100 hectads.	Naturalised	E	S	W	94	53	8
Tenebrio obscurus	NA		Naturalised	E	S	W	15	1	0
Alphitobius diaperinus	NA		Naturalised	E	S	W	28	28	2
Alphitobius laevigatus	NA		Naturalised	E	S	W	16	1	0
Tribolium castaneum	NA		Naturalised	E	S	W	34	16	2
Tribolium confusum	NA		Naturalised	E	S	W	21	2	0
Tribolium destructor	NA		Naturalised	E		W	2	0	0
Latheticus oryzae	NA		Non-native	E		W	4	1	0
Palorus ratzeburgii	NA		Naturalised	E			9	0	0
Palorus subdepressus	NA		Naturalised	E			7	1	0
Uloma culinaris	NA	A few isolated records only; presumed to be the result of importations.	Non-native	E			2	2	0
Phylan gibbus	LC	Under-recorded. Likely to be in excess of 100 hectads.		E	S	W	74	62	35

Melanimon tibialis	LC	Under-recorded. Likely to be in excess of 100 hectads.		E	S	W	59	60	25
Opatrum sabulosum	LC		NS	E		W	44	32	11
Helops caeruleus	LC		NS	E			27	17	5
Nalassus laevioctostriatus	LC			E	S	W	180	182	73
Xanthomus pallidus	LC	No evidence for any decline.	NS	E		W	17	10	2
Blaps lethifera	NA		Non-native	E			6	0	0
Blaps mortisaga	NA		Non-native	E	S		7	0	0
Blaps mucronata	NA		Non-native	E	S	W	92	20	2
Crypticus quisquilius	LC		NS	E		W	27	28	14
Phaleria cadaverina	LC		NS	E		W	39	36	15
Myrmechixenus subterraneus	RE	Only reported from two sites, most recently in 1956.		E			2	0	0
Myrmechixenus vaporariorum	NA	Not generally known to survive minimum outdoor temperatures in Britain.	Naturalised	E			10	9	1
Corticeus bicolor	LC	Population crashed following Dutch elm disease, as the dead elms lost their bark and young elms failed to survive; however no evidence of decline since then; merely ticking over at lower level.	NS	E		W	72	6	4
Corticeus fraxini	NA		Naturalised	E		W	8	4	0
Corticeus linearis	NA		Naturalised	E		W	16	4	2
Corticeus unicolor	LC		NS	E			8	17	2
Scaphidema metallicum	LC	Under-recorded. Likely to be in excess of 100 hectads.		E		W	77	70	14

Alphitophagus bifasciatus	NA			Naturalised	E			20	15	1
Gnatocerus cornutus	NA			Naturalised	E		W	28	0	0
Gnatocerus maxillosus	NA			Non-native	E			0	0	0
Pentaphyllus testaceus	VU	D2	There appears to be a substantial breeding population at Windsor. Its apparently specialized habitat requirements, coupled with its highly reclusive habits are likely to make the species very difficult to find. IUCN criteria satisfied are based on the restricted population: geographic range restricted in area of occupancy with severely fragmented populations.	NR	E			1	3	0
Platydema violaceum	LC		A highly mobile species on the very edge of its range in the southern and eastern counties of England. A new colonization appears to be progressing into eastern England.	NR	E			2	2	0
Diaperis boleti	LC			NS	E			11	45	2
Prionychus ater	LC		Under-recorded. Likely to be in excess of 100 hectads.		E		W	32	65	7
Prionychus melanarius	LC			NS				4	16	1
Gonodera luperus	LC			NS	E		W	52	29	12
Pseudocistela ceramboides	LC			NS	E			23	18	3
Isomira murina	LC				E	S	W	190	160	57
Mycetochara humeralis	LC			NS	E		W	14	16	5

Cteniopus sulphureus	LC		Under-recorded. Likely to be in excess of 100 hectads.		E		W	69	45	25
Omophlus pubescens	VU	D2	IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (less than 1 tetrad post 1980) with severely fragmented populations (known historically from just 3 localities).	NR	E			2	1	1
Oedemeridae										
Nacerdes melanura	LC			Naturalised	E	S	W	93	38	17
Chrysanthia nigricornis	VU	D2	IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (less than 1 tetrad) with severely fragmented populations (known historically from just the one site).	NR		S		1	1	1
Ischnomera caerulea	LC			NR	E		W	8	6	2
Ischnomera cinerascens	LC			NR	E			3	12	2
Ischnomera cyanea	LC		Under-recorded. Likely to be in excess of 100 hectads.		E		W	33	89	19
Ischnomera sanguinicollis	LC			NS	E		W	30	23	8
Oedemera femoralis	LC			NS	E	S	W	33	41	14
Oedemera lurida	LC				E		W	158	374	82
Oedemera nobilis	LC				E		W	150	343	64

Oedemera virescens	LC		There is no suggestion of any decline.	NR	E	S		8	8	3
Meloidae										
Lytta vesicatoria	LC			Non-native	E			47	2	2
Meloe autumnalis	RE				E			6	0	0
Meloe brevicollis	VU	D2	IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy with severely fragmented populations currently known from just four sites on Coll and one in South Devon.	NR	E	S	W	38	4	1
Meloe cicatricosis	RE				E			5	0	0
Meloe mediterraneus	VU	D2	IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (less than 1 tetrad) with severely fragmented populations (currently known from a small site in South Devon).	NR	E			2	1	0
Meloe proscarabaeus	LC				E	S	W	227	117	28
Meloe rugosus	LC			NS	E			21	26	3
Meloe variegatus	RE				E			4	0	0
Meloe violaceus	LC				E	S	W	194	124	23

Sitaris muralis	VU	D2	A difficult species to detect. IUCN criteria satisfied are based on the very small or restricted population: geographic range restricted in area of occupancy (less than 1 tetrad) with severely fragmented populations (only two reports in past 25 years).	NR		E			14	1	1
Mycteridae											
Mycterus curculioides	NA		Doubtfully native & long gone.			E			0	0	0
Pythidae											
Pytho depressus	LC		Historically known from 14 hectads and no evidence for a decline.	NR	LC		S		9	5	2
Pyrochroidae											
Pyrochroa coccinea	LC					E		W	93	101	45
Pyrochroa serraticornis	LC					E		W	273	305	111
Schizotus pectinicornis	LC		Historically known from 22 hectads and no evidence for a decline.	NR		E	S	W	14	8	2
Salpingidae											
Aglenus brunneus	LC			Naturalised		E		W	9	3	0
Lissodema cursor	LC			NR		E			13	9	0
Lissodema denticolle	LC			NS		E			44	54	10
Rabocerus foveolatus	DD		Too little information available to make an assessment.	NR		E		W	13	4	1

Rabocerus gabrieli	LC		Too little information available to make an assessment.	NS	E	S	W	24	11	0
Sphaeriestes ater	DD		Too little information available to make an assessment.	NS	E	S	W	17	1	0
Sphaeriestes castaneus	LC		Under-recorded. Likely to be in excess of 100 hectads.		E	S	W	63	16	6
Sphaeriestes reyi	DD		Too little information available to make an assessment.	NS	E	S	W	39	7	2
Vincenzellus ruficollis	LC		Under-recorded. Likely to be in excess of 100 hectads.		E	S	W	89	78	17
Salpingus planirostris	LC				E	S	W	212	208	71
Salpingus ruficollis	LC		Under-recorded. Likely to be in excess of 100 hectads.		E	S	W	115	57	18
Anthicidae										
Anthicus angustatus	VU	D2	IUCN criteria satisfied are based on the restricted population: geographic range restricted in area of occupancy with severely fragmented populations (recent reports from just one viable site and one specimen in transit).	NR	E			3	2	0
Anthicus antherinus	LC				E		W	58	101	17

Anthicus bimaculatus	VU	B2, a, b iii	IUCN criteria satisfied are based on the area of occupancy, with severely fragmented populations, and evidence for decline due to increasing stabilization of its dry open sandy habitats. In addition to its documented decline at Newborough Warren NNR the site at The Crumbles near Eastbourne, East Sussex has also become much smaller and the population may have been lost as a result (AJ Allen, pers. comm.).	NR	E	W	8	6	2
Anthicus flavipes	LC		It has recently been found very widely on the Cumbrian coast and is clearly neither Threatened nor Vulnerable; more under-recorded at other suitable sites.	NR	E	W	4	5	1
Anthicus tristis	VU	D2	Difficult to assess as there are large gaps in the recording from individual sites, eg the Chesil Beach population was recorded in 1926 and then not again until 1989. IUCN criteria satisfied are based on the very restricted population: geographic range restricted in area of occupancy with severely fragmented populations.	NR	E		4	2	2
Cordicollis instabilis	LC			NS	E	W	13	16	3

Cyclodinus constrictus	LC			NS	E			17	24	5
Cyclodinus salinus	LC		No evidence for any decline; known from large sections of coast.	NR	E			5	7	0
Omonadus bifasciatus	NA		Almost certainly an importation, associated with old dung heaps in the Midlands and East Anglia.	NS	E			5	8	0
Omonadus floralis	LC				E	S	W	120	146	29
Omonadus formicarius	LC		Under-recorded. Likely to be in excess of 100 hectads.		E		W	37	69	8
Stricticollis tobias	NA		Not native, originated in the East (Hammond, 1974 in Hawksworth).	Non-native	E		W	22	6	0
Notoxus monoceros	LC		Under-recorded. Likely to be in excess of 100 hectads.		E		W	67	69	25
Aderidae										
Aderus populneus	LC			NS	E		W	33	28	4
Euglenes oculatus	LC			NS	E		W	25	55	6
Vanonus brevicornis	VU	B2 a, b iii	Extremely rare (Fowler, 1891) and still the case. IUCN criteria satisfied are based on the geographic range restricted in area of occupancy with severely fragmented populations and projected continuing decline in area, extent and quality of habitat.	NR	E			4	6	0
Scraptiidae										
Scraptia dubia	RE		One confirmed record from Glanvilles Wotton, Dorset in 1842	Extinct	E			1	0	0

Scraptia fuscula	VU	B2 a, b iii	The trend over the last few decades appears to be one of increasing population size, with the discovery of probably overlooked populations farther afield. However, the host veteran trees are known to be in long-term decline nationally and probably locally. IUCN criteria satisfied are based on the geographic range restricted in area of occupancy with severely fragmented populations and projected continuing decline in area, extent and quality of habitat.	NR	E			1	6	0
Scraptia testacea	LC		Most likely to be present in more than 15 hectads, hence NS seems more appropriate.	NS	E		W	4	13	1
Anaspis bohemica	VU	D2	Only known from three areas of Caledonian pine forest although likely to occur in other examples of the habitat. IUCN criteria satisfied are based on the restricted population: geographic range restricted in area of occupancy with severely fragmented populations.	NR		S		0	1	0
Anaspis fasciata	LC				E		W	49	164	20
Anaspis frontalis	LC				E	S	W	96	216	40

Anaspis garneysi	LC			E	S	W	25	100	2
Anaspis lurida	LC	Under-recorded. Likely to be in excess of 100 hectads.		E		W	13	67	2
Anaspis maculata	LC			E	S	W	124	379	71
Anaspis pulicaria	LC	Under-recorded. Likely to be in excess of 100 hectads.		E		W	23	97	7
Anaspis regimbarti	LC			E		W	81	222	25
Anaspis thoracica	LC		NS	E		W	10	32	1
Anaspis costai	LC		NS	E		W	17	49	2
Anaspis rufilabris	LC			E	S	W	83	195	31

Appendix 2. Summary of IUCN Criteria

Table B. Summary of the five criteria (A–E) used to evaluate if a taxon belongs in a threatened category (Critically Endangered, Endangered or Vulnerable)

Use any of the criteria A–E	**Critically Endangered**	**Endangered**	**Vulnerable**
A. Population reduction			
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3 & A4	≥ 80%	≥ 50%	≥ 30%

A1. Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible **AND** understood **AND** have ceased, based on and specifying any of the following:

(a) direct observation

(b) an index of abundance appropriate to the taxon

(c) a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality

(d) actual or potential levels of exploitation

(e) effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

A2. Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased **OR** may not be understood **OR** may not be reversible, based on (a) to (e) under A1.

A3. Population reduction projected or suspected to be met in the future (up to a maximum of 100 years) based on (b) to (e) under A1.

A4. An observed, estimated, inferred, projected or suspected population reduction (up to a maximum of 100 years) where the time period must include both the past and the future, and where the causes of reduction may not have ceased **OR** may not be understood **OR** may not be reversible, based on (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)			
B1. Extent of occurrence (EOO)	< 100 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²

AND at least 2 of the following:

(a) Severely fragmented, **OR**

Number of locations	= 1	≤ 5	≤ 10

(b) Continuing decline in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** area, extent and/or quality of habitat; **(iv)** number of locations or subpopulations; **(v)** number of mature individuals.

(c) Extreme fluctuations in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** number of locations or subpopulations; **(iv)** number of mature individuals.

C. Small population size and decline			
Number of mature individuals	< 250	< 2,500	< 10,000
AND either C1 or C2:			
C1. An estimated continuing decline of at least: (up to a max. of 100 years in future)	25% in 3 years or 1 generation	20% in 5 years or 2 generations	10% in 10 years or 3 generations
C2. A continuing decline **AND** (a) and/or (b):			
(a i) Number of mature individuals in each subpopulation:	< 50	< 250	< 1,000
or			
(a ii) % individuals in one subpopulation =	90–100%	95–100%	100%
(b) Extreme fluctuations in the number of mature individuals.			

D. Very small or restricted population			
Either:			
Number of mature individuals	< 50	< 250	**D1.** < 1,000
			AND/OR
VU D2. Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time.			**D2.** typically: AOO < 20 km² or number of locations ≤ 5
E. Quantitative Analysis			
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations (100 years max.)	≥ 20% in 20 years or 5 generations (100 years max.)	≥ 10% in 100 years