Natural England Commissioned Report NECR236

A review of the status of the beetles of Great Britain

The wood-boring beetles, spider beetles, woodworm, false powder-post beetles, hide beetles and their allies – Derodontidoidea (Derodontidae) and Bostrichoidea (Dermestidae, Bostrichidae and Ptinidae)

Species Status No. 33

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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 the conservation of species should be based upon objective assessments 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 the Derodontidae, Dermestidae, Bostrichidae and Ptinidae. It covers all species in these groups, identifying those that are rare and/or under threat as well as non-threatened and non-native species. Reviews for other invertebrate groups will follow.

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1 Introduction to the Species Status project

1.1 The Species Status project

The Species Status project is a recent initiative, providing up-to-date assessments of the threat status of taxa using the internationally accepted Red List guidelines developed by the International Union for Conservation of Nature (IUCN) IUCN Standards and Petitions Subcommittee, 2014); (IUCN, 2012a; 2012b). It is the successor to the Joint Nature Conservation Committee (JNCC) Species Status Assessment project (http://jncc.defra.gov.uk/page-3352) which ended in 2008. This publication is one in a series of reviews to be produced under the auspices of the new project.

Under the Species Status project, the UK's statutory nature conservation agencies, specialist societies and NGOs will initiate, resource and publish Red Lists and other status reviews of selected taxonomic groups for Great Britain. All publications will explain the rationale for the assessments made. The approved threat statuses will be entered into the JNCC spreadsheet of species conservation designations (http://jncc.defra.gov.uk/page-3408).

1.2 The status assessments

This Review adopts the procedures recommended for the regional application of the IUCN threat assessment guidelines which can be viewed at IUCN (2012b).http://cmsdocs.s3.amazonaws.com/keydocuments/Reg_Guidelines_en_web%2Bcover%2Bbackcover.pdf Section 3 and Appendix 1 provide further details. This is a two-step process, the first identifying the taxa threatened in the region of interest using information on the status of the taxa of interest in that region (IUCN, 2012), the second amending the assessments where necessary to take into account interaction with populations of the taxon in neighbouring regions (IUCN Standards and Petitions Subcommittee, 2014; http://cmsdocs.s3.amazonaws.com/RedListGuidelines.pdf).

In addition, but as a separate exercise, the Great Britain Rarity System, used for assessing rarity and based solely on distribution, is used alongside the IUCN system.

1.3 Species status and conservation action

Sound decisions about the priority to attach to conservation action for any species should primarily be based upon objective assessments 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 although the IUCN (2014) point out that a category of threat is often not sufficient to determine priorities for conservation action. However, the 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.

2 Introduction to the Beetle Reviews

Many beetles are important ecological indicators (much more refined than most plants) due to their dependency on complex factors such as vegetation structure, microclimate and substrate. 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 can provide a very useful indication of ecological 'health', in a way that monitoring plants, birds, bats or other insect groups, for example, may not.

The Bostrichoidea comprise three families of well-defined and easily recognisable groups of beetles. The superfamily contains some of the best known – albeit infamous - British beetles, such as woodworm, deathwatch, and museum beetles. In addition, the saproxylic (wood decay) species in particular are ecosystem engineers, creating and maintaining habitat suitable for a whole host of associates. All three families are involved in the provision of essential ecosystem services, being part of the processes of returning dead organic material back into the soil, releasing nutrients that other organisms may exploit. No up-to-date overview of the British fauna currently exists other than the short synopses provided by Cooter (2006a,b,c). Dermestidae and Derodontidae are covered by an in-depth handbook (Peacock, 1993). While some species are regarded as pest species – or at best nuisance species – the group is also notable for a range of rare and threatened native species.

2.1 Taxa selected for this review

Table 1 summarises the taxa included in this review. Nomenclature follows Duff (2012). The Dermestidae have been the subject of a British national recording scheme, coordinated by the Biological Records Centre, but attempts to contact the voluntary scheme organiser have not been successful. The Scheme was not well-supported by the recording community. A new Dermestidae Recording Scheme (including Derodontidae) has been announced by the Biological Records Centre but data collation has barely begun (G. Holloway, pers. comm. 2016). The other families have never formed part of any national recording scheme.

Table 1. Distribution across higher taxonomic groupings of the 111 taxa selected for review.

Order	Family	Species
Coleoptera	Bostrichiidae	*Bostrichus capucinus* (Linnaeus, 1758)
		Rhyzopertha dominica (Fabricius, 1792)
		Stephanopachys substriatus (Paykull, 1800)
		Lyctus brunneus (Stephens, 1830)
		Lyctus cavicollis LeConte, 1866
		Lyctus linearis (Goeze, 1777)
		Lyctus planicollis LeConte, 1858

		Lyctus sinensis Lesne, 1911
		Trogoxylon parallelopipedum
	Derodontidae	*Laricobius erichsonii* Rosenhauer, 1846
	Dermestidae	*Anthrenocerus australis* (Hope, 1843)
		Anthrenus angustefasciatus (Ganglbauer, 1904)
		Anthrenus coloratus Reitter, 1881
		Anthrenus flavipes LeConte, 1854
		Anthrenus fuscus Olivier, 1789
		Anthrenus museorum (Linnaeus, 1761)
		Anthrenus olgae Kalik, 1946
		Anthrenus pimpinellae Fabricius, 1775
		Anthrenus sarnicus Mroczkowski, 1963
		Anthrenus scrophulariae (Linnaeus, 1758)
		Anthrenus verbasci (Linnaeus, 1767)
		Attagenus brunneus Faldermann, 1835
		Attagenus cyphonoides Reitter, 1881
		Attagenus fasciatus (Thunberg, 1795)
		Attagenus pellio (Linnaeus, 1758)
		Attagenus smirnovi Zhantiev, 1973
		Attagenus trifasciatus (Fabricius, 1787)
		Attagenus unicolor (Brahm, 1791)
		Ctesias serra (Fabricius, 1792)
		Dermestes ater De Geer, 1774
		Dermestes carnivorus Fabricius, 1775
		Dermestes frischii Kugelann, 1792
		Dermestes haemorrhoidalis Küster, 1852
		Dermestes lardarius Linnaeus, 1758
		Dermestes leechi Kalik, 1952
		Dermestes maculatus De Geer, 1774
		Dermestes murinus Linnaeus, 1758
		Dermestes peruvianus Laporte, 1840

		Dermestes undulatus Brahm, 1790
		Globicornis rufitarsis (Creutzer in Panzer, 1796)
		Megatoma undata (Linnaeus, 1758)
		Orphinus fulvipes (Guérin-Méneville, 1838)
		Reesa vespulae (Milliron, 1939)
		Thorictodes heydeni Reitter, 1875
		Thylodrias contractus Motschulsky, 1839
		Trinodes hirtus (Fabricius, 1781)
		Trogoderma angustum (Solier, 1849)
		Trogoderma glabrum (Herbst, 1783)
		Trogoderma granarium Everts, 1898
		Trogoderma inclusum LeConte, 1854
		Trogoderma variabile Ballion, 1878
	Ptinidae	*Anitys rubens* (Hoffmann, J., 1803)
		Anobium inexspectatum Lohse, 1954
		Anobium punctatum (De Geer, 1774)
		Caenocara affinis (Sturm, 1837)
		Caenocara bovistae (Hoffmann, J., 1803)
		Dorcatoma ambjoerni Baranowski, 1985
		Dorcatoma chrysomelina Sturm, 1837
		Dorcatoma dresdensis Herbst, 1792
		Dorcatoma flavicornis (Fabricius, 1792)
		Dorcatoma substriata Hummel, 1829
		Dryophilus anobioides Chevrolat, 1832
		Dryophilus pusillus (Gyllenhal, 1808)
		Ernobius abietis (Fabricius, 1792)
		Ernobius angusticollis (Ratzeburg, 1837)
		Ernobius gigas (Mulsant & Rey, 1863)
		Ernobius mollis (Linnaeus, 1758)
		Ernobius nigrinus (Sturm, 1837)
		Ernobius pini (Sturm, 1837)

	Gastrallus immarginatus (Müller, P.W.J., 1821)
	Gastrallus knizeki Zahradník, 1996
	Gibbium aequinoctiale Boieldieu, 1854
	Gibbium psylloides (de Czenpinski, 1778)
	Grynobius planus (Fabricius, 1787)
	Hadrobregmus denticollis (Creutzer in Panzer, 1796)
	Hedobia imperialis (Linnaeus, 1767)
	Hemicoelus fulvicornis (Sturm, 1837)
	Hemicoelus canaliculatus (C.G. Thompson, 1863)
	Lasioderma serricorne (Fabricius, 1792)
	Mesocoelopus collaris Mulsant & Rey, 1864
	Mezium affine Boieldieu, 1856
	Mirosternomorphus heali Bercedo & Arnáiz, 2010
	Niptus hololeucus (Faldermann, 1835)
	Ochina prinoides (Marsham, 1802)
	Priobium carpini (Herbst, 1793)
	Pseudorostus hilleri (Reitter, 1877)
	Ptilinus pectinicornis (Linnaeus, 1758)
	Ptinus clavipes Panzer, 1792
	Ptinus dubius Sturm, 1837)
	Ptinus exulans Erichson, 1842
	Ptinus fur (Linnaeus, 1758)
	Ptinus latefasciatus Gorham, 1883
	Ptinus lichenum Marsham, 1802
	Ptinus palliatus Perris, 1847
	Ptinus pilosus Müller, P.W.J., 1821
	Ptinus pusillus Sturm, 1837
	Ptinus raptor Sturm, 1837
	Ptinus sexpunctatus Panzer, 1792
	Ptinus subpilosus Sturm, 1837
	Ptinus tectus Boieldieu, 1856

	Ptinus villiger Reitter, 1884
	Sphaericus gibboides (Boieldieu, 1854)
	Stegobium paniceum (Linnaeus, 1758)
	Stethomezium squamosum Hinton, 1943
	Tipnus unicolor (Piller & Mitterpacher, 1783)
	Trigonogenius globulus Solier, 1849
	Xestobium rufovillosum (De Geer, 1774)
	Xyletinus ater (Creutzer in Panzer, 1796)
	Xyletinus longitarsis Jansson, 1942

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 to work with the Irish Republic to cover whole Ireland reviews. The Channel Islands and the Isle of Man are Crown Dependencies and outside of the UK, and so are not included.

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). This listed 546 of the total British beetle fauna of some 3900 species, which equates to 14% having a conservation status of threat. Shirt used 5 Categories (Endangered, Vulnerable, Rare, Out of Danger and Endemic) as well as 'Appendix' which concerned extinct species formerly native to Britain but not recorded since 1900. These categories were assigned by count data only. Magnitude of decline was not considered. Data sheets were only provided for each of the Category 1 (Endangered) and 2 (Vulnerable) species. The list of species covered in the present *Review* by category from Shirt (1987), allowing for taxonomic changes which have occurred since 1987 (see Duff, 2012 for changes) is provided in Table 2.

Table 2. Bostrichoidea Red List assignments after Shirt (1987)

FAMILY	SPECIES	CATEGORY
Bostrichidae	*Bostrichus capucinus*	RDB3: Rare
Dermestidae	*Globicornis nigripes* (F.)	RDB1: Endangered
	Trinodes hirtus (F.)	RDB3: Rare
Ptinidae	*Caenocara affinis* (Sturm)	RDB1: Endangered
	Dorcatoma dresdensis Herbst	RDB1: Endangered
	Ernobius gigas (Mulsant & Rey)	RDB3: Rare
	Gastrallus immarginatus (Mueller)	RDB1: Endangered

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 for all British beetles and presented data sheets for all scarce and threatened terrestrial species. Hyman expanded on Shirt's Categories, but retained Categories 1, 2, 3 and 5 and 'Appendix' with their criteria. He also introduced additional categories, those for Red Data Book Indeterminate (RDBI), Red Data Book Insufficiently Known (RDBK), Nationally Scarce Category A (Notable A), Nationally Scarce Category B (Notable B) and Nationally Scarce (Notable). As with Shirt (1987), the magnitude of decline was not considered in the evaluation of status. Data sheets for aquatic beetles were not included, although these have been subsequently determined and data sheets provided by Foster (2010). The list of species covered in the present *Review* by category from Hyman (1992, 1994) allowing for taxonomic changes which have occurred since 1994 (see Duff, 2012 for changes) is provided in Table 3.

Table 3. Rarity and scarcity categories assigned by Hyman (1992, 1994) for species in the status review of Bostrichoidea

FAMILY	SPECIES	CATEGORY
Bostrichidae	*Bostrichus capucinus* (Linnaeus, 1758)	EXTINCT
	Lyctus linearis (Goeze, 1777)	Nb
Dermestidae	*Globicornis nigripes* (Fabricius, 1792)	RDB1: Endangered
	Megatoma undata (Linnaeus, 1758)	Nb
	Ctesias serra (Fabricius, 1792)	Nb
	Anthrenus pimpinellae (Fabricius, 1775)	EXTINCT
	Anthrenus scrophulariae (Linnaeus, 1758)	EXTINCT
	Trinodes hirtus (Fabricius, 1781)	RDB3: Rare
Ptinidae	*Ptinomorphus imperialis* (Linnaeus, 1767)	Nb
	Dryophilus anobioides Chevrolat, 1832	RDB3: Rare
	Gastrallus immarginatus (Müller, 1821)	RDB1: Endangered
	Hemicoelus nitidus (Herbst, 1793)	RDBI: Indeterminate
	Anobium inexspectatum Lohse, 1954	Nb
	Hadrobregmus denticollis (creutzer in Panzer, 1796)	Nb
	Xyletinus longitarsis Jansson, 1942	RDB2: Vulnerable
	Dorcatoma ambjoerni Baranowski, 1985	RDBK: Insufficiently Known
	Dorcatoma dresdensis Herbst, 1792	Na
	Dorcatoma flavicornis (Fabricius, 1792)	Nb
	Dorcatoma serra Panzer, 1795	Na
	Caenocara affinis (Sturm, 1837)	RDBI: Indeterminate
	Caenocara bovistae (Hoffmann, 1803)	RDB3: Rare
	Anitys rubens (Hoffmann, 1803)	Nb
	Ptinus lichenum Marsham, 1802	RDB3: Rare
	Ptinus palliates Perris, 1847	Na
	Ptinus sexpunctatus Panzer, 1792	Nb
	Ptinus subpilosus Sturm, 1837	Nb

2.2.3 This review

The present review provides an up to date assessment of the status of the Derodontoidea and Bostrichoidea beetle families in the format now almost universally adopted for the assessment of threat in any taxa. The IUCN Guidelines have been revised (IUCN, 1994) and subsequently updated (IUCN, 2012a): the criteria for threat categories concentrate on imminent danger of regional extinction whereas the older, non-IUCN criteria for Nationally Rare and Nationally Scarce relate to the restriction of geographic distribution within Great Britain without taking any account of trends, whether for increase or decline. Much new information on distribution and trends has become available since the publication of Shirt (1987) and Hyman (1992, 1994). This review revises the status assigned to many species in the earlier reviews and several nomenclatural changes have been incorporated in accordance with the latest checklist (Duff, 2012).

3 The IUCN threat categories and selection criteria as adapted for Invertebrates in Great Britain

3.1 Summary of the 2001 Threat Categories

It is necessary to have a good understanding of the rationale behind red listing and the definitions used in the red listing process. This is because these definitions may differ from standard ecological definitions e.g. "populations" or have very specific meanings e.g. "inferred". Details regarding methods and terminology are contained in the *Guidelines for Using the IUCN Red List Categories and Criteria* IUCN 2014; http://www.iucnredlist.org/documents/RedListGuidelines.pdf). This is summarised without any detail in *IUCN Red List Categories and Criteria: Version 3.1* (IUCN 2012a; http://cmsdocs.s3.amazonaws.com/keydocuments/Categories_and_Criteria_en_web%2Bcover%2Bbckcover.pdf). The procedure for assessing taxa at a regional level differs from that at a global level and is summarised in the *Guidelines for Application of IUCN Red List Criteria at Regional and National Levels IUCN* (2012b http://cmsdocs.s3.amazonaws.com/keydocuments/Reg_Guidelines_en_web%2Bcover%2Bbackcover.pdf).

A brief outline of the revised IUCN criteria and their application is given below. The definitions of the categories are given in Table 4 and the hierarchical relationship of the categories in Figure 1.

Table 4. Definitions of IUCN threat categories (from IUCN, 2012b with a more specific definition for regional extinction)

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 Appendix 2).
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 Appendix 2).
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 Appendix 2).
NEAR THREATENED (NT) A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
LEAST CONCERN (LC) A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.
DATA DEFICIENT (DD) A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate.
NOT EVALUATED (NE) A taxon is Not Evaluated when it is has not yet been evaluated against the criteria.
NOT APPLICABLE (NA) Taxa deemed to be ineligible for assessment at a regional level because they are not wild populations or not within their natural range in the region, or non-natives (whether this is the result of accidental or deliberate importation), or because they are vagrants. A taxon may also be NA because it occurs at very low numbers in the region (i.e. when the regional Red List authority has decided to use a "filter" to exclude taxa before the assessment procedure) or the taxon may be classified at a lower taxonomic level (e.g. below the level of species or subspecies) than considered eligible by the regional Red List authority.

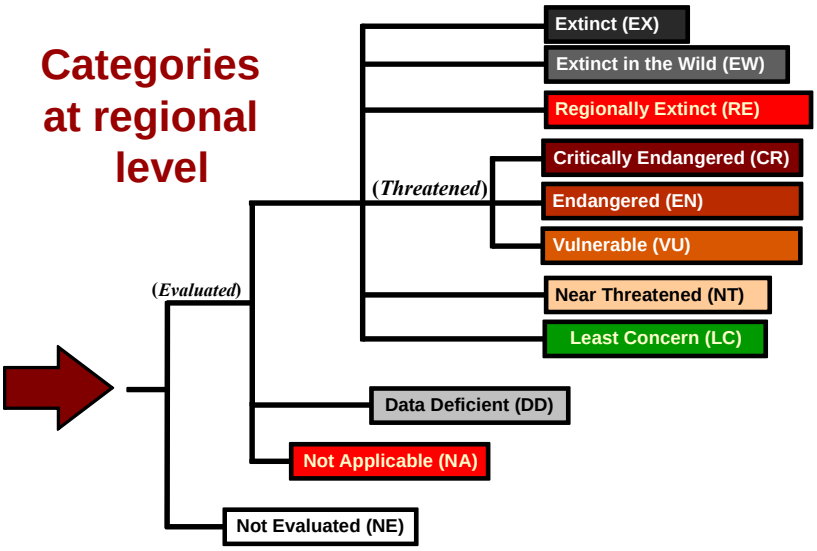

Figure 1. Hierarchical relationships of the categories adapted from IUCN (2001)

Taxa listed as *Critically Endangered*, *Endangered* or *Vulnerable* are defined as Threatened taxa. For each of these threat categories there is a set of five main criteria A-E, that reflect varying degrees of threat of extinction, with a number of sub-criteria within A, B and C (and an additional sub-criterion in D for the *Vulnerable* category), any one of which qualifies a taxon for listing at that level of threat. A taxon therefore need not meet all of the criteria A-E, but must be tested against all five criteria. The taxon should then be listed against the highest threat category for one or more of the five criteria. The qualifying thresholds within the criteria A-E are detailed in Appendix 2: IUCN Criteria and Categories.

Status evaluation procedure relies on an objective assessment of the available evidence. Understanding data uncertainty and data quality is essential when applying the criteria. However, it is not always possible to have detailed and relevant data for every taxon. For this reason, the Red List Criteria are designed to incorporate the use of inference and projection, to allow taxa to be assessed in the absence of complete data. Although the criteria are quantitative in nature, the absence of high-quality data should not deter attempts at applying the criteria. In addition to the quality and completeness of the data (or lack of), there may be uncertainty in the data itself, which needs to be considered in a Red List assessment (data uncertainty is discussed in section 3.2; IUCN 2014). The IUCN criteria use the terms Observed, Estimated, Projected, Inferred, and Suspected to refer to the quality of the information for specific criteria and the specific IUCN red list definitions of these terms was used (see section 3.2; IUCN 2014).

The guidelines stipulate/advise that a precautionary approach 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 worst-case scenario that will determine the threat category to which the taxon will be assigned.

3.1.2 The use of the Not Applicable category

A taxon may be Not Applicable (NA) when it occurs in a region but is not included in the regional assessment. See Table 4 for details.

3.1.3 The use of the Near Threatened category

The IUCN guidelines recognise a *Near Threatened* category to identify taxa that need to be kept under review to ensure that they do not further decline to become Threatened. This category would be best considered for those taxa that come close to qualifying as CR, EN or VU but not quite; i.e. meets many but not all of the criteria and sub-criteria and there is ongoing threat. For those criteria that are not quite met, there should be sufficient evidence to show that the taxon is close to the relevant threatened thresholds. As such, it is up to the reviewers to provide evidence and methods for discerning this.

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

The IUCN regional guidelines (IUCN, 2012b) indicate taxa should be assessed using a two-stage approach. Populations in the region under review should firstly be assessed using the global guidelines. That status should then be reassigned a higher or a lower category if their status within the region is likely to be affected by emigration or immigration (IUCN, 2012b).

3.2 Application of the Guidelines to the Derodontoidea & Bostrichoidea

3.2.1 Use of criteria in this review

The IUCN process requires that each species is evaluated against all 5 criteria.

British invertebrate data have been collected since the 19th century in a presence absence form. Often there is only enough information to identify the median point in the numbers of records gathered and compare these two periods (pre- and post-median). Sometimes the data are better and can be grouped into several 10 year periods (e.g. 1985 – 1996 and so forth). Occasionally, there is a single record for a taxon (and therefore date) which makes calculation of decline over a given period easier (possibly Criterion A). Further, a few species do have sufficient data required for the use of Criterion A.

Criterion A was tested on all taxa, but was not found to be viable for any species. It proved feasible only to use Criteria B and D using the available data. It was not possible to use Criterion E as the current data do not allow for determining the probability of extinction using population modelling.

The Invertebrate Inter Agency Working Group has defined the following for the use of B2bii which is commonly used in reviews. Continuing decline has to be demonstrated, and proven that it isn't an artefact of under-recording. If decline is demonstrated, then the reviewer needs to consider whether or not B2a (and B2c if the data are present) is met:

- If 10 or less current localities then *Critically Endangered*, *Endangered*, *Vulnerable* is applicable;
- If 11 -15 and the taxon can be shown to be vulnerable to a specific and realistic threat, then *Near Threatened* applies;
- If more than 15 locations, then *Least Concern* applies.

3.2.2 Scale for calculating decline and area

The IUCN have recommended a scale of 4km^2 (a tetrad) as the reference scale (IUCN, 2014). This needs to be applied with caution and there will be instances where a different scaling may be more applicable, or where attempting to apply any scale is extremely difficult. It should be noted that, historically, invertebrate datasets used hectads (10km^2) as the default scale. Old records (e.g. pre-1950) have only been recorded at this scale. This means that, for some taxa, comparative declines can only be made at this scale. Hectads are also used to determine the Great Britain Rarity Status, and are therefore still usefully recorded. For rarer, more restricted, taxa the tetrad is more applicable, in particular those taxa which may occur on a few fragmented sites within the UK and/or whom are often restricted to certain, well-defined habitat types that are easily identified. Tetrads have therefore been recorded for taxa that qualify as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) and future reviews should make efforts to record all taxa at both the hectad and tetrad scale.

Rate of Decline is used in Criteria A, B & C to assess threat status. For Criterion A and C1 a decline threshold is related to a specific number of years. For Criterion A it is precisely ten years, and for Criterion C1 precisely 3, or 5 or 10 years (exceptionally up to 100 years for long-lived species such as *Margaritifera margaritifera*). [Criterion A is usually dependent on a pattern of decline in population size over the last 10-year period (unless quality data exist to prove significant former decline or projected future decline). Where data are poor or patchy, this decline can be calculated from an estimate over a non-contemporary time interval providing, significantly, that the decline of the taxon is linear. Linear decline means that the gradient of decline is constant over a given period of time. This is easy to establish for taxa that have been the subject of repeated and regular population counts, where constant monitoring protocols or controlled sampling procedures have been adopted. Examples might be transect-butterfly counts, MV-light trapping of moth species over a prolonged period at regular intervals at a specific location and regular bird count and nesting surveys. The Derodontoidea and Bostrichoidea have not been sampled with this degree of regularity or control and as a consequence, the data quality is too poor to establish whether a decline is linear. In many respects, the assumption that a decline is linear could be statistically suspect, particularly where poor-quality and patchy data are sampled from a non-contemporary time period to the present and any number of population dynamic models might be in force. Criterion C1 likewise utilises population size decline measured over specific time intervals but places more emphasis on population counts referring throughout to number of mature individuals.

Criterion B also relies on a pattern of continuing decline. The number of hectads (data quality is too poor for tetrad use) is calculated for several pre-determined periods. The degree of accuracy with which the location is recorded is variable and often poor. If a decline is apparent in this initial main recording period analysis, reference to a later 'contemporary' time period may be used to reinforce or weaken the suggestion of a decline. The quality of the data in the contemporary time period is invariably better than that in the earlier date class and usually allows us to consider AoO (Area of Occupancy) to tetrad detail or better. In this latter date period, the number of locations is also calculated for taxa recorded from 15 or fewer hectads. The resulting figures are used for application of the spatial distribution Criteria under B.

For most invertebrate taxa, data are gathered by observation of presence in a particular location. The data are generated by field observation, the location and timing of which is at the random whim of collectors of varying skills. However, it is usually possible to ascribe some degree of decline whether observed, or inferred (i.e. the balance of probability suggests that a decline is present). The application of Criterion B is less susceptible to incorrect statistical conclusions compared to A as applied to taxa for which data quality is poor. There is no specific requirement for the decline to be within the last 10-year period nor the requirement to meet any threshold, although it makes sense to use this or a similar recent measure as a constant time period for each reviewed invertebrate group. The necessity to prove that a decline is linear is also absent, continuous decline being assessed by the observation of a reduction in the AoO between the prescribed contemporary time periods and not requiring a numerical percentage of magnitude. The number of contemporary locations is also a significant factor in the evaluation and is once more, relatively straightforward to appreciate and is reliable. The author's professional and field knowledge and intuition of a species can play an integral part in the application of this criteriona where the data are patchy.

3.2.3 Taxa applicable to this review

Taxa with wild populations inside their natural range and a long-term presence (since 1500 AD) in Britain were considered for review. All other taxa deemed to be ineligible for assessment at a regional level, e.g. non-natives, were placed in the category of **'Not Applicable (NA)'** and included recent colonists (or attempted colonists) responding to the changing conditions available in Britain as a result of human activity and/or climate change.

In practice, long-term presence can be difficult or even impossible to demonstrate unequivocally. Data available on sub-fossil material known from Britain can be extremely helpful in this respect, although coverage is very incomplete. Even this data can mask patterns of periodic colonisation and local extinction. And there may be exceptional circumstances such as the recent discovery of the ptinid beetle *Mirosternomorphus heali* in Britain, but unknown anywhere else in the world.

3.2.4 Knowledge about immigration and emigration effects for this group

The review process includes consideration of the relative isolation of the regional population, the proximity and the population dynamics of conspecific populations if they exist and the presence of barriers to immigration of neighbouring populations. There has been very limited research on this subject within the Derodontoidea and Bostrichoidea, both taxonomically and geographically (North Temperate region). None of the species in this taxonomic group are endemic in our region. None of our populations are known to be augmented by migrants from mainland European populations, although this might be shown to occur with any future research in this field. Within the confines of our current knowledge it is safe to assume that there is no such movement and therefore no perceived 'rescue effect' by conspecific populations for the taxa which are IUCN categorised in our region.

4 GB Rarity Status categories and criteria

At the national level, countries are permitted under the IUCN guidelines to refine the definitions for the non-threatened categories and to define additional ones of their own. The Nationally Rare and Nationally Scarce categories are unique to Britain. Broadly speaking, the Nationally Rare category is equivalent to the Red Data Book categories used by Bratton (1991), namely: Endangered (RDB1), Vulnerable (RDB2), Rare (RDB3), Insufficiently Known (RDBK) and Extinct. These are not used in this review. The Nationally Scarce category is directly equivalent to the combined Nationally Notable A (Na) and Nationally Notable B (Nb) categories used in the assessment of various taxonomic groups (e.g. by Hyman (1992) in assessing the status of beetles) but never used in a published format to assess the Derodontoidea and Bostrichoidea.

For the purposes of this review, the following definitions of Nationally Rare and Nationally Scarce have been applied:

Great Britain Rarity Status	
Nationally Rare	A native species recorded from between 1- 15 hectads of the Ordnance Survey national grid in Great Britain since 1990 and: • There is reasonable confidence that exhaustive recording would not find them in more than 15 hectads. • Where it is believed to occur as a breeding species within each of these hectads (i.e. discount those that are known to contain only casual immigrants). • This category includes species that are possibly extinct, such as those in the CR(PE) category, but not those where there is confidence that they are regionally extinct (RE).
Nationally Scarce	A native species recorded from between 16 - 100 hectads of the Ordnance Survey national grid in Great Britain since 1990. • There is reasonable confidence that exhaustive recording would not find them in more than 100 hectads. • Where it is believed to occur as a breeding species within each of these hectads (i.e. discount those that are known to contain only casual immigrants).

The choice of the date class as the start of the modern recording period for the Scarabaeoidea is discussed in Section 6.

This national set of definitions is referred to as the GB Rarity Status within this document. Importantly, Nationally Rare and Nationally Scarce are not categories of threat.

5. Methods and sources of information

5.1 Introduction

The most recent published list of scarce and threatened beetles (Hyman, 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 *et al*. (1983). The original IUCN criteria for assigning threat status used in these publications gave the categories Endangered, Vulnerable and Rare, which were defined rather loosely and without quantitative thresholds. The application of these categories was largely subjective, and it was not easy to apply consistently within a taxonomic group or to make comparisons between groups of different organisms.

5.2 Data sources

This *Review's* author assessed the status of all 104 British species of wood-boring beetles, spider beetles, woodworm beetles, false powder-post beetles, hide beetles and their allies using the information sources described in this section and the system described in Sections 3 and 6. During this process, the views of a number of other specialists (listed in Acknowledgements) were sought. The bulk of the data however come from the National Biodiversity Network (NBN) supplemented by information provided directly by a number of entomologists with experience in particular species and/or locations. It is important to acknowledge the considerable contribution made by all of these recorders.

The key source is the dataset collated through the NBN Gateway. This data set was interrogated for mistakes, and potentially erroneous records were highlighted and followed up. Data were then requested through the beetles-britishisles yahoo group. This group, founded by Andrew Duff in 1999 has 371 members, many of whom are Coleopterists active in the field. Historical data were also sourced from literature searches. No attempt was made to collate data for many of the imported species as this data is not generally accessible, being held by specialists dealing specifically with imported pests, eg within the relevant Government Departments.

The total number of records used in the whole review is 13,603.

For species attaining IUCN or GB Rarity Status, data were more intensely scrutinized and records considered unreliable were discounted. However, a small number of these records are mentioned in the *Species Accounts* and elsewhere in this *Review* where considered informative.

6 The assessments

6.1 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
GB IUCN status (2015)
Qualifying criteria
Rationale
GB Rarity status (2015)
Global IUCN status (2010)
Presence in:
- England
- Scotland
- Wales

Area of occupancy:
- Total number of hectads occupied for period up to and including 1989
- Total number of hectads occupied from period from 1990-2015
- Total number of dual hectads where species have been recorded from within the hectad in both date classes (see 5.2 below)
- Total number of hectads occupied during sixteen year period 1990-2015
- No. of locations, for species that qualify as NR (i.e. 15 or less hectads from 1990-2015)

Old BRC number
BRC concept code
NBN taxon number
Status in Shirt (1987)
Status in Hyman (1986)
Status in Hyman (1992)
Ecological account
Popular synonyms

7 Downgraded and excluded species

7.1 Downgraded species

Down-grading of species should not be seen necessarily as evidence that species status has improved. In many cases species were categorised too highly in the early Reviews (Hyman, 1992, 1994) due to limitations in the available data and to the omission of criteria such as decline, when evaluating the status of a taxon. The intervening period has seen an increase of recorder effort, targeting species with Nationally Scarce or RDB status. In particular, these

earlier Reviews acted as a focus, stimulating new recording effort, and the revised statuses provided by the present Review more accurately reflect the status of those species. The Reviews (Hyman, 1992, 1994) should in many ways be regarded as a first draft and an initial attempt at assessing status. Some species have increased their abundances and/or ranges in the intervening period, but the reasons for some or all of these increases remain unclear. Nevertheless, other species, based on available data, appear to be declining, and the lack of records following publication of the Reviews (Hyman, 1992, 1994) is therefore all the more significant. Table 5 provides a list of species downgraded and the justification for downgrading since the publication of Shirt (1987) and Hyman (1992, 1994).

Table 5. Species included in Hyman (1992) but downgraded in this review

Scientific name	Shirt (1987)	Hyman (1992)	This Review	Rationale for downgrading
Globicornis rufitarsis	RDB1	RDB1	VU	Data only meets criterion D2 which only applies to VU category
Hedobia imperialis		Nb	LC	Known from 149 hectads between 1990 and 2015.
Ptinus sexpunctatus		Nb	LC	Steadily increasing range, likely to exceed 100 hectads within next 10 years; 78 hectads between 1990 and 2015 of which only 8 the same hectad as previously.
Gastrallus immarginatus	RDB1	RDB1	NS	Discovered at 15 new hectads between 1990 and 2015; now appreciated that it is widespread in traditional orchards in the west Midlands.
Anobium inexspectatum		Nb	LC	Only recently distinguished at time of Hyman (1992); now known from in excess of 100 tetrads.
Hemicoelus canaliculatus		RDBI	NS	Reported from 11 new hectads during 1990-2015 period.

7.2 Excluded species

The status of some species newly recorded in Britain or recorded after a protracted absence can be very difficult to ascertain. Most problematic are those species that could conceivably be on the edge of their natural range in Britain and only occur in a limited number of locations to which they may equally have been introduced. The geographical position of Britain makes it inevitable that our fauna includes Western European, Northern European and even Central European species some of which are considered native, but others which are demonstrably present through introduction. It is important to recognise that lack of clear evidence of native status is not automatically taken to mean that a species has been introduced.

Where the presence of a species results from natural colonisation from the continent, they may be expected to continue to expand their distribution and records may occur from more than 50 hectads over the next few decades. Their natural range, or 'Extent of Occurrence' under the IUCN Guidelines expands with them, but they are not considered long-term residents in Britain and are therefore excluded from the IUCN categorisation. 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, although climate change may impose such a threat.

Species excluded from assessment on the basis they are introduced non-natives, whether this is the result of accidental or deliberate importation, have been assigned to the category 'Not Applicable (NA)' as required under the IUCN Guidelines. Even where these species occur in 50 hectads or less, they have not been assessed for scarcity or rarity as they are not considered to be native to Britain. The checklist for the group of beetles currently under review includes an unusually high proportion of importations and established introductions; this reflects the biology of the species concerned, being favoured by international trade, through reltively long-term storage and transportation of perishable goods around the world.

Mirosternomorphus heali presents a particularly difficult assessment. The genus was described from the Australian Region (New Zealand and Norfolk Island) and the Kent population is assumed to have resulted from a casual import, and is now well-established in this site (Bercedo & Arnáiz, 2010). A single known population globally might suggest Vulnerable (D2) as the most applicable IUCN category but there is no plausible threat to the one known site; presumably Near Threatened would be the correct status, and - if correct globally – should also be applied regionally. However, advice from the IUCN Global Species Programme is that a global assessment is only possible for species within their natural range, or outside their natural range if they have been translocated for conservation purposes. This seems an anomalous situation – that Red List status is dependent on human intention rather than actual threat. There are other examples of species in this situation and IUCN needs to find a way of incorporating them into the Red List system – to exclude a species that is so rare globally appears idosyncratic.

A list of the excluded species and the rationale for their exclusion is provided in Table 6.

Table 6. Species categorised as 'Not Applicable (NA)'
*Species associated with imported goods, etc, and where data is held by the pest industry rather than biological recorders.

Scientific name	Post-1990 hectads (where known)*	Rationale for exclusion
Anthrenocerus australis	*	Naturalised introduction
Anthrenus angustefasciatus	1	First reported in 2014. It may be extending its European range, having only recently been detected in northern Italy, France and Germany
Anthrenus coloratus	*	Importation
Anthrenus flavipes	*	Importation
Anthrenus olgae	*	Importation
Anthrenus sarnicus	*	Importation
Anthrenus scrophulariae	*	Importation
Anthrenus verbasci	*	Naturalised introduction
Attagenus brunneus	*	Recent introduction
Attagenus cyphonoides	*	Importation
Attagenus fasciatus	*	Importation
Attagenus smirnovi	*	Naturalised introduction
Attagenus trifasciatus	*	Importation
Attagenus unicolor	*	Naturalised introduction
Dermestes ater	*	Importation
Dermestes carnivorus	*	Importation
Dermestes frischii	*	Importation
Dermestes haemorrhoidalis	*	Naturalised introduction
Dermestes leechi	*	Importation
Dermestes maculatus	*	Naturalised introduction
Dermestes peruvianus	*	Naturalised introduction
Dryophilus pusillus	101	Naturalised introduction
Ernobius abietis	0	Importation
Ernobius angusticollis	5	Importation
Ernobius gallicus	1	Importation
Ernobius gigas	0	Naturalised introduction
Ernobius mollis	71	Naturalised introduction
Ernobius pini	6	Naturalised introduction
Gibbium aequinoctiale	*	Importation
Gibbium psylloides	*	Importation
Laricobius erichsonii	37	Natural colonisation of Britain and still expanding
Lasioderma serricorne	*	Importation; Tobacco Beetle
Lyctus cavicollis	*	Naturalized introduction
Lyctus planicollis	*	Naturalized introduction
Lyctus sinensis	*	Importation
Mesocoelopus collaris	2	A recent arrival in the London area
Mezium affine	*	Importation
Mirosternomorphus heali	1	Only recently detected and assumed to be an introduction
Nicobium castaneum	*	Importation
Niptus hololeucus	*	Naturalised introduction
Orphinus fulvipes	*	Importation
Priobium carpini	*	Importation
Pseudeurostus hilleri	*	Importation

Scientific name	Post-1990 hectads (where known)*	Rationale for exclusion
Ptinus clavipes	*	Importation
Ptinus dubius	*	Naturalised introduction
Ptinus exulans	*	Importation
Ptinus latefasciatus	*	Importation
Ptinus pusillus	*	Naturalised introduction
Ptinus raptor	*	Naturalised introduction
Ptinus villiger	*	Importation
Reesa vespulae	*	Locally established importation
Rhyzopertha dominica	*	Naturalised introduction
Sphaericus gibboides	*	Importation
Stephanopachys substriatus	*	Importation
Stethomezium squamosum	*	Importation
Thorictodes heydeni	*	Importation
Thylodrias contractus	*	Importation
Trigonogenius globulus	*	Importation
Trogoderma angustum	*	Naturalised introduction
Trogoderma glabrum	*	Importation
Trogoderma granarium	*	Importation
Trogoderma inclusum	*	Importation
Trogoderma variabile	*	Importation
Trogoxylon parallelopipedum	*	Importation

8 Format of the species accounts

8.1 Information on the species accounts

Species accounts have been prepared for each of the Regionally Extinct, Critically Endangered, Endangered, Vulnerable and Near Threatened species. These species account for 9 of the 111 species assessed; approximately 8% of our Bostrichoidea fauna. However, with 65 species (see Table 6) not being long-term natives, the 9 species detailed actually form about 14% of the native fauna. Previous reviews have included species accounts for all taxa now re-assessed as remaining Nationally Rare and Nationally Scarce taxa, but do not cover species raised to these statuses by this review, i.e. *Dermestes murinus*, *D. undulatus*, *Lyctus brunneus*. These species appear to have been overlooked by the previous reviews, being wrongly assumed to be non-native. It is beyond the scope of the current Review to include these for the Bostrichoidea.

Information on each species is given in a standard format. The species accounts are in the form of data sheets designed to be largely self-contained in order to enable site managers to compile species-related information for site files; this accounts for some repetition between the species accounts. This section provides context for eight information sections provided for each species data sheet.

8.2 The species name

The nomenclature used in this *Review* follows the most recent checklist for the British fauna (Duff, 2012), unless otherwise stated. Under the *Species Accounts* where the name differs from that used by Shirt (1987) or Hyman (1992, 1994) the previous name is indicated.

8.3 Identification

The emphasis in the accounts, where possible, is on readily available English language publications covering the British Isles; work in other languages or from other/wider geographical areas is only referred to where no other options are available or where the non-English/wider work is more detailed or up-to-date. With experience, identification for many British species can be achieved in the field, although some only with the aid of a good hand lens. A microscope is required to identify and/or confirm the identitification for many species. On rare occasions dissection of the male aedeagus will be required as a confirmatory character.

Peacock (1993) is the standard work on the British Dermestidae and Derodontidae fauna and allows for the accurate identification of the majority of British species. Although it may become out of print in due course, it should by then be possible to download for free from the Royal Entomological Society website at http://www.royensoc.co.uk/content/out-print-handbooks. In addition, useful references and images are available for Dermestidae from http://markgtelfer.co.uk/beetles/scarabaeoidea/. The most recent work for British Ptinidae remains Joy (1932) but Zahradník (2013) has more useful keys (in English) and covers a wider range of European species, making it more useful for picking out any additions to the British fauna that might be encountered.

The third in the series of '*Beetles of Britain and Ireland'* (Duff, A.G., in prep.) will include all of the species in our region (Duff, A.G. pers. comm.). Bostrichiidae larvae are keyed to species in

Emden (1943), and Peacock (1993) provides a key to the genera of Dermestidae. Larval identification is aided by reference to Klausnitzer (1978).

A number of Dermestidae species have been added to the British list since the publication of Peacock (1993) and the identification resources required for these species are listed in Table 7.

Table 7. Dermestidae species not covered in Peacock (1993)

Species	**Identification reference(s)**
Anthrenus angustefasciatus	Foster & Holloway, 2015
Attagenus trifasciatus	Hinton, 1945
Trogoderma angustum	Shaw, 1999

8.4 Distribution

Records held in the NBN Gateway (https://data.nbn.org.uk/) form the basis for determining the distribution of each species. The Watsonian vice-counties (Dandy, 1969) are included in the NBN database for many records and are referred to in this review. International distribution is referred to within the species accounts where a comment on biogeography is considered relevant and where the information is readily accessible but it has not influenced the assessment of status. For the Bostrichoidea, the distribution section of the *Species Account* tends to focus on the currently known distribution with details of former distribution patterns discussed under the Status section (see 8.6 below). However, where a species is Regionally Extinct its known distribution history may be presented in the *Distribution* section of the account.

8.5 Habitat and ecology

This section aims to provide an overview of both the known habitat requirements for each species and the wider landscape context. However, for many species this information is inadequate or incomplete. Information on the life cycle and seasonal activity for Britain is included where known, or taken from the wider European literature. The understanding of species-level habitat preferences, even when there are well-known localities, can be difficult to ascertain. Several species are able to disperse over long distance and therefore the recorded capture site may not be the breeding site.

Habitat data, such as vegetation structure and substrate type, are well known to be of major importance to invertebrates. However, most published records, label data associated with specimens in collections and data submitted to the NBN Gateway lack this level of detail. Comments provided in the *Species Accounts* are based on a relatively few, and often *ad hoc* personal experiences or gathered from the wider scientific literature (e.g. from continental Europe based research).

Flight and dispersive ability are vital to understanding how beetles utilise habitat mosaics, how they move within the wider landscape and how habitat fragmentation will affect populations. However, there has been limited research and our understanding of this complex topic is incomplete. Local climatic factors are an important influence and will vary across the country. In many beetle species flight activity is directly correlated with conditions of relatively high temperatures, high relative 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.

Emphasis is placed in this *Review* on the importance of relict sites for supporting rare species. In such instances, this normally indicates that a species has limited dispersal ability or that they require a specific suite of environmental conditions only provided by such sites or in some cases a combination of both factors.

8.6 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 (see Section 3) were then used to decide whether such species might also be considered under threat, and to assign a category. Detailed survey data is rare but has has been used where available, to inform the designation process. Provisonal statuses were made available to the beetles-british-isles yahoo group for discussion, in order to provide a final approval stage by the recording community.

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

The IUCN criteria allow data of different quality to be used in the assessments as explained for 'estimated, inferred, projected or suspected' data. In addition, there is the problem of under-recording. 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 post-glacial 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. The data have been collated and made available by Buckland & Buckland (2006).

8.7 Threats

It is those human activities that result in the loss of sites or degrade habitat quality that pose the greatest threat to invertebrate populations. Where specific threats are recognised they are included in the species accounts, otherwise the statements attempt to summarise in general terms those activities that are considered most likely to place populations at risk.

The majority of the most threatened Dermestoidea are associated with saproxylic habitats and old trees with dry decayed sapwood, cavities and larger hollows in particular. It is not merely the widespread clearance of dead and decaying wood from the countryside that has created this

situation but also more insidious changes such as a lack of new generations of veteran trees developing – for a variety of reasons – and also the widespread lack of understanding that open-grown trees are far more valuable for saproxylic beetles than close-grown trees. It is increasingly being appreciated that large old trees are a globally decling habitat feature (Lindenmayer *et al*, 2012). At the current rate of loss, most of the wood pasture systems that were analysed by Gibbons *et al* (2008) would lose all of their veteran trees within the next 90-180 years.. Wood pastures continue to be treated as an anomalous habitat, with their inherent mosaic nature, and there is considerable pressure to change them into either woodland or grassland (Alexander, 2016).

Other important threats include:

- increased countryside hygiene and 'tidying up' which results in the removal of animal carcases, a threat to Dermestidae in particular
- coastal habitats are prime areas for development, such as golf course and other recreational facilities, which has a knock-on impact on coastal grazing systems which maintain the turf structure.

8.8 Management and conservation

Some of the oldest Nature Reserves in Britain were created to protect their invertebrate fauna (e.g. Wicken Fen), however beetles are rarely amongst the primary reasons for site designation and protection. Nevertheless, the value of beetles as indicators of habitat quality has been recognised when many SSSI's have been re-evaluated. Beetles also feature in designations for some Special Areas of Conservation (SAC).

Where known sites 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. 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 and degradation 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 interconnecting habitats. For these species it is critical to maintain connectivity 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.

It is very unusual for threatened bostrichoids to have been the subject of detailed ecological research or even standardised monitoring, but these are referred to where such are known. More often the implementation of further survey, or monitoring or a specific line of research is recommended.

Preventative measures and positive action designed to maintain populations are suggested where these are understood 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. However, this general advice is retained in order to ensure that the species data sheets can be read as stand-alone documents. Fry & Lonsdale (1991) and Kirby (2001) both give excellent general accounts of the relevant conservation issues and habitat management measures which may be undertaken.

8.9 Published sources

Literature references specific to the taxon that have contributed information to the data sheet are cited here.

9 Acknowledgements

Jon Webb (Natural England) commissioned the current review and the report was quality assured by an inter-agency working group. The format and content is based closely on the recent water beetle review (Foster, 2010) and subsequent publications in this review series (Alexander, 2014; Alexander, Dodd & Denton, 2014; Hubble, 2014; Lee, 2015; Macadam, 2015; Lane & Mann, 2016); key sections of text have been adopted and adapted for the current review in order to maintain a consistent approach.

The review would not have been possible without the efforts of the many contributors to biological recording nationally and locally through the data made available via the NBN Gateway. It is not possible to list here every individual that has contributed to the data gathering.

The following people responded to a request for data on the yahoo group beetles-britishisles and the author would like to thank them for providing personal records or collated regional data: Ralph Atherton, Tristan Bantock, Charlie Barnes, Roger Booth, Dave Buckingham, Andy Chick, Jon Cole, Martin Collier, Richard Comont, Scotty Dodd, Tony Drane, Andrew Duff, Roger Dumbrell, Adrian Dutton, Graham Finch, Bob Fleetwood, Bryan Formstone, Andy Foster, Adrian Fowles, Martin Harvey, Peter Hodge, Dave Hodges, Mike Howe, Trevor James, Steve Lane, Brian Levey, Martin Luff, Dave Murray, Adrian Mylward, Bruce Philp, Don Stenhouse, Malcolm Storey, Mark Telfer, Caroline Uff, and Clive Washington. In addition, the following responded to specific requests for data on particular species: Graham Holloway, Richard Lyszkowski, Howard Mendel, and Martin Sanford.

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10 Species listed by IUCN status category

In this list the species are given in taxonomic order within status categories (nomenclature follows Duff, 2012).

Regionally Extinct
Bostrichus capucinus (Linnaeus, 1758)

Critically Endangered
Lyctus linearis (Goeze, 1777)

Endangered
Ptinus lichenum Marsham, 1802

Vulnerable
Dermestes undulatus Brahm, 1790
Globicornis rufitarsis (Creutzer in Panzer, 1796)
Ptinus palliatus Perris, 1847
Xyletinus longitarsis Jansson, 1942

Near Threatened
Trinodes hirtus (Fabricius, 1781)
Caenocara bovistae (Hoffmann, J.J., 1803)

11 Species listed by GB Rarity Status category

In this list the species are given in taxonomic order within status categories (nomenclature follows Duff, 2012, updated from Zahradnik, 2013).

Regionally Extinct
Bostrichus capucinus (Linnaeus, 1758)

Nationally Rare
Dermestes undulatus Brahm, 1790
Globicornis rufitarsis (Creutzer in Panzer, 1796)
Trinodes hirtus (Fabricius, 1781)
Lyctus brunneus (Stephens, 1830)
Lyctus linearis (Goeze, 1777)
Ptinus lichenum Marsham, 1802
Ptinus palliatus Perris, 1847
Dryophilus anobioides Chevrolat, 1832
Ernobius nigrinus (Sturm, 1837)
Hemicoelus canaliculatus (C.G.Thomson, 1863)
Xyletinus longitarsis Jansson, 1942

Dorcatoma ambjoerni Baranowski, 1985
Caenocara bovistae (Hoffmann, 1803)

Nationally Scarce
Dermestes murinus Linnaeus, 1758
Megatoma undata (Linnaeus, 1758)
Ptinus subpilosus Sturm, 1837
Gastrallus immarginatus (Müller, P.W.J., 1821)
Hadrobregmus denticollis (Creutzer in Panzer, 1796)
Dorcatoma dresdensis Herbst, 1792
Dorcatoma flavicornis (Fabricius, 1792)
Dorcatoma substriata Hummel, 1829
Anitys rubens (Hoffmann, 1803)

12 Criteria used for assigning species to IUCN threat categories

Table 8. Criteria used to assign extant species to GB IUCN categories with a level of threat VU or greater, not including Regionally Extinct (RE) or Data Deficient (DD) species. (See Appendix 2 for summary of criteria and categories)

Scientific name	**Status**	**Criteria used**
Dermestes undulatus	VU	B2a, bi, bii, biv
Globicornis rufitarsis	VU	D2
Lyctus linearis	CR	B1, B2a, bi, bii, biii, biv
Ptinus lichenum	EN	B2a, bii, biii, biv
Ptinus palliatus	VU	B2a, bi, bii, biii, biv
Xyletinus longitarsis	VU	B2a, bi, bii, biii, biv

13 List of Threatened, Nationally Rare and Nationally Scarce species

Table 9. List of Threatened, Nationally Rare and Nationally Scarce species

Species name	Shirt (1987)	Hyman (1992)	This review (IUCN Status)	This review (GB Rarity)
Bostrichus capucinus		Extinct	RE	na
Dermestes murinus				NS
Dermestes undulatus			VU	NR
Globicornis rufitarsis	RDB1	EN	VU	NR
Megatoma undata		Nb		NS
Trinodes hirtus	RDB3	Rare	NT	NR
Lyctus brunneus				NR
Lyctus linearis		Nb	CR	NR
Ptinus lichenum		Rare	EN	NR
Ptinus palliatus		Na	VU	NR
Ptinus subpilosus		Nb		NS
Dryophilus anobioides		Rare		NR
Ernobius nigrinus				NR
Gastrallus immarginatus		EN		NS
Hemicoelus canaliculatus		Indeterminate		NR
Hadrobregmus denticollis		Nb		NS
Xyletinus longitarsis		VU	VU	NR
Dorcatoma ambjoerni		RDBK		NR
Dorcatoma dresdensis	RDB1	Na		NS
Dorcatoma flavicornis		Nb		NS
Dorcatoma substriata		Na		NS
Caenocara bovistae		Rare	NT	NR
Anitys rubens		Nb		NS

14 The data sheets

Data sheets for the species assessed as Regionally Extinct, Critically Endangered (Possibly Extinct), Critically Endangered, Endangered, Vulnerable and Near Threatened are given in this section. The data sheets are arranged, within each Family of the Bostrichoidea, in alphabetical order by scientific name. Individual species accounts can be located by looking up the generic or specific names, including synonyms used in Hyman (1992, 1994) and Peacock (1993) in the index.

14.1 DERMESTIDAE

DERMESTES UNDULATUS
VULNERABLE B2ab(i, ii, iv)
Order COLEOPTERA
Family DERMESTIDAE

Dermestes undulatus Brahm, 1790

Identification The adult and larva is keyed by Peacock (1993).

Distribution Southern and south-eastern England, near coast: from Suffolk to East Devon. Not uncommon along the Suffolk coast (Mendel, H., in Peacock, 1993). Wales (early records only). Distributed throughout the entire Holarctic Region.

Habitat and ecology On dry dead fish, shellfish and sea birds, as well as rabbits and other mammals. Sites are mostly large expanses of coastal shingle or long sections of land-slipped under-cliffs, presumably favoured by the long draw-down zones where carrion can be washed onto the strandline by the waves and blown inland by the winds, to dry out naturally, exposed to the weather; the beetle is also able to overwinter in the low-lying country beyond. Adults have been found from March to September, but most records are from April.

Status This species qualifies as Vulnerable as it is in decline, from 23 hectads pre 1990 to only 5 hectads since; it has an AoO of 32 square km and is present in only 8 tetrads. The key period of decline appears to have been pre-1990; however, the data does suggest a continuing and significant reduction in the AoO. The species is currently extremely thinly scattered within the former range (7 locations), and continuing decline is projected in (i) extent of occurrence, (ii) area of occupancy, and (iv) number of locations, all combining to indicate Vulnerable under criterion B. None of the recent records have been within the last 10 years although this probably reflects under-recording to some extent.

Threats This species requires continuity of air-dried carrion, therefore the removal of dead animals from coastal land will negatively impact on this species. ‘Beach cleans’ have been promoted by local authorities in recent decades, with local residents and visitors encouraged to collect and remove debris, but are targeted at human-created litter rather than natural systems. However, hygiene is also considered an objective and rotting animal material tends also to be removed, to the detriment of the natural recycling communities. Carrion may also be declining in

abundance along coasts for a variety of reasons, such as through declines in fish stocks off-shore, increased disturbance and hence declines in nesting birds along coasts, and climate change will undoubtedly have impacts through affecting patterns in carrion deposition.

Management and Conservation Much of the potentially suitable coastland has some form of conservation protection, from SSSIs and Nature Reserves to AONB, etc, although disturbance and removal of carrion may continue irrespectively. The key conservation requirement is for carrion to be left in situ, to degrade naturally, or to be pushed out-of-view into cover if considered necessary.

Published sources
Peacock (1993).

GLOBICORNIS RUFITARSIS
VULNERABLE D2
Order COLEOPTERA
Family DERMESTIDAE

Globicornis rufitarsis (Creutzer in Panzer, 1796)
nigripes (Fabicius, 1792) non (Olivier, 1790): Hyman (1992)

Identification The adult and larva is keyed by Peacock (1993).

Distribution Known in Britain from four distinct areas across England: i) Windsor Forest & Great Park and surrounding area (SU97); ii) Severn Vale - Bredon Hill (SO93), Croome Park (SO83), Forthampton Oaks (SO83); iii) Wyre Forest (SO77); and High Park, Blenheim (SP41). It has a wide range across much of Europe, extending into the Caucasus (Peacock, 1993).

Habitat and ecology The larvae live under loose bark and in old decayed wood on standing tree trunks – usually live trees, but populations persist once the tree is dead; they feed on the dry larval and pupal skins of other insects; larvae may take five months to become fully grown (Peacock, 1993). The adults emerge in the spring and appear to feed on pollen; they may be found at umbellifer flowers (hogweed & cow parsley) from May until July, or by sweeping grasses under old oaks; they have also been reported from *Spiraea* blossom. The species is considered a Grade 2 indicator of ecological continuity (Alexander, 2004).

Status Although known from just four populations, two of these extend across a wide landscape full of suitable host trees, especially the Severn Vale area – P.F. Whitehead (*in lit*) reports that the species remains widespread locally. Recent records come from at least 6 hectads. There is no direct evidence for decline, but this may be inferred as the availability of host trees must be diminishing with continuing agricultural intensification. It has only been documented from six locations (six tetrads) since 1990, i.e. an AoO of 24 square km. The availability of suitable host trees is diminishing with intensive agriculture continuing to cause decline and death of old trees (especially severe at the Forthampton location), old trees continue to be removed for tidiness reasons (in orchards and parklands), and new generations of suitable trees are not being established in sufficient numbers. This species has been assessed as VU D2: note that D" is 'flexible' with typical value being less than 5 locations and less than 20km 2, plus plausible

threat. In this case, there is a clear and ongoing threat, just 6 locations and only 24km (ie 1 tetrad more than their typical' example).
Threats This species requires ancient and veteran broadleaved trees growing in concentrations in open well-lit situations. A declining availability of suitable host trees, especially open-grown ancient oaks and old orchard trees, is occurring at landscape scale. The Severn Vale population in particular is almost certainly heavily fragmented.

Management and Conservation Windsor Forest & Great Park and High Park, Blenheim are both SSSI; Bredon Hill and Wyre Forest are both NNRs; Croome Park and Forthampton Oaks are unprotected by any designations. However, designation alone does not ensure conservation – the tree populations require active management under modern conditions, keeping existing host trees alive as long as possible, while ensuring that new generations of future veteran trees are being brought on.

Published sources
Fowler & Donisthorpe (1913); Hyman (1992); Peacock (1993); Welch (1987); Woodroffe (1971).

TRINODES HIRTUS
NEAR THREATENED B2ab(ii, iii, iv)
Order COLEOPTERA
Family DERMESTIDAE

Trinodes hirtus (Fabricius, 1781)

Identification The adult and larva is keyed by Peacock (1993).

Distribution Known in Britain from only eighteen localities, of which fourteen have records from the last 25 years – 4 sites (just over 20%) appear to have been lost. There is a distinct concentration of records through the Severn Vale, from Berkeley Deer Park and Forthampton Oaks (West Gloucestershire), Bredon Hill and Hanbury Park (Worcestershire) and Packington Park (Warwickshire). There are also a few sites in the lower Thames Valley, notably Windsor Great Park (Berkshire) and Richmond Park (London). Elsewhere there is only a very thin scatter of sites, including 'Exeter' (Fowler, 1889), the New Forest (1911 but not since), St Osyth Park, Essex (2010), Shrubland Park, Suffolk, and Little Eaton, Derbyshire (Tomlin, 1905) and Dunham Park, Cheshire (Hardy, 1900 – see Johnson, 1977). Known across Europe, and in Algeria, the Caucasus and Turkmenia (Peacock, 1993).

Habitat and ecology This beetle is found in or near webs of tube- and sheet-web building spiders beneath loose bark on old trees, as well as in old decayed wood or stumps or hollow trees, where the larvae feed on the remains of dead insects and dead spiders, and on dry larval and pupal skins. It is found mainly in oak, but also elm and poplar, sometimes in company with the common and widespread cobweb beetle *Ctesias serra*. The adult beetles have been seen between May and August, on flowers and foliage (Peacock, 1993). The species is considered a Grade 2 indicator of ecological continuity (Alexander, 2004).

Status This species does not qualify as Threatened but is categorised as Near Threatened as it

narrowly fails on criterion B2. It has only been documented from 14 locations (14 tetrads) since 1990, i.e. an AoO of 56 square km. The population is still in continuing decline; both observed (it has apparently been lost from the New Forest and 'Exeter' in the south-west, and from Dunham Park and Long Eaton in the north) and projected: the availability of suitable host trees is diminishing with intensive agriculture continuing to cause decline and death of old trees (especially severe at the Forthampton location), old trees continue to be removed for tidiness reasons (in parklands and wood pastures), and new generations of suitable trees are not being established in sufficient numbers. A large range contraction is apparent over the past 100 years or so. However, the number of locations known is substantially above that required for 'severely fragmented' under B2a - the species range is severely fragmented but not to the extreme extent required to be meaningful for criterion B2a within the IUCN criteria.While many of the currently known populations appear reasonably safe, the contraction in range suggests that Near Threatened would be the appropriate conservation status.

Threats This species requires ancient and veteran broadleaved trees growing in concentrations in open well-lit situations. A declining availability of suitable host trees, especially open-grown ancient oaks and old orchard trees, is occurring at landscape scale. There are severe threats at many sites: at Berkeley Deer Park the species only occurs on a single ancient oak tree; the host trees at Forthampton Oaks are dying at an alarming rate due to unsympathetic land management; there are few suitable trees left in Hanbury Park.

Management and Conservation Windsor Forest and Great Park and Richmond Park are both SSSI; Bredon Hill is a NNR; most other sites remain unprotected. However, designation alone does not ensure conservation – the tree populations require active management under modern conditions, keeping existing host trees alive as long as possible, while ensuring that new generations of future veteran trees are being brought on.

Published sources
Nash (1990 & 2000); Peacock (1993).

14.2 BOSTRICHIDAE

BOSTRICHUS CAPUCINUS - A false powder-post beetle
REGIONALLY EXTINCT
Order COLEOPTERA
Family BOSTRICHIIDAE

Bostrichus capucinus (Linnaeus, 1758)

Identification Identification keys to adults are available in Fowler(1890).

Distribution Known historically from a very wide scatter of records across southern and eastern Britain but most recently from an undated specimen in the J.R. Hardy collection held at Manchester Museum; the date is estimated to be early 20th century (Johnson, 1977). Present over a large part of the Palaearctic region. In Europe it is commoner in the south, being rare in the north (Zahradník & Chvála, 1989).

Habitat and ecology In decayed trees. A thermophilous lowland species, the adults active May to July; they require old broad-leaved trees for their development. The female lays her eggs in cracks in the bark of dry roots or at the base of the trunk. The larva tunnels in the wood and pupates just beneath the outer surface. The generation time is one year (Zahradník & Chvála, 1989).

Hyman (1992) reports that the beetle is occasionally imported with timber, and is said to have bred in a timber yard at Millwall, South Essex from 1906-1908. He notes a record from a shop floor in Northamptonshire 'recently'.

Status Very rare. Not taken for over 100 years and presumed extinct in Britain. Very unclear why it should have become extinct although the scatter of sites do not suggest a genuine ecological pattern and may be merely a record of a more extensive population already in serious decline and unrecoverable.

Included in the British Red Data Book (Shirt, 1987) as RDB3 (rare) but reassessed by Hyman (1992) as Extinct.

LYCTUS LINEARIS - A false powder post beetle
CRITICALLY ENDANGERED B1,2ab(i,ii,iii,iv)
Order COLEOPTERA
Family BOSTRICHIDAE

Lyctus linearis (Goeze, 1770)

Identification The adults may be keyed using Fowler (1890).

Distribution Widely in eastern England, from Kent to Northumberland & Durham district; more western sites occur in the rain-shadow country of the Welsh borders, e.g. Church Stretton; also Dunham Park, Repton, and Windsor (Fowler, 1890).

Habitat and ecology In freshly dead sapwood of hardwoods, while the starch content is at the right concentration – the wood needs to be killed suddenly, so that the tree is unable to withdraw the starch before death; also the wood needs to be relatively large girth timber. The female places her eggs with care and precision in the early wood vessels or pores (Hickin, 1981). These may be exposed in the sectioned wood as cut or indeed opened by the beetle herself in the 'tasting' marks. Up to fifty eggs are laid. The larva initially feeds on a yolk-like substance left behind in the egg until its girth is sufficient to enable it to move down the pore by gripping the sides with its body. It makes its way along the pore and finally pierces it. The larva then bores its way backwards and forwards in the sapwood, gradually increasing in size. The larvae gradually reduce the timber to dust, leaving a thin veneer of sound wood on the outside. Flight holes are about 1.4mm diameter.

It only occurs in wood in its first few seasons after the wood was killed. The larva feeds on the cell contents, containing mostly starch, sugars and related substances together with a little protein. The cell walls cannot be digested. A moisture content in the wood of 8-30% is necessary for feeding (Hickin, 1981). The female only lays eggs if there is a 3% starch content of sapwood; she is attracted to fresh-cut timber.

The species has had a long history of exploiting wood that has been cut and fashioned by people. It used to be strongly associated with freshly-cut oak palings, used for fencing, and on hop poles in Kent. Another focus for the beetle was ash wood used for tool handles, gun-stocks, etc; but it also occurs in more natural situations associated with freshly split or damaged trees, especially of oak and beech (Fowler, 1890). As industrialization, has progressed the opportunities for the beetle have diminished.

Sub-fossil data (Buckland & Buckland, 2006) provide tantalising glimpses into these relationships. *Lyctus linearis*, for example, appears to have been attracted to the freshly cut and split timbers of Roman building across Britain: it is first detected in Britain from a Roman well in Warwickshire dated to about AD 64-80, from a defensive ditch around the fortress at Exeter dug AD 80-120, a Roman well at York of about 175-250, and also known from Roman Alcester (AD 200-300). It is also associated with another major phase of building arising from the Norman invasion some 700 years later, being found in a sample from the Norman motte and bailey fortification at Hen Domen in West Wales, dated to between the late 12th and early 13th century. It was also present in a medieval friary near Leicester, dated to between 1250 and 1540, and in late 15th century medieval Worcester. Moving into the historic (entomological) period, Stephens (1830) comments that it frequents dry oak wood and "delight especially in new palings". He states that it was "very common in the neighbourhood of London, and I believe throughout the country: it abounds on palings, beneath bark, etc, especially of the oak." Dillwyn (loc.cit.) had reported to him that it "occurred under the bark of decaying oaks (near Swansea). Not uncommon". Of course, paling-wire fencing was a relatively new thing at the time, having been developed from the mid 1800s (Cameron, 1984). Stephens (1830) adds "very abundant during the summer, in Notts" (Dr Howitt) and "Bottisham" (L. Jenyns). Fowler (1890) repeats much of this information, but describes its status as "local, but occasionally abundant where it occurs". It was then "common on hop poles" and "abounds in Birmingham in ash wood used for spade and other tool handles, gun-stocks, etc, and does immense damage to both the raw and

finished materials". This may be assumed to represent a record of continuous presence across lowland Britain since Roman times. Locally made fresh oak palings may have been commonplace in the Victorian countryside but have largely been replaced in recent decades by mass-produced and chemically treated posts and fences. This appears to have had a major impact on specialist saproxylics such as *Lyctus linearis* and *Xyletinus longitarsis*. Untreated freshly cut timber has become a rarity in the countryside – the beetle has been obliged to rely once again on its native habitat of naturally split trees, but there are now many fewer trees in the countryside than in times past and technological developments mean that people can remove freshly split trunks and branches soon after they appear. The species has now virtually disappeared.

The evidence suggests that *Lyctus linearis* may be a 'boom and bust' species. The data available to the present assessment indicates that *L. linearis* was last 'widespread but local' over 100 years previously, but that it had almost died out within its known range by the 1930s.

Status With just a single record in the past ten years, giving it an AoO of just 4km^2, this species meets Critically Endangered under Criterion B2 (a) with continuing decline projected in (i) extent of occurrence, (ii) area of occupancy, (iii) area, extent and/or quality of habitat, (iv) number of locations. The data suggests that it should have been assessed as RDB1 (Endangered) in Hyman (1992) rather than Notable B.

Threats The species requires freshly split or damaged timber from broad-leaved trees, generally in open and well-lit situations, in the warmer and drier parts of the country. It is therefore threatened by the increasing tidiness in the countryside, etc, whereby collapsed timber is quickly cut and removed.

Management and Conservation Although it has been reported from many sites in the past, modern records are notably few, and it is clear that the population has crashed under modern conditions.

Published sources
Hickin (1981); Hyman (1992).

14.3 PTINIDAE

PTINUS LICHENUM – a spider beetle
ENDANGERED B2ab (ii,iii,iv)
Order COLEOPTERA
Family PTINIDAE

Ptinus lichenum Marsham, 1802

Identification A key to the adult beetles is available in Zahradník (2013).

Distribution Historic records are centred on the lower Thames basin, with just a small number of more isolated reports elsewhere across southern and eastern Britain, plus an isolated record from Dumfries-shire. However, there appear to have been only two recent finds, from East Sussex and South Yorkshire. Britain, France, Spain, Corsica (Hinton, 1941); Europe, but not the

east (Zahradník, 2013).

Habitat and ecology An outdoor species occurring on old dead ivy stems and on lichen- covered wood of many broad-leaved trees, including sycamore *Acer pseudoplatanus* (P. Skidmore, in lit.). It is also well-known from old lichen-covered fence posts. The larvae bore in the dry dead wood and bark (Hinton, 1941); abundant in July on old fences at Enfield (Pool, 1906). Adults have been found in March, May, June and November (Hyman 1992). Palm (1959) associated it in Denmark with large numbers being found on oak posts; also especially from ivy. Koch (1989) associated it with warm slopes; in and on dry twigs of old ivy on walls and old deciduous tree trunks; also in dry twigs of plum *Prunus domestica*. Few British records are associated with habitat data.

Status This species qualifies as endangered as it is in decline, from 18 hectads pre 1990 to now only 2 hectads; it has an AoO of 8 square km and is present in only two tetrads. The species appears to have always been a rarity apart from what appears to have been a substantial population in the London area in late 19th century, from the North Downs (Box Hill and Mickleham) northwards to Windsor Forest and Great Park, Highgate and Hainault Forest. The three most recent reports (one pre-1990) spread across much of its former British range. The main population reduction appears to have been in the distant past, but the Area of Occupancy is fragmented and continuing decline is apparent from the few modern records, none in the past 10 years, so a status of 'Endangered' appears clear. It seems possible that it is moving towards Critically Endangered but targeted survey is required in order to clarify the situation. The species range is also severely fragmented but not to the extreme extent required to be meaningful for criterion B2a within the IUCN criteria.

Threats The species is associated with old dry deadwood, especially old ivy stems and old fence posts. This type of deadwood has become increasingly scarce across the beetle's range, with increasing development of previously undisturbed places where old wood has been left undisturbed, the replacement of old wooden fence posts with modern longer-lasting materials, the clearance of old ivy, etc. Habitat loss at landscape-scale has presumably resulted in the collapse of this species' population.

Management and Conservation One of the two recent records is from lichen-covered fence posts on East Guldeford Level (Hodge, 1990). This is very consistent with what is known about this species' history in Britain but more information is needed on the specific habitat and trends at this site. The other record is for 'King's Wood' in South Yorkshire, without habitat details, and comes from the NBN Gateway. With such limited understanding of the species' ecology it is difficult to comment any further – research is needed.

Published sources
Hinton (1941); Hodge (1990); Pool (1906); Zahradník (2013).

PTINUS PALLIATUS – a spider beetle
VULNERABLE B2ab (i,ii,iii,iv)
Order COLEOPTERA

Family PTINIDAE

Ptinus palliatus Perris, 1847

Identification A key is available in Hinton (1941) and – as *Ptinus germanus* - Joy (1932); this species does not feature in the key to the Central European fauna (Zahradník, 2013).

Distribution England and Wales. Records are concentrated in the south and east of England, but with a thin scatter westwards into Herefordshire, Glamorgan and Somerset. There are only old records from the north-east of England. Modern records are from just a few localities: Grimsthorpe Park, Lincolnshire (2013), Windsor Great Park (2006), Croome Park, Worcestershire (1996 & 2006), Felbrigg Great Wood, Norfolk (2003), Ickworth Park, Suffolk (1999 & 2003), Field Farm in Lower Kennet floodplain of Berkshire (2003), and Peper Harrow Park, Surrey (2000). Its global range appears to be focused on Western Europe, including western parts of Germany and Austria (Zahradník, 2013).

Habitat and ecology In old dry timber of oak, less often beech and other woody broad-leaves, and from old fence-posts, both in ancient wood-pasture and in exposed places by coasts (P. Skidmore, in lit.). It lives in early-stage white-rotten wood, requiring at least two years for its development (Palm, 1959); it feeds on larval and pupal skins in the galleries of other insects inhabiting the wood; the larvae dig galleries themselves and devour the wood (West, 1942). Adults have been reported during spring and autumn. The species is considered a Grade 3 indicator of ecological continuity (Alexander, 2004).

Status This species qualifies as Vulnerable as it is in decline, from 20 hectads pre 1990 to now only 8 hectads; it is known from 8 locations (9 tetrads) and has an AoO of 36 square km. Under criterion B2, continuing decline is inferred in i) extent of occurrence, ii) area of occupancy, iii) quality of habitat, and iv) number of locations. Pope (1988) comments on its much greater rarity and apparently diminished range in the 20th Century; Owen (1992) concurred. The species range is also severely fragmented but not to the extreme extent required to be meaningful for criterion B2a within the IUCN criteria.

Threats The species appears to be omnivorous in dry white-rotted wood of broad-leaved tree species, and may require both a diverse assemblage of the associated biodiversity and good ecological continuity. This implies that it is threatened not only by clearance of deadwood but specifically the type of deadwood found in open and exposed situations such as old parkland and wood pasture. Although reported from old wooden fence posts in the past, this habitat has largely disappeared from much of its range.

Management and Conservation This species benefits from legal protection of many of its old parkland localities and increased appreciation of the biodiversity value of deadwood in general. It is nonetheless very vulnerable to its habitat being ‘tidied up’ in those historic parks which have been converted to landscape gardens. Its old dry deadwood needs to be exposed to full sunshine and to be subject to air-drying.

Published sources

Buckland & Buckland (2006); Hinton (1941); Owen (1992); Pope (1988); Zahradník (2013).

XYLETINUS LONGITARSIS – a woodworm beetle
VULNERABLE B2ab (i,ii,iii,iv)
Order COLEOPTERA
Family PTINIDAE

Xyletinus longitarsis Jansson, 1942
ater sensu auctt. Brit. partim non (Creutzer in Panzer, 1796) Hyman (1992)

Identification A key to the adult beetles is available in Zahradník (2013).

Distribution The species formerly occurred across much of central, southern and eastern England, with old records as far west as South Devon, and north as the Derbyshire/Yorkshire border. Modern records are very few and the range appears to have contracted somewhat. The West Midlands (Herefordshire, Worcestershire and Shropshire) remain a stronghold, with other modern records coming from East Sussex, Buckinghamshire and Lincolnshire.
Europe, Turkey, Kazakhstan, Mongolia; more frequent at forest-steppe localities in Czech area (Zahradník, 2013).

Habitat and ecology In very brittle and powdery white-rotten deadwood of oak, usually large old hulks in open parkland; also exceptionally in old broom *Cytisus* at Dungeness. Many early records came from untreated oak palings and fences. Active in bright sunshine, not after dark (Cooter, 1992). On dead oak trunks and by beating the thin crown branches and twigs of dead or fallen trees (Cooter, 2006). Cooter (2006) notes that A.M. Massee discovered the species breeding in numbers in powdery dry broom growing at Dungeness, and that contemporary and later collectors came to regard broom as its preferred host. Its occurrence in broom was however a marked exception rather than the norm. The species is considered a Grade 3 indicator of ecological continuity (Alexander, 2004).

Status This species qualifies as Vulnerable as it is in decline, from 26 hectads pre 1990 to now only 8 hectads; it is known from 8 locations (8 tetrads) and has an AoO of 32 square km. Under criterion B2, continuing decline is inferred in i) extent of occurrence, ii) area of occupancy, iii) quality of habitat, and iv) number of locations. Records tend to be of single specimens on particular individual trees, including dead hulks, and long-term viability of populations is questionable. The species range is also severely fragmented but not to the extreme extent required to be meaningful for criterion B2a within the IUCN criteria.

Threats The species requires very brittle and powdery white-rotten deadwood of oak, usually large old hulks in open parkland. It is threatened not only by clearance of deadwood but specifically the type of deadwood found in open and exposed situations such as old parkland and wood pasture. It is particularly at risk in historic parklands which have been converted into landscape gardens. Although reported from old wooden fence posts in the past, this habitat has largely disappeared from much of its range. It is also associated with stands of old broom along coastal shingle – Dungeness in particular -where it may be threatened by pressure to remove

scrub. It used to be known from the New Forest but there are no modern records.

Management and Conservation This species benefits from legal protection of many of its old parkland localities and increased appreciation of the biodiversity value of deadwood in general. It is nonetheless very vulnerable to its habitat being 'tidied up' in those historic parks which have been converted to landscape gardens. Its old dry deadwood needs to be exposed to full sunshine and to be subject to air-drying. Moccas Park NNR is one of its best-known sites, but it also occurs in Grimsthorpe Park SSSI. Many other parkland sites are undesignated and merit attention.

Published sources Cooter (1992); Zahradník (2013).

CAENOCARA BOVISTAE
NEAR THREATENED B2ab(i,ii,iii,iv)D2
Order COLEOPTERA
Family PTINIDAE

Caenocara bovistae (Hoffmann, J., 1803)

Identification A key to the adult beetles is available in Zahradník (2013).

Distribution Historically the species has been found widely across lowland heaths, downs and coastlands in south-eastern England, from East Sussex to Norfolk and inland to Berkshire, with outlying colonies on the North Wales and Lancashire coasts, and inland sites in South Devon and Lincolnshire. Modern records have only come from the Suffolk coast, East Kent and North Lincolnshire. Central and Northern Europe, Caucasus, Siberia, Far East (Zahradník, 2013).

Habitat and ecology Develops in puff-ball fungi where they grow in semi-natural grasslands on dry, freely-draining soils – sand, limestone, shingle. Reputedly in both the Potato Earthball *Scleroderma bovistae* (formerly *Lycoperdon*), which is associated with well-drained sandy soils, and the Lead-grey Bovist *Bovista plumbea* (syn. *Lycoperdon bovista*), associated with humus in many types of grassland; the fungal host identification merits clarification. Adults have been reported in April and from June to September (Hyman, 1992).

Status This species would qualify as Vulnerable as it appears to be in decline, from 23 hectads pre 1990 to now only 4 hectads; it is known from 4 locations (4 tetrads) and has an AoO of 16 square km. But the lack of known plausible threats means that neither B2 nor D2 apply, although this is due to lack of information rather than known lack of threat. Plausible threats cannot be fully assessed at present without close examination of the condition of the remaining known sites. The Extent of Occurrence has declined severely over the past 100 years but there is no data on change in the past 25 or 10 years. Area of Occupancy is certainly currently highly fragmented, with just four locations known, but there is no evidence available concerning decline in modern times. Near Threatened is therefore suggested as the current status using IUCN criteria.

Threats The types of grasslands on which the species occurs are very prone to ecological damage through intensification of agriculture, but most of such damage happened in the past.

Management and Conservation The Suffolk Coast is the key remaining area for this beetle and the various SSSIs present provide much suitable habitat; with The Swale SSSI of North Kent and Moor Farm Nature Reserve (Lincolnshire Wildlife Trust) producing the only other recent reports. Moor Farm has heath and dry pastures on fen-edge sands and gravels. Recommendations for site management for this species are difficult to determine as so little is known about its ecology, but presumably sward structure needs to be kept low to facilitate fungal fruiting. Rabbit grazing may be sufficient most of the time but is unreliable on its own due to myxomatosis causing periodic crashes; livestock grazing may be necessary to ensure the right conditions are maintained.

Published sources
Zahradník (2013).

15 References and further reading

ALEXANDER, K.N.A. 2004. *Revision of the Index of Ecological Continuity as used for saproxylic beetles*. English Nature Research Report Number 574

ALEXANDER, K.N.A. 2014. *A review of the beetles of Great Britain: The Soldier Beetles and Their Allies.* Species Status No.16. Natural England Commissioned Reports, Number 134.

ALEXANDER, K.N.A. 2016. Europe's wood pastures - rich in saproxylics but threatened by ill-conceived EU instruments. *Bulletin de la societe royale belge d'Entomologie* **152**: 168-173.

ALEXANDER, K.N.A, DODD, S. & DENTON, J.S. 2014. *A review of the beetles of Great Britain: The darkling beetles and their allies.* Species Status No. 18. Natural England Commissioned Reports, Number 148.

BERCEDO, P. & ARNÁIZ, L. 2010. A new species of the genus *Mirosternomorphus* Español, 1977 from England (United Kingdom) (Coleoptera: Ptinidae: Dorcatominae). *The Coleopterist* **19**: 105-110.

BRATTON, J.H. (ed.). 1991. *British Red Data Books: 3. Invertebrates other than Insects*. Nature Conservancy Council, Peterborough.

BUCKLAND, P.I. & BUCKLAND, P.C. 2006. *Bugs coleopteran ecology package Software* [Component versions: Bugs CEP: Release 7.43; Bugsdata: Release 7.09; Bugs MCR: Release 2.0; Bustats: Release 1.2] [CDROM].

CAMERON, D.K. 1984. *The Cornkister Days. A Portrait of a Land and its Rituals*. London: Victor Gollancz Ltd.

COOTER, J. 1992. *Xyletinus longitarsis* Jansson (Col., Anobiidae) in Herefordshire. *Entomologist's Monthly Magazine* **128**: 183.

COOTER, J. 2006a. Derodontidae. In: Cooter, J. & Barclay, M.V.L. (eds) A Coleopterist's Handbook (4th Edition). *The Amateur Entomologist* **11**: 73.

COOTER, J. 2006b. Dermestidae. In: Cooter, J. & Barclay, M.V.L. (eds) A Coleopterist's Handbook (4th Edition). *The Amateur Entomologist* **11**: 74.

COOTER, J. 2006c. Anobiidae. In: Cooter, J. & Barclay, M.V.L. (eds) A Coleopterist's Handbook (4th Edition). *The Amateur Entomologist* **11**: 75-78.

DANDY, J.E. 1969. *Watsonian vice-counties of Great Britain*. London, Ray Society.

DUFF, A.G. 2012. (ed.) *Checklist of Beetles of the British Isles*. 2nd edition. Pemberley Books.

EMDEN, F. van.1943. Larvae of British Beetles. IV. Various small families. *Entomologist's Monthly Magazine* 79: 259-270.

FOSTER, C.W. & HOLLOWAY, G.J. 2015. *Anthrenus (Anthrenus) angustefasciatus* (Coleoptera: Dermestidae), a species new to Britain *British Journal of Entomology & Natural History* **28**: 47-51.

FOSTER, G.N. 2010. A review of the scarce and threatened Coleoptera of Great Britain Part (3): Water beetles of Great Britain. *Species Status* 1. Joint Nature Conservation Committee, Peterborough.

FOWLER, W.W. 1889. *The Coleoptera of the British Islands.* Vol. III. L. Reeve & Co., London.

FOWLER, W.W. 1890. *The Coleoptera of the British Islands.* Vol. IV. L. Reeve & Co., London.

FOWLER, W.W. & DONISTHORPE, H. St.J. D. 1913. *The Coleoptera of the British Islands.* Vol. VI. L. Reeve & Co., London.

FRY, R. & LONSDALE, D. (eds.).1991. Habitat conservation for insects – a neglected green issue. *The Amateur Entomologist* **21**: 1–262.

GIBBONS, P., LINDENMAYER, D.B., FISCHER, J., MANNING, A.D., WEINBERG, A., SEDDON, J., RYAN, P. & BARRETS, G. 2008. The future of scattered trees in agricultural landscapes. *Conservation Biology* **22**: 1309-1319.

HARDE, K.W. 1998. *Beetles*. Bookmart Ltd, Leicester.

HICKIN, H.E. 1981. *The Woodworm Problem*. Rentokil Library.

HINTON, H.E. 1941. The Ptinidae of Economic Importance. *Bulletin of Entomological Research* **31**: 331-381.

HINTON, H.E. 1945. *A monograph of the beetles associated with stored products*. I: 443 pp. London: British Museum (Natural History).

HODGE, P.J. 1990. Notable Coleoptera from Southern England. *British Journal of Entomology & Natural History* **4**: 40

HUBBLE, D.S. 2014. *A review of the scarce and threatened beetles of Britain. The leaf beetles and their allies. Chrysomelidae, Megalopodidae and Orsodacnidae.* Species Status No.19. Natural England Commissioned Reports, Number 161.

HYMAN, P.S. (revised PARSONS, M.S.). 1992. *A review of the scarce and threatened Coleoptera of Great Britain.* Part 1. UK Nature Conservation: 3. Joint Nature Conservation Committee, Peterborough.

HYMAN, P.S. (revised PARSONS, M.S.). 1994. *A review of the scarce and threatened Coleoptera of Great Britain.* Part 2. UK Nature Conservation: 12. Joint Nature Conservation Committee, Peterborough.

IUCN. 1994. *IUCN Red List Categories and Criteria: Version 2.3*, IUCN Species Survival Commission. IUCN, Gland, Switzerland.

IUCN. 2001. *IUCN Red List Categories and Criteria.* Version 3.1. IUCN Species Survival Commission. IUCN, Gland, Switzerland & Cambridge, UK.

IUCN. 2003. *Guidelines for Application of IUCN Red List Criteria at Regional Levels.* Version 3.0. IUCN Species Survival Commission IUCN. Gland, Switzerland & Cambridge, UK.

IUCN. 2012a. *IUCN Red List Categories and Criteria*. Version 3.1. 2nd Edition, IUCN Species Survival Commission. IUCN, Gland, Switzerland & Cambridge, UK.

IUCN. 2012b. *Guidelines for Application of IUCN Red List Criteria at Regional and National Levels.* Version 4.0. IUCN Species Survival Commission. IUCN, Gland, Switzerland & Cambridge, UK.

IUCN. (2012). *Guidelines for Application of IUCN Red List Criteria at Regional and National Levels:* Version 4.0. Gland, Switzerland and Cambridge, UK: IUCN. iii + 41pp.

IUCN. 2013. *Guidelines for Using the IUCN Red List Categories and Criteria*. Version 10. IUCN Species Survival Commission. IUCN, Gland, Switzerland.

JOHNSON, C. 1977. Dunham Park. *A conservation report on a parkland of high entomological interest*. Nature Conservancy Council: CSD Notes No.5.

JOY, N.H. 1932. *A practical handbook of British beetles* (2 vols.). London: Witherby.

KIRBY, P. 2001. *Habitat Management for Invertebrates: a Practical Handbook*. RSPB, Sandy, Bedordshire.

KLAUSNITZER, B. 1978. *Ordnung Coleoptera (Larven).* Junk.

KOCH, K. (1989) *Ökologie, 1. Die Käfer Mittleeuropas*. Goecke & Evers, Krefeld.

LANE, S.A. & MANN, D.J. 2016. *A review of the scarce and threatened beetles of Britain. The stag beetles, dor beetles, dung betles, chafers and their allies – Lucanidae, Geotrupidae, Trogidae and Scarabaeidae.* Species Status No.31. Natural England Commissioned Reports, Number 224.

LEE, P. 2015. *A review of the millipedes (Diplopoda), centipedes (Chilopoda) and woodlice (Isopoda) of Great Britain.* Species Status No. 23. Natural England Commissioned Reports, NERC 186.

LINDENMAYER, D.B., LAURANCE, W.F. & FRANKLIN, J.F 2012. Global decline in large old trees. *Science* **338**: 1305-1306.

MACADAM, C. 2015. *A review of the stoneflies (Plecoptera) of Great Britain.* Species Status No. 20. Natural England Commissioned Reports, Number 174.

NASH, D. R.1990. *Trinodes hirtus* (F.) (Col.: Dermestidae) rediscovered in Suffolk.

Entomologist's Record **102**: 186.

NASH, D.R. 2000. *Trinodes hirtus* (F.) (Col.: Dermestidae) – a further Suffolk locality. *Entomologist's Record* **112**: 178-9.

NIETO, A. & ALEXANDER, K.N.A. 2010. *The status and conservation of saproxylic beetles in Europe*. Publications Office of the European Union.

OWEN, J.A. 1992. Experience with an emergence trap for insects breeding in dead wood. *British Journal of Entomology & Natural History* **5**: 17-20.

PALM, T. (1959). Die Holz und Rindenkäfer der sud- und mittelschwedischen Laubbaume. *Opuscula Entomologica Suppl*. 16.

PEACOCK, E.R. 1993. Adults and larvae of hide, larder and carpet beetles and their relatives (Coleoptera: Dermestidae) and of derodontid beetles (Coleoptera: Derodontidae). *Handbooks for the Identification of British Insects* **5 (3)**: 1-144)

POOL, C.J.C. 1906. Coleoptera in the Enfield district. *Entomologist's Record* 18: 20-21.

POPE, R.D. 1988. A rare spider beetle (Col., Ptinidae) new to West Sussex. *Entomologist's Monthly Magazine* **124**: 76.

SHAW, M.R. 1999. *Trogoderma angustum* (Solier,1849) (Coleoptera: Dermestidae), a museum and herbarium pest new to Britain. *Entomologist's Gazette* **50**: 99-102.

SHIRT, D.B. 1987. *British Red Data Books: 2. Insects*. Nature Conservancy Council, Peterborough.

STEPHENS, J.F. 1830. *Illustrations of British Entomology; or, a synopsis of indigenous insects: containing their generic and specific distinctions; with an account of their metamorphoses, times of appearance, localities, food, and economy, as far as practicable.* Mandibulata, volume 3. Baldwin and Craddock, London.

STEPHENS, J.F. 1839. *A manual of British Coleoptera, or beetles: Containing a brief description of all the species of beetles hitherto ascertained to inhabit Great Britain and Ireland; together with a notice of their chief localities, time and places of appearances, etc.* Longman, Orme, Brown, Green, and Longmans, London.

TOMLIN, J.R. le B. 1905. Beetles. In: PAGE, W. (ed) *The Victoria History of the County of Derbyshire*. London.

WELCH, R.C. 1987. *Globicornis nigripes*. Page 196 in SHIRT, D.B. (ed.) *British Red Data Books: 2. Insects.* Nature Conservancy Council.

WELLS, S.M., PYLE, R.M., & COLLINS, N.M. 1983. *The IUCN invertebrate Red Data Book*. International Union for Conservation of Nature and Natural Resources. Gland, Switzerland.

WEST, A. (1942). Fortegnelse over Denmarks biller. *Entomologiske Meddelelser* 21, 1-664.

WOODROFFE, G.E. 1971. *Globicornis nigripes* F. (Col., Dermestidae) in Buckinghamshire. *Entomologist's Monthly Magazine* **107**: 148.

ZAHRADNIK, P. 2013. *Beetles of the family Ptinidae of Central Europe*. Academia, Praha.

Appendix 1: Summary Table - An alphabetical list of the wood-boring beetles, spider beetles, woodworm beetles, false powder-post beetles, hide beetles, and their allies – Bostrichiidae, Derodontidae, Dermestidae and Ptinidae (note: more information is included in the accompanying Excel spreadsheet)

Species Name	GB IUCN Status (2016)	Qualifying criteria	Rationale	GB Rarity status (2016)	Presence in England	Presence in Scotland	Presence in Wales	AoO (hectads) <1990	AoO (hectads) 1990-2015	AoO (tetrads) 1990-2015	No. of Locations 1990-2015
Anitys rubens	LC		No perceived threats specific to this species.	NS	E		W	35	37		
Anobium inexspectatum	LC		No perceived threats specific to this species.		E		W	41	126		
Anobium punctatum	LC		No perceived threats specific to this species.		E	S	W	156	346		
Anthrenocerus australis	NA		Naturalized introduction		E			Not collated	Not collated		
Anthrenus angustefasciatus	NA		First reported in 2014. It may be extending its European range, having only recently been detected in northern Italy, France and Germany		E			Not collated	Not collated		
Anthrenus coloratus	NA		Importation		E			Not collated	Not collated		
Anthrenus flavipes	NA		Importation		E			Not collated	Not collated		
Anthrenus fuscus	LC		No perceived threats specific to this species. Very under-recorded.		E	S	W	44	94		

Species Name	GB IUCN Status (2016)	Qualifying criteria	Rationale	GB Rarity status (2016)	Presence in England	Presence in Scotland	Presence in Wales	AoO (hectads) <1990	AoO (hectads) 1990-2015	AoO (tetrads) 1990-2015	No. of Locations 1990-2015
Anthrenus museorum	DD		The data collation only found records from seven hectads since 1990. It is very difficult to know if this is an accurate representation of its true status, or whether the species is just being ignored by naturalists, being dismissed as 'museum beetle' irrespective of the true identity of the pest species concerned. It is no longer the commonest pest in museum collections.	DD	E			9	7		
Anthrenus olgae	NA		Importation		E			1	0		
Anthrenus pimpinellae	DD		The sole British record is: Blackheath, 1895. Unclear whether a casual importation or an extinct native.	DD	E			1	0		
Anthrenus sarnicus	NA		Importation		E	S		4	5		
Anthrenus scrophulariae	NA		Importation		E			0	0		
Anthrenus verbasci	NA		Naturalized introduction		E			29	99		
Attagenus brunneus	NA		Recent introduction		E			Not collated	Not collated		

Species Name	GB IUCN Status (2016)	Qualifying criteria	Rationale	GB Rarity status (2016)	Presence in England	Presence in Scotland	Presence in Wales	AoO (hectads) <1990	AoO (hectads) 1990-2015	AoO (tetrads) 1990-2015	No. of Locations 1990-2015
Attagenus cyphonoides	NA		Importation		E			Not collated	Not collated		
Attagenus fasciatus	NA		Importation		E	S		Not collated	Not collated		
Attagenus pellio	LC		Under-recording appears very likely due to a general lack of interest in recording synanthropic species. There is consensus amongst contacts that this is the case. A decline is very likely but not to the extent that it merits NS.		E	S		52	59		
Attagenus smirnovi	NA		Naturalized introduction		E			Not collated	Not collated		
Attagenus trifasciatus	NA		Importation		E	S		Not collated	Not collated		
Attagenus unicolor	NA		Naturalized introduction		E			Not collated	Not collated		
Bostrichus capucinus	RE		Not taken for over 100 years and presumed extinct in Britain. Last reported in Dunham Park in early 20C.	RE	E			10	0		
Caenocara affinis	DD		Added to the British list in 1918 based on rearing from a Suffolk Breckland site, but no further records. A single observation does not however make a long-established native population. Data Deficient appears to be the most rational status, at least until further material is forthcoming.	DD	E			1	0		
Caenocara bovistae	NT	B2ab (i,ii,iii,iv) & D2	This species would qualify as Vulnerable as it is in decline, from 23 hectads pre-1990 to now only 4 hectads; it is known from 4 locations (4 tetrads) and has an AoO of 16 square km. But the lack of known plausible threat means that neither B2 nor D2 apply, although this is due to lack of	NR	E		W	23	4		

Species Name	GB IUCN Status (2016)	Qualifying criteria	Rationale	GB Rarity status (2016)	Presence in England	Presence in Scotland	Presence in Wales	AoO (hectads) <1990	AoO (hectads) 1990-2015	AoO (tetrads) 1990-2015	No. of Locations 1990-2015
			information rather than known lack of threat. Plausible threats cannot be fully assessed at present without close examination of the condition of the remaining known sites. The Extent of Occurrence has declined severely over the past 100 years but there is no data on change in the past 25 or 10 years. Area of Occupancy is certainly currently highly fragmented, with just four locations known, but there is no evidence available concerning decline in modern times. Near Threatened is therefore suggested as the current status using IUCN criteria.								
Ctesias serra	LC		No perceived threats specific to this species and no decline observed.		E	S	W	124	180		
Dermestes ater	NA		Importation		E			Not collated	Not collated		
Dermestes carnivorus	NA		Importation		E			Not collated	Not collated		
Dermestes frischii	NA		Importation		E			Not collated	Not collated		
Dermestes haemorrhoidalis	NA		Naturalized introduction		E			Not collated	Not collated		
Dermestes lardarius	LC		Widespread in synanthropic conditions as well as in the wild; poorly documented due to familiarity but potentially in decline.		E	S		Not collated	42		
Dermestes leechi	NA		Importation		E	S		Not collated	Not collated		
Dermestes maculatus	NA		Naturalized introduction		E			Not collated	Not collated		

Species Name	GB IUCN Status (2016)	Qualifying criteria	Rationale	GB Rarity status (2016)	Presence in England	Presence in Scotland	Presence in Wales	AoO (hectads) <1990	AoO (hectads) 1990-2015	AoO (tetrads) 1990-2015	No. of Locations 1990-2015
Dermestes murinus	LC			NS	E		W	37	38		
Dermestes peruvianus	NA		Naturalized introduction		E			Not collated	Not collated		
Dermestes undulatus	VU	B2ab (i,ii,iv)	This species qualifies as Vulnerable as it is in decline, from 23 hectads pre-1990 to now only 5 hectads; it has an AoO of 32 square km and is present in only 8 tetrads. The key period of decline appears to have been pre-1990; however, the data does suggest a continuing and significant reduction in the AoO. The species is currently extremely thinly scattered within the former range (7 locations), and continuing decline is projected in (i) extent of occurrence, (ii) area of occupancy, and (iv) number of locations, all combining to indicate Vulnerable under criterion B. None of the recent records have been within the last 10 years although this probably reflects under-recording.	NR	E		W	24	5	8	7
Dorcatoma ambjoerni	LC		Known from 3 hectads since 1980. All known material in Britain dates from 1982 which might suggest a recent arrival. However, i) the species was described 'new to science' only in 1985; ii) the host fungus is associated with ancient wood pasture situations and very localized as a result, and ii) the host fungus is known to very few Coleopterists and tends to be overlooked as a result. Interestingly, a similar situation occurs in Sweden where museum specimens were only found from 1968, 1970, and 1973. A rare native old growth species does appear to be a reasonable assumption until contrary evidence becomes available. The data are difficult to interpret in terms of any decline as no information is available on subsequent gross change at any of the known sites.	NR	E			1	3		
Dorcatoma chrysomelina	LC		No perceived threats specific to this species.		E		W	53	102		

Species Name	GB IUCN Status (2016)	Qualifying criteria	Rationale	GB Rarity status (2016)	Presence in England	Presence in Scotland	Presence in Wales	AoO (hectads) <1990	AoO (hectads) 1990-2015	AoO (tetrads) 1990-2015	No. of Locations 1990-2015
Dorcatoma dresdensis	LC		No perceived threats specific to this species.	NS	E		W	17	45		
Dorcatoma flavicornis	LC		No perceived threats specific to this species.	NS	E		W	43	62		
Dorcatoma substriata	LC		No perceived threats specific to this species.	NS	E		W	17	43		
Dryophilus anobioides	LC		No perceived threats specific to this species and no decline observed	NR	E			8	12		
Dryophilus pusillus	NA		Naturalized introduction		E	S	W	75	101		
Ernobius abietis	NA		Importation		E			1	0		
Ernobius angusticollis	NA		Importation		E			3	5		
Ernobius gallicus	NA		Importation		E			0	1		
Ernobius gigas	NA		Naturalized introduction		E			2	0		
Ernobius mollis	NA		Naturalized introduction		E	S	W	56	71		
Ernobius nigrinus	LC		Apparently very under-recorded; current knowledge suggests native to Scottish Highlands but spread widely through conifer forestry, but very few records from supposed native range. No evidence for any decline; expansion with forestry suggests no significant threat..	NR	E	S		20	8		
Ernobius pini	NA		Naturalized introduction		E		W	9	6		
Gastrallus immarginatus	LC		No perceived threats specific to this species and no decline observed.	NS	E			1	16		

Species Name	GB IUCN Status (2016)	Qualifying criteria	Rationale	GB Rarity status (2016)	Presence in England	Presence in Scotland	Presence in Wales	AoO (hectads) <1990	AoO (hectads) 1990-2015	AoO (tetrads) 1990-2015	No. of Locations 1990-2015
Gastrallus knizeki	DD		Only very recently discovered; unclear at present whether an over-looked native or a recent arrival, although most likely the latter.	DD	E			0	1		
Gibbium aequinoctiale	NA		Importation		E			Not collated	Not collated		1
Gibbium psylloides	NA		Importation		E			Not collated	Not collated		
Globicornis rufitarsis	VU	D2	This species is assessed as VU using criterion D2. It has only been documented from six locations (six tetrads) since 1990, i.e. 24 square km. The availability of suitable host trees is diminishing with intensive agriculture continuing to cause decline and death of old trees (especially severe at the Forthampton location), old trees continued to be removed for tidiness reasons (in orchards and parklands), and new generations of suitable trees are not being established in sufficient numbers.	NR	E			3	5		
Grynobius planus	LC		No perceived threats specific to this species and no decline observed.		E	S	W	100	203		
Hadrobregmus denticollis	LC		No perceived threats specific to this species and no decline observed.	NS	E			22	32		
Hedobia imperialis	LC		No perceived threats specific to this species and no decline observed.		E	S	W	112	149		
Hemicoelus canaliculatus	LC		No perceived threats specific to this species and no decline observed.	NR	E			3	11		
Hemicoelus fulvicornis	LC		No perceived threats specific to this species and no decline observed.		E		W	98	275		

Species Name	GB IUCN Status (2016)	Qualifying criteria	Rationale	GB Rarity status (2016)	Presence in England	Presence in Scotland	Presence in Wales	AoO (hectads) <1990	AoO (hectads) 1990-2015	AoO (tetrads) 1990-2015	No. of Locations 1990-2015
Laricobius erichsonii	NA		Natural colonisation.		E	S	W	9	37		
Lasioderma serricorne	NA		Importation		E			Not collated	Not collated		
Lyctus brunneus	LC		Known in past 50 years from just 15 ancient wood pasture and parkland sites. No reliable evidence for a decline in native situations however.	NR	E	S		25	13		
Lyctus cavicollis	NA		Naturalized introduction		E			Not collated	Not collated		
Lyctus linearis	CR	B1,2ab (i, ii, iii, iv)	A single record in the past 10 years meets Critically Endangered under Criterion B2 (a) with continuing decline projected in (i) extent of occurrence, (ii) area of occupancy, (iii) area, extent and/or quality of habitat, (iv) number of locations. The data suggest that it should have been assessed as RDB1 (Endangered) in Hyman (1992).	NR	E			24	1	1	1
Lyctus planicollis	NA		Naturalized introduction		E			Not collated	Not collated		
Lyctus sinensis	NA		Importation		E			1	0		
Megatoma undata	LC		No perceived threats specific to this species and no decline observed. Undoubtedly under-recorded but no evidence to suggest not NS.	NS	E	S	W	46	52		
Mesocoelopus collaris	NA		A recent arrival in the London area.		E			0	2		
Mezium affine	NA		Importation		E			Not collated	Not collated		
Mirosternomorphus heali	NA		Described ‘new to science’ from a recently discovered site in Kent, but the genus was described from the Australasian region and the new species is assumed to be a recently established introduction.		E			0	1		

Species Name	GB IUCN Status (2016)	Qualifying criteria	Rationale	GB Rarity status (2016)	Presence in England	Presence in Scotland	Presence in Wales	AoO (hectads) <1990	AoO (hectads) 1990-2015	AoO (tetrads) 1990-2015	No. of Locations 1990-2015
Niptus hololeucus	NA		Naturalized introduction		E	S	W	59	15		
Ochina ptinoides	LC		No perceived threats specific to this species and no decline observed		E	S	W	62	187		
Orphinus fulvipes	NA		Importation		E			Not collated	Not collated		
Priobium carpini	NA		Importation		E			0	1		
Pseudorostus hilleri	NA		Importation		E			Not collated	Not collated		
Ptilinus pectinicornis	LC		No perceived threats specific to this species and no decline observed.		E	S	W	167	328		
Ptinus clavipes	NA		Importation		E			Not collated	Not collated		
Ptinus dubius	NA		Naturalized introduction		E			4	5		
Ptinus exulans	NA		Importation		E			Not collated	Not collated		
Ptinus fur	LC		Almost certainly under-recorded due to synanthropic habits, although also occurs out-of-doors.		E	S	W	78	75		
Ptinus latefasciatus	NA		Importation		E			Not collated	Not collated		
Ptinus lichenum	EN	B2ab (ii, iii, iv)	This species qualifies as endangered as it is in decline, from 18 hectads pre-1990 to now only 2 hectads; it has an AoO of 8 square km and is present in only two tetrads. The species appears to have always been a rarity apart from what appears to have been a substantial population in the London area in late 19th century, from the North Downs (Box Hill and Mickleham) northwards to Windsor Forest and Great Park, Highgate and Hainault Forest. The three most recent reports (one pre-1990) spread across much of its former	NR	E	S		18	2	2	2

Species Name	GB IUCN Status (2016)	Qualifying criteria	Rationale	GB Rarity status (2016)	Presence in England	Presence in Scotland	Presence in Wales	AoO (hectads) <1990	AoO (hectads) 1990-2015	AoO (tetrads) 1990-2015	No. of Locations 1990-2015
			British range. The main population reduction appears to have been in the distant past, but the Area of Occupancy is severely fragmented and continuing decline is apparent from the few modern records, none in the past 10 years, so a status of 'Endangered' appears clear.								
Ptinus palliatus	VU	B2ab (i,ii, iii,iv)	This species qualifies as Vulnerable as it is in decline, from 20 hectads pre-1990 to now only 8 hectads; it is known from 8 locations (9 tetrads) and has an AoO of 36 square km. Under criterion B2, the species is severely fragmented, and continuing decline is inferred in i) extent of occurrence, ii) area of occupancy, iii) quality of habitat, and iv) number of locations.	NR	E		W	20	8	9	8
Ptinus pilosus	DD		19th century records only, and requiring confirmation.	DD	E			2			
Ptinus pusillus	NA		Naturalized introduction		E			8	1		
Ptinus raptor	NA		Importation		E			Not collated	Not collated		
Ptinus sexpunctatus	LC		There is reasonable confidence that exhaustive recording would find this species in more than 100 hectads. The species has become increasingly common and widespread in recent decades and current data lags behind the reality.		E		W	37	78		
Ptinus subpilosus	LC		No perceived threats specific to this species and no decline observed.	NS	E	S	W	25	25		
Ptinus tectus	NA		Naturalized introduction		E	S	W	66	20		
Ptinus villiger	NA		Importation		E			Not collated	Not collated		
Reesa vespulae	NA		Locally established importation.		E			Not collated	Not collated		
Rhyzopertha	NA		Naturalized introduction		E			Not	Not		

Species Name	GB IUCN Status (2016)	Qualifying criteria	Rationale	GB Rarity status (2016)	Presence in England	Presence in Scotland	Presence in Wales	AoO (hectads) <1990	AoO (hectads) 1990-2015	AoO (tetrads) 1990-2015	No. of Locations 1990-2015
dominica								collated	collated		
Sphaericus gibboides	NA		Importation		E			Not collated	Not collated		
Stegobium paniceum	NA		Probably of Mediterrean origin and with a long history in domestic situations; occasionally found out-of-doors.		E		W	46	58		
Stephanopachys substriatus	NA		Importation		E			1	0		
Stethomezium squamosum	NA		Importation		E			Not collated	Not collated		
Thorictodes heydeni	NA		Importation		E			Not collated	Not collated		
Thylodrias contractus	NA		Importation		E			Not collated	Not collated		
Tipnus unicolor	NA		Naturalized introduction. Semi-synanthropic; present since Roman times.		E	S		Not collated	Not collated		
Trigonogenius globulus	NA		Importation		E			Not collated	Not collated		
Trinodes hirtus	NT	B2ab(ii, iii, iv)	This species does not qualify as Threatened but is proposed for Near Threatened as it narrowly fails on criterion B2. It has only been documented from 14 locations (14 tetrads) since 1990, i.e. 56 square km. The population is severely fragmented and continuing decline is both observed (lost from the New Forest and Exeter in the SW, and from Dunham Park and Long Eaton in the north) and projected: the availability of suitable host trees is diminishing with intensive agriculture continuing to cause decline and death of old trees (especially severe at the Forthampton location), old trees continued to be removed for tidiness reasons (in parklands and wood pastures), and new generations of	NR	E			10	16		

Species Name	GB IUCN Status (2016)	Qualifying criteria	Rationale	GB Rarity status (2016)	Presence in England	Presence in Scotland	Presence in Wales	AoO (hectads) <1990	AoO (hectads) 1990-2015	AoO (tetrads) 1990-2015	No. of Locations 1990-2015
			suitable trees are not being established in sufficient numbers.								
Trogoderma angustum	NA		Naturalized introduction		E	S		Not collated	Not collated		
Trogoderma glabrum	NA		Importation		E			Not collated	Not collated		
Trogoderma granarium	NA		Importation		E			Not collated	Not collated		
Trogoderma inclusum	NA		Importation		E			Not collated	Not collated		
Trogoderma variabile	NA		Importation		E			Not collated	Not collated		
Trogoxylon parallelopipedum	NA		Importation		E			Not collated	Not collated		
Xestobium rufovillosum	LC		No perceived threats specific to this species and no decline observed		E	S	W	57	150		
Xyletinus ater	DD		One specimen found in 2003 on scrubby chalk downland in Hampshire; impossible to interpret at this stage.	DD	E			0	1		
Xyletinus longitarsis	VU	B2ab (i, ii, iii, iv)	This species qualifies as Vulnerable as it is in decline, from 26 hectads pre-1990 to now only 8 hectads; it is known from 8 locations (8 tetrads) and has an AoO of 32 square km. Under criterion B2, the species is severely fragmented, and continuing decline is inferred in i) extent of occurrence, ii) area of occupancy, iii) quality of habitat, and iv) number of locations. Records tend to be of single specimens on particular individual trees, including dead hulks, and long-term viability of populations is questionable.	NR	E			26	8	8	8

Appendix 2. Summary of IUCN Criteria

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

	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 where the time period must include both the past and the future (up to a maximum of 100 years in 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 observed, estimated, inferred or projected 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 at least one of C1 or C2:			
C1. An observed, estimated or projected continuing decline of at least (up to a maximum of 100 years in future):	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
(up to a max. of 100 years in future)			
C2. An observed, estimated, inferred or projected continuing decline **AND** at least 1 of the following 3 conditions:			
(a i) Number of mature individuals in each subpopulation:	≤ 50	≤ 250	≤ 1,000
or			
(a ii) % of mature 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
D2. *Only applies to the VU category*. 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	≥ 50% in 10 years or 3 generations,	≥ 20% in 20 years or 5 generations,	≥ 10% in 100 years

extinction in the wild to be:	whichever is longer (100 years max.)	whichever is longer (100 years max.)	