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A Review of the Non-Marine Mollusca of Great Britain: Species Status No. 17

M.B. Seddon, I.J. Killeen & A.P. Fowles

Evidence Report No. 14



JNCC

Joint Nature Conservation Committee



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| | |
|---|-----------|
| Contents | |
| Crynodeb | 1 |
| Summary | 1 |
| Preface | 3 |
| 1. Introduction to the Species Status Reviews | 4 |
| 1.1 <i>Species Status</i> | 4 |
| 1.2 <i>The Red List system</i> | 4 |
| 1.3 <i>Status assessments other than Red Lists for species in Britain</i> | 5 |
| 1.4 <i>Species Status Assessment and conservation action</i> | 6 |
| 1.5 <i>References</i> | 6 |
| 2. Introduction to Species Status Review of Non-Marine Mollusca | 8 |
| 3. The IUCN threat categories and selection criteria | 8 |
| 3.1 <i>The evolution of threat assessment methods</i> | 8 |
| 3.2 <i>Summary of the 2001 categories and criteria</i> | 9 |
| 3.3 <i>The two-stage process in relation to developing a Red List</i> | 12 |
| 3.4 <i>The use of Near Threatened, Nationally Rare and Nationally Scarce categories</i> | 13 |
| 4. Methodology and sources | 16 |
| 5. Results of the Non-marine Mollusc Conservation Assessment | 18 |
| 5.1 <i>IUCN Summary</i> | 18 |
| 6. Detailed Accounts For Threatened Species | 21 |
| 6.1 <i>Anisus vorticulus (Troschel, 1834)</i> | 21 |
| 6.2 <i>Balea biplicata (Montagu, 1803)</i> | 23 |
| 6.3 <i>Gyraulus acronicus (Ferussac, 1807)</i> | 23 |
| 6.4 <i>Heleobia stagnorum (Gmelin, 1775)</i> | 25 |
| 6.5 <i>Helicodonta obvoluta (Müller, 1774)</i> | 25 |
| 6.6 <i>Lauria sempronii (Charpentier, 1837)</i> | 26 |
| 6.7 <i>Margaritifera margaritifera (Linne, 1758)</i> | 27 |
| 6.8 <i>Marstoniopsis insubrica (Küster, 1853)</i> | 29 |
| 6.9 <i>Mercuria cf similis (Draparnaud 1805)</i> | 30 |
| 6.10 <i>Myxas glutinosa (Müller, 1774)</i> | 31 |
| 6.11 <i>Pisidium conventus Clessin, 1877</i> | 32 |
| 6.12 <i>Quickella arenaria (Bouchard-Chantereaux, 1837)</i> | 34 |
| 6.13 <i>Sphaerium solidum (Normand, 1844)</i> | 35 |

| | |
|--|-----------|
| 6.14 <i>Succinella oblonga</i> (Draparnaud, 1805) | 36 |
| 6.15 <i>Truncatellina cylindrica</i> (Férussac, 1807) | 37 |
| 6.16 <i>Valvata macrostoma</i> Morch, 1864 | 38 |
| 6.17 <i>Vertigo angustior</i> Jeffreys, 1830 | 39 |
| 6.18 <i>Vertigo modesta</i> (Say, 1824) | 41 |
| 6.19 <i>Vertigo moulinsiana</i> (Dupuy, 1849) | 42 |
| 7. Acknowledgements | 45 |
| 8. General bibliography | 45 |
| Appendix 1: The IUCN Red List Categories and Criteria as set out in Version 3.1 of the guidance (IUCN 2001) | 48 |
| Appendix 2: Full list of British non-marine Mollusca | 55 |

List of Tables

Table 1. Summary of the thresholds for the IUCN Criteria

Table 2. GB Rarity Status of British Non-marine Molluscs

Table 3. Summary of the Threatened Status of British Species

Table 4. Threatened British Non-marine Molluscs on International Red Lists

List of Figures

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

Species Status Review of the Non-Marine Mollusca of Great Britain

Crynodeb

Mae'r adroddiad hwn yn cynnwys adolygiad o statws cadwraeth 183 o gastropodiau a 32 o rywogaethau cregyn deuglawr dŵr croyw ar lefel genedlaethol yn seiliedig ar ein gwybodaeth bresennol am y rhywogaethau. Mae hwn yn cyflenwi'r ymarferiad a wnaed yn Iwerddon (Byrne *et al.*, 2009).

Yn gyffredinol, ystyrir fod 70% o ffawna Prydain yn Bryder Lleiaf gyda 9.4% (18 o rywogaethau) o dan fygythiad difodiant. Mae yna 11 o rywogaethau sy'n agos at gwrdd â'r trothwyau ar gyfer Rhywogaethau o dan Fygythiad, naill ai ar sail amrywiaeth cyfyngedig neu ar sail y dirywiadau mewn poblogaeth dros y 40 mlynedd ddiwethaf, a rhestrir y rhain fel Bron o dan Fygythiad. Mae gan 5.7% arall (11 rhywogaeth) statws ansicr oherwydd diffyg gwybodaeth, ac, os ceir eu bod o dan fygythiad, gallai canran cyffredinol y rhywogaethau sydd o dan fygythiad fod cyfuch â 15.1%.

Mae statws tacsonomig rhai rhywogaethau, o'i gymharu â'u perthnasau cyfandirol yn ansicr, a dangosir y rhywogaethau hyn gyda statws 'cf' yn enw'r rhywogaeth. Daw'r ansicrwydd oherwydd bod yr endid tacsonomig yn cario'r enw ar y cyfandir, gan fod y rhywogaeth ar hyn o bryd yn cael ei adnabod ar sail morffometreg y gragen neu mewn rhai achosion systemeg foleciwlaidd. Datgelodd hyn fwy o rywogaethau nag a adnabuwyd o'r blaen, ond nid yw'r poblogaethau Prydeinig wedi'u trefnu eto. Ni ddylid cymysgu hyn ag ansicrwydd tacsonomig a fyddai'n arwain at statws Diffyg Data, gan fod y rhywogaethau hyn yn gyffredin ac nid ystyrir eu bod o dan fygythiad.

Summary

This report contains a review of the Threat Status of 183 gastropods and 32 freshwater bivalve species at national level based on our current knowledge of the species. This complements the exercise carried out in Ireland (Byrne *et al.*, 2009).

In general over 70% of the British fauna are considered to be Least Concern with 9.4% (18 species) threatened with extinction. There are 10 species that are close to meeting the thresholds for Threatened species, either on the basis of restricted ranges or on the basis of population declines over the last 40 years, and these are listed as Near Threatened. A further

5.7% (11 species) have uncertain status due to poor information and, if found to be threatened, the overall percentage of threatened species could be as high as 15.1%.

The taxonomic status of some species, relative to their continental relatives is uncertain, and these species are indicative by a 'cf' status in the species name. The uncertainty relates to the taxonomic entity bearing the name on the continent, as the species is currently identified on the basis of shell morphometrics or in some cases molecular systematics has revealed more species than previously recognised, but where the British populations have yet to be sequenced. This should not be confused with taxonomic uncertainty that would lead to a Data Deficient status, as these species are widespread and not considered to be threatened.

Preface

The initial report on which the following document was based was initiated by Mary Seddon and Ian Killeen on behalf of the Recording and Conservation Committee of the Conchological Society of Great Britain and Ireland (2009-2010) and was compiled with the assistance of members of the Conchological Society. Subsequently the Countryside Council for Wales (CCW) commissioned the completion and publication of this Species Status review on behalf of the Country Conservation Agencies as a contribution to the Species Status project of the Joint Nature Conservation Committee (JNCC).

Since the draft manuscript was initially compiled in 2010, the Threatened Species accounts have been reviewed and completely revised and an additional appendix was added to meet the requirements of the report.

These species assessments have been reviewed by many people over the last 5 years, but special thanks are due to the following members of the Conchological Society:

Robert Cameron (Chair of Conservation and Recording Committee), Martin Willing (Conservation Officer), Adrian Norris (Non-Marine Recorder) and Adrian Sumner

Other contributors include: David Aldridge, Keith Alexander, Barry Colville, Janice Light, David Long, Rosemary Hill, Evelyn Moorkens, Sebastian Payne, Peter Tattersfield.

1. Introduction to the Species Status Reviews

1.1 Species Status

The Species Status Assessment project initiated by JNCC in 1999 ended in 2008 after a number of reviews were published. However, there remains a need to continue assessing the threat status of species in the UK so a new project renamed Species Status has been created. The purpose is to provide an up-to-date threat status of taxa against standard criteria based on the internationally accepted guidelines developed by the International Union for Conservation of Nature (IUCN) (see IUCN, 2012a,b 2013). This publication is part of a new series of reports produced under this project.

Under the Species Status, JNCC and the statutory nature conservation agencies within the UK will be able to produce, initiate and fund Red Lists prepared by Non-governmental Organisations and other specialists, submitting these reports to JNCC for accreditation.

Assessments will be produced as Red Lists or as broader National Reviews of taxonomic groups of species (see 1.3). Both types of publication provide an audit trail of the assessment. The approved data will be used in the JNCC database of species conservation designations.

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

1.2 The Red List system

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

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

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

The British Red List of vascular plants has had a full update twice (Wigginton, ed. 1999, Cheffings and Farrell, 2005) following the production by the IUCN of a new, quantitative approach to threat assessment (IUCN, 1994, 2001, 2003). The recent Red Lists of British Odonata (Daguet *et al.*, eds, 2008), butterflies (Fox *et al.*, 2010), and British lichens and lichenicolous fungi (Woods & Coppins 2012), as well as reviews of Diptera (Falk and Crossley, 2005, Falk and Chandler, 2005), beetles (Foster 2010, Alexander 2014) and Bolete fungi (Ainsworth *et al.* 2013) have continued to follow the revised IUCN guidelines.

1.3 Status assessments other than Red Lists for species in Britain

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

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

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

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

1.4 Species Status Assessment and conservation action

Making good decisions to conserve species should primarily be based upon an objective process of determining the degree of threat to the survival of a species, in the present exercise by assigning the species to one of the IUCN threat categories. This assessment of threats to survival should be separate and distinct from the subsequent process of deciding which species require action and what activities and resources should be allocated.

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

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2. Introduction to Species Status Review of Non-Marine Mollusca

This review revises the Threat Status of British non-marine molluscs based on the IUCN criteria version 3.1 applied at regional level. It also comments on species of conservation interest which, whilst not meeting the criteria of species that are threatened with extinction, do meet other criteria which merit monitoring and possibly implementation of conservation action if declines are observed.

The species in Northern Ireland were reviewed as part of the Irish Red Data book of Non-marine Mollusca (Byrne *et al.*, 2009) and, as such, this area has not been considered in the review of status in Great Britain. This document should also be used in conjunction with the European Red List of Non-marine Molluscs (Cuttelod *et al.*, 2011), which has separate chapters on the freshwater and terrestrial non-marine molluscs. The ultimate goal of this review is to provide a conservation assessment for all British non-marine Mollusca, so that a comprehensive document is available for conservation authorities. However, recent research on British slugs, using DNA analysis supported by morphological studies (Rowson *et al.* 2014a), has identified the presence of eight previously undetected species, including perhaps four that are undescribed. Further taxonomic work is required to clarify the situation and it will also be necessary to try and ascertain which of these new species are native to the British fauna. As such, this review considers the slug fauna as listed in Anderson (2005, updated 2008) and does not take account of the forthcoming AIDGAP publication on the slugs of Britain and Ireland (Rowson *et al.* 2014b)

3. The IUCN threat categories and selection criteria

3.1 The evolution of threat assessment methods

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

Newly established categories were *Extinct in the wild* (EW), and *Critically Endangered* (CR). Whilst the names *Endangered* (EN) and *Vulnerable* (VU) were maintained, they were defined differently from in the original guidelines, and species in one of these threat categories in the old system will not necessarily be in the same category in the new. Most species deemed to be 'Rare' in the old system have been assigned to the *Near Threatened* (NT) category in the new system, although on the basis of the new criteria, some are now regarded as *Vulnerable*. The *Least Concern* (LC) category www.naturalresourceswales.gov.uk

represents most other species, but some species are regarded as *Nationally Rare* (NR) or *Nationally Scarce* (NS) to highlight their restricted distribution, a status peculiar to Great Britain (see Section 3.4).

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

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

3.2 Summary of the 2001 categories and criteria

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

REGIONALLY EXTINCT (RE)

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

CRITICALLY ENDANGERED (CR)

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered.

ENDANGERED (EN)

A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered.

VULNERABLE (VU)

A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Table 3).

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 has not yet been evaluated against the criteria.

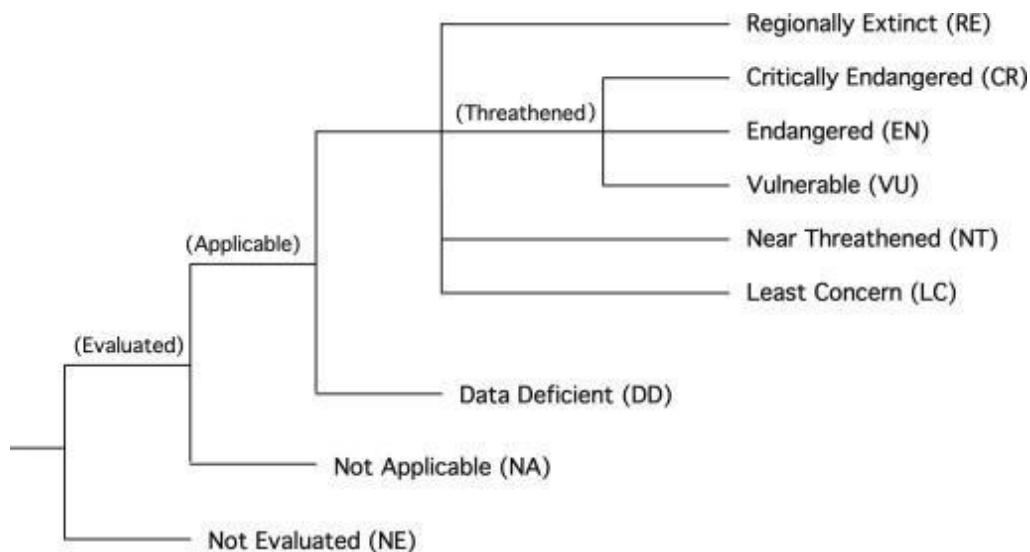


Figure 1. Hierarchical relationships of the categories . Figure adapted from IUCN (2001)

Taxa listed as *Critically Endangered*, *Endangered* or *Vulnerable* are defined as Threatened (Red List) species. For each of these threat categories there is a set of five main criteria A-E, with a number of sub-criteria within A, B and C (and an additional sub-criterion in D for the *Vulnerable* category), any one of which qualifies a taxon for listing at that level of threat. The qualifying thresholds within the criteria A-E differ between threat categories. They are summarised in Table 1, and given in full in Appendix 1.

Table 1. Summary of the thresholds for the IUCN Criteria

| Criterion | Main thresholds | | |
|---|---|--|---|
| | Critically Endangered | Endangered | Vulnerable |
| A. Rapid decline | >80% over 10 years or 3 generations in past or future | >50% over 10 years or 3 generations in past or future | >30% over 10 years or 3 generations in past or future |
| B. Small range + fragmented, declining or fluctuating | Extent of occurrence <100 km ² or area of occupancy <10 km ² + two of the following: - severely fragmented or only a single location - continuing decline - extreme fluctuations | Extent of occurrence <5,000 km ² or area of occupancy <500 km ² + two of the following: - severely fragmented or no more than 5 locations - continuing decline - extreme fluctuations | Extent of occurrence 20,000 km ² or area of occupancy <2,000 km ² + two of the following: - severely fragmented or no more than 10 locations - continuing decline - extreme fluctuations |
| C. Small population and declining | <250 mature individuals, population declining | <2,500 mature individuals, population declining | <10,000 mature individuals, population declining |
| D. Very small population | <50 mature individuals | <250 mature individuals | D1. <1,000 mature individuals |
| D2. Very small area of occupancy | | | D2. <20 km ² or 5 or fewer locations |
| E. Quantifiable probability of extinction | >50% within 10 years or three generations | >20% within 20 years or five generations | >10% within 100 years |

In this Review, Area of Occupancy is indicated thus:

- for Critically Endangered, <10 km² is equivalent to being recorded at a single location from 1980 onwards or from a later specified date if the species has been subject to a special survey of its status since 1980
- for Endangered, <500 km² is equivalent to being recorded in at least two locations and up to five hectads from 1980 onwards or from a later specified date if the species has been subject to a special survey of its status since 1980
- for Vulnerable, <2,000 km² is equivalent to being present in five to ten hectads from 1980 onwards or from a later specified date if the species has been subject to a special survey of its status since 1980.

The revised IUCN criteria have more quantitative elements than the previous criteria, although these can be difficult to apply where there are limited data on abundance and distribution for the group concerned. However, subjective assessments are still required as, for example, in predicting future trends and judging the quality of the habitat. Since the criteria have been designed for global application and for a wide range of organisms, it is hardly to be expected that each will be appropriate to every taxonomic group or taxon. Thus, a taxon need not meet all the criteria A-E, but is allowed to qualify for a particular threat category on any single criterion.

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

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

The IUCN regional guidelines (IUCN, 2003) stipulate that, once the taxa have been assessed within a particular region, consideration should be given to the relationship with populations in adjacent Regions. If migration between Regions is known or likely then the threat status will need to be modified if there is a possibility that individuals from neighbouring populations may reduce the extinction risk of populations in the Region under assessment.

Many mollusc species are dispersed unintentionally by international trade, especially horticulture, but there is no evidence that any terrestrial or freshwater species are capable of reaching Britain naturally from Europe. None of the species that are considered Threatened in

this review have a reduced risk of extinction as a result of immigration and hence the statuses are unamended.

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

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

At the national level, countries are permitted to refine the definitions for the non-threatened categories and to define additional ones of their own. The *Nationally Rare (NR)* category is defined as species recently recorded from 15 or fewer hectads of the Ordnance Survey national grid in Great Britain. The *Nationally Scarce (NS)* category is defined in the same way but the species is recorded from between 16 and 100 hectads. The Nationally Rare category was formerly known as Red Data Book Categories 1-3 while the Nationally Scarce category was formerly known as Nationally Notable for invertebrates, and was divided into Lists A and B.

The focus of this Review is to assess Britain's non-marine mollusc fauna against current IUCN criteria, but the opportunity has also been taken to re-evaluate the GB Rarity Status of these species on the basis of available data (Table 2). Although Bratton (1991) included 29 Red Data Book non-marine molluscs, the only comprehensive review of the fauna is now thirty years old (Foster 1983), and even that was intended as a provisional overview. Willing (2003) drew attention to a number of changes to the 1983 statuses that appeared necessary in light of current knowledge.

The aim of IUCN Red Lists is "to identify taxa that exhibit symptoms of endangerment, and not simply depletion or conservation priority" (IUCN 2013), but wildlife conservation should ideally be in place long before species become endangered. Traditionally, rarity has provided a mechanism to help identify species in need of conservation effort and the GB Rarity Status presented here continues that approach. Twenty-three species are considered to be Nationally Rare and a further twenty-eight are classed as Nationally Scarce. In other words, 26.6% of the native British non-marine mollusc fauna have a restricted range, many of which occur in small populations and are declining. Not all of these 51 species are directly threatened with extinction in the foreseeable future and 21 are considered to be of Least Concern under the terms of the IUCN Red List criteria, with a further ten species thought to be Near Threatened. Whilst the IUCN Red List provides an objective method to identify those species most under threat, it should not be forgotten that the complete suite of rare and scarce species is in need of conservation if the richness of Britain's fauna is to be maintained.

Table 2. Comparison of previous Red Data Book statuses and GB Rarity Status for Non-marine Molluscs
KEY: RDB 1 = Endangered; RDB 2 = Vulnerable; RDB 3 = RARE; NB = Nationally Notable;
 NR = Nationally Rare; NS = Nationally Scarce

| <i>Species Name</i> | <i>Foster (1983)</i> | <i>Bratton (1991)</i> | <i>this review (2013)</i> |
|------------------------------------|----------------------|-----------------------|---------------------------|
| <i>Abida secale</i> | | | NS |
| <i>Anisus vorticulus</i> | RDB3 | RDB2 | NR |
| <i>Assimineia grayana</i> | | | NS |
| <i>Balea biplicata</i> | RDB2 | RDB3 | NR |
| <i>Candidula gigaxii</i> | | | NS |
| <i>Clausilia dubia</i> | | | NS |
| <i>Ena montana</i> | NB | RDB3 | NS |
| <i>Fruticicola fruticum</i> | RDB1 | | |
| <i>Gyraulus acronicus</i> | RDB3 | RDB2 | NR |
| <i>Gyraulus laevis</i> | | | NS |
| <i>Heleobia stagnorum</i> | | | NR |
| <i>Helicodonta obvolvata</i> | RDB2 | RDB3 | NR |
| <i>Helix pomatia</i> | | | NS |
| <i>Hydrobia acuta neglecta</i> | | | NS |
| <i>Lauria sempronii</i> | Extinct | RDB1 | NR |
| <i>Leucophytia bidentata</i> | | | NS |
| <i>Lucilla singleyana</i> | NB | | |
| <i>Macrogastra rolphii</i> | | | NS |
| <i>Malacolimax tenellus</i> | NB | | NS |
| <i>Margaritifera margaritifera</i> | | | NR |
| <i>Marstoniopsis insubrica</i> | RDB2 | RDB3 | NR |
| <i>Mercuria cf similis</i> | RDB2 | RDB1 | NR |
| <i>Monacha cartusiana</i> | RDB2 | RDB3 | NR |
| <i>Myxas glutinosa</i> | RDB1 | RDB1 | NR |
| <i>Omphiscola glabra</i> | RDB3 | RDB2 | NS |

| | | | |
|----------------------------------|------|------|----|
| <i>Oxyloma sarsi</i> | RDB2 | RDB2 | NR |
| <i>Phenacolimax major</i> | NB | | NS |
| <i>Pisidium conventus</i> | NB | | NR |
| <i>Pisidium pseudosphaerium</i> | RDB3 | RDB3 | NS |
| <i>Pisidium tenuilineatum</i> | RDB3 | RDB3 | NS |
| <i>Ponentina subvirescens</i> | NB | | NS |
| <i>Pseudanodonta complanata</i> | | | NS |
| <i>Pseudotrichia rubiginosa</i> | | RDB2 | NR |
| <i>Quickella arenaria</i> | RDB1 | RDB1 | NR |
| <i>Segmentina nitida</i> | RDB2 | RDB1 | NS |
| <i>Spermodea lamellata</i> | NB | | |
| <i>Sphaerium solidum</i> | RDB2 | RDB1 | NR |
| <i>Succinella oblonga</i> | RDB2 | RDB3 | NR |
| <i>Truncatella subcylindrica</i> | | RDB3 | NR |
| <i>Truncatellina callicratis</i> | RDB3 | RDB3 | NR |
| <i>Truncatellina cylindrica</i> | RDB2 | RDB2 | NR |
| <i>Valvata macrostoma</i> | RDB3 | RDB2 | NR |
| <i>Ventrosia ventrosa</i> | | | NS |
| <i>Vertigo alpestris</i> | | | NS |
| <i>Vertigo angustior</i> | RDB1 | RDB1 | NS |
| <i>Vertigo genesii</i> | RDB1 | RDB1 | NR |
| <i>Vertigo geyeri</i> | RDB1 | RDB1 | NS |
| <i>Vertigo lilljeborgi</i> | NB | RDB3 | NS |
| <i>Vertigo modesta</i> | | RDB1 | NR |
| <i>Vertigo moulinsiana</i> | NB | RDB3 | NS |
| <i>Vertigo pusilla</i> | | | NS |
| <i>Vitrea subrimata</i> | NB | | NS |
| <i>Viviparus contectus</i> | | | NS |

Individual Species Accounts are not provided in this Review for Nationally Rare or Nationally Scarce taxa that are not also IUCN Threatened.

4. Methodology and sources

Range data were reviewed from a variety of sources: mainly from the last British Atlas (Kerney 1999), supplemented by data from the National Biodiversity Network (NBN), The Conchological Society's Non-marine Recording Scheme, and the Alien Snail search (NMGW). Local Environmental Records Centres were consulted for some rare species. Range data provided in papers about UK species in the Journal of Conchology, other journals from county natural history societies, Natural England (NE), CCW and Scottish Natural Heritage (SNH) reports as well as other unpublished data from recorders.

The range data were used to make a Red List assessment following the recommendations provided by IUCN for use of the global criteria at regional level (IUCN, 2003). These require an assessment based on the IUCN global criteria, which is then reviewed to examine the likelihood that the species status could change as the result of immigration from adjacent countries. Given the low mobility of land and freshwater snails on our islands, immigration from adjacent populations does not normally apply.

Population data are so rarely available for British populations of molluscs, hence the A and C criteria are rarely used in these assessments. For the majority of the species there are insufficient data to use criteria E. However it is reasonable to use range data as proxy data for population decline where it can be argued that any change in species range could be reflected by similar changes for population size and where the observed decline could be proportional to population decline. Hence, for widespread but declining species in Great Britain, the use of the range data as proxy data for population decline (A) could be applicable. This was based on 3 critical periods:

1960-1979: The period when the first GB atlas and the Field Guide to landsnails of NW Europe was compiled, with a consequent increase in recording effort (Kerney 1976, Kerney & Cameron, 1979).

1980-1999: The period when the second GB atlas (Kerney, 1999) was compiled, with emphasis on recording the rarer species, especially with the compilation of the UK Biodiversity Action Plans.

2000-2012: Post Kerney Atlas recording efforts combined with the development of the NBN allowing a more rapid feedback on observation data for species.

In addition to the use of the NBN databases, the initial species assessment list and the threatened species data files were sent to individual scientists across Great Britain to get feedback on their local recording experiences, especially for trend data. Another potential data source as proxy data for species decline is the decrease of suitable habitat. Where the species has a well defined habitat that is monitored for other purposes; it is possible to use such rates of decline of habitat to infer a species decline, again where it is reasonable to believe that the rate of species decline would be proportional to the rate of decline of the habitat.

Most of the rarer, range restricted species are assessed using the B criterion, which is not so strict in the timescale over which species decline data are taken. In such cases, where detailed information is not available, Area of Occupancy has been calculated on the basis that each population (or recorded hectad) equates to an AoO of 4km² as this is the advised reference scale (IUCN 2013). However the widespread, but declining species are more difficult to assess. This is because they are not range restricted so Criterion B is not applicable. Criterion A is therefore more suitable especially where there is a proxy for population decline. Criterion A however, requires decline data meeting specific thresholds, mainly derived from the last three generations (or 10 years) whichever is the shorter. Given that many of our species have limited data for this period, we have to seek 'proxy' data of the decline rates, from either local studies of populations, which are argued as being representative of the decline rates for British populations, or habitat decline data for species where we can infer that habitat loss equates to equivalent population loss.

The IUCN Regional Application Working Group (Gardenfors et al 2001) defined any species that arrived more recently than 1800 AD as a non-native species, and hence 'Not Applicable' would be the correct status. The cut-off point of 1800AD has therefore been adopted in this review. There are some species where the native status is uncertain, and each case is taken on its merit in determining Threat Status.

There is a requirement for trend data to assess the threat status for widespread, but declining species and this demonstrates the need for continuing recording to establish the true picture of rates of decline. Whilst widespread and easily identified species, such as *Discus rotundatus*, have good data-sets, recording of species requiring more specialist techniques such as litter sieving has declined country-wide since production of the second GB Atlas (Kerney 1999). This hampers assessment of the rate of recent decline (criterion A) and makes determination of the number of populations (to estimate Area of Occupancy for criterion B2) uncertain. At the same time there has been an increase in the accessibility of data through portals such as National Biodiversity Network, bringing in new data-sets which add to the data-sources for assessing species. However, these sources also bring in unverified records, frequently in the absence of voucher specimens, for some of the rare species which are easily confused with common species with variability in shell morphology such as *Valvata macrostoma* and *Valvata piscinalis*, *Anisus vortex* and *Anisus vorticularis*. Here, the value of voucher specimens must be emphasised for species where there are no known records within close proximity of the sampling site.

5. Results of the Non-marine Mollusc Conservation Assessment

This report contains a review of the threat status of 215 species of non-marine molluscs, including 183 gastropods and 32 freshwater bivalve species at national level based on our current knowledge of the species. This complements the exercise carried out in Ireland (Byrne *et al.*, 2009) for the species in Northern Ireland and the Republic of Ireland.

5.1. IUCN Summary

More than three-quarters of the native British non-marine molluscan fauna are considered to be Least Concern, with 9.4% (18 species) threatened with extinction (Table 3). A further 5.7% (11 species) have uncertain status due to insufficient information and if they are also found to be threatened then the threatened percentage could be as high as 15.1%. In addition 5.2% (10 species) are Near Threatened and require monitoring. Some of these species show decline over the last 40 years, but the rate of decline does not equate to more than 30% loss of population over 3 generations, and as such they have been listed as Near Threatened. As declines lead to a low Area of Occupancy, these species may qualify for Threatened status using the B criterion in future years. A comparison of the Global and European Red List threat status for species listed in this review as Threatened or Near Threatened is provided in Table 4.

The IUCN Regional Application Working Group (Gardenfors *et al* 2001) defined any species that arrived more recently than 1800AD as non-native and such species are assigned 'Not Applicable' in this review in accordance with that guidance. Species such as *Margaritifera auricularia* (Spengler, 1793) are not included, as the last records were dated at 4000 to 5000 years old (Kerney, 1999), thus predating the extinction threshold. Other species such as *Trochoidea geyeri* (Soos, 1926) and *Helicopsis striata* (Müller, 1774) are also Holocene extinctions (Kerney, 1999). There are some species where the native status is uncertain, and each case is taken on its merit in determining threat status. Species that are now extinct, such as *Ceriuella neglecta* (Draparnaud, 1805) and *Fruticola frumentum* (Müller, 1774), are also not listed, as these species are introductions from the early 1900's and hence the appropriate listing is Not Applicable.

Table 3. Summary of the Threat Status of British Species

| IUCN Categories | Number of species | % native species in each category |
|-----------------------|-------------------|-----------------------------------|
| Critically Endangered | 4 | 2.1% |
| Endangered | 2 | 1.0% |
| Vulnerable | 12 | 6.3% |
| Near Threatened | 10 | 5.2% |

| | | |
|----------------------------|-----|-------|
| Data Deficient | 11 | 5.7% |
| Least Concern | 152 | 79.2% |
| Subtotal | 192 | |
| Not Applicable | 23 | |
| Total fauna recorded in GB | 215 | |

Anderson (2005) reviewed the species list for Great Britain and Ireland following the creation of the Fauna Europa lists for Mollusca (Bank *et al.*, 2006). In this list the taxonomic status of some species, relative to their continental relatives is uncertain, and these species are indicative by a 'cf' status in the species name. The uncertainty relates to the taxonomic entity bearing the name on the continent, as the species is currently identified on the basis of shell morphometrics or in some cases molecular systematics has revealed more species than previously recognised, but where the British populations have yet to be sequenced. This should not be confused with taxonomic uncertainty that would lead to a Data Deficient status, as these species are widespread and not considered to be threatened.

Table 4. Threatened British Non-marine Molluscs on International Red Lists

| Species Name | IUCN Global Status (version 2012.2) | IUCN European Status (Cuttelod <i>et al.</i> , 2011) | IUCN British Status (this review) |
|------------------------------------|---|---|--|
| <i>Anisus vorticulus</i> | Data deficient | Near Threatened | Vulnerable |
| <i>Balea biplicata</i> | Not Assessed | Not Assessed | Vulnerable |
| <i>Ena montana</i> | Least Concern | Least Concern | Near Threatened |
| <i>Gyraulus acronicus</i> | Not Assessed | Data deficient | Vulnerable |
| <i>Heleobia stagnorum</i> | Least Concern | Least Concern | Critically Endangered |
| <i>Helicodonta obvoluta</i> | Least Concern | Least Concern | Vulnerable |
| <i>Hydrobia acuta neglecta</i> | Not Assessed | Least Concern (<i>H. acuta</i>) | Near Threatened |
| <i>Lauria sempronii</i> | Not Assessed | Not Assessed | Vulnerable |
| <i>Margaritifera margaritifera</i> | Endangered | Critically Endangered | Critically Endangered |
| <i>Marstoniopsis insubrica</i> | Not Assessed | Least Concern | Endangered |
| <i>Mercuria cf similis</i> | Least Concern | Least Concern | Vulnerable |
| <i>Monacha cartusiana</i> | Least Concern | Least Concern | Near Threatened |

| | | | |
|----------------------------------|-----------------|-----------------|-----------------------|
| <i>Myxas glutinosa</i> | Not Assessed | Least Concern | Critically Endangered |
| <i>Omphiscola glabra</i> | Near Threatened | Near Threatened | Least Concern |
| <i>Oxyloma sarsi</i> | Not Assessed | Not Assessed | Near Threatened |
| <i>Pisidium conventus</i> | Least Concern | Least Concern | Vulnerable |
| <i>Pseudotrichia rubiginosa</i> | Least Concern | Least Concern | Near Threatened |
| <i>Quickella arenaria</i> | Not Assessed | Not Assessed | Vulnerable |
| <i>Sphaerium solidum</i> | Not Assessed | Near Threatened | Critically Endangered |
| <i>Succinella oblonga</i> | Not Assessed | Not Assessed | Vulnerable |
| <i>Truncatella subcylindrica</i> | Not Assessed | Not Assessed | Near Threatened |
| <i>Truncatellina callicratis</i> | Not Assessed | Least Concern | Near Threatened |
| <i>Truncatellina cylindrica</i> | Not Assessed | Least Concern | Endangered |
| <i>Valvata macrostoma</i> | Least Concern | Least Concern | Vulnerable |
| <i>Vertigo angustior</i> | Near Threatened | Vulnerable | Vulnerable |
| <i>Vertigo genesii</i> | Least Concern | Least Concern | Near Threatened |
| <i>Vertigo geyeri</i> | Least Concern | Least Concern | Near Threatened |
| <i>Vertigo lilljeborgi</i> | Not assessed | Near Threatened | Near Threatened |
| <i>Vertigo modesta</i> | Near Threatened | Near Threatened | Endangered |
| <i>Vertigo moulinsiana</i> | Vulnerable | Vulnerable | Vulnerable |

6. Detailed Accounts for Threatened Species

6.1 *Anisus vorticulus* (Troschel, 1834)

Legal Status: Listed on EUHSD Annex II & IV.

Threat Status:
Vulnerable B2ab(ii,iii)

Rationale: The Threat Status is based on the habitat and population declines observed over the last 10 years, combined with a small restricted range and habitat requiring management to maintain favourable conditions. The current AoO is estimated as 28km², with presence in at least 7 subpopulations (based on presence in 7 10km squares), confirming a Vulnerable B2ab(ii,iii) status.

GB distribution: Currently known living in 7 hectads (=10km squares) in Sussex and East Anglia (JNCC 2007 and NBN database 2011). Populations were lost from approx. 10 sites between 1950-1990 (Sussex, Middlesex, 3 in Norfolk) (Willing & Killeen, 1998). JNCC (2007) noted that historically, there appear to be records for 34 localities (= 1km squares) in the south-east of England, covering 18 hectads. Records since 1965 indicate only 13 hectads have been occupied by *A. vorticulus* (24 colonies/marshes), with the last round of monitoring in 1994-2000 indicating that the snail existed in only 5-7 of the previously recorded hectads (13 colonies/marshes).

Populations have been declining for over 60 years throughout the strongholds of the range in Sussex, Middlesex and Norfolk) (Willing & Killeen, 1998). Most losses of sites occurred over 20 years ago, however evidence from the Arun Valley in Sussex shows a substantial decline (approx. 60%) since the late 1990's (Willing, 2005). However, Pevensey Levels in Sussex still appears to support strong populations (Willing, 2009). JNCC (2007) concluded *A. vorticulus* has always been a rare species, probably due to natural (geological, dispersal, chemistry etc) barriers that have contributed to a limited distribution of *A. vorticulus* in the UK and that although there has been a decline in range since the 1960s, they felt it was difficult to conclude that the current range is insufficiently large to support extant populations for the foreseeable future.

Area of Occupancy: 28km²

Life cycle: Detailed sampling and biometrical studies showed that (at least in Southern England) the snail has an annual life cycle with adults dying in mid-summer (Willing & Killeen, 1998).

Habitat: JNCC (2007) report that *A.vorticulus* has only been found in the UK within grazing marshes which are drained by ditches, dykes etc. It occurs in the unpolluted, calcareous waters of well-vegetated marsh drains and is occasionally found with other uncommon or vulnerable molluscs, such as *Valvata macrostoma*, *Pisidium pseudosphaerium* and *Segmentina nitida*, and often found floating on the surface amongst duckweed (*Lemna* spp.). It also shows preference

for ditches or channels of >3m in width and >1m in depth with a diverse flora but with a moderate emergent vegetative cover, and often occurs in ditches in wet fields that flood in winter, as this may be important in enabling young snails to colonise new ditches.

Threats: Losses of grazing marsh across Britain have been significant in the last 60 years, broadly resulting from ecologically insensitive flood defence works, agricultural intensification, declines in traditional management and eutrophication and these threats have been continuing over the last 10 years (Watson & Ormerod 2004, JNCC 2007).

Key references:

Joint Nature Conservation Committee. 2007. Second Report by the UK under Article 17 on the implementation of the Habitats Directive from January 2001 to December 2006. Peterborough: JNCC. Available from: www.jncc.gov.uk/article17

Kerney, M.P. 1999. Atlas of the Land and Freshwater Molluscs of Britain and Ireland. Harley Books, Colchester.

Killeen, I.J. 1999. The freshwater snail *Anisus vorticulus*: 1998 monitoring survey of ditches in East Anglia. *English Nature Research Reports No. 311*.

Killeen, I.J. 2005. A Survey to determine the present status of *Anisus vorticulus* at sites in Suffolk and Norfolk. *Report for Environment Agency*.

Killeen, I.J., & Willing, M.J. 1997. Survey of Ditches in East Anglia and South East England for the Freshwater Snails *Segmentina nitida* and *Anisus vorticulus*. *English Nature Research Reports No. 220*.

Watson, A. 2002. *The Ecology of Four Scarce Wetland Molluscs* – University of Wales, Cardiff, PhD thesis. Environment Agency R&D Project W1-038PR.

Watson, A. & Ormerod, S.J. 2004. The distribution of three uncommon freshwater gastropods in the drainage ditches of British grazing marshes. *Biological Conservation*, 110, 455-466.

Willing, M.J. 2005. Monitoring populations of the little Whirlpool Ram's-horn snail *Anisus vorticulus* at Pulborough Brooks & Amberley Wildbrooks, June – September 2004. Unpublished report for the RSPB and Environment Agency.

Willing, M.J. 2009. The survey and monitoring of populations of the Little Whirlpool Ram's-horn Snail *Anisus vorticulus* on Pevensy Levels (2007 & 2008). Unpublished report to the Environment Agency, Worthing.

Willing, M.J. & Killeen, I.J. 1998. The freshwater snail *Anisus vorticulus* in ditches in Suffolk, Norfolk and West Sussex. *English Nature Research Reports No 287*.

6.2 *Balea biplicata* (Montagu, 1803)

Threat Status:
Vulnerable B2a(ii, iv)

Rationale: This species is treated as a native species. Although its provenance is uncertain and it is normally found close to human habitation, it has been present since Roman times. In the 19th century the species occurred in scattered colonies across southern England, now it is restricted to seven locations in four tetrads, usually associated with disturbed habitats, in the Thames valley close to London. Most of these sites are under pressure for urban development, and as such, with less than 10 locations, there is a case for Vulnerable.

GB Distribution: In west London, although several previously known sites have been lost to river-side development, apparently stable populations survive at Duke's Hollow Local Nature Reserve, Isleworth and Lots Aits, the Tide Meadow in Syon Park (all in the London Borough of Hounslow), and at Occupation Lane Nature Reserve, close to Kew Bridge and alongside Kew Meadow Path (all in LB Richmond). All populations are within Sites of Importance for Nature Conservation (Syon Tide Meadow is also a SSSI). Most locations lie within a single hectad.

Area of Occupancy: 16 km²

Life cycle: Up to 4 years, although maturity reached around 18 months.

Habitat: Earthy banks, walls and hedgerows, usually occurring amongst ground litter beneath rough herbage and strand-line rubbish on the uppermost banks of river.

Threats: Disruption to sites and loss of habitat, pesticide use on vegetation.

Key references:

Arthur, J. & Tofts, R. 2006. Ecology and distribution of the two-lipped door snail *Balea biplicata* in Britain. *London Naturalist* No. 85, pp 125-134

Bratton, J.H. (ed.). 1991. *British Red Data Books: 3. Invertebrates other than insects*. JNCC, Peterborough.

Kerney, M.P. 1999. *Atlas of the Land and Freshwater Molluscs of Britain and Ireland*. Harley Books, Colchester.

6.3 *Gyraulus acronicus* (Ferussac, 1807)

Threat Status:
Vulnerable B2ab(ii, iii)

Rationale: In the period 1965-1999 the species was recorded from 10 hectads, with a further four records from hectads prior to 1965 (Kerney 1999). This indicates a 29% decline in range. It is assessed on the basis of small AoO (under 2000 km²) as it is living in just five hectads in six stretches of river. In some rivers the species is restricted to relatively short sections, thus Area

of Occupancy is small. The absence of the species in surveys of the Thames catchment in the early 2000s (some targeted for this species), show the decline is real.

GB distribution: This species has a restricted range in Great Britain, and is currently known living in 5-10km squares in the River Thames tributaries (Pang, Evenlode, Windrush, Thame, and Back Water) (Killeen & MacFarland 2004; Killeen 2011; M. Willing, pers. comm., 2007). In 2003 the population of *G. acronicus* in the R. Evenlode appeared to be thriving over a distance of 6km, but in the R. Windrush, R. Pang and Back Water it had a much more restricted distribution. However, a repeat survey in 2010 showed an apparent decline in the Evenlode where the species was found living only at the downstream end of the river, and in the Windrush where no living individuals were found (Killeen 2011). Only in the Pang was the situation unchanged. It appears likely that these four waterbodies, perhaps along with the R. Cherwell and R. Thame, support the entire British population of the species, but they are clearly extremely vulnerable. Additional records shown on the NBN are unconfirmed and are not considered to represent extant populations

Life cycle: less than 2 years.

Habitat: *G. acronicus* has a preference for slow-moving water and densely vegetated river margins. The water quality needs to be good but there is insufficient data to indicate upper levels for components such as nitrate and phosphate (Killeen & McFarland 2004, M. Willing, pers. comm., 2007).

Threats: There may be several reasons for the decline of the species, and in particular the apparent disappearance from the Thames, but the effects of boat traffic may be a primary cause. The presence of moorings, locks and marinas, combined with the effects of dredging the channel, and bow waves from the continuous boat traffic have, to a considerable extent, affected the habitat such that there are now few areas with quiet, stable and well-vegetated margins. None of the tributaries which support *G. acronicus* have any boat traffic. However, following the decline indicated in the 2010 surveys, it is speculated that predation resulting from the significant increase in signal crayfish *Pacifastacus leniusculus* in the Evenlode and Windrush may be having a major impact on *G. acronicus*.

Key references:

Kerney, M.P. 1999. *Atlas of the land and freshwater molluscs of Britain and Ireland*. Harley Books, Colchester.

Killeen, I.J. 2011. *A survey of Thames catchment rivers for the Thames ram's horn snail, Gyraulus acronicus*. Malacological Services Report to the Environment Agency.

Killeen, I.J. & McFarland, B. 2004. The distribution and ecology of *Gyraulus acronicus* (Ferussac, 1807) (Gastropoda, Planorbidae) in England. *Journal of Conchology* **38**:441-456.

6.4 *Heleobia stagnorum* (Gmelin, 1775)

Threat Status:
Critically Endangered B2ab(iii)

Rationale: The species is listed as Critically Endangered B2ab(iii), given the single location and the declining quality of habitat with threats from pollution and coastal development.

GB distribution: In the UK, previously known from a single site, a coastal lagoon at Farlington, Hampshire, where it was viewed as becoming extinct between 1960 and 1970 (Kerney 1999). It has recently been found in a lagoon on nearby Thorney Island, West Sussex (Willing, 2010).

Area of Occupancy: c. 5 km² based on single site with 2 x 2km buffer zone.

Life cycle: A few months to 2 years.

Habitat: Lagoonal species, present in habitats that are susceptible to changing water quality due to pollution from sewage or to changes in salinity.

Threats: The single site is adjacent to Chichester Harbour. Rhodes (2010) noted that the water quality in the harbour is already being reduced whenever prolonged heavy rain leading to the discharge sewage from different Waste Water Treatment Works. Rhodes (2010) notes that planned developments of housing without improvements to the capacity of the sewage works will clearly worsen an already serious situation. Willing (2010) noted that management of the site is required to maintain suitable habitat and that changes in salinity, invasive *Phragmites* and eutrophication impact this population.

Key References:

Kerney, M.P. 1999. *Atlas of the Land and Freshwater Molluscs of Britain and Ireland*. Harley Books, Colchester.

Rhodes, M. 2010. Serious concern about council's development plans. *Friends of Chichester Harbour Newsletter*, Spring 2010. p. 1

Willing, M.J. 2010. *A survey of selected brackish water areas on Thorney Island for the Lagoon Spire Snail Heleobia stagnorum*. Survey for Chichester Harbour Conservancy, Itchenor, Chichester.

6.5 *Helicodonta obvoluta* (Müller, 1774)

Threat Status
Vulnerable B2ab(iii)

Rationale: This species has a restricted range known from an area of 6 hectads on the South Downs between the River Arun and Winchester (West Sussex / Hampshire), where it declined from a pre-1960 range of c. 25 hectads. Recent surveys suggest it is stable at some sites and may have locally increased in the last 15 years. However, the species is considered vulnerable to habitat disturbance in woodland and predation; one increasing threat is the presence of

pheasant release pens in its habitats (Willing, pers. comm., 2011). The small AoO, fragmented range and threats to habitats suggest the species should be listed as Vulnerable B2ab(iii).

GB Distribution: Native or possibly introduced during Neolithic times, as the main range of this species is southern Europe. Known only from southern England. Most of the range decline was after the Neolithic (Kerney, 1999), when the range extended north to Gloucestershire. The range decline may have been due to decreasing summer temperatures as well as changing habitats. The present distribution appears to be relatively stable with the species common in the right habitat. Most sites are on the steep South Downs escarpment, but with a proportion on the more gently sloping dip slope woodlands (Cameron, 1972).

Area of Occupancy: The current AoO is between 24 and 600 km² (based on presence in 6 hectads), declining, with possible losses from a further 4 hectads (Kerney 1999, Cameron pers. comm., 2012).

Life-cycle: Believed to be between 6 months and 2 years (Taylor, 1916), with reproduction typically between May and July with eggs hatching within a month. Depending on the date of hatching, adulthood could be reached by Autumn or Spring of the following year.

Habitat: A species of old woodland of mixed beech, ash and large-leaved lime on chalk, found in leaf litter and under logs and fallen trunks (Kerney, 1999).

Threats: Changes in habitat management and declining quality of habitat due to a) felling of old broad-leaved woodland and old beech trees for agriculture or intensive forestry and b) lack of management allowing trees to become so crowded that the ground flora and its invertebrates are completely shaded out. Urban or agricultural development leading to fragmentation of the habitat. A recent threat is the increase in the number of pheasant pens within woodland, increasing predation on the species (Willing, pers. comm., 2012).

Key references:

Cameron R.A.D. 1972. The distribution of *Helicodonta obvoluta* (Müll.) in Britain. *J. Conch., London* 27: 363-369.

Kerney, M.P. 1999. *Atlas of the Land and Freshwater Molluscs of Britain and Ireland*. Harley Books, Colchester.

Taylor, J.W. 1916 *Monograph of the Land and Freshwater Mollusca of the British Isles*, part 22, pp. 56-58.

6.6 *Lauria sempronii* (Charpentier, 1837)

Threat Status:
Vulnerable D2

Rationale: This species could be listed as Endangered, as it is known from only 2 adjacent hectads in Gloucestershire at sites that are extremely vulnerable to habitat destruction.

However, it occurs on at least thirteen walls and some of these are well managed with regular monitoring, hence at present it is considered Vulnerable D2 in recognition of these efforts.

GB distribution: The only British populations of *Lauria sempronii* occur in Gloucestershire and were re-discovered after over 40 years without any records (Cameron & Killeen, 2001). Whitehead (2007) reported a second location near Stroud. It is known from the area around Edgeworth in the Cotswolds in small stretches of vegetated dry-stone limestone wall where it is present in small numbers. To date it has been reported from thirteen stretches of wall in the area (A. Norris, *pers. comm.* 2014)

Area of Occupancy: Each site consists of small lengths of drystone wall and the total AoO will be less than 10km²

Life cycle: Likely that maturity is reached after 2.5 years with life span 4 years or more.

Habitat: Present in small stretches of vegetated dry-stone limestone wall under stonecrop *Sedum acre*, amongst dead leaves, and under the less dense areas of ivy *Hedera helix*.

Threats: The Gloucestershire LBAP indicates that any disturbance, such as excessive defoliation or removal of stones, of the walls where this species occurs could severely affect the population. Encroachment by thick cover of ivy could also impact the species.

Key references:

Cameron, R.A.D. & Killeen, I.J. 2001. Land slugs and snails. In: Hawksworth, D.L. (ed) *The changing wildlife of Great Britain and Ireland*. Systematics Association Special Volume Series, **62**. 355-366

Gloucestershire Local Biodiversity Action Plan

Kerney, M.P. 1999. *Atlas of the Land and Freshwater Molluscs of Britain and Ireland*. Harley Books, Colchester.

Whitehead, P.F. 2007. Another Gloucestershire locality for *Lauria sempronii* (Charpentier, 1837) (Gastropoda, Stylommatophora, Pupillidae) with observations on the species. *Journal of Conchology*, 39 p. 377.

6.7 *Margaritifera margaritifera* (Linne, 1758)

Threat Status:

Legal Status: Listed on EUHSD Annex II.

Critically Endangered (CR A2b,c + A4b,c)

Rationale: Due to the unique slow decline of this species, as adults may live for 80 years without successfully reproducing, this assessment is based on a 30 year generation length, which gives a backcast for 90 years. It compares past population numbers with current population numbers and discounts those populations where there has been no recruitment for at least 1 generation (=30 years), as these populations are effectively functionally extinct and both ageing and declining slowly, as the oldest individuals die off and are not replaced by

juveniles due to habitat decline. Only 15 (9.7%) of the 155 remaining populations in Britain show evidence of active recruitment within the last thirty years and the rate of loss of functioning populations would be much greater than this if we had accurate data on extinctions. The assessment as Critically Endangered (CR A2b,c + A4b,c) is based on past decline levels, although there are still recruiting populations in Scotland, as the species meets the 80% decline threshold based on recruiting populations over 3 generations using the 90 year backcast. In England and Wales the situation is more severe, most of these populations are close to extinction and without conservation breeding programmes the genetic diversity originally seen in the southern populations will be lost.

GB distribution: In Britain, the freshwater pearl mussel was formerly known from a number of English rivers from Cornwall and Devon in the south-west to Cumbria and Northumberland in the north, north and South Wales and over much of Scotland (Kerney 1999). Of the 155 estimated populations in GB, only 15 are considered to be actively recruiting (Moorkens, 2011). This is a decline of over 90% over the last 3 generations, hence providing the basis for assessment as Threatened. Moorkens (2011) noted that the best remaining populations are in Scotland but that 2/3rds of the originally known 155 populations are now functionally extinct or extinct. In Britain there are overall still more than 12,000,000 mussels, with one river estimated as having 10,000,000 alone. In Scotland there are 15 rivers with juvenile recruitment amounting to more than 10% of the population, but in five of these the mussel population is relatively small with less than 10,000 individuals. In England 10 pearl mussel rivers remain, and the best population had more than 100,000 mussels, but only one with juveniles and there is recent evidence of major declines in juveniles in this river (Killeen pers. comm., 2012). In Wales there are only 11 rivers remaining with pearl mussels and the best population has less than 2,000 mussels (Killeen 2004). Moorkens (2011) noted that there is an estimated loss in Britain of recruiting subpopulations equating to 90% over the last 3 generations.

Area of Occupancy: These data have little relevance to a conservation assessment as the majority of the populations are non-recruiting. Records from nearly 250 hectads are shown in the 1999 Atlas, but there have been many extinctions.

Life cycle: Over 100 years.

Habitat: The freshwater pearl mussel lives principally in oligotrophic streams and rivers with a pH of 5.5 to 7, low calcium and low conductivity. The species also occurs occasionally in a few rivers and streams that have higher calcium and conductivity levels and can be considered to be more eutrophic. It prefers stable stream-beds of sand, gravel and cobbles into which it buries or where it can become lodged between larger stones. It can be very common in riffle areas, living in the gravel patches downstream of rocks and boulders. It will also aggregate into dense beds of over 500 per square metre in moderate to fast flowing stretches, often in deeper water from 0.5 to 2m depth. In some small streams, especially in highland areas, it can also be found in very shallow water where the flow is constant and temperatures low.

Threats: The loss of pearl mussel populations mostly occurs from continuous failure to produce new generations of mussels because of the loss of clean gravel beds, which have become infiltrated by fine sediment and/or over-grown by algae or macrophytes. These block

the required levels of oxygen from reaching young mussels, which spend their first five to ten years buried within the river bed substrate. In England, where populations are within catchments with regulated flows, good management of water levels is critical to maintenance of the habitat. Other threats include water pollution (pesticides, discharges), habitat disturbance (sand and gravel extraction, canalisation), adult mussel kills (pearl fishing) and loss of host fish which are essential to the life cycle of *Margaritifera*.

Key references:

Cosgrove, P.J., Young, M.R., Hastie, L.C., Gaywood, M. & Boon, P.J. 2000. The status of the freshwater pearl mussel *Margaritifera margaritifera* Linn. in Scotland. *Aquatic Conservation: Marine and Freshwater Ecosystems*, **10**: 197-208.

Hastie, L.C., Young, M.R., Boon, P.J., Cosgrove, P.J. & Henninger, B. 2000. Sizes, densities and age structures of Scottish *Margaritifera margaritifera* (L.) populations. *Aquatic Conservation*, **10**: 229-248.

Kerney, M.P. 1999. *Atlas of the Land and Freshwater Molluscs of Britain and Ireland*. Harley Books, Colchester.

Killeen, I.J. 2004. Monitoring of the freshwater pearl mussel *Margaritifera margaritifera* on the Afon Eden candidate Special Area of Conservation. *CCW Contract Science*. **618**. Countryside Council for Wales.

Moorkens E., 2011 *Margaritifera margaritifera* in IUCN Red List for Europe. Online Species Account (consulted 15th December 2012). Search portal: http://ec.europa.eu/environment/nature/conservation/species/redlist/index_en.htm

Skinner, A., Young, M. & Hastie, L. 2003. *Ecology of the freshwater pearl mussel*. *Conserving Natura 2000 Rivers Ecology Series*. **No. 2**. English Nature.

6.8 *Marstoniopsis insubrica* (Küster, 1853)

Syn: Marstoniopsis scholtzi (A. Schmidt, 1856)

Threat Status:
Endangered B2ab(iii)

Rationale: *Marstoniopsis insubrica* has a localised presence at less than 5 locations scattered through southern England and near Manchester, where it was introduced in the early 1900's (Kerney, 1999). Since 2000 there are further unconfirmed records, from South Wales, Staffordshire and a canal in Scotland, which require review, hence the only recent confirmed records lie in Norfolk Broads. Given the small Area of Occupancy (<500km), number of locations (under 5) and the declining quality of habitat the species is considered to be Endangered. If the current records for some of these regions are shown to be erroneous, then the species may qualify as Critically Endangered.

Distribution in GB: Kerney (1999) reported that the species had a localised presence at less than 10 locations scattered through Eastern England and in canals near Manchester where it was introduced in the early 1900's. Kerney (1999) noted that the Grangemouth populations declined before 1965, and Sumner (pers. comm., 2013) confirmed that site is now part of the Grangemouth docks, with a newly constructed canal linking to the River Carron. Hence all post

2000 records outside the Norfolk Broads (SE Wales, Staffordshire and Scotland) are considered unconfirmed records, as this species is small and could be confused with juvenile *Bithynia* or other species in the family Hydrobiidae.

Area of Occupancy: 25 to 400 km². This estimation is based on the minimum from a single site in Norfolk to 4 older records from the 1980-1999 period from the 10 km² Atlas.

Life cycle: Believed to be less than 2 years.

Habitat: Believed to be native on the basis of Holocene fossils. Found in slow moving water in rivers and canals in aquatic weeds (Kerney, 1999).

Threats: Major threats are decline in quality of habitat, e.g. mooring construction on river banks, although apparently tolerant to some pollution (Kerney, 1999).

Key References:

Baker, R. & Howlett, D. 2008. *Marstoniopsis insubrica* (Kuster) Taylors's Spire Snail in Norfolk: Surveys 2008. Transactions of the Norfolk and Norwich Naturalist's Society. 41: 84 – 90.

Bratton, J.H. (ed.). 1991 *British Red Data Books:3. Invertebrates other than insects*. JNCC, Peterborough,

Kerney MP 1999. Atlas of the Land and Freshwater Molluscs of Britain and Ireland. Harley Books, Colchester.

6.9 *Mercuria cf similis* (Draparnaud 1805)

Threat Status:
Vulnerable B2a,b(iii)

Taxonomic Note: Anderson (2012, Habitas web-site) notes that the correct name for this taxon is by no means certain. If the Atlantic and Mediterranean forms are synonymous then *similis* (Draparnaud 1805) has page priority over *anatina* (a name applied to British populations by Bank *et al.* (2007)) in Draparnaud's monograph.

Rationale: The small Area of Occupancy under 1000 km², combined with fewer than 10 locations, as well as a range loss of more than 50% between 1960 and 1999, with declining area and habitat quality, make the species Vulnerable to extinction. Although survey work (2005-2009) provided range extensions, the habitats are still narrow strips along the rivers. Known only from a number of isolated sites, where the habitat is vulnerable to pollution, changing water salinity and habitat modification, making it vulnerable to extinction in the GB range (Kerney, 1999).

GB Distribution: This species occurs in isolated locations on the east coast of England and Scotland (Kerney, 1999), as well as the tidal River Arun on the south coast (Willing pers. comm., 2013). Kerney (1999) believed that although the species was under-recorded, there

would not be a significant increase in the number of sites given its narrow ecological range. In Europe, this species ranges along coasts from southern and western Ireland and south-eastern Britain to the western Mediterranean. Based on the data from Kerney (1999) the species range has declined by 60% over the last century.

Area of Occupancy: The current Area of Occupancy could range from a minimum of 28km² up to a maximum 700 km² but it is likely to be closer to the minimum based on the narrow strips of habitat occupied in canals or along riverbanks and coastal shorelines within the recorded 7 hectads (10 km² squares), which puts the species into the Vulnerable, and possibly Endangered category.

Life cycle: Less than 2 years.

Habitat: Restricted to very slightly brackish water in estuaries and tidal ditches. Mainly a detritus feeder which can tolerate exposure at low tide (Kerney, 1999). In Britain *Mercuria* associates with freshwater species such as *Potamopyrgus antipodarum*, *Bithynia tentaculata* or with lymnaeids and planorbids in nearly fresh conditions (Fretter & Graham, 1978).

Threats: Changes to habitat management, for example river dredging, changes to tidal patterns due to barrages, salinity changes, reclamation of land for industrial use or pollution events in habitats.

Key References:

Bratton, J.H. (ed.). 1991. *British Red Data Books:3. Invertebrates other than insects*. JNCC, Peterborough,

Fretter, V. & Graham, A. 1978. The prosobranch molluscs of Britain and Denmark. Part 3 – Neritacea, Viviparacea, Valvatacea, terrestrial and freshwater Littorinacea and Rissoacea. *Journal of Molluscan Studies Suppl.* 5: 1-152.

Kerney, M.P. 1999. *Atlas of the Land and Freshwater Molluscs of Britain and Ireland*. Harley Books, Colchester.

6.10 *Myxas glutinosa* (Müller, 1774)

Threat Status:
Critically Endangered B1, B2ab(iii, iv, v)

Rationale: This species has been lost from various UK sites over the last 100 years. It is now restricted to a single lake in Wales, where there is a significant risk of eutrophication, mainly from agricultural practices in the catchment. In addition, the lake levels in Llyn Tegid are artificially altered by use of sluice gates, although all recent surveys show that the sub-populations are in favourable condition (Willing, 2006 & 2010; Willing & Holyoak, 1998).

GB distribution: This species has been lost from various British sites over the last 100 years (historically reported from more than 50 hectads). It is now considered to be restricted to a single lake in Wales. The old sites near Oxford and Lake Windermere have been repeatedly surveyed without success. The glutinous snail was first discovered in Llyn Tegid prior to 1852

and was reported to be abundant during searches in the early 1950s, however, it was not recorded during the 1970's to 1990's until it was rediscovered in September 1998 (Willing & Holyoak, 1998). Searches of other water bodies in southern Snowdonia failed to locate additional populations (Willing, 2006). Records from three Scottish rivers in 2005 shown on the NBN have not been confirmed, and hence have been discounted given the similarity to other species (see Willing, 2006 on identification issues).

Area of Occupancy: 1 location with less than 8km².

Life-cycle: The snail has an annual life cycle (Willing, 2006). The adult snails appear to reach maturity in late winter, mostly dying off after reproducing in February/March. In the period April – June snails are very difficult to locate. By August, partially grown snails are relatively easy to locate around most of the lake margins. These grow throughout the autumn, whilst population numbers decline due to predation and/or other factors (Willing, Holyoak & Holyoak, *in press*).

Habitat: In the margins of the lake, under stones during a period of low water levels, and absent from margins with silty substrates (Willing 2006).

Threats: Eutrophication, mainly from agricultural practices in the catchment. The reliance of the snail upon the shallow margins of the lake may also make it particularly vulnerable to sudden or extreme lake level changes (Willing 2006).

Key references:

Willing, M.J. 2006. Condition assessment of the glutinous snail *Myxas glutinosa* in Llyn Tegid in 2005. *CCW Contract Science Report No. 726*, Countryside Council for Wales

Willing M.J. 2010. Condition assessment of the glutinous snail *Myxas glutinosa* in Llyn Tegid, 2009. *CCW Contract Science Report No. 923* Countryside Council for Wales.

Willing, M.J. & Holyoak, D.T. 1998. Status and ecology of the glutinous snail *Myxas glutinosa* at Llyn Tegid. *CCW Contract Science Report No. 338*. Countryside Council for Wales

Willing, M.J., Holyoak, D.T. & Holyoak, G.A. (in press). Ecology and Annual Cycle of *Myxas glutinosa* (Müller) (Gastropoda: Lymnaeidae) in Llyn Tegid, North Wales. *Journal of Conchology*.

6.11 *Pisidium conventus* Clessin, 1877

**Threat Status:
Vulnerable D2**

Rationale: The current knowledge, post-1960, suggests that this species is known from less than 5 locations, although some old remote sites have not been revisited for decades. The habitat requirements of this species suggest that it is threatened by climate change, as this species is susceptible to future changes in water temperatures. The assessment as Vulnerable

D2 reflects the number of known sites and the plausible threat, such that if water temperature warms the species could rapidly become extinct.

GB distribution: A rare species in Britain, having been recorded only from Snowdonia in Wales, Helvelyn in the English Lake District (last seen in 1936), and a few locations in Scotland. Historically there are records from 12 hectads (10 x10km squares) prior to 1960, but only one confirmed record post 2000 in the NBN database (consulted Dec, 2012). Many of these remote locations have not been resurveyed since the original records. Up-to-date information is urgently required to determine whether the species is still present at other sites in Scotland.

Area of Occupancy: uncertain

Life cycle: 3 months to 3 years.

Habitat: Profundal zone of large lakes. It is an Arctic relict species in Britain where it occurs mostly in cold mountain tarns and lakes at altitudes between 300 and 750 metres, but also in deep lochs at lower altitude (e.g. Loch Ness). It has been recorded at considerable depths, 125 to 300m. It is a stenotopic species and its optimal temperature conditions are 3.86°C-6.85°C (Piechocki, 2002; Killeen *et al.*, 2004).

Threats: The species habitat in lakes and tarns is threatened by conversion of the water bodies into reservoirs, but it is unlikely that the lakes in which this species lives are under threat from pollution or drainage. However, their water temperature may be adversely compromised by future climate change as warmer waterbodies are predicted under likely climate change scenarios

Key references:

Kerney, M.P. 1999. *Atlas of the Land and Freshwater Molluscs of Britain and Ireland*. Harley Books, Colchester.

Killeen, I.J., Aldridge, D.C. & Oliver, P.G., 2004. *Freshwater bivalves of Britain and Ireland*. Field Studies Occasional Publication 82. FSC Publications, Shrewsbury. 114pp.

Piechocki, A. 2002: The Fauna of pill-clams (*Pisidium* C. Pfeiffer) (Bivalvia, Sphaeriidae) at various depths in Lake Ostrowite (N.W. Poland). — In: *Collectanea Malacologica. Festschrift für Gerhard Falkner*. Falkner, M., Groh, K. & Speight, M. C. D. (Eds.), S. 449-461. Hackenheim [ConchBooks].

Van Damme, D. & Killeen, I. 2011. *Pisidium conventus*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2. <www.iucnredlist.org>. Downloaded on **06 March 2013**

6.12 *Quickella arenaria* (Bouchard-Chantereaux, 1837)

Threat Status:
Vulnerable D2

Taxonomic note: Previously known as *Catinella arenaria* (Bouchard-Chantereaux, 1837)

Rationale: The species is known from only 3 locations in GB, in dune slacks on Braunton Burrows and in base-rich flushes on Orton Gill and Crosby Gill. Although currently stable and widespread across these sites, active management is needed to maintain the habitats in favourable condition for the species.

GB distribution: The species has a restricted range in Great Britain with very localised presence and is currently known from only seven tetrads on Braunton Burrows in North Devon and Orton and Crosby Gill in Cumbria.

Area of Occupancy: 28 km²

Life cycle: The life-cycle is probably completed in one year

Habitat: *Q. arenaria* occurs in two kinds of habitat, in calcareous dune slacks as at Braunton Burrows, and in calcareous flush habitats in Cumbria. It requires an open habitat (unshaded with low vegetation) that remains wet or damp (at or near the water-table).

Threats: The upland flush sites in Cumbria are particularly vulnerable from any changes in grazing resulting in under- or overgrazing of vegetation. The slacks at Braunton Burrows are at risk from vegetation succession with progressive invasion by rank grasses and scrub. Recent conservation management at Braunton Burrows includes the excavation of artificial 'scrapes' which creates new habitat at or near the water-table where the species thrives, but this programme of work will need to be maintained to prevent vegetation succession and maintain the open habitat required by this species.

Key references:

Drake, C.M. 1998. English Nature's contribution to the conservation of non-marine molluscs. In: Molluscan conservation: a strategy for the 21st Century. *Journal of Conchology*. Special Publication No. 2. Eds. I.J. Killeen, M.B. Seddon, & A.M. Holmes, pp. 113-124.

Holyoak, D.T., Holyoak, G.A. & Willing, M.J. 2004. Monitoring of sand-bowl amber snail *Catinella arenaria* populations at Braunton Burrows, North Devon in 2004. Unpublished Report to English Nature.

Kerney, M.P. 1999 *Atlas of the land and freshwater molluscs of Britain and Ireland*. Harley Books, Colchester.

6.13 *Sphaerium solidum* (Normand, 1844)

Threat Status:
Critically Endangered B2ab (ii,iii,iv)

Rationale: Originally known from two river systems, surveys in the early 2000s showed a near total collapse of populations of *S. solidum* on the River Witham system over a 10-15 year timescale, and this population is considered possibly extinct (Willing, pers. comm, 2011). There is still one population located on New Bedford River, Great Ouse (Willing, 2007). The species qualifies for Critically Endangered listing based on small Extent of Occurrence (Under 100 km²), single location, threats from the habitat declining due to eutrophication, the impact of non-native species, and continuing decline.

GB distribution: Historically known from a short stretch of the River Witham (Lincolnshire), one part of the Great Ouse River (tidal section), and intermittently along about 19km of Great Ouse (non-tidal section). Surveys in 2001 and 2002 show a near total collapse of populations of *S. solidum* on the Witham system in 10 –15 years (Willing, pers. comm., 2012). Surveys in 2003 – 2004 show intermittent distribution along about 20km of the Great Ouse, but at most sites (sampled to mid-channel of river) only a few freshly dead shells were recovered; 7 sites produced in total only 7 live mussels. One Great Ouse site sampled in 2003 (then showing a healthy population of live individuals) produced no live individuals in 2004.

Area of Occupancy: c. 40km²

Life cycle: A few months to 2 years (occasionally more).

Habitat: In Britain, the species lives in canalised rivers and large, deep drains. Due to the species rarity in Britain the details on its ecology are sparse. However, the habitats in which it was found in Lincolnshire are generally poor in aquatic vegetation but rich in their associated mollusc fauna, and the mussels are generally found in deep water (as for *S. rivicola*). In the recently discovered site on the Great Ouse in Cambridgeshire (Bass *et al.*, 2003), *S. solidum* was found on silt and clay substrates, principally in depths of 1-2m and with little aquatic vegetation

Threats: The principal threats to the species are pollution of its habitats through eutrophication or other chemical sources, alteration of water courses, changes to flow regimes, over-frequent dredging and the effect of invasive species. In the New Bedford River there is a significant threat of interspecific completion with the introduced Asian Clam *Corbicula fluminea*. There is circumstantial evidence on both the Witham and Great Ouse systems that suggests eutrophication as a primary cause of decline. However, excessive sediment clearance could also pose a possible threat to local populations. Mouthon (1996) showed that *S. solidum* was one of the species of freshwater bivalve most sensitive to biodegradable pollution.

Key references:

Bass, J., Blackburn, J. & Giraudy, C. 2003. Range extension of the 'Witham Orb Mussel' *Sphaerium solidum* (Normand) (Bivalvia: Sphaeriidae) or an overlooked resident of the Great Ouse. *Journal of Conchology*, 38: 61 – 65.

Holyoak, D.T., Holyoak, G.A. & Willing, M.J. 2004. A survey of *Sphaerium solidum* (Witham orb mussel) in Lincolnshire, Cambridgeshire & Huntingdonshire 2003. *English Nature Research Reports* No. 491.

Kerney, M.P. 1999. *Atlas of the Land and Freshwater Molluscs of Britain and Ireland*. Harley Books, Colchester.

Killeen, I.J., Aldridge, D.C. & Oliver, P.G., 2004. *Freshwater bivalves of Britain and Ireland*. Field Studies Occasional Publication 82. FSC Publications, Shrewsbury. 114pp.

Mouthon, J. 1996. Molluscs and biodegradable pollution in rivers: proposal for a scale of sensitivity of species. *Hydrobiologia*, **317**: 221-229.

Willing, M.J. 2007. *Sphaerium solidum* and *Corbicula fluminea*: two rare bivalve molluscs in the Great Ouse System in Cambridgeshire. *Nature in Cambridgeshire* 49: 39 – 49.

6.14 *Succinella oblonga* (Draparnaud, 1805)

Threat Status:
Vulnerable B2 ab(ii)

Rationale: There are only 7 records from 10km squares which postdate 1975 (NBN data) and of these only 5 post-date 1990. All these locations are widely separated and as such the species is a candidate for Vulnerable, as the area of occupied habitat at these sites is often very small and vulnerable to disturbance.

GB distribution: This species has a restricted distribution in Great Britain with a very localised presence historically, ranging from central Scotland to SE England. However, the species has not been recorded in southern England since 1980.

Life cycle: less than 3 years.

Habitat: Found amongst short grasses in damp areas (Kerney, 1999), often these sites are grazed habitats.

Threats: Main threats lie in changes to the habitats, either as result of drainage to improve grasslands for agriculture or increased sward length due to changes in grazing patterns.

Key references:

Kerney, M.P. 1999. *Atlas of the land and freshwater molluscs of Britain and Ireland*. Harley Books, Colchester.

6.15 *Truncatellina cylindrica* (Férussac, 1807)

Threat Status:
Vulnerable B2ab(iii)

Rationale: The species has an AoO less than 500km² with losses from over 13 locations through the last century. Given that the species is currently recorded in 7 locations, and at one location habitat disturbance in 2003 led to severe declines in population with absence during surveys for over 5 years, then the species qualifies as Vulnerable B2ab(iii). The specific threats to the species are changes in grassland management, disturbance of banks and, in the future, the possible impact of climate change.

GB distribution: This species is known to be restricted to a few isolated sites in Britain. Kerney, (1999) reported 3 sites where live specimens were collected over the period 1950 to 1999 at Potton (Bedfordshire), Went Valley (Yorkshire) and Thetford (Norfolk). In the last 10 years live specimens have been recorded at Went Valley (Brockadale Nature Reserve) and Barnham Cross Common nr Thetford. At Potton (Lawrence, 2005) there was a period between 2003 and 2010 when no live specimens were found following maintenance work on the church wall, demonstrating the vulnerability of populations to habitat disturbance. It has since been refound living at Potton in 2010. Additional sites near Horden (Warren House Ghyll and Horden Cliffs, Co. Durham) (Willing, 2006) and coastal sand dune sites in Fife (Corbett, 2011) have added 2 locations in the last 10 years. Over the past 100 years a further 13 sites have recorded losses, many of which were abbeys or castles where improvement of the walls may have resulted in their loss as resurveys have failed to locate the species (Kerney, 1999). The picture of distribution and population abundance may change as the use of suction samplers for invertebrate sampling in short grassland habitats is likely to be effective for this species.

Area of Occupancy: 24 km² although the actual occupancy is much smaller, as each site is extremely localized.

Life cycle: Less than 18 months

Habitat: Found on short calcareous grassland on sandy or stony ground (Kerney, 1999). Former records from Yorkshire and Lincolnshire were from coastal sandhills (Kerney, 1999).

Threats: The specific threats to the species are changes in grassland management, disturbance of banks and the possible impact of climate change in the future. Many of the sites were abbeys or castles, where improvement of the walls may have resulted in their loss. In general, the major threats are disturbance to sites and changes in habitat management (grazing, scrub control) or burning of grassland. Kerney (1999) also suggests that climate change may be a factor in the loss of the northern populations in GB.

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6.16 *Valvata macrostoma* Morch, 1864

Threat Status:
Vulnerable B2a,b(iii)

Rationale: This species has always been rare with a fragmented range and exists in several small sub-populations that are severely threatened by poor ditch management and decline in water quality. Within the last 20–30 years former populations have been lost near Oxford and the Lewes Levels in East Sussex. Some sites, such as Avon and Lewes marshes, have shown a decline in populations over the last 8 years (Willing, pers. comm. 2010). There has been a decline of c. 70% in range over the last 4 decades, such that the species now meets the B2 criteria for listing, with under 10 locations, declining habitat quality and populations, and threats through poor habitat management.

GB distribution: Within the last 20–30 years former populations have been lost near Oxford and the Lewes Levels in East Sussex (though it was rediscovered at a single site on Lewes Levels in 2002 (Willing, 2002)). Most populations north of Peterborough appear to be extinct (the Scottish records included on the NBN are believed to be erroneous (Sumner, pers. comm., 2013)). Even in the Norfolk Broads, a former stronghold of the species, a number of workers have noted this species to be `in some trouble` and rarer than other threatened species, e.g. *Segmentina nitida*. It is estimated that the species has declined by between 38 – 43% in Britain since 1975. Survey work in late 2004 demonstrated that the species is in serious trouble at its main (and possibly only remaining site) in the Hampshire Avon corridor, but strong populations still occur throughout Pevensy Levels where it is one of the most frequently recorded species over large areas.

Area of Occupancy: current AoO 9 hectads and 17 tetrads, implying an AoO of <70km².

Life cycle: Most freshwater pulmonates have a life-cycle of less than 18 months (Boycott, 1936)

Habitats: Ditches with *Valvata macrostoma* are dominated by floating plants, but this species reaches its greatest abundance within emergent stands (Watson & Ormerod, 2005). Watson (loc. cit.) found that *Valvata macrostoma* was absent from otherwise suitable ditches which had significantly higher concentrations of nitrate and nitrite than occupied ditches.

Threats: High concentrations of nitrate and nitrite from agricultural run-off. Particularly vulnerable to poor ditch management and decline in water quality.

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6. 17 *Vertigo angustior* Jeffreys, 1830

Legal Status: EUHSD Annex II species.

Threat Status:
Vulnerable B2ab(iii)

Rationale: This species has a highly fragmented population over Britain with the majority of sites close to the coast and strongholds on the Gower peninsula, the Suffolk estuaries, and the Norfolk Broads. Although the species is known from over 60 sites, some of these are closely adjacent and occupy a very narrow (and vulnerable) ecotone. This species has an Area of Occupancy that is probably under 300km² (based on the current known sites), even allowing for the 2km buffer. Within the strongholds there are a number of small fragments of subpopulations which occur in narrow fringes along the sea-walls and estuaries and these are likely to be highly vulnerable to even small rises in sea level. Inland sites are also vulnerable to habitat change, such as scrub encroachment, changes in site hydrology and use of herbicides. B2b(iii) is cited as decline is 'projected' on the basis that predicted sea level rise has a strong likelihood of destroying the stronghold of the species on sea embankments in East Anglia, where the majority of the British population occurs. Global sea level is reported as rising at 3mm every year and sea-level change around the British coast broadly mirrors global trends.

GB distribution: This species has a highly fragmented population over Britain, with the majority of sites close to the coast, namely the Gower peninsula, the Suffolk estuaries, and Norfolk Broads, extending north to Ayrshire and Aberdeenshire. Inland sites on small fens such as Florden Common and Redgrave Fen, or limestone pavement on Gait Barrows, are less common (Kerney 1999, Killeen 2003).

Life cycle: Less than 18 months.

Habitat: Most sites are maritime. The species typically occurs in the transition zone between saltmarsh and heathland/dune, in grassland communities and those with short herbs, mosses and *Iris*. In Scotland it is found in coastal dunes (Killeen, 2003). At Gait Barrows, Cumbria, it occurs amongst loose moss on limestone pavement and there are a few populations in open calcareous fen in East Anglia. It is normally found on permanently moist but free-draining soils, not subject to prolonged inundation.

Threats: The major threat is habitat change and disturbance, due to a variety of causes, such as modification of site hydrology, changing grazing regime, scrub encroachment, eutrophication, use of herbicides, expansion of leisure facilities (e.g. caravan parks & marinas) and construction and modification of sea defence walls. Climate change and sea level rise are considered to threaten the large populations in Suffolk, where about 97% of this population is found on sea walls (Killeen & Moorkens 2011), and south Wales. In other cases populations lie below sea level in marsh habitats. With rising sea levels and increased maintenance along these banks the vast majority of the populations could be lost in only a few years.

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6.18 *Vertigo modesta* (Say, 1824)

Threat Status:
Endangered B2 a,b (iii)

Rationale: This species has an extremely restricted range in Great Britain, known from two montane sites, in small areas of habitat that are extremely vulnerable to future habitat decline as a result of any disturbance to the site. Possible threats include climate change as well as changes in land-use management (grazing, fire) and localized disturbance such as sampling. Montane habitats are considered to be amongst the most vulnerable to climate change and it is predicted, with High Confidence, that species of montane plant communities are likely to decline.

GB distribution: First recognized in Britain in 1987 (Marriot & Marriot, 1988). Known only from two high-altitude sites in the Scottish Highlands, in small areas of habitat that are extremely vulnerable to future decline as result of any disturbance to the site.

Area of occupancy: c. 10 km² (2 x 10 km squares). The range may be extended if more suitable habitat is found, although calcareous habitats at high elevation are uncommon in Scotland.

Life cycle: less than 18 months.

Habitat: Found at high elevations in calcareous arctic-alpine habitats with Dwarf Willow (*Salix lanata*, *Salix reticulata*) and *Dryas octapetala* between 800-900m (Kerney, 1999).

Threats: Change in land-use management (over-grazing, fire). Unless there is significant change to the habitats the species is likely to remain stable, but is very vulnerable due to the small area of suitable habitat in sites that require protection and active management. Possible threats include climate change as well as changes in land-use management (grazing, fire) and localized disturbance such as sampling.

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6.19 *Vertigo moulinsiana* (Dupuy, 1849)

Legal Status: EUHSD Annex II species.

Threat Status:
Vulnerable A2abc, B2bc

Rationale: National decline of this species is difficult to assess as targeted surveys over the last 15 years have resulted in many additional sites being discovered and an apparent increase of EoO (e.g populations found in Cheshire, Cornwall, Kent and Radnor), but they are considered to be overlooked populations and not due to the spread of the species. Past population declines over the last 10 years are evident from parts of the range in Berkshire, Norfolk, Hampshire and Wiltshire. Population declines of over 50% have been observed in the last 7 years in the Kennet & Lambourn SAC (Tattersfield & Killeen, 2006, Tattersfield pers. comm, 2010) and up to 72% in the Avon SAC (Willing, 2012). Whilst some of these declines are due to loss of habitat in both SAC's there has also been loss from sites with ideal habitats. The species is known to be subject to extreme fluctuations and, as a consequence, damaging activities during certain points in the life cycle may have far more impact and cause local extinctions at micro-sites. As a consequence, based on the population crashes at two well monitored sites, the species is listed as Vulnerable A2a,b,c.

GB distribution: *V. moulinsiana* is mainly found in the fens of East Anglia and the river valleys of central southern England, with outlying populations in Cornwall, Radnorshire, the Lley peninsula and the Midlands. A recent survey in Cheshire, Shropshire and Staffordshire found *moulinsiana* present in 10 sites (Abrehart Ecology, 2011). The species' range has increased as the result of targeted species surveys over the last 10 years. However, this follows a gradual trend of decline, as the species lies at the north-western distributional limit in the UK and lives in a habitat subject to agricultural improvement and river management. Current data as result of an ongoing monitoring programme in the Kennet & Lambourn Valley SAC shows substantial population declines. For instance, *V. moulinsiana* is still present at Thatcham Reedbeds over a wide area of the site but there have been localized contractions and disappearances, and very significant decreases in abundance at all its present locations (Killeen, 2013). At present, SAC populations elsewhere appear to be stable and healthy.

Area of Occupancy: Recorded from over 83 ten km squares ((UK BAP Review, 2006) but many populations occupy a narrow linear band of habitat along watercourses. The latest estimate of the area occupied by this species in England and Wales (for Article 17 reporting in 2013) is 41 km²

Life cycle: less than 18 months.

Habitat: This species mainly inhabits calcareous, lowland wetlands. It occurs in swamps, fens and marshes usually bordering rivers, canals, lakes and ponds (Killeen, 2003). Killeen (2003) points out that, in Britain, this species exhibits a capacity to use "habitats that have arisen from

relatively recent watercourse manipulations". As well as a tall vegetation structure, *V. moulinsiana* requires a stable hydrogeology, where the water-table is at, or slightly above, the ground surface for much of the year and any seasonal flooding is of very low amplitude (Tattersfield & McInnes 2003). It climbs tall vegetation in the summer and autumn, but in severe conditions aestivates on the lower leaves of plants. In winter it descends to litter level and becomes less active.

Threats: Modification of site hydrology (lowering of water tables due to drought, water abstraction), heavy grazing of fens, shading due to successional changes from fen to carr / willow scrub, site destruction due to infilling /draining of wet areas, development works such as roads, industrial & residential building on flood plains.

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8. General bibliography

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Appendix 1: The IUCN Red List Categories and Criteria as set out in Version 3.1 of the guidance (IUCN 2001)

CRITICALLY ENDANGERED (CR)

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing an extremely high risk of extinction in the wild:

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of 90% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND 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, extent of occurrence and/or quality of habitat; (d) actual or potential levels of exploitation; (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

2. An observed, estimated, inferred or suspected population size reduction of 80% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

3. A population size reduction of 80%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.

4. An observed, estimated, inferred, projected or suspected population size reduction of 80% over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:

1. Extent of occurrence estimated to be less than 100 km², and estimates indicating at least two of a–c:

a. Severely fragmented or known to exist at only a single location.

b. Continuing decline, observed, inferred or projected, in any of the following:

(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 the following:

(i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals.

2. Area of occupancy estimated to be less than 10 km², and estimates indicating at least two of a–c:

a. Severely fragmented or known to exist at only a single location.

b. Continuing decline, observed, inferred or projected, in any of the following:

(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 the following:

(i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals.

C. Population size estimated to number fewer than 250 mature individuals and either:

1. An estimated continuing decline of at least 25% within three years or one generation, whichever is longer, (up to a maximum of 100 years in the future) OR

2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a–b):

a. Population structure in the form of one of the following:

(i) no subpopulation estimated to contain more than 50 mature individuals, OR

(ii) at least 90% of mature individuals in one subpopulation.

b. Extreme fluctuations in number of mature individuals.

D. Population size estimated to number fewer than 50 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 50% within 10 years or three generations, whichever is the longer (up to a maximum of 100 years).

ENDANGERED (EN)

A taxon is Endangered when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing a very high risk of extinction in the wild:

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of ³70% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND 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, extent of occurrence and/or quality of habitat

(d) actual or potential levels of exploitation

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

2. An observed, estimated, inferred or suspected population size reduction of 50% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

3. A population size reduction of 50%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.

4. An observed, estimated, inferred, projected or suspected population size reduction of 50% over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:

1. Extent of occurrence estimated to be less than 5000 km², and estimates indicating at least two of a–c:

a. Severely fragmented or known to exist at no more than five locations.

b. Continuing decline, observed, inferred or projected, in any of the following:

(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 the following:

(i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals.

2. Area of occupancy estimated to be less than 500 km², and estimates indicating at least two of a–c:

a. Severely fragmented or known to exist at no more than five locations.

b. Continuing decline, observed, inferred or projected, in any of the following:

(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 the following:

(i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals.

C. Population size estimated to number fewer than 2500 mature individuals and either:

1. An estimated continuing decline of at least 20% within five years or two generations, whichever is longer, (up to a maximum of 100 years in the future) OR

2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a–b):

a. Population structure in the form of one of the following:

(i) no subpopulation estimated to contain more than 250 mature individuals, OR

(ii) at least 95% of mature individuals in one subpopulation.

b. Extreme fluctuations in number of mature individuals.

D. Population size estimated to number fewer than 250 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or five generations, whichever is the longer (up to a maximum of 100 years).

VULNERABLE (VU)

A taxon is Vulnerable when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing a high risk of extinction in the wild:

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of 50% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are: clearly reversible AND understood AND 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, extent of occurrence and/or quality of habitat

(d) actual or potential levels of exploitation

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

2. An observed, estimated, inferred or suspected population size reduction of 30% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

3. A population size reduction of 30%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.

4. An observed, estimated, inferred, projected or suspected population size reduction of 30% over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:

1. Extent of occurrence estimated to be less than 20,000 km², and estimates indicating at least two of a–c:

a. Severely fragmented or known to exist at no more than 10 locations.

b. Continuing decline, observed, inferred or projected, in any of the

following:

(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 the following:

(i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals.

2. Area of occupancy estimated to be less than 2000 km², and estimates indicating at least two of a–c:

a. Severely fragmented or known to exist at no more than 10 locations.

b. Continuing decline, observed, inferred or projected, in any of the following:

(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 the following:

(i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals.

C. Population size estimated to number fewer than 10,000 mature individuals and either:

1. An estimated continuing decline of at least 10% within 10 years or three generations, whichever is longer, (up to a maximum of 100 years in the future) OR

2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a–b):

a. Population structure in the form of one of the following:

(i) no subpopulation estimated to contain more than 1000 mature individuals, OR

(ii) all mature individuals are in one subpopulation.

b. Extreme fluctuations in number of mature individuals.

D. Population very small or restricted in the form of either of the following:

1. Population size estimated to number fewer than 1000 mature individuals.

2. Population with a very restricted area of occupancy (typically less than 20 km²) or number of locations (typically five or fewer) such that it is prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and is thus capable of becoming Critically Endangered or even Extinct in a very short time period.

E. Quantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years.

DEFINITIONS

Extent of occurrence (Criteria A and B): Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy. This measure may exclude discontinuities or disjunctions within the overall distributions of taxa (*e.g.* large areas of obviously unsuitable habitat) (but see 'area of occupancy'). Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence).

Area of Occupancy (Criteria A, B and D): Area of occupancy is defined as the area within its 'extent of occurrence' which is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may, for example, contain unsuitable habitats. In some cases the area of occupancy is the smallest area essential at any stage to the survival of existing populations of a taxon. The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the taxon, the nature of threats and the available data.

Location (Criteria B and D): The term 'location' defines a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations. Where a taxon is affected by more than one threatening event, location should be defined by considering the most serious plausible threat.

Quantitative analysis (Criterion E): A quantitative analysis is defined here as any form of analysis which estimates the extinction probability of a taxon based on known life history, habitat requirements, threats and any specified management options. Population viability analysis (PVA) is one such technique. Quantitative analysis should make full use of all relevant available data. In a situation in which there is limited information, such data as are available can be used to provide an estimate of extinction risk (for instance, estimating the impact of stochastic events on habitat). In presenting the result of quantitative analysis, the assumptions (which must be appropriate and defensible), the data used and the uncertainty in the data or quantitative model must be documented.

Appendix 2: Full list of British non-marine Mollusca

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|-----------------------------|--------------|--------------------------|--------------------------|-----------------------|---------------------|-----------------------|----------|--|------------------|
| <i>Abida secale</i> | Chondrinidae | 100 | 94 | 32 | | Least Concern | | Little evidence to indicate significant decline, as opposed to a lack of recent recording | NS |
| <i>Acanthinula aculeata</i> | Vallonidae | 985 | 679 | 142 | | Least Concern | | Still widespread in Britain, but there is strong evidence of some regional and local decline. | |
| <i>Acicula fusca</i> | Aciculidae | c260 | c320 | 46 | | Least Concern | | Some local and regional decline, but undoubtedly under-recorded | |
| <i>Acroloxus lacustris</i> | Ancylidae | 495 | 523 | 150 | | Least Concern | | Still widespread and common, but undoubtedly under-recorded | |
| <i>Aegopinella nitidula</i> | Oxychilidae | c2500 | c2500 | c480 | | Least Concern | | Still widespread within its known range in Britain. | |
| <i>Aegopinella pura</i> | Oxychilidae | c2200 | c220 | c350 | | Least Concern | | Still widespread within its known range in Britain. | |
| <i>Ancylus fluviatilis</i> | Ancylidae | c1800 | c1800 | c300 | | Least Concern | | Still widespread within its known range in Britain. | |
| <i>Anisus leucostoma</i> | Planorbidae | c800 | c1000 | c180 | | Least Concern | | Still widespread within its known range in Britain. | |
| <i>Anisus spirorbis</i> | Planorbidae | n/a | n/a | 9 | | Data Deficient | | British distribution and status is uncertain as the separation of narrow-whorled (<i>A. spirorbis</i>) and broad-whorled forms (<i>A. leucostoma</i>) is doubted by some, given the variability in form from year to year (Anderson, 2005) | |
| <i>Anisus vortex</i> | Planorbidae | c1000 | c1000 | c220 | | Least Concern | | Still widespread within its known range in Britain. | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|-----------------------------|-------------|--------------------------|--------------------------|-----------------------|---------------------|-----------------------|--------------|---|------------------|
| <i>Anisus vorticulus</i> | Planorbidae | 21 | 16 | 7 | 28 | Vulnerable | B2ab(ii,iii) | The Threat Status is based on habitat and population declines observed over the last 10 years, combined with a small restricted range and habitat requiring management to maintain favourable conditions. | NR |
| <i>Anodonta anatina</i> | Unionidae | c600 | c600 | 80 | | Least Concern | | Still widespread throughout its range, but there are recent declines and a possible threat from zebra mussels, especially in the Norfolk Broads. If there is sufficient evidence to show that population numbers are being reduced by zebra mussels then an upgrade of status may be appropriate. | |
| <i>Anodonta cygnea</i> | Unionidae | c400 | c450 | 82 | | Least Concern | | Hectad recording in Britain suggests there has been substantial decline in distribution, though Recent recording effort has not been as intensive as in the past and the rate of decline is not clear. | |
| <i>Aplexa hypnorum</i> | Physidae | 225 | 195 | 90 | | Least Concern | | Still widespread in Britain but with many local and regional declines. There is evidence for widespread decline but this species does not meet the 30% loss in 10 years. | |
| <i>Arianta arbustorum</i> | Helicidae | c1500 | c1500 | c400 | | Least Concern | | Widespread species. Stable, although the density and abundance may have changed in intensively farmed areas (Kerney, 1999). | |
| <i>Arion ater</i> | Arionidae | c500 | c500 | c500 | | Data Deficient | | There are currently taxonomic issues, between this species and <i>Arion rufus</i> . Whilst it apparently is an abundant and widespread species, once better data is present to separate this species it might be found that <i>ater</i> is in active decline, whilst <i>rufus</i> is expanding. | |
| <i>Arion circumscriptus</i> | Arionidae | c1500 | c1500 | c400 | | Least Concern | | Believed to be widespread throughout Britain except for northern Scotland and the more acid habitats elsewhere. | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|--------------------------|-----------|--------------------------|--------------------------|-----------------------|---------------------|----------------------|----------|--|------------------|
| <i>Arion distinctus</i> | Arionidae | c1000 | c1000 | c600 | | Least Concern | | Believed to be widespread throughout Britain. | |
| <i>Arion fasciatus</i> | Arionidae | c800 | c800 | c180 | | Least Concern | | Believed to be widespread throughout Britain but less common in southern and south-west England and parts of Wales. | |
| <i>Arion flagellus</i> | Arionidae | c240 | c250 | c220 | | Least Concern | | Believed to be common and widespread, increasing in range and frequency of records . | |
| <i>Arion hortensis</i> | Arionidae | c400 | c400 | c150 | | Least Concern | | Knowledge of the full distribution is still incomplete and although records suggest a more southern distribution, it is likely to be widely spread | |
| <i>Arion intermedius</i> | Arionidae | c2500 | c2600 | c350 | | Least Concern | | Believed to be abundant and widespread. | |
| <i>Arion owenii</i> | Arionidae | c120 | c120 | c100 | | Least Concern | | Believed to have a wide but disjunct distribution and is locally common | |
| <i>Arion rufus</i> | Arionidae | 6 | 26 | 68 | | Least Concern | | Although partly data deficient, the species is increasing in range, likely to be common and widespread, and may be a threat to <i>A. ater</i> . | |
| <i>Arion silvaticus</i> | Arionidae | c1000 | c1000 | c200 | | Least Concern | | Believed to be widespread throughout Britain | |
| <i>Arion subfuscus</i> | Arionidae | c2000 | c2200 | c700 | | Least Concern | | Based on current knowledge, the species is widespread and relatively common throughout most of the country | |
| <i>Arion vulgaris</i> | Arionidae | 56 | 62 | 6 | | Least Concern | | Based on current knowledge, the species is likely to be relatively widespread and although the species distribution is incompletely known, it is probably spreading. | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|--------------------------------|---------------|--------------------------|--------------------------|-----------------------|---------------------|----------------------|---------------|--|------------------|
| <i>Ashfordia granulata</i> | Hygromidae | c700 | c800 | c180 | | Least Concern | | Widespread with no evidence of significant decline. A Species of Conservation Interest in GB, as Britain holds more than 60% of the Global Population, with additional populations in Northern Ireland, Eire and NW France. | |
| <i>Assimineia grayana</i> | Assimineidae | 59 | 48 | 21 | | Least Concern | | Mainly found in south-east England, but no evidence of significant decline in last 50 years; paucity of recent hectads believed to be due to patchy recording effort. On the coasts of north-west England and north Wales there appears to have been recent colonization of new localities | NS |
| <i>Azeca goodalli</i> | Cochlicopidae | 218 | 111 | 49 | | Least Concern | | This species is still widespread in Britain but with many local and regional declines. | |
| <i>Balea biplicata</i> | Clausiliidae | 4 | 3 | 1 | 16 | Vulnerable | B2ab(iii, iv) | This species is treated as a native as it has been present since Roman times. Although its provenance is uncertain it is normally found close to human habitation. It is now restricted to four tetrads in the Thames valley close to London, where habitats are threatened by changing management practices and flooding. | NR |
| <i>Balea sarsii</i> | Clausiliidae | 144 | 129 | 119 | | Least Concern | | <i>B. sarsii</i> and <i>B. perversa</i> have only recently been recognised as 2 separate species. The evidence suggests that <i>B. sarsii</i> is by far the commoner and more widespread species. | |
| <i>Balea perversa</i> | Clausiliidae | n/a | 15 | 15 | | Least Concern | | This species seems to be present in upland and inland areas, compared to the range of <i>B. heydeni</i> , and the numbers of records are now increasing such that it is not considered to be threatened, although much more local than <i>B. heydeni</i> . | |
| <i>Bathyomphalus contortus</i> | Planorbidae | c1000 | c1200 | c200 | | Least Concern | | Still widespread and common. Overall, the British population is believed to be currently stable. | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|------------------------------|---------------|--------------------------|--------------------------|-----------------------|---------------------|-----------------------|----------|---|------------------|
| <i>Bithynia leachii</i> | Bithynidae | c300 | c300 | c150 | | Least Concern | | Still widespread and common in suitable habitats. | |
| <i>Bithynia tentaculata</i> | Bithynidae | c1200 | c1200 | c300 | | Least Concern | | Still widespread and common. | |
| <i>Boettgerilla pallens</i> | Milacidae | c350 | c350 | c200 | | Not Applicable | | This species was introduced to GB in 1972 and is becoming more widespread. | |
| <i>Candidula gigaxii</i> | Helicellidae | 145 | 80 | 28 | | Least Concern | | Still widespread in its British range (mostly England) but with many local and regional declines. Records show a continued decline over the last 40 years, but more up-to-date information is required to show if there is continuing decline at a rapid rate | NS |
| <i>Candidula intersecta</i> | Helicellidae | c1000 | c1200 | c400 | | Least Concern | | Widespread species with no evidence of significant decline. | |
| <i>Carychium minimum</i> | Ellobiidae | c2000 | c2000 | c300 | | Least Concern | | Widespread throughout Britain, although there are some localised declines in population abundance. | |
| <i>Carychium tridentatum</i> | Ellobiidae | c2000 | c2000 | c300 | | Least Concern | | Widespread throughout Britain, although some localised declines in population abundance have been reported in England in recent years. | |
| <i>Cecilioides acicula</i> | Ferussaciidae | c300 | c300 | 70 | | Least Concern | | This species is under-recorded due to its underground lifestyle. The 1999 Atlas shows the species is still widespread but with some local and regional decline | |
| <i>Cepaea hortensis</i> | Helicidae | c2000 | c2200 | c600 | | Least Concern | | Widespread species. Kerney (1999) comments that distribution has not changed significantly since the 19th century and it is considered stable. | |
| <i>Cepaea nemoralis</i> | Helicidae | c2000 | c2200 | c700 | | Least Concern | | Widespread species. Recent data from surveys in show declines in south of England (Cameron & Killeen, 2001) and expansion in urban sites in Northern England (Cameron, pers. comm., 2010). | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|---------------------------------|----------------|--------------------------|--------------------------|-----------------------|---------------------|-----------------------|----------|--|------------------|
| <i>Ceruella aginnica</i> | Helicellidae | 0 | 1 | 1 | | Data Deficient | | Status in Britain unknown, but likely to be rare, and uncertain as to whether native or introduced. Still known only from one site in Kent. | |
| <i>Ceruella neglecta</i> | Helicellidae | 0 | 0 | 0 | | Not Applicable | | Probably introduced in Kent in early 1900's and not recorded since then. | |
| <i>Ceruella virgata</i> | Helicellidae | c600 | c600 | c200 | | Least Concern | | Still widespread within its known range in Britain. Some local and regional decline | |
| <i>Clausilia bidentata</i> | Clausiliidae | c1800 | c2000 | c400 | | Least Concern | | Widespread species with no evidence of significant decline. | |
| <i>Clausilia dubia</i> | Clausiliidae | 63 | 61 | 21 | | Least Concern | | AoO is close to the threshold for Vulnerable but the species appears to be stable, hence the other criteria do not apply. | NS |
| <i>Cochlicella acuta</i> | Cochlicellidae | c200 | c200 | c90 | | Least Concern | | Widespread species present in many different habitats. No evidence of any decline. | |
| <i>Cochlicella barbara</i> | Cochlicellidae | 4 | 5 | 3 | | Not Applicable | | Introduced species, now known from four populations in Great Britain. | |
| <i>Cochlicopa cf lubrica</i> | Cochlicopidae | c2500 | c2700 | c450 | | Least Concern | | Taxonomic issues need to be resolved but likely to be common and widespread. | |
| <i>Cochlicopa cf lubricella</i> | Cochlicopidae | c1200 | c1400 | c200 | | Least Concern | | Taxonomic issues need to be resolved but likely to be common and widespread. | |
| <i>Cochlodina laminata</i> | Clausiliidae | c500 | c500 | c200 | | Least Concern | | Still widespread within its known range. Some local and regional decline | |
| <i>Columella aspera</i> | Vertiginidae | c500 | c600 | c120 | | Least Concern | | Widespread species present in many different habitats. No evidence of any decline although some loss of lowland heath sites reported in southern England (Kerney, 1999). | |
| <i>Columella edentula</i> | Vertiginidae | c750 | c650 | c100 | | Least Concern | | Widespread species present in many different habitats. No evidence of any decline. | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|---|--------------|--------------------------|--------------------------|-----------------------|---------------------|------------------------|-------------|---|------------------|
| <i>Corbicula fluminea</i> | Corbiculidae | 0 | 1 | 17 | | Not Applicable | | Introduction, currently present in East Anglia, the Midlands canal basin, lower Thames, lower Great Ouse, Medway and South Wales. | |
| <i>Cornu aspersum</i> | Helicidae | c2000 | c2200 | c1000 | | Least Concern | | Widespread species able to exist in many habitats and is abundant when present. | |
| <i>Deroceras agreste</i> | Limacidae | c120 | 120 | 21 | | Least Concern | | Disjunct but widespread distribution and no obvious threat or evidence of decline. | |
| <i>Deroceras laeve</i> | Limacidae | c2300 | c2500 | c300 | | Least Concern | | Widespread and abundant | |
| <i>Deroceras panormitanum</i> (= <i>D. invadens</i>) | Limacidae | 693 | 592 | c500 | | Least Concern | | Widespread and abundant | |
| <i>Deroceras reticulatum</i> | Limacidae | c2800 | c2900 | c1200 | | Least Concern | | Probably the most widespread and abundant mollusc in the country | |
| <i>Discus rotundatus</i> | Endodontidae | c2600 | c2600 | c1000 | | Least Concern | | Widespread species with no evidence of decline | |
| <i>Dreissena polymorpha</i> | Dreissenidae | c250 | c200 | c170 | | Not Applicable | | Early 19th century introduction. Has shown a dramatic increase in distribution and abundance in the last 10 years. | |
| <i>Ena montana</i> | Enidae | 41 | 31 | 14 | 64 | Near Threatened | B2b(ii,iii) | Restricted to southern Britain and believed to be in slow decline with changes in land management. It is close to meeting the criteria for Vulnerable under AoO and with continued loss of hectads over the last 20 years a status of Near Threatened is justified. | NS |
| <i>Euconulus cf. alderi</i> | Euconulidae | c300 | c350 | c110 | | Least Concern | | Taxonomic issues in relation to identity compared with continental species need to be resolved, but it is likely to be common and widespread. | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|------------------------------------|---------------|--------------------------|--------------------------|-----------------------|---------------------|-----------------------|----------------|--|------------------|
| <i>Euconulus cf. fulvus</i> | Euconulidae | c1200 | c1000 | c250 | | Least Concern | | Taxonomic issues in relation to identity compared with continental species need to be resolved, but it is likely to be common and widespread. | |
| <i>Ferrissia wautieri</i> | Ancylidae | 8 | 34 | 27 | | Not Applicable | | A non-native species introduced from North America and recognised here in 1976. | |
| <i>Fruticicola fruticum</i> | Bradybaenidae | 0 | 0 | 0 | | Not Applicable | | Probably introduced in Kent in early 1900's (Kerney, 1999), and not found since 1920s. | |
| <i>Galba truncatula</i> | Lymneidae | c1500 | c1800 | c500 | | Least Concern | | Widespread throughout Britain | |
| <i>Granaria frumentum illyrica</i> | Chondrinidae | 0 | 0 | 1 | | Data Deficient | | Recently found at one site on Scilly and is not thought to be native. | |
| <i>Gyraulus acronicus</i> | Planorbidae | 14 | 5 | 5 | <100 | Vulnerable | B2b(ii,iii,iv) | Currently known to be living in six stretches of river within 5 hectads. In some rivers the species is restricted to relatively short sections, thus Area of Occupancy is small. The absence of the species in targeted surveys of the Thames catchment in the early 2000s shows the decline is real | NR |
| <i>Gyraulus albus</i> | Planorbidae | c1800 | c1800 | c350 | | Least Concern | | Widespread species with no evidence of significant decline. | |
| <i>Gyraulus crista</i> | Planorbidae | c750 | c750 | c200 | | Least Concern | | Still widespread and common. Overall, the British population is believed to be currently stable. | |
| <i>Gyraulus laevis</i> | Planorbidae | c150 | c130 | 70 | | Least Concern | | The species is still found throughout its British range, but losses are across the country, with loss of habitat a major contributing factor. More up-to-date survey is required to determine whether there is continuing decline at a rapid rate. | NS |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|------------------------------|--------------|--------------------------|--------------------------|-----------------------|---------------------|------------------------------|-----------|---|------------------|
| <i>Heleobia stagnorum</i> | Cochliopidae | 1 | 0 | 1 | 4 | Critically Endangered | B2ab(iii) | This species was known only from one site in Britain, where it was thought to have gone extinct in 1970's (Kerney, 1999). However, a population has since been found in a lagoon in Sussex. The species is listed as Critically Endangered given the single location and the declining quality of habitat, with threats from pollution and coastal development. | NR |
| <i>Helicella itala</i> | Helicellidae | c450 | 228 | 106 | | Least Concern | | Records imply a distinct decline over recent decades. The loss of populations in southern and central England is a cause for concern but up-to-date information is required to quantify the rate of decline | |
| <i>Helicigona lapicida</i> | Helicidae | c300 | c250 | 66 | | Least Concern | | Records over the last 100 years show a slow but steady decline. In East Anglia, the loss of habitat, such as hedgerows, is the main reason for decline, whilst in the Midlands and southern England atmospheric pollution has impacted on the range of epiphytes that <i>H. lapicida</i> feeds on. | |
| <i>Helicodonta obvolvata</i> | Hygromidae | 10 | 7 | 6 | 24 | Vulnerable | B2ab(iii) | This species has a restricted range in southern England (South Downs and Hampshire), where it has declined from its pre-1960 range of c. 25 hectads. Although recent surveys suggest it is stable at some sites, and may have locally increased, the species is considered vulnerable to habitat disturbance in woodland. The small AoO, fragmented range and threats to habitats suggest the species should be listed as Vulnerable. | NR |
| <i>Helix pomatia</i> | Helicidae | 60 | 54 | 35 | | Least Concern | | This species has declined with a regional trend of loss of habitat since 1900. However the slow rate of decline and number of protected sites means that this species has adequate protection to maintain UK populations. | NS |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|--------------------------------|-------------|--------------------------|--------------------------|-----------------------|---------------------|------------------------|----------|---|------------------|
| <i>Hippeutis complanatus</i> | Planorbidae | c500 | c500 | c200 | | Least Concern | | Still widespread and common. Overall, the British population is believed to be currently stable. | |
| <i>Hydrobia acuta neglecta</i> | Hydrobiidae | 20 | 14 | 8 | | Near Threatened | B2b(iii) | Still localised within its known range, with sites vulnerable to coastal developments. Given the small number of sites and vulnerability to habitat loss, the species merits listing as Near Threatened. | NS |
| <i>Hygromia cinctella</i> | Hygromidae | 47 | 85 | c130 | | Not Applicable | | Early 20th century introduction, now increasing rapidly northwards and eastwards. | |
| <i>Hygromia limbata</i> | Hygromidae | 23 | 21 | 5 | | Not Applicable | | Early 20th century introduction, most frequent in south-west England but now expanding. | |
| <i>Lauria cylindracea</i> | Pupillidae | c2500 | c2200 | c700 | | Least Concern | | Widespread species with no evidence of significant decline. | |
| <i>Lauria sempronii</i> | Pupillidae | 2 | 2 | 2 | | Vulnerable | D2 | This species is now known from 13 locations in adjacent hectads. Although regular monitoring takes place at some of these, the sites (short stretches of dry stone wall) are vulnerable to habitat destruction through maintenance and clearance of ivy. | NR |
| <i>Lehmannia marginata</i> | Limacidae | c1700 | c2000 | c1000 | | Least Concern | | Widespread throughout the country with no evidence of overall decline. | |
| <i>Lehmannia valentiana</i> | Limacidae | 11 | 30 | 86 | | Not Applicable | | Native to Iberian peninsula, now widely established and naturalised. | |
| <i>Leiostyla anglica</i> | Pupillidae | c300 | c250 | c700 | | Least Concern | | This species is still widespread within its known range, although there is some local and regional decline related to habitat disturbance. It is a litter species and may be under-recorded in general sampling. Generally considered that populations are relatively stable and, in suitable habitats, common. Britain holds a substantial part of the known global range (c. 75%), hence the species is of Conservation Interest. | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|------------------------------|--------------|--------------------------|--------------------------|-----------------------|---------------------|-----------------------|----------|--|------------------|
| <i>Leucophytia bidentata</i> | Ellobiidae | 48 | 43 | 9 | | Least Concern | | Widespread species with no evidence of decline. | NS |
| <i>Limacus maculatus</i> | Limacidae | 27 | 35 | c125 | | Least Concern | | Widespread species with no evidence of decline. | |
| <i>Limax cinereoniger</i> | Limacidae | c300 | c500 | c110 | | Least Concern | | Still widespread within its known range. Some recent local declines, but overall, the population is believed to be relatively stable. | |
| <i>Limax flavus</i> | Limacidae | c250 | c300 | c150 | | Least Concern | | Still widespread within its range. Some evidence of decline but without up-to-date survey, there are insufficient data to indicate whether the species is under any real threat. | |
| <i>Limax maximus</i> | Limacidae | c2000 | c2000 | c700 | | Least Concern | | Widespread species with no evidence of significant decline. | |
| <i>Lucilla singleyana</i> | Endodontidae | 8 | 9 | 2 | | Not Applicable | | Introduced species, unknown in Britain before 1975 and is still known only from <15 widely spread sites. | |
| <i>Lymnaea stagnalis</i> | Lymneidae | c1000 | c1000 | c400 | | Least Concern | | Widespread throughout Britain | |
| <i>Macrogastra rolphii</i> | Clausiliidae | c150 | c130 | 27 | | Least Concern | | Some local losses but uncertain evidence of significant decline rather than levels of recording effort at known sites. | NS |
| <i>Malacolimax tenellus</i> | Limacidae | 161 | 122 | 28 | | Least Concern | | Still widespread throughout its British range although the population is fragmented. Conchological Society field surveys over last 10 years specifically for this species show recent new discoveries, although known to have declined in the previous 50 years. | NS |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|------------------------------------|------------------|--------------------------|--------------------------|-----------------------|---------------------|------------------------------|------------|---|------------------|
| <i>Margaritifera margaritifera</i> | Margaritiferidae | 184 | 122 | 134 | n/a | Critically Endangered | A2bc, A4bc | The assessment as Critically Endangered is based on past decline levels, although there are still recruiting populations in Scotland. The species meets the 80% decline threshold based on recruiting populations over 3 generations using the 90 year backcast. | NR |
| <i>Marstoniopsis insubrica</i> | Hydrobiidae | 9 | 7 | 1 | 4 | Endangered | B2ab(iii) | Less than 5 locations scattered though southern England and near Manchester where it was introduced in the early 1900's (Kerney, 1999). The only recent confirmed records lie in Norfolk Broads. Given the small AoO, number of locations (under 5) and the declining quality of habitat, the species is considered to be Endangered. | NR |
| <i>Menetus dilatatus</i> | Planorbidae | 11 | 14 | 11 | | Not Applicable | | Introduced in 1869 hence considered as Not applicable. | |
| <i>Mercuria cf similis</i> | Hydrobiidae | 11 | 8 | 5 | 20 | Vulnerable | B2ab(iii) | The small AoO, combined with fewer than 10 locations, as well as a range loss of more than 50%, with declining area and habitat quality, make the species Vulnerable to extinction. Only known from a number of isolated sites, where the habitat is vulnerable to pollution, changing water salinity and habitat modification. | NR |
| <i>Merdigera obscura</i> | Enidae | c1000 | c1000 | c250 | | Least Concern | | Still widespread within its known range in Britain. Some local and regional decline but no evidence of significant decline. | |
| <i>Milax gagates</i> | Milacidae | c250 | c250 | 74 | | Least Concern | | According to the Atlas, this species is still widespread in Britain, however the current slug survey has not produced many reliable records (Cameron, pers. comm., 2013) | |
| <i>Milax nigricans</i> | Milacidae | 0 | 0 | 0 | | Not Applicable | | Only known from a single site and not recorded in last 50 years, and probably an accidental record. | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|-------------------------------|--------------|--------------------------|--------------------------|-----------------------|---------------------|------------------------------|----------------------|---|------------------|
| <i>Monacha cantiana</i> | Monachidae | c800 | c700 | c400 | | Least Concern | | Widespread over much of England and still appears to be spreading. | |
| <i>Monacha cartusiana</i> | Monachidae | 24 | 18 | 3 | | Near Threatened | B2b(ii) | This species has been clearly declining for the last 40 years and is close to meeting the A2c criteria of loss with between 25% to 30% each decade from 1960. There are over 15 confirmed records post 1990, so the assessment is based on the possibility that it still occurs at many of these sites, even though there are only 3 records post 2000. | NR |
| <i>Musculium lacustre</i> | Sphaeriidae | c600 | c600 | c180 | | Least Concern | | A widely distributed species with some evidence of local regional decline in south-east and northern England, and Scotland, but this may, in part, be an artefact of recording effort. | |
| <i>Musculium transversum</i> | Sphaeriidae | 22 | 18 | 8 | | Not Applicable | | Although this species is clearly in decline, the status as a probable introduction was discussed by Kerney (1999) and on this basis it should be assessed as Not Applicable. | |
| <i>Myosotella denticulata</i> | Ellobiidae | n/a | n/a | 4 | | Data Deficient | | Segregate only recently recognised as part of the British fauna. Status unknown but not a saltmarsh species so may be less widespread than <i>M. myosotis</i> . | |
| <i>Myosotella myosotis</i> | Ellobiidae | 196 | 211 | 54 | | Least Concern | | Widespread species with no evidence of decline. | |
| <i>Mytilopsis leucophaeta</i> | Dreissenidae | 0 | 1 | 0 | | Not Applicable | | Recent introduction, known from brackish waters in Cardiff Bay, but possibly expanding | |
| <i>Myxas glutinosa</i> | Lymneidae | 6 | 4 | 2 | 8 | Critically Endangered | B1, B2ab(iii, iv, v) | This species has been lost from various UK sites over the last 100 years. It is now restricted to a single lake in Wales, where there is a significant risk of eutrophication, mainly from agricultural practices in the catchment. In addition the lake levels in Llyn Tegid are artificially altered by use of sluice gates | NR |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|------------------------------|-------------|--------------------------|--------------------------|-----------------------|---------------------|------------------------|----------|---|------------------|
| <i>Nesovitrea hammonis</i> | Zonitidae | c2000 | c2200 | c400 | | Least Concern | | Widespread species with no evidence of significant decline. | |
| <i>Omphiscola glabra</i> | Lymneidae | 73 | 86 | 47 | | Least Concern | | Post 1960 records occur in less than 130 hectads, with continuing loss of sites through habitat destruction and less than 50 recent hectads. Recent surveys in areas with intensive recording effort, such as New Forest and County Durham, suggest it is still declining within its strongholds (Willing, pers. comm, 2011; I.J. Killeen, pers. comm., 2011). The status of this species should be kept under review as more information becomes available | NS |
| <i>Oxychilus alliarius</i> | Oxychilidae | c2800 | c2800 | c1000 | | Least Concern | | Widespread species with no evidence of decline. | |
| <i>Oxychilus cellarius</i> | Oxychilidae | c2400 | c2600 | c1000 | | Least Concern | | Widespread species with no evidence of decline. | |
| <i>Oxychilus draparnaudi</i> | Oxychilidae | c600 | c600 | c250 | | Least Concern | | Becoming widespread throughout Britain, continues to increase | |
| <i>Oxychilus navarricus</i> | Oxychilidae | c1000 | c1200 | c250 | | Least Concern | | Distribution mostly England and Wales, continues to increase | |
| <i>Oxyloma elegans</i> | Succineidae | c1500 | c1800 | c300 | | Least Concern | | Widespread throughout Britain | |
| <i>Oxyloma sarsi</i> | Succineidae | 7 | 4 | 9 | 36 | Near Threatened | B2a | This species has a restricted range in Britain, but recording is difficult as it is very similar to <i>O. elegans</i> and dissection is required for confirmation. The main strongholds are found in the Norfolk Broads and Lea Valley with 8-10 locations, with an isolated record on Anglesey. The species qualifies as Vulnerable based on number of locations and an AoO under the threshold, but there is no evidence of decline. | NR |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|-------------------------------|--------------|--------------------------|--------------------------|-----------------------|---------------------|-----------------------|----------|---|------------------|
| <i>Papillifera papillaris</i> | Clausiliidae | 1 | 1 | 2 | | Not Applicable | | This species was introduced to GB during construction of gardens last century. | |
| <i>Paralaoma servilis</i> | Endodontidae | n/a | 20 | 6 | | Not Applicable | | Introduction, not known before 1985, and first records were from greenhouses. This species is increasing in range in UK and now occurs in gardens and hedgerows. | |
| <i>Peringia ulvae</i> | Hydrobiidae | c200 | c200 | 25 | | Least Concern | | Widespread, but under-recorded, given its presence in estuaries and saltmarshes. | |
| <i>Phenacolimax major</i> | Vitrinidae | 64 | 58 | 14 | | Least Concern | | Targeted surveys have led to re-finding the species in the northwest part of its recorded range and further records extend the range in SW England. In England east of the Cotswolds, however, it is at risk from habitats drying out due to climate change and to disturbance by site management or leisure activities (Long, 2007). | NS |
| <i>Physa fontinalis</i> | Physidae | c1000 | c1200 | c350 | | Least Concern | | Widespread species with no evidence of significant decline. | |
| <i>Physella acuta</i> | Physidae | c150 | c150 | c100 | | Not Applicable | | Introduction, increasing | |
| <i>Physella gyrina</i> | Physidae | 6 | 8 | 17 | | Not Applicable | | Introduction, increasing | |
| <i>Pisidium amnicum</i> | Sphaeriidae | c600 | c700 | c150 | | Least Concern | | Still widespread in Britain. There is evidence of some regional decline but there are insufficient data to indicate whether the species is under any real threat. | |
| <i>Pisidium casertanum</i> | Sphaeriidae | c1500 | c1500 | c200 | | Least Concern | | An abundant and widespread species. | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|---------------------------------|-------------|--------------------------|--------------------------|-----------------------|---------------------|-----------------------|----------|--|------------------|
| <i>Pisidium conventus</i> | Sphaeriidae | 4 | 3 | 1 | 4 | Vulnerable | D2 | Current knowledge suggests that this species occurs in less than 5 locations, although some old remote sites have not been revisited for decades. The habitat requirements suggest that it is threatened by climate change, as this species is susceptible to changes in water temperature. The assessment reflects the number of known sites and the plausible threat that if water temperature warms the species could rapidly become extinct. | NR |
| <i>Pisidium globulare</i> | Sphaeriidae | 0 | 0 | uncertain | | Data Deficient | | Only recently recognised as part of the British fauna. Virtually no information on distribution, but there are indications that the species is rare in Britain. Habitat vulnerable to drainage. | |
| <i>Pisidium henslowanum</i> | Sphaeriidae | c600 | c700 | c100 | | Least Concern | | Still widespread in Britain although there is limited evidence of some regional decline, but this may be an artefact of low recording effort. | |
| <i>Pisidium hibernicum</i> | Sphaeriidae | c500 | c500 | 25 | | Least Concern | | Still widespread in Britain although there is limited evidence of some regional decline, but this may be an artefact of low recording effort. | |
| <i>Pisidium lilljeborgii</i> | Sphaeriidae | 197 | 135 | 10 | | Least Concern | | Considered likely to be widespread within its narrow range in Britain. There is evidence of a significant decline (40% over 30 years), though there are insufficient data to indicate whether the species is under any real threat. | |
| <i>Pisidium milium</i> | Sphaeriidae | c800 | c800 | c150 | | Least Concern | | Still widespread in Britain although there is limited evidence of some regional decline, but this may be an artefact of low recording effort. | |
| <i>Pisidium moitessierianum</i> | Sphaeriidae | 178 | 116 | 16 | | Least Concern | | Killeen (pers. comm., 2011) considered it was likely to be widespread within its known range in Britain. It is pollution sensitive and there is evidence of some regional decline. | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|---------------------------------|-------------|--------------------------|--------------------------|-----------------------|---------------------|----------------------|----------|---|------------------|
| <i>Pisidium nitidum</i> | Sphaeriidae | c1400 | c1400 | c250 | | Least Concern | | Still widespread in Britain although there is limited evidence of some regional decline, but this may be an artefact of low recording effort. | |
| <i>Pisidium obtusale</i> | Sphaeriidae | 130 | 94 | 48 | | Least Concern | | Killeen (pers. comm., 2011) considered it was likely to be still relatively widespread, but there is some evidence of local regional decline. | |
| <i>Pisidium personatum</i> | Sphaeriidae | c1500 | c1500 | c150 | | Least Concern | | An abundant and widespread species. | |
| <i>Pisidium pseudosphaerium</i> | Sphaeriidae | 34 | 32 | 12 | | Least Concern | | This species has a very local distribution within habitats that are vulnerable to inappropriate management, drainage and eutrophication, hence susceptible to localised extinction. At present still in favourable Threat Status at grazing marsh sites in southern England (Willing, pers. comm., 2011). More than 20 known sites, hence at present does not meet the B criteria and rates of decline do not meet the A criteria, however, a candidate for Near Threatened, requiring future monitoring. | NS |
| <i>Pisidium pulchellum</i> | Sphaeriidae | 120 | 111 | 17 | | Least Concern | | Very localised within Britain, the known range declined by 33% between 1900 and 1960, so may be a candidate for Near Threatened. Although stable between 1960 and 1999, there is an apparent decline in recent records. Information on suitable habitats within England and Wales supports the declining extent of habitat and water quality. | |
| <i>Pisidium subtruncatum</i> | Sphaeriidae | c200 | c280 | c250 | | Least Concern | | Still widespread in Britain although there is limited evidence of some regional decline, but this may be an artefact of low recording effort. | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|-------------------------------|-------------|--------------------------|--------------------------|-----------------------|---------------------|----------------------|----------|---|------------------|
| <i>Pisidium supinum</i> | Sphaeriidae | 146 | 131 | 26 | | Least Concern | | Killeen (pers. comm., 2011) considered it was likely to be widespread within its known range in Britain. It is pollution sensitive and there is evidence of some regional decline. However, at present there are insufficient data to indicate whether the species is in decline, but it may be threatened by introduced species (<i>Dreissena</i> and <i>Corbicula</i>). | |
| <i>Pisidium tenuilineatum</i> | Sphaeriidae | 60 | 37 | 42 | | Least Concern | | The species has disappeared from several of its former sites, notably in the Midlands. Britain is believed to support a significant population in European terms. Although common in some parts of Britain, the species is extremely local and displays a fragmented distribution on many rivers. | NS |
| <i>Planorbarius corneus</i> | Planorbidae | c1000 | c400 | c320 | | Least Concern | | Widespread species with no evidence of significant decline. | |
| <i>Planorbis carinatus</i> | Planorbidae | c180 | c300 | c260 | | Least Concern | | Widespread species with no evidence of significant decline. | |
| <i>Planorbis planorbis</i> | Planorbidae | c300 | c350 | c320 | | Least Concern | | Widespread species with no evidence of significant decline. | |
| <i>Pomatias elegans</i> | Pomatiidae | 349 | 263 | 67 | | Least Concern | | Still widespread within its relatively restricted range in Britain. Some local and regional decline, particularly in the north of England and East Anglia, although southern populations are believed to be stable | |
| <i>Ponentina subvirescens</i> | Helicidae | 20 | 31 | 22 | | Least Concern | | Although this species has a restricted range, it does not meet either rate of population decline nor small range criteria for listing. A Species of Conservation Interest in GB, as Britain holds more than 75% of the Global Population | NS |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|---------------------------------|--------------|--------------------------|--------------------------|-----------------------|---------------------|------------------------|----------|--|------------------|
| <i>Potamopyrgus antipodarum</i> | Hydrobiidae | c600 | c1000 | c1000 | | Not Applicable | | This species was introduced to GB in 1852, and is now widespread and abundant. | |
| <i>Pseudanodonta complanata</i> | Unionidae | 39 | 50 | 34 | | Least Concern | | This species has been the subject of mis-identifications and confusion with <i>Anodonta anatina</i> , and hence some of the historical records are in doubt. The evidence of hectad recording suggests there has been a decline in distribution, though under-recording is a possibility and new populations have been found in recent years. Zebra mussels may be a threat in some locations and if they are shown to have a significant impact then an upgrade of status may be justified. | NS |
| <i>Pseudotrichia rubiginosa</i> | Hygromidae | n/a | 6 | 3 | 24 | Near Threatened | B2a | This species was not recognised in Britain prior to 1980 and is only known from a few sites, but is possibly under-recorded due to confusion with other species. It meets the criteria for Vulnerable with AoO of 24 km ² and less than 7 locations, but there is insufficient evidence on possible decline to warrant Threatened status. | NR |
| <i>Punctum pusillum</i> | Endodontidae | c1800 | c1700 | c300 | | Least Concern | | Widespread species with no evidence of any decline. | |
| <i>Pupilla muscorum</i> | Pupillidae | c100 | c280 | c120 | | Least Concern | | Still widespread within its range in Britain. Some local and regional decline, particularly in the north of England and East Anglia but southern populations believed to be stable | |
| <i>Pupilla pratensis</i> | Pupillidae | 0 | 0 | 3 | | Data Deficient | | Only separated from <i>P. muscorum</i> in 2009, there are three confirmed British records, two from the Black Isle in Scotland and one from Oxwich Bay. However, other <i>muscorum</i> sites with suitable habitat require survey to confirm the status of this species. Likely to be rare (Killeen, pers.comm., 2013). | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|------------------------------|---------------|--------------------------|--------------------------|-----------------------|---------------------|-----------------------|----------|--|------------------|
| <i>Pyramidula pusilla</i> | Pyramidulidae | c120 | c160 | c90 | | Least Concern | | Still widespread within its British range. Some local and regional decline but overall, the British population is believed to be currently stable. | |
| <i>Quickella arenaria</i> | Succineidae | 2 | 4 | 2 | 28 | Vulnerable | D2 | This species is known from only 3 sites in Great Britain. The AoO is under 100 km ² . All of these locations require active management to maintain suitable habitat for the species, hence the species is assessed based on potential for declining quality of habitat. | NR |
| <i>Radix auricularia</i> | Lymneidae | c150 | c150 | c110 | | Least Concern | | Still widespread in Britain, although there have been some local and regional declines | |
| <i>Radix balthica</i> | Lymneidae | c500 | c1000 | c800 | | Least Concern | | Widespread throughout Britain | |
| <i>Segmentina nitida</i> | Planorbidae | 22 | 22 | 18 | <80 | Least Concern | | The most severe decline in the range of this species occurred through the 19th and 20th centuries (Kerney, 1999), but there has still been localised decline over the last 10 years. <i>Segmentina</i> occupies small ecotones and is vulnerable to declining quality of habitat. Whilst currently not threatened, this species should be kept under review and its status upgraded if there is evidence of increased rates of population loss | NS |
| <i>Selenochlamys ysbryda</i> | Testacellidae | 0 | 0 | 17 | | Data Deficient | | This recently described species is possibly an introduction to the UK although Rowson & Symondson (2008) could not exclude the possibility that the species is native. It is difficult to evaluate due to its subterranean habit. The species is currently rare, with confirmed sites in gardens, churchyards and lanes. The lack of any known native area means that these are the sole known sites for this species globally. | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|----------------------------|-------------|--------------------------|--------------------------|-----------------------|---------------------|------------------------------|------------------|---|------------------|
| <i>Spermodea lamellata</i> | Vallonidae | 100 | 87 | 35 | | Least Concern | | Still widespread throughout its main range of Wales, N England and Scotland, although there has been a steady decline in records. At least in part this is likely to be due to reduced recording effort but the status of this species should be monitored to determine the rate of decline | |
| <i>Sphaerium corneum</i> | Sphaeriidae | c300 | c400 | c450 | | Least Concern | | Still widespread in Britain. Some evidence of local regional decline in south-east and northern England, and Scotland, but may be an artefact of lack of recording effort. | |
| <i>Sphaerium nucleus</i> | Sphaeriidae | 0 | 1 | 13 | | Data Deficient | | This species was not recognized in GB until 2004, hence there is insufficient data to make a conservation assessment. | |
| <i>Sphaerium rivicola</i> | Sphaeriidae | 37 | 30 | 21 | | Least Concern | | Declining populations, but the species is still widespread and the level and speed of decline does not merit Red Listing at present. However, this could be reconsidered on the basis of future prospects and its lower pollution tolerance. | |
| <i>Sphaerium solidum</i> | Sphaeriidae | 4 | 2 | 4 | 38 | Critically Endangered | B2ab (ii,iii,iv) | Originally known from two river systems and surveys in early 2000s showed a near total collapse of populations on the River Witham system over a 10-15 year timescale. This population is considered possibly extinct (Willing, pers. comm, 2011). There is still one population located on New Bedford River (Willing, 2007). The species qualifies for Critically Endangered listing based on AoO (Under 100 km ²), single location, and threats from habitat declining due to eutrophication and impact of non-native species. | NR |
| <i>Stagnicola fuscus</i> | Lymneidae | 39 | 39 | 72 | | Least Concern | | Recent segregate records indicate that <i>S. fusca</i> is much the commoner of the 2 taxa within the <i>Stagnicola</i> complex currently recognised in Britain (Killeen, pers. comm., 2011) | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|-------------------------------|---------------|--------------------------|--------------------------|-----------------------|---------------------|-----------------------|----------|---|------------------|
| <i>Stagnicola palustris</i> | Lymneidae | n/a | n/a | n/a | | Data Deficient | | Recent segregate records indicate that <i>S. palustris</i> is much the rarer of the 2 taxa within the <i>Stagnicola</i> complex currently recognised in Britain (Killeen, pers. comm., 2011) | |
| <i>Succinea putris</i> | Succineidae | c230 | c500 | c350 | | Least Concern | | Widespread species with no evidence of significant decline. | |
| <i>Succinella oblonga</i> | Succineidae | 16 | 7 | 5 | 20 | Vulnerable | D2 | This species has a restricted range in Great Britain with only 7 hectads which postdate 1975 and of these only 5 postdate 2000. All these locations are widely separated and as such the species is a candidate for Vulnerable, as the area of occupied habitats at these sites is often very small and vulnerable to disturbance | NR |
| <i>Tandonia budapestensis</i> | Milacidae | c250 | c500 | c450 | | Least Concern | | Widespread and increasing throughout Britain | |
| <i>Tandonia rustica</i> | Milacidae | n/a | n/a | 2 | | Data Deficient | | This species is only known only from a single site in Kent, on which basis it would qualify as CR under EoO and AoO, and an unconfirmed record from Greater London. However, its status as a native species is unclear and has been evaluated as Data Deficient until more information is available. | |
| <i>Tandonia sowerbyi</i> | Milacidae | c90 | c240 | c130 | | Least Concern | | Widespread and probably increasing throughout Britain | |
| <i>Testacella haliotideia</i> | Testacellidae | 37 | 32 | 7 | | Least Concern | | The species is possibly an introduction, but was listed as a possible resident in the last Red List (Bratton, 1991). This species has a cryptic lifestyle living underground, hence it is difficult to assess the range as it is under-recorded. Largely present in gardens, except in SW England (Kerney, 1999). At present the data are inadequate for evaluating trend | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|------------------------------|---------------|--------------------------|--------------------------|-----------------------|---------------------|-----------------------|----------|--|------------------|
| <i>Testacella maugei</i> | Testacellidae | 48 | 27 | 10 | | Least Concern | | The species is possibly an introduction, but was listed as a possible resident in the last Red List (Bratton, 1991). This species has a cryptic lifestyle living underground, hence it is difficult to assess the range as it is under-recorded. At present the data is inadequate to determine if the species meets the criteria for Red Listing, but the consensus of opinion suggests it is likely to be Least Concern or if introduced, then Not Applicable. | |
| <i>Testacella scutulum</i> | Testacellidae | 79 | 62 | 10 | | Not Applicable | | The species was listed as naturalised in last Red List (Bratton, 1991). This species has a cryptic lifestyle living underground, hence it is difficult to assess the range. It may also be taxonomically data deficient, given comments on relationship to <i>T. haliotidea</i> (Kerney, 1999). | |
| <i>Theba pisana</i> | Helicidae | 7 | 20 | 13 | | Not Applicable | | An accidental introduction in 19th century becoming widespread in SW England and south Wales (Cameron & Killen, 2001). | |
| <i>Theodoxus fluviatilis</i> | Neritidae | 263 | 251 | 336 | | Least Concern | | Still widespread within its known range in Britain. Probably stable but may possibly be declining. | |
| <i>Trochoidea elegans</i> | Helicellidae | 4 | 3 | 1 | | Not Applicable | | 19th century introduction. As a non-native species it does not merit a Threat Status. | |
| <i>Trochulus hispidus</i> | Hygromidae | c600 | c1500 | c800 | | Least Concern | | Widespread species with no evidence of significant decline. | |
| <i>Trochulus sericeus</i> | Hygromidae | c70 | c75 | 24 | | Least Concern | | Widespread species within its range with no evidence of decline. | |
| <i>Trochulus striolatus</i> | Hygromidae | c600 | c800 | c1000 | | Least Concern | | Widespread species with no evidence of significant decline. | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|----------------------------------|----------------|--------------------------|--------------------------|-----------------------|---------------------|------------------------|-----------|---|------------------|
| <i>Truncatella subcylindrica</i> | Truncatellidae | 14 | 14 | 4 | | Near Threatened | B2b(ii) | Whilst many former sites have been lost, several new sites have also been discovered. The NBN shows a decline from 27 hectads historically to 4 current hectads. However, this species is undoubtedly under-recorded, although it is presumed it is close to VU B2a. The species often lives in a highly cryptic habitat, which is vulnerable to destruction, with an extremely small AoO and current threats due to shingle management and storm surges. | NR |
| <i>Truncatellina callicratis</i> | Vertiginidae | 12 | 8 | 5 | | Near Threatened | B2b(iii) | This species has a restricted range, with a small AoO under the threshold for Vulnerable, however the populations at the known sites are stable and the number of sites is currently considered to exceed 10. Hence the species is listed as Near Threatened due to the threats of habitat loss through quarrying and changing land-use management. | NR |
| <i>Truncatellina cylindrica</i> | Vertiginidae | 4 | 6 | 7 | 28 | Vulnerable | B2ab(iii) | The species has an AoO less than 500km ² and 7 locations, with losses from 11 hectads through the last century. The specific threats to the species are changes in grassland management and disturbance of banks. | NR |
| <i>Unio pictorum</i> | Unionidae | 164 | 104 | 45 | | Least Concern | | This species is still widespread throughout its range, however the number of hectads for this species declined by 36% between 1979 and 1999. If populations continue to be lost and there is evidence to show that zebra mussels are a significant threat, then the status of this species will need to be upgraded. | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|----------------------------|------------|--------------------------|--------------------------|-----------------------|---------------------|----------------------|-----------|---|------------------|
| <i>Unio tumidus</i> | Unionidae | 57 | 34 | 25 | | Least Concern | | This species is still widespread across its range, however the number of hectad records for this species has declined by over 50% since 1960. If populations continue to be lost and there is evidence to show that zebra mussels are a significant threat, then the status of this species will need to be upgraded. | |
| <i>Vallonia costata</i> | Vallonidae | 160 | 280 | 125 | | Least Concern | | Still widespread within its known range in Britain, but there is some evidence of some regional and local decline. | |
| <i>Vallonia excentrica</i> | Vallonidae | c300 | c500 | c250 | | Least Concern | | Widespread species with no evidence of any significant decline. | |
| <i>Vallonia pulchella</i> | Vallonidae | c450 | c400 | 41 | | Least Concern | | Still widespread within its known range in Britain, but there is evidence of some regional and local decline. | |
| <i>Valvata cristata</i> | Valvatidae | c800 | c700 | c200 | | Least Concern | | Still widespread and common, with some losses in southern England due to habitat destruction. Overall, the British population is believed to be currently stable. | |
| <i>Valvata macrostoma</i> | Valvatidae | 42 | 20 | 9 | 36 | Vulnerable | B2ab(iii) | This species has always been rare with a fragmented range and exists in several small sub-populations where sites are severely threatened by poor ditch management and decline in water quality. There has been a decline of c. 70% over the last 4 decades, such that the species meets the B2 criteria for listing. | NR |
| <i>Valvata piscinalis</i> | Valvatidae | c750 | c800 | c210 | | Least Concern | | Still widespread and common. | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|----------------------------|--------------|--------------------------|--------------------------|-----------------------|---------------------|----------------------|-----------|---|------------------|
| <i>Ventrosia ventrosa</i> | Hydrobiidae | 49 | 60 | 17 | | Least Concern | | Widely scattered range with the majority of records from North Sea and English Channel coasts. Low recording due to marginal habitats and difficulty with identifications, but probably stable. Vulnerable to habitat loss, and hence localised declines observed in southern England. | NS |
| <i>Vertigo alpestris</i> | Vertiginidae | 32 | 38 | 18 | | Least Concern | | Still widespread within its localised range in Lake District, Yorkshire, north Wales and central Scottish Highlands. There is evidence of recent decline but more data are required to establish whether there is an ongoing decline, as only slight declines were observed in earlier decades. | NS |
| <i>Vertigo angustior</i> | Vertiginidae | 9 | 9 | 25 | 100 | Vulnerable | B2ab(iii) | This species has a highly fragmented population over Britain. Although the species is known from over 60 sites, some of these are closely adjacent and occupy a very narrow (and vulnerable) ecotone. Within the strongholds, there are a number of sub-populations, which occur in narrow fringes along the sea-walls and estuaries and are likely to be highly vulnerable to even small rises in sea levels. This threat applies to most of the British population and hence qualifies the species under B2a. Inland sites are vulnerable to habitat change, such as scrub encroachment and changes in site hydrology and use of herbicides. Hence a listing of Vulnerable B2ab(iii) is appropriate given the threats to the habitat, which need careful and active management to retain favourable Threat Status | NS |
| <i>Vertigo antivertigo</i> | Vertiginidae | c600 | c400 | 82 | | Least Concern | | Still widespread in Britain. Some significant local and regional declines, but there is insufficient evidence to show there has been a 30% decline in distribution within the past 10 years. | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|---------------------------|--------------|--------------------------|--------------------------|-----------------------|---------------------|------------------------|----------|--|------------------|
| <i>Vertigo genesii</i> | Vertiginidae | 4 | 7 | 5 | 20 | Near Threatened | B2a | This species has an extremely restricted range in Great Britain, found in less than 10 locations ranging from the Yorkshire Dales to northern Scotland. However, individual flushes within a site are fragmented. The species lives in a very narrow ecotone that is vulnerable to stochastic damage and these montane flushes are also particularly vulnerable to climate change. | NR |
| <i>Vertigo geyeri</i> | Vertiginidae | 12 | 18 | 27 | 108 | Near Threatened | | This species lives in very narrow (and highly vulnerable) ecotones. The individual flushes where the species is found are often only a few square metres in area. Although not known to have disappeared from any sites in the UK in the last 25 years, most of these are maintained under active site management schemes to protect the species, as the habitat is particularly vulnerable to changes in grazing, as well as being vulnerable to climatic pattern changes altering the hydrogeology of the site. As such <i>V. geyeri</i> is regarded as Near Threatened on the basis of being Conservation Dependent | NS |
| <i>Vertigo liljeborgi</i> | Vertiginidae | 25 | 18 | 5 | | Near Threatened | B2b(ii) | This species has an extremely restricted range in Great Britain, known from under 20 sites, in highland areas that are extremely vulnerable to habitat disturbance due to upland grazing improvements and changing water levels around reservoirs (Kerney, 1999). The species has an AoO that meets the limit for Vulnerable B2, but is known from more than 10 widely scattered sites. The rate of decline is uncertain, as these sites are remote and survey data is probably inadequate over the last 10 years. | NS |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|----------------------------|--------------|--------------------------|--------------------------|-----------------------|---------------------|----------------------|-----------|--|------------------|
| <i>Vertigo modesta</i> | Vertiginidae | 1 | 2 | 1 | 8 | Endangered | B2ab(iii) | This species has an extremely restricted range in Great Britain, known from two sites, in small areas of habitat that are extremely vulnerable to future habitat decline as result of any disturbance to the site. Possible threats include climate change as well as change in land-use management (grazing, fire) and localized disturbance such as sampling. | NR |
| <i>Vertigo moulinsiana</i> | Vertiginidae | 66 | 50 | 37 | 41 | Vulnerable | A2abc | National decline of this species is difficult to assess as targeted surveys over the last 15 years have resulted in many additional sites being discovered, but this is not considered to be due to the spread of the species. Population declines over the last 10 years are evident from parts of the range in Berkshire, Norfolk, Hampshire and Wiltshire. Population declines of over 50% have been observed recently in the Kennet & Lambourn SAC (Tattersfield & Killeen, 2006, Tattersfield pers. comm, 2010) and up to 64% in the Avon SAC (Willing, pers. comm., 2011). Whilst some of these declines are due to loss of habitat in both SAC's there has also been loss from sites with ideal habitats. The species is known to be subject to extreme fluctuations and, as a consequence, damaging activities during certain points in the life cycle may have far more impact and cause local extinctions at micro-sites. As a consequence, based on the population crashes at two well monitored sites, the species is listed as Vulnerable | NS |
| <i>Vertigo pusilla</i> | Vertiginidae | 77 | 83 | 23 | | Least Concern | | Still widespread within its range in Britain. Some local and regional decline, particularly in southern and central England. Probably under-recorded, particularly in less calcareous habitats. At present, the level of decline (c.15% each decade) means the species does not fulfil the A criteria for Red Listing. | NS |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|----------------------------|--------------|--------------------------|--------------------------|-----------------------|---------------------|----------------------|----------|---|------------------|
| <i>Vertigo pygmaea</i> | Vertiginidae | c1000 | c1000 | c250 | | Least Concern | | Widespread throughout Britain. The species range has declined slightly in the Midlands and parts of Scotland | |
| <i>Vertigo substriata</i> | Vertiginidae | c550 | c600 | 82 | | Least Concern | | Still widespread in Britain. Some local and regional decline, particularly in southern and central England. Probably under-recorded. At present, the level of decline (10% each decade) means the species does not fulfil the A criteria for Red Listing. | |
| <i>Vitrea contracta</i> | Zonitidae | c2500 | c2500 | c270 | | Least Concern | | Widespread, with no evidence of decline. | |
| <i>Vitrea crystallina</i> | Zonitidae | c2500 | c2700 | c250 | | Least Concern | | Widespread, with no evidence of decline. | |
| <i>Vitrea subrimata</i> | Zonitidae | 22 | 14 | 8 | | Least Concern | | This species has a restricted range in Great Britain and is a cryptic species due to a partially subterranean habit. The evaluation of this species as Least Concern rather than Near Threatened is due to the relative lack of threats to the known habitats and the density and presence of over 50 sites in the region (A. Norris, pers. comm., 2010). | NS |
| <i>Vitrina pellucida</i> | Vitrinidae | c3200 | c3200 | c500 | | Least Concern | | Widespread, with no evidence of decline. | |
| <i>Viviparus contectus</i> | Viviparidae | 53 | 44 | 18 | | Least Concern | | Believed to be still widespread in Britain, but there is strong evidence of regional and local decline (nearly 40% prior to 1960's), with similar levels of decline in following recording periods. | NS |
| <i>Viviparus viviparus</i> | Viviparidae | 86 | 75 | 55 | | Least Concern | | Still widespread within its known range in Britain. Available data suggests the species is locally stable but considered to be in slow decline. | |

| Species | Family | AoO Hectads 1960 to 1979 | AoO Hectads 1980 to 1999 | AoO Hectads 2000-2012 | AoO Km ² | GB IUCN Status | Criteria | Notes on Rationale for listing | GB Rarity Status |
|--------------------------------|------------|--------------------------|--------------------------|-----------------------|---------------------|----------------------|----------|---|------------------|
| <i>Zenobiella subrufescens</i> | Hygromidae | c600 | c600 | c150 | | Least Concern | | Still widespread within its known range in Britain. Long term decline nationally (c. 20% prior to 1965) and some recent local and regional decline in eastern England. However, most populations believed to be relatively stable and thus, at present, the species does not fulfil the criteria for Red Listing. Britain holds a substantial part of the known global range. | |
| <i>Zonitoides excavatus</i> | Zonitidae | 496 | 460 | 114 | | Least Concern | | Still widespread within its known range in Britain. Some local and regional decline, but at present does not fulfil criteria for Red Listing | |
| <i>Zonitoides nitidus</i> | Zonitidae | c1000 | c1200 | c100 | | Least Concern | | Widespread species with no evidence of significant decline. | |



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