

Draft R&D Note R&D Project 461

Species Management in Aquatic Habitats

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SPECIES MANAGEMENT IN AQUATIC HABITATS

Phase 1 - Development of priority lists of rare and nuisance species

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EXECUTIVE SUMMARY

The NRA has in the past generally adopted a habitat maintenance and protection approach to conservation, with on the whole less attention directed at individual species. There is a risk that conservation based on a habitat management policy alone will not further the conservation of certain rare species. In addition, certain 'nuisance' species cause problems for conservation by having a negative impact on more valued species or ecosystems. This project was initiated as part of a programme of research to develop strategies for the management of both rare and nuisance species.

Through the combination of the review of current legislation and literature and consultation with NRA staff, this project identified key rare and nuisance species of interest to the NRA and prioritised research needs to develop conservation strategies for these species.

A combined provisional list of almost a thousand rare species of potential interest was developed by a process of literature review and from suggestions by NRA conservation staff. Selection criteria were identified and applied to produce a priority list of 58 species (and one species group). Terms of reference were drawn up for further research to develop conservation strategies for these species, either centred on individual species or species groups. A further four would-be priority species and one species group were already the subject of current or recent NRA R&D initiatives.

A provisional list of nuisance species was similarly produced and selection criteria identified. A priority list of nine nuisance species was produced. Existing NRA R&D initiatives were already addressing all but two of the key problem species identified in the project.

KEYWORDS

Conservation, species management, rare species, nuisance species.

1. INTRODUCTION

The NRA has a statutory duty, under Section 16 the Water Resources Act 1991 and Section 12 of the Land Drainage Act 1991, to further the conservation of fauna and flora through all regulatory, operational and advisory activities. The duty has predominantly been addressed through mechanisms of sympathetic management of the physical habitat and plant communities, focused largely at flood defence activities, and ecosystem protection through the enforcement of general water quality standards. Other relevant activities have included sponsorship of, or collaboration on, projects aimed at improving ecological knowledge and management.

There is no doubt that the current NRA practices of focusing on habitats and the wider ecological community yield substantial conservation benefits in terms of biological diversity and abundance. However, to date there has been little attention directed at the management of individual species, which may have some considerable influence on the successful conservation of ecosystems. Two groups of organisms which have a great bearing on the conservation value of a community are rare or endangered species, which have a positive effect on conservation value, and nuisance species, which have a negative impact. In addition, nuisance species may also affect the performance of management duties other than conservation, such as flood defence.

There is an urgent need to place the management of key species into a strategic national framework, in order that species management activities may be prioritised both temporally and geographically. This would enable resources to be targeted at areas and times at which they would be most effective, and minimise any duplication of effort caused by lack of awareness of other initiatives, particularly the Species Recovery Programme of English Nature (EN).

The present study was commissioned as part of a programme of research towards developing management strategies for priority rare and nuisance species. It represents Phase 1 of a two phase programme. In essence, this report considers and identifies appropriate criteria for the identification and selection of priority rare and nuisance species and outlines the research required in a second phase to develop detailed species management options.

2. OBJECTIVES

2.1 Programme objective

The overall objective of the programme of research, of which this report is one element, is:

To formulate practicable conservation and management strategies for rare and nuisance species relevant to NRA duties and activities in order to comply with relevant legislation.

2.2 Project objectives

The objectives for this element, Phase 1, of the research programme are to:

1. Identify species management issues with implications for NRA operational activities and conservation duties.
2. Establish criteria for inclusion in a prioritised listing of species requiring management/control.
3. Identify species for which development of a practicable management/control strategy is possible and the implementation of which has a reasonable likelihood of success.
4. Prepare a prioritised programme for the development of such strategies.
5. Prepare draft terms of reference for subsequent projects to address the formulation of strategies for the management/control of appropriate species.

3. RARE SPECIES

For the purposes of species management by the NRA, 'key threatened or rare species' are likely to include a subset of nationally rare species. The NCC (1989) defined species rarity as:

the proneness to extinction, and this concept is expressed in the variety of terms (endangerment, vulnerability, threat etc.) which are adopted in Red Data Book treatments and in legislation for the special protection of nationally rare species (Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981).

The priorities of species lists such as these schedules and those of Red Data Book (RDB) species are not necessarily the most appropriate for the purposes of species management within the NRA for a number of reasons:

- (a) The basis of the lists is rarity or threat on a national basis (i.e. England, Wales and Scotland), and species are not necessarily of relevance to England and Wales alone, the area of NRA jurisdiction.
- (b) The lists include species that are obviously not aquatic or associated with marginal or other habitats of relevance to NRA activities.
- (c) The relevance of species to the NRA is tempered by the threats of particular NRA activities and how dependent the species are on affected habitats
- (d) Seemingly relevant species may be occasional vagrants in England and Wales.

Further species that are not necessarily identified by traditional rarity or threat criteria may be of particular interest to the NRA.

3.1 Methods

To identify the key species of interest to the NRA a 3-stage approach was used, that of:

1. Development of a provisional lists of rare species.
2. Development of selection criteria.
3. Application of selection criteria to produce a priority species list.

For each of the priority species (or species group), terms of reference to develop species management strategies were produced.

3.1.1 Provisional list of rare species

Information sources identifying species as 'rare' or 'threatened' were examined to derive a provisional list of over-950 species. The sources used, which are listed in the References and Extended Bibliography, included legislation, the available literature and unpublished

outputs from relevant R&D. The resolution of information on the status of species was not consistent across groups, being dependent on the readily available information.

In essence, the species selected for the provisional list were:

- protected by statutory means (i.e. WCA 1981), or
- identified as threatened or rare (e.g. listed in relevant EC Directives, Red Data Books, International Conventions) **and** reported to be associated with habitats considered to be relevant (rivers, still waters, estuaries, coasts and their margins) in England and Wales, the area of NRA jurisdiction.

The detailed criteria for the selection of species are given in Table 3.1. Some species were excluded on the basis that they were identified in source texts as threatened through exploitation/trade or were vagrant/extinct.

In addition to the species identified from the literature, further species were suggested during consultation with NRA staff.

3.1.2 Development of selection criteria

Selection criteria were developed in consultation with relevant NRA staff. A consultation exercise, largely questionnaire¹ based, identified habitats of particular importance with respect to NRA activities and conservation priorities.

3.1.3 Application of selection criteria to produce a priority species list.

The criteria developed were applied to produce a priority species list. Draft terms of reference to develop strategies for each species or species group were then produced.

3.2 Results

3.2.1 Provisional rare species list

The provisional list of over 950 rare species is presented as Appendix A with notes explaining the abbreviations used. Table 3.2 summarises the availability of information sources (as at September 1993) and gives the number of species in each group that appear in the provisional species list.

¹ Questionnaires were distributed to staff representing each of the former 10 regions and to Head Office.

Table 3.1 Criteria for provisional list of threatened species

Criteria for the inclusion of species

1) Legislation/rarity/threat

EC Habitats Directive	Annex II - designation of protected areas for species Annex IV - special protection of plant and animal species
Berne Convention	Appendix I - strict protection for plant species Appendix II - strict protection for animal species and habitats
Bonn Convention	Appendix I - strict protection of migratory species Appendix II - multilateral agreements between Range States for the conservation and management of migratory species
Wildlife and Countryside Act 1981	Schedule 1 - special protection for birds Schedule 5 - special protection for animal species (other than birds) Schedule 8 - special protection for plant species
Red Data Books	RDB 1,2,3, I and K for aquatic species or species associated with aquatic habitats (and provisional RDB listings in NCC reports and JNCC reviews).
Aquatic Flora Database	Species covered by the database (aquatic vascular plants) that have been identified as nationally rare or scarce on the basis of post-1970 records
Species Acts	Badger, Seal Acts

2) Distribution

England and Wales

3) Habitats included

Running waters (and margins) - canal, dyke, ditch, river, small stream or trickle, stream

Still waters (and margins) - lake, pond, pool, reservoir

Wet terrestrial habitats - boggy heath, bog, fen, flood meadow, marsh, wetland

Coastal habitats (and margins) - sand dune, dune slacks, estuary, inshore and intertidal waters (fish), offshore, sea cave, saline lagoon, saltmarsh, sea wall

1) Legislation/rarity/threat

Red Data Books	RDB Birds not listed in other categories (WCA 1981, Berne, EC Directive).
EC Habitats Directive	Annex V - exploitation of animal and plant species to be subject to management
Berne Convention	Appendix III - exploitation of animal species to be subject to regulation
CITES	Applies to trade in endangered species (whales, porpoises, dolphins, walrus, otter, stoat, wildcat, turtles, sturgeon, medicinal leech, Apollo butterfly, various plants)
Wildlife and Countryside Act 1981	Schedule 6 - animals (other than birds) which may or may not be killed or taken by certain methods Schedule 9 - established animal and plant species for which release to the wild is prohibited without a licence

Other specific Acts, e.g. Deer Act

Species listed in relevant schedules, annexes and appendices but considered as 'probably vagrant' (i.e. various bat, whale, seal and turtle species, a butterfly and a moth)

Species listed in relevant annexes and appendices but considered as 'established aliens' (i.e. a porcupine, goat, terrapin, lizard, snake, newt, fish and plant species and two toad and frog species).

Various species listed in relevant annexes and appendices but considered 'extinct' (i.e. a beetle and two plant species)

2) Habitats excluded

Flushes, coastal cliffs and sandhills

Notes:

JNCC Joint Nature Conservation Committee
NCC Nature Conservancy Council

Table 3.2 Information available on species rarity and numbers of species identified in each group on provisional species list

Group	Information Sources				No. Spp. listed in Appendix A
	Legislation W&C Act Schedules 1, 5 & 8	Publications Red Data Books	NCC/JNCC reviews	River Margin spp. ¹	
PLANTS					
Algae	* ³	* ²			16
Mosses	*		* ⁵		24
Liverworts	*		* ⁵		9
Lichens	*		* ⁵		26
Vascular Plants	*	*	* ⁴		175
ANIMALS					
Invertebrates					
Annelida:					
Polychaeta	*	*			2
Hirudinea	*	*		*	2
Arachnida	*	*		*	34
Bryozoa	*	*		*	2
Coelenterata	*	*			3
Crustacea	*	*		*	9
Insecta:					
Coleoptera	*	*	*	*	208
Diptera		*	*	*	132
Ephemeroptera		*	*	*	4
Hemiptera	*	*	*	*	33
Hymenoptera		*			6
Lepidoptera	*	*		*	49
Neuroptera			*	*	0
Odonata	*	*	* ⁵	*	21
Orthoptera	*	*			5
Plecoptera			*	*	2
Trichoptera		*	*	*	34
Mollusca	*	*		*	26
Myriapoda		*			1
Nemertea		*			1
Platyhelminthes		*			0
Vertebrates					
Fish	*	* ⁶	* ⁷		17
Amphibians	*				6
Reptiles	*				6
Birds	*	*			105
Mammals	*	IP			38

Notes for Table 3.2

- * Information available
- 1 As identified by Ball (undated) RDB, pRDB and Notable categories given
- 2 R&D Project 352
- 3 Charophytes
- 4 Palmer and Newbold (1983) - 'Wetland and Riparian Plants in Great Britain' - now largely superseded by Aquatic Flora Database.
- 5 SSSI guidelines give details of species rarity
- 6 Provisional RDB categories allocated to estuarine/marine species by Swaby and Potts (1991)
- 7 Freshwater species reviewed by Maitland and Lyle (1991), estuarine/marine species by Swaby and Potts (1991)
- IP In preparation by The Mammal Society

Identification of species management issues

The consultation process identified that the main concerns regarding species were their rarity, the impact of NRA activities directly upon species or indirectly through impacts on their habitats.

The need was recognised to promote the conservation of species protected under national and international legislation (i.e. WCA Schedules and EC Directives respectively), and rare species (i.e. Red Data Book species) as a primary issue.

It was not reasonably possible, nor a sensible use of resources to attempt to gauge the direct impact of NRA activities for each species on the provisional list. However, to some extent the consultation process identified species regarded as priorities for the second phase of the project on account of their vulnerability to NRA activities. NRA activities may have both negative and positive effects. For instance, flood defence operations clearly have the potential for direct damaging effects, although careful design can often reduce the impact and may even bring net benefits to the environment. Indirect activities such as issuing consents for discharges and abstraction may have important consequences for conservation through water quality and quantity.

The importance and vulnerability of habitats to NRA activities were assessed during consultation with NRA staff. The most important habitats for NRA conservation were felt to be river margins, rivers, stream margins, followed by wetlands, streams, ponds, flood meadows and small stream or trickle margins (Table 3.3). Marine, bog and canal habitats were generally regarded as of low importance, although saltmarshes and estuaries were quite highly rated. The table indicates the habitat codings used in the provisional list. Some similar habitat types were ascribed the same habitat codes for convenience. The evaluation of the degree of threat was based on a more limited response than the evaluation of the importance of habitat, and therefore may be a less representative view. The habitats considered most threatened were streams and saltmarshes, followed by rivers, river and stream margins, ponds and pond margins, flood meadows, wetlands, inshore and offshore waters and sea walls.

Table 3.3 Relative importance of habitat types to NRA conservation and threat from NRA activity

Habitat	Habitat Code used in provisional list	Rank ¹	Threat ²
Running waters			
canal	D	28	neg.
ditch/dyke	D	16	low
river	R	2	mod.
stream	R	5	high
small stream or trickle	St	9	low
canal margins	DM	28	neg.
ditch/dyke margins	DM	12	low
river margins	RM	1	mod.
stream margins	RM	3	mod.
small stream/ trickle margins	StM	8	low
Still waters			
lake	L	21	low
pond	L	6	mod.
pool	P	21	neg.
lake margins	LM	27	neg.
pond margins	LM	13	mod.
pool margins	P	21	neg.
Wet terrestrial habitats			
boggy heath	Bog	25	low
bog	Bog	19	low
fen	Wt	18	low
flood meadow	FM	7	mod.
marsh	Wt	16	low
wetland	Wt	4	mod.
Coastal habitats			
sand dune	Du	30	neg.
dune slacks	DS	30	neg.
estuary	E	9	low
estuary margins	EM	14	low
coastal margins	CM	26	low
inshore an inter- tidal waters (fish)	MIt	24	mod.
offshore	Moff	32	mod.

Table 3.3 continued

Habitat	Habitat Code used in provisional list	Rank ¹	Threat ²
sea cave	SC	33	neg.
saline lagoon	SL	19	low
saltmarsh	SM	9	high
sea wall	SW	14	mod.

Notes:

- 1 Lowest rank is the most important habitat.
- 2 On the basis of the number of yes/no responses (3 respondents), negligible (neg.), low, moderate (mod.) and high degrees of threat were assigned.

Development of criteria for prioritised species listing

From consultations it was ascertained that different criteria should not generally be identified to different species groups, although it was felt that a criteria of public perception would only be applicable to certain groups (notably vertebrates and vascular plants). Species of established rarity were considered a priority. Other criteria of importance were species threatened by NRA activity, and those utilising threatened or important habitats.

3.3 Further development of selection criteria and priority rare species

Criteria were applied to the provisional list of 997 species as described below. The effect of the criteria on the numbers of species is indicated in Table 3.4.

- listed as rare or threatened (RDB1, RDB2, RDB3, WCA1, WCA5, WCA8) and associated with the priority habitats
- or
- proposed by more than one respondent as either a priority species or an addition to the provisional list.

This had the effect of reducing the list to rare species associated with habitats of higher priority (i.e. river margins, rivers, stream margins and streams) and to the those species suggested by more than consultee and therefore likely to be of national interest, rather than regional interest alone. It was not possible to eliminate species associated with streams *per se*, a habitat of lower priority than rivers, due to the common habitat coding (R) used in the formulation of the provisional list. Some of the lower priority habitats are the subject of existing NRA R&D initiatives (i.e. wetlands, Project Ref 472; coastal areas,

Project Ref). In addition, many species of the species utilising such habitats are likely to be may be adequately conserved by a general habitat management approach, perhaps targeted at the locations of rare species.

The criterion

- species that are currently not believed to be extinct

removed a number of species (the beetle *Rhyssalus germanus*; dragonflies *Coenagrion armatum*, *C.-scitulum* and *Oxygastra curtisii*; stonefly *Isoperla obscura*; caddis flies *Hydropsyche bugaromanorum* and *H. exocellata*; and burbot *Lota lota*) that are currently believed to be extinct and thus difficult to conserve without re-introduction. Re-introductions would normally be co-ordinated (and certainly licensed) by the JNCC, EN and/or the Countryside Council for Wales.

The criterion

- species not the subject of species or group-specific research (i.e. EN Species Recovery Programme, NRA research)

had the effect of removing the species currently recently the subject of research (i.e. invertebrates of exposed sediments, otter, natterjack toad, coregonids, and crayfish). However, further research or strategy development may be required for some of the species eliminated by this criterion, such as the otter and crayfish.

Table 3.4 The effect of applying successive criteria on the numbers of species provisionally selected

Criteria applied	Number of species remaining
Provisional list of 960 species (Appendix A)	997
Species on provisional list associated exclusively with the priority habitat types (i.e. river margins, rivers, stream margins and streams) or recommended by more than one consultee	154
Species not extinct	146
Species not subject to current NRA/EN research	111
High public perception	59
Species not widespread and common	58

The criterion

- high public perception was applied.

This was very subjective, but was based on the impression of the author that there may be little public interest in the following:

- beetles, other than in the water beetles
- flies
- stoneflies
- caddis flies
- snails
- moss
- lichen

The application of the criterion

- Species is not widespread and common

removed the bulhead from the list as it is a relatively widespread species. The resulting list of 58 species (and one species group) recommended for attention in phase 2 is listed in Table 3.5. The research requirements for these priority species were assessed and the research needs given as a basis for a terms of reference as Appendix B. In this appendix some species are grouped according to related research needs or rather more pragmatic units of research.

Table 3.5 Recommended final list of rare species for Phase 2

Species		
Leeches	Vor <i>Hirudo medicinalis</i>	Medicinal Leech
Water beetles	A <i>Hydraena pulchella</i> ST, Wh <i>Macronychus quadrituberculatus</i> " " <i>Normandia nitens</i>	
Mayflies	T, " " <i>Ephemera lineata</i> Heptagenia longicauda A?, T, WX <i>Paraleptophlebia werneri</i> NW, T, Wh <i>Potamanthus luteus</i>	
Moths	NW, Wh <i>Eustroma reticulatum</i>	Netted carpet
Dragonflies/damselflies	A <i>Aeshna isosceles</i> S, Wh <i>Coenagrion hastulatum</i> ? <i>Coenagrion mercuriale</i> ? <i>Cordulia aenia</i> ? <i>Ischnura pumilio</i> A, S <i>Lestes dryas</i> ? <i>Libellula fulva</i> ? <i>Somatochlora arctica</i>	Norfolk Aeshna Dragonfly Northern coenagrion/damselfly Southern coenagrion/damselfly Downy emerald Scarce bluetail damselfly Scarce emerald Scarce chaser Northern emerald
Molluscs	Z <i>Margaritifera margaritifera</i>	Freshwater Pearl Mussel
Fish	S, Wh <i>Alosa alosa</i> Vor <i>Alosa fallax</i> Vor <i>Cobitis taenia</i> ? <i>Lampetra fluviatilis</i> ? <i>Lampetra planeri</i> ? <i>Petromyzon marinus</i> ✓ <i>Salmo salar</i>	Allis Shad Twaite shad Spined loach River lamprey Brook lamprey Sea lamprey Salmon
Amphibians	✓ <i>Bufo bufo</i> ✓ <i>Rana temporaria</i> ✓ <i>Triturus cristatus</i> ✓ <i>Triturus helveticus</i> ✓ <i>Triturus vulgaris</i>	Common Toad Common Frog Great Crested (Warty) Newt Palmate Newt Smooth Newt
Reptiles	✓ <i>Natrix natrix</i> (<i>Natrix helvetica</i>)	Grass Snake

Table 3.5 continued

Species

Birds	<p>SE <i>Acrocephalus palustris</i> Var <i>Alcedo atthis</i> A, E, W <i>Botaurus stellaris</i> ? <i>Cettia cetti</i> ✓ <i>Cinclus cinclus</i> ✓ <i>Motacilla cinerea</i> ✓ <i>Motacilla flava</i> ? <i>Panurus biarmicus</i> ✓ <i>Riparia riparia</i> Var <i>Tyto alba</i></p>	<p>Marsh warbler Kingfisher Bittern Cetti's warbler Dipper Grey wagtail Yellow wagtail Bearded tit Sand martin Barn owl</p>
Mammals	<p>✓ <i>Arvicola terrestris</i> ? <i>Delphinus delphis</i> ? <i>Halichoerus grypus</i> Var <i>Myotis daubentonii</i> ? <i>Myotis mystacinus</i> ? <i>Myotis natterii</i> ✓ <i>Neomys fodiens bicolor</i> Var <i>Nyctalus noctula</i> ? <i>Phoca vitulina</i> ? <i>Phocaena phocaena</i> ? <i>Plecotus auritus</i> ? <i>Plecotus austriacus</i></p>	<p>Water vole Common dolphin Grey seal Daubenton's bat Whiskered bat Natterers's bat Water shrew Noctule (bat) Common seal Harbour porpoise Brown long-eared bat Grey long-eared bat</p>
Vascular Plants	<p>N, W, W, Y <i>Eleocharis austriaca</i> Var <i>Pilularia globulifera</i> T, W, X <i>Potamogeton nodosus</i> S, SW, W <i>Scirpus holoschoenus</i> A, S, SW, T <i>Scirpus triquetrus</i> (= <i>Schoenoplectus triquetrus</i>)</p>	<p>Northern spike-rush Pillwort Loddon pondweed Round-headed club-rush Triangular Club-rush</p>

Plants on lists of Palmer and Newbold (1983)

58 sp
 37 of which "identified" by me & the 1 consulted

4. NUISANCE SPECIES

Under certain conditions, native and (more often) alien or introduced species become a 'nuisance' to a variety of aspects of river, lake or coastal management, including conservation. As such the NRA need to consider management techniques to prevent, control or eradicate problems caused by such species. The identification of species regarded as a problem or 'nuisance' is likely to be particularly NRA specific, being to some extent based on experiences of the species affecting the Authority's operations.

4.1 Methods

4.1.1 Provisional list of nuisance species

A provisional species list was compiled from a review of the literature and legislation, and additions suggested during consultation. Species were primarily identified on the basis of the legislation. Schedule 9 of the Wildlife and Countryside Act 1981 provides a list of animals and plants for which releases into the wild are restricted. This list, unlike the Schedules of 'threatened' species is not so directly applicable to the identification of relevant species as the list includes both problem species and also species listed for their protection, i.e. poorly planned introductions of such species are unlikely to be successful. Further species were added to the list on the basis of perceived potential problems such as predation, although for some species, e.g. otter and kingfisher, this was inconsistent with conservation interests.

4.1.2 Development of criteria to prioritise species

Through consultation selection criteria were identified on the basis of comments from on suggestions for criteria to prioritise problem species. The criteria included general effects, economics (e.g. cost of control), ecology (competitive effects) and legislation.

4.1.3 Application of selection criteria to produce a priority species list

The criteria identified were developed and applied to produce a priority list of nuisance species for management and control. Draft terms of reference to develop strategies for each species were then produced.

4.2 Results

4.2.1 Provisional nuisance species list

The provisional species list is presented as Appendix C. An indication of the importance of species was given and additions suggested by consultees are indicated. These included the badger (damage to flood defences), coarse fish introductions (effect on indigenous stocks and invertebrates) and balsam and monkeyflower (garden escapes colonising

riverbanks). Some of the species listed from WCA Schedule 9 were inappropriate as 'nuisance' species (e.g. white-tailed eagle and barn owl), their scheduling being due to concern over the release of reared individuals into existing populations.

4.2.2 Identification of criteria to prioritise species for management and control

Consultation identified the following as the most important criteria.

- species that are introduced
- species that spread easily
- species causing costly (financial) damage
- species causing costly ecological damage
- species that prevent maintenance of banks etc.
- species giving rise to aesthetic problems
- species with Schedule 9 listing

4.2.3 Further development of selection criteria and their application to produce a priority species list

Unfortunately, there was not sufficient information to quantitatively assess species against criteria such as species that spread easily, species causing costly (financial) damage, species causing costly ecological damage, species that prevent maintenance of banks etc., and species giving rise to aesthetic problems. Thus, in the absence of such information, it is recommended that species are selected on the basis of the recommendations of the staff consulted, their recommendations representing an integration of the above criteria. Thus the following selection criterion

- species specifically proposed by more than one respondent

was used to select the an intermediate priority list (Table 4.1). As for rare species, the recommendation of more than one consultee suggests a national, rather a more local problem. Table 4.1 indicates those species which are already the subject of existing or recent R&D initiatives. Thus, by applying a criterion of

- **not** the subject of species or group specific research

it is suggested that these species are excluded, leaving a priority list of two species alone, the zander *Stizostedion lucioperca* and the American mink *Mustela vison*. Draft terms of reference for research on these two species are presented in Appendix D.

Table 4.1 Provisional priority list of nuisance species

Signal crayfish	<i>Pacifastacus leniusculus</i> ¹
Red swamp crayfish	<i>Procambrus clarkii</i> ¹
Zander/pikeperch	<i>Stizostedion lucioperca</i>
Mink	<i>Mustela vison</i>
Water fern	<i>Azolla filiculoides</i> ²
Australian reedswamp/stonecrop	<i>Crassula helmsii</i> ²
Giant hogweed	<i>Heracleum mantegazzianum</i> ²
Japanese knotweed	<i>Polygonum cuspidatum/Reynoutria japonica</i> ²
Himalayan balsam	<i>Impatiens glandifera</i> ²

Notes:

¹ R&D project on the conservation of freshwater crayfish

² R&D project on invasive riparian and aquatic weeds

It is suggested that the seven criteria identified in Section 4.2.2 above should not be dismissed and should be developed for future use and utilised as information becomes available. Assuming that the habitat priorities for nuisance species are similar to those for rare species, an additional criterion is recommended,

- species associated with freshwater habitats

It is also suggested that as WCA Schedule 9 lists some species that are not relevant as nuisance species (i.e. not barn owl, white-tailed eagle, black rat), there is suggested modification of the Schedule 9 criterion to

- **problem** species listed on WCA Schedule 9

The criteria used in this report and those recommended for future use are summarised below.

Summary of nuisance selection criteria

Criteria used in this report

- species specifically proposed by more than one respondent
- **not** the subject of species or group specific research

Criteria suggested for future use

- species that are introduced
- species that spread easily
- species causing costly (financial) damage

- species causing costly ecological damage
- species that prevent maintenance of banks etc.
- species giving rise to aesthetic problems
- **problem** species listed on WCA Schedule 9

or, where information on the above is not available:

- species specifically proposed by a number of consultees, the number depending on the numbers consulted and level of response
- **not** the subject of species or group specific research.

5. GENERAL DISCUSSION AND CONCLUSIONS

In the future strategic management of priority species there will have to be a division of resources between the management of rare and that of nuisance species. In essence, a primary aim of this study has been to identify and apply criteria to produce lists of rare and nuisance species of national importance for consideration in phase 2 of the project. The combination of literature review and consultation has identified priority species, with the emphasis (and future research implications) being on rare species; current research activity seems to already be addressing most of the nuisance species identified. It is therefore felt that species management at this stage should concentrate on rare species.

In general, results from the consultation process, largely achieved by a postal questionnaire, were not as clear as hoped and the results may reflect this. Apart from reflecting regional conservation needs, the responses may to some extent have reflected the background and particular expertise of respondents. Also, although well regionally spread, the views obtained during consultation represented a relatively small sample.

5.1 Rare species

Conservation strategies with respect to rare species include a variety of general approaches. There are the differing approaches of habitat- and species-driven management. The general maintenance or rehabilitation of habitats (e.g. through the maintaining of minimum river flows and groundwater levels, maintenance or creation of backwaters and other refugia, maintenance or improvement of water quality) ensures the success of many species, including rarities. However, the particular needs of certain species can be overlooked by such a general approach and there may a requirement for particular species-specific management for their success. The need to conserve both habitats and individual species is recognised under the EC Directive on the conservation of natural habitats and of wild fauna and flora (92/43/EEC). Under the Directive, Special Areas for Conservation (SACs) will be identified and designated as SSSIs for statutory protection. These may be required for species listed in the Directive that are not necessarily rare, e.g. bullhead. The study has attempted to focus on individual species requiring conservation beyond habitat management alone. However, as some of the responses suggest there seemed to be some differing opinion as to the importance of the habitat approach to a species management programme.

The study relied heavily on habitat types to prioritise rare species, with a reduced emphasis, perhaps, on the impact of NRA activities. The consultation exercise failed to identify which activities are particularly important and which species are specifically threatened by such activities. Thus the criteria used did not address the issue of the impact of direct and indirect NRA activities or frequency of 'NRA contact' as such. It was hoped that the respondents' replies had identified the most vulnerable species, and habitats. The reasons for the selection of species by consultees was not generally stated but it was probable that the reasons included an element of threat along with 'public perception' and, possibly, 'perceived decline', criteria which again are largely unquantified or ill-defined for many species or species groups.

The subjectivity which surrounds the choice of species for conservation management is to some extent unavoidable. Although species rarity may be assessed objectively through recognised conservation criteria such as Red Data Book status, other factors such as habitat conservation, vulnerability to NRA activities, public perception and perceived decline are likely to be important and subject to personal and regional differences. However, it is unlikely that objective criteria could replace the subjective assessments of conservation staff who are familiar with the regions, habitats and species in question. This said, the consultation with regional experts was only partially successful in obtaining a balanced view due to the somewhat limited response.

If the selection of species is to be periodically reviewed, the selection criteria based on the opinions of conservation staff, such as the number of respondents used, are not very repeatable without a further study and may need to be replaced by a criteria such as the number of votes at conservation managers' meetings. Also, the provisional list of species upon which decisions may be made could be developed by a periodic review of conservation literature or further research to identify the relevance of Red Data Book species for which habitat and distribution information is not readily available. For instance, an examination of detailed literature on particular moth groups indicates that a further thirteen Red Data Book Category 3 (Rare) species are of potential interest (i.e. Ground Lackey *Malacosoma castrensis*, a saltmarsh species; Bright Wave *Idaea ochrata* and White spot *Hadena albimacula*, coastal species; Belted Beauty *Lycia zonaria*, a sand dune species; Dotted Footman *Pelosia muscerda*, Flame Wainscot *Senta flammea*, The Concolorous *Photodes extrema*, Fenn's Wainscot *Photodes brevilinea*, Marsh Mallow Moth or Giant Ear *Hydraecia osseola*, White-mantled Wainscot *Archanara neurica* and Marsh Moth *Athetis pallustris*, wetland species; Northern Footman *Eilema sericea*, a bog species; and Rush Wainscot *Archanara algae*, a lake margin species). Such detailed examination of the wider literature will generate some information on species of generally low priority with respect to both rarity (species would mostly be RDB Category 3) and habitat (a report by Ball (undated) used in this study identified rare species associated with the river margins).

The criteria identified a number of species and species groups as potential candidates for of species management. A number of important species were rejected on the basis of existing NRA/EN species management research. Where current NRA research identifies further research needs these should be considered for inclusion in the species management programme. For species in the EN Species Recovery Programme, e.g. natterjack toad, it is suggested that the NRA co-operates in these initiatives, and highlights those sites at which these species occur, whilst not actively pursuing the management of these species.

The extent to which species-level identification is required in species management is an issue that requires consideration. Currently, surveys conducted by the NRA are rarely carried out to such a level of identification, with the exception of bird and fish surveys. Detailed information on the distribution and site locations of rare species would generally need to be obtained from other sources. The findings of the R&D project on surveying techniques will provide more up-to-date information on NRA policies with respect to surveying. Surveys to species level would generally be conducted or requested as part of environmental assessments of land drainage and development schemes. The provisional

rare species list (Appendix A) should be useful to assess the importance of aquatic-related species in the interpretation of data from such environmental assessments. In addition, where the NRA does identify important species, there should be appropriate policies and mechanisms whereby such information can be passed onto relevant authorities and databases.

The project has identified information that may be useful in other aspects, e.g. information on species associated with particular habitats may be useful in habitat-orientated research, such as wetland conservation.

5.2 Nuisance Species

The criteria that could potentially be used to identify nuisance species were again largely subjective. Some criteria, e.g. costs of control, costs of damage incurred are quantifiable, but this information has not been calculated for the majority of species. It should be possible to perform cost-benefit assessments for management of certain species and thus enable an economic as well as ecological justification for species control. A criterion based on the opinions of consultees was again used for species selection. In the absence of more objective criteria, if there is a re-assessment of nuisance species in the future this criterion should similarly be replaced by a more repeatable criterion such the number of votes at conservation managers' meetings.

5.3 Prioritised programme for species management

The final prioritisation of resources for species management will no doubt be a subject of some debate. This project identifies rare species alone as the priority species warranting attention. However, existing R&D on both rare and nuisance species may identify other resource requirements for species management.

For the rare species and species groups identified, it is tentatively suggested that prioritisation is made in the following order (most to least important):

Water vole, spined loach, bats, water shrew, shads, dragonflies, lampreys, kingfisher, sand martin, grey wagtail, amphibians, grass snake, vascular plants (including an update of Palmer and Newbold (1983), dipper, bittern, barn owl, bearded tit, Cetti's warbler, marsh warbler, mayflies, water beetles, pearl mussel, netted carpet moth, salmon, dolphin and porpoise, yellow wagtail.

For the nuisance species identified, it is suggested that prioritisation is made in the following order (most to least important):

mink, zander.

6. RECOMMENDATIONS FOR PHASE 2

For the selected species, projects based on the terms of reference given in Appendices B and D should be developed and implemented in close liaison with relevant organisations. The final prioritisation of the species and the allocation of resources for these species should be decided.

The provisional lists of both rare and 'nuisance' species should be updated from the wider literature and/or as further information on the status and habitat requirements of species is published or otherwise becomes available. As such, a watching brief should be maintained for potentially useful information. In particular, research could be allocated to identify the relevance of some species for which no detailed information is given in Red Data Books.

The allocation of species to a priority listing should be periodically reviewed on the basis of changes to the information available on species rarity, the availability of funds for further research, the success of habitat management approaches and changes in species status and NRA activities. For example, should breeding populations of species that were thought to be extinct be identified or become re-established, the species should be considered for priority species management.

There should be appropriate policies and mechanisms whereby NRA-generated information on important species can be passed onto relevant authorities and databases.

Regional concerns and initiatives with both regionally important species, not identified as priorities, and nationally important species should be actively supported and integrated into a national species management programme where appropriate.

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Scientific name	Species Common Name/Description	Status		Ecology/ Distribution		Consn Rec ^y
		WCA	RDB	Habitat	Distn	
ANIMALS						
Invertebrates						
Annelida:						
Polychaeta						
	<i>Alkmaria romijni</i>	Tentacled lagoon-worm	WCA 5			
	<i>Armandia cirrhosa</i>	Lagoon Sandworm	WCA 5	RDBK	SL	S SS/SR
Hirudinea						
X	<i>Hirudo medicinalis</i>	Medicinal Leech - species recommended by more than 1 consultee	WCA 5	RDB3	L	Var SS
	<i>Placobdella costata</i>	A leech		RDBK	R,FM	S nr
Arachnida						
	<i>Agroeca lusaticca</i>	A spider		RDB1	CDu	S nr
	<i>Apostenus fuscus</i>	A spider		RDB1	C	S nr
	<i>Arctosa fulvolineata</i>	A wolf spider		RDB3	SM	A,S,Wx nr
	<i>Baryphyma gowerense</i>	A spider		RDBK	SM,Wt	A,Wh nr
	<i>Baryphyma duffeyi</i>	A spider		RDB3	SM	A,S nr
	<i>Carorita limnaca</i>	A spider		RDB1	Wt	NW nr
	<i>Carorita paludosa</i>	A spider		RDB2	Wt	A,Wx nr
	<i>Centromerus incultus</i>	A spider		RDB2	Wt,DM	A nr
	<i>Centromerus persimilis</i>	A money spider		RDBK	RM@g	N nr
	<i>Clubiona rosserae</i>	A spider		RDB1	Wt	A nr
	<i>Clubiona similis</i>	A spider		RDB3	CDu	A nr
	<i>Clubiona juvenis</i>	A spider		RDB2	C,Wt	A,T?,Wx nr
	<i>Diplocephalus connatus</i>	A money spider		RDB2		RM@g N nr
	<i>Diplocephalus jacksoni</i>	A money spider		pRDB1	RM@sh	N nr
	<i>Dolomedes plantarius</i>	Fen raft spider	WCA 5	RDB1	Wt,P	A,S SS/SR
	<i>Enoplognatha tecta</i>	A spider		RDB1	Wt,RM	Wx nr
	<i>Eresus niger</i>	Ladybird Spider	WCA 5	RDB1	na	- -
	<i>Euphrys browningi</i>	A jumping spider		RDB3	CSh	A,S nr
	<i>Haplodrassus minor</i>	A spider		RDB3	CM	Var nr
	<i>Heliophanus auratus</i>	A jumping spider		RDB2	CM	A nr
	<i>Hypsosinga heri</i>	A spider		RDB1	Wt,LM	A,T nr
	<i>Lathys stimatisata</i>	A spider		RDB3	CM,t	S,SW nr
	<i>Maro lepidus</i>	A spider		RDB3	Bog,Wt,RM	Nw,Y,Wh nr
	<i>Neobisium carpenteri</i>	A spider		RDBK	CM,t	Var nr
	<i>Neon valentulus</i>	A jumping spider		RDB2	Wt	A nr
	<i>Pardosa palludicola</i>	A wolf spider		RDB3	Wt,LM,t	Var nr

Scientific name	Species		Status			Ecology/ Distribution		Consn
	Common Name/Description	WCA	RDB	EC DIVE	Berne Bonn	Habitat	Distn	Rec ^y
<i>Pellenes tripunctatus</i>	A jumping spider		RDB1			CSh	S	
<i>Phlegra fasciata</i>	A jumping spider		RDB3			CDu,CSh	S,Wx	nr
<i>Robertus insignis</i>	A spider		RDB1			Wt	A	nr
<i>Sitticus floricola</i>	A jumping spider		RDB3			Wt	NW,Wh,Sc	nr
<i>Trichopterna cito</i>	A spider		RDB2			CDu	A,S	nr
<i>Trichoncus affinis</i>	A spider		RDB2			CSh	A,S	nr
<i>Trichoncus hackmani</i>	A spider		RDB2			CSh	A,S	nr
<i>Zora armillata</i>	A spider		RDB3			Wt	A,Wx/SW	nr
Bryozoa								
<i>Lophopus crystallinus</i>			RDB3			L,R,RM@,D	Var	nr
<i>Victorella pavida</i>	Trembling Sea-Mat	WCA 5	RDBK			SL	SW	
Coelenterata/Cnidaria								
<i>Edwardsia ivelli</i>	Ivelli's Sea Anemone	WCA 5	RDB1,RL1		SL	S	SS	
<i>Eunicella verrucosa</i>	Pink sea-fan	WCA 5*****						
<i>Nematostella vectensis</i>	Starlet Sea Anemone	WCA 5	RDB3,RL2		E,SL	A,S,Wx	SS	
Crustacea								
<i>Allomelita pellucida</i>	An amphipod		RDBK			SD,E	Var	nr
+ <i>Artemia salina</i>	Brine shrimp		RDB1			SL	S	
<i>Austropotamobius pallipes</i>	Atlantic Stream Crayfish	WCA 5**	IIa					NRA
	- species recommended by more than 1 consultee							
<i>Chirocephalus diaphanus</i>	Fairy Shrimp	WCA 5	RDB2			P	Var	SS
<i>Corophium lacustre</i>	An amphipod		RDB3			CR,SP	A,S/Wx	nr
<i>Gammarus insensibilis</i>	Lagoon Sand Shrimp	WCA 5	RDB3			E,SL	A,S,Wx	SS
<i>Mysis relicta</i>	An opossum shrimp		RBB1			L	NW	nr
<i>Niphargellus glenniei</i>	Freshwater Shrimp		RDBK			RM@ig,Ca	SW	
<i>Triops cancriformis</i>	Apus, tadpole shrimp	WCA 5	RDB1			P	Wx	SS
Insecta:								
Coleoptera								
<i>Acilius canaliculatus</i>	A water beetle		pRDB3			Wt,P,Bog	Var	
+ <i>Acupalpus elegans</i>	A ground (carabid) beetle		RDB1			SM	A,S,Wx,Y	
<i>Aegialia rufa</i>	A scarabid dung beetle		RDB1			CDu	NW	
<i>Agabus brunneus</i>	A water beetle		RDB2			St	S,SW	
<i>Agabus striolatus</i>	A water beetle		RDB2			P,Wt	A	

Scientific name	Species		Status			Ecology/ Distribution		Consn	
	Common Name/Description	WCA	RDB	EC Dive	Berne Bonn	Habitat	Distn	Rec ^y	
	Agabus undulatus	A water beetle		RDB2/pRDB3			D,L,Wt,P	A,ST,Y?	nr
(+)	Agelastica alni	A leaf beetle		RDBAp./RDBK			Wt,RM,t	Var	
	Aglyptinus agathidoides	A beetle		RDB1			Wt	A/T	
	Agriotes sordidus	A click beetle		pRDB3			C,E,RM		
	Amara fusca	A ground beetle		RDB2/pRDB1			CDu,t	Var	
	Amara strenua	A ground beetle		pRDB3			SM,t	A,S,SW,Wx	
	Anisodactylus poeciloides	A ground beetle		pRDB3			SM,SD	A,S,SW,Wx	
	Anthicus scoticus	A beetle		pRDB3			LM,C	NW,S,Wh	
	Anthicus tristis	A beetle		pRDB1			CSH,SM	S,Wx	nr
	Aphanisticus emarginatus	A jewel beetle		pRDB1			Wt,RM,t	S	
	Aphodius brevis	A scarabid dung beetle		RDB1			CDu,t	Var	
	Aphodius niger	A scarabid dung beetle		RDB1			PM,DM	Wx	
	Astenus subditus	A rove beetle		RDB1			Du,t	SW	
	Atomaria reitteri	A cryptophagid beetle		RDB1			Wt	A,T	nr
	Badister anomalus	A ground beetle		pRDB1			Wt,LM	A,S,Wx	
	Badister meridionalis	A ground beetle		pRDB1			LM	T	
	Bagous arduus	A weevil		RDB3/pRDBK			Wt?	T	
	Bagous argillaceus	A weevil		RDB2			CD,SL	A,S,T	nr
+	Bagous binodulus	A weevil		RDB1			L,D	A,S,T	
	Bagous brevis	A weevil		RDB1			LM	S,T,Wx	nr
	Bagous collignensis	A weevil		pRDB3			Wt,L,RM	Var	
	Bagous cylindrus	A weevil		RDB2			D,L	A,S	nr
	Bagous czwalinai	A weevil		RDB1			Bog	Wx	nr
	Bagous diglyptus	A weevil		RDB1			Wt?RM?DM?	A,ST	
	Bagous frit	A weevil		RDB1/pRDB3			Bog	Wx	nr
	Bagous longitarsis	A weevil		RDB1			L,D?	S,Wx	
	Bagous lutosus	A weevil		RDB1			L,D	Var	
	Bagous nodulosus	A weevil		RDB1			L,D	A,S,Wx	
	Bagous puncticollis	A weevil		RDB1			L,D	S,T	
	Baris scolopacea	A weevil		RDB3			SM	A,S	
	Bembidion argenteolum	A ground beetle		pRDBK			CM	S	
	Bembidion humerale	A ground (carabid) beetle		RDB1			Wt	Y	nr
+	Bembidion octomaculatum	A ground beetle		RDB1			PM,FwM	S,T	
	Berosus fulvus	A water beetle		RDB3			S,SM	A,S,T	
	Biblopectus tenebrosus	A pselaphid beetle		RDB2			Wt,Bog,t	Var	nr

Species		Status		Ecology/ Distribution		Consn		
Scientific name	Common Name/Description	WCA	RDB	EC DIVE	Berne Bonn	Habitat	Distn	Rec ^y
<i>Bidessus minutissimus</i>	A water beetle		RDB3			RM@s	Wh,Sc	
<i>Bidessus unstriatus</i>	A water beetle		RDB1			P,DS,Wt,P	A	nr
<i>Bledius crassicornis</i>	A rove beetle		RDB2			C,FwM,RM@s	S	
<i>Bledius dissimilis</i>	A rove beetle		RDB2			FwM	T,Y	
<i>Bledius erraticus</i>	A rove beetle		RDB3			RM@s		
<i>Bledius filipes</i>	A rove beetle		RDB1			CM,RM	A	
<i>Bledius furcatus</i>	A rove beetle		RDB1			CM,E,SM	sE,Wh	
<i>Brachinus sclopecta</i>	A ground beetle		pRDB1			C,t	S,SW,T	
<i>Bromius obscurus</i>	A leaf beetle		RDB1			RM/t	NW	
<i>Cantharis fusca</i>	A soldier beetle		pRDB3			Wt,CSh,RM,t	Var	
<i>Cafius cicatricosus</i>	A rove beetle		RDB1			C	S	
<i>Carpelimus obesus</i>	A rove beetle		RDB3			RM@s,m		
<i>Carpelimus sneideri</i>	A rove beetle		RDB1			E,SM	A,NW	
<i>Carpelimus similis</i>	A rove beetle		RDB3			RM@s,t		
<i>Carpelimus subtilis</i>	A rove beetle		RDB3			RM@s,LM	sB	
<i>Cercyon granarius</i>	A water beetle		RDB3			D	ST,Wx	
<i>Ceutorhynchus arquatus</i>	A weevil		RDB3p/RDB1			Wt	Var	
<i>Ceutorhynchus pilosellus</i>	A weevil		RDB2			CDu,t	T,Wh	nr
<i>Ceutorhynchus querceti</i>	A weevil		RDB2			Wt,RM,LM	A	
<i>Ceutorhynchus verrucatus</i>	A weevil		RDB3			CSh	S	
<i>Chaetocnema aenea</i>	A flea beetle		RDBK			Wt	S,T	
<i>Chlaenius nitidulus</i>	A ground (carabid) beetle		RDB1			C	S,Wx	
<i>Chlaenius tristis</i>	A ground (carabid) beetle		RDB1			Wt,LM	A,Wh,Y	nr
<i>Chrysolina cerealis</i>	Rainbow leaf beetle	WCA 5	RDB1			na	-	-
<i>Cicindella germanica</i>	A tiger beetle		RDB3			C	Var	
<i>Cicindella hybrida</i>	A tiger beetle		RDB3/pRDB2			CDu	Var	
<i>Coccinella quinquepunctata</i>	A beetle		RDB3			RM@sh	Wh,Sc	
<i>Coenocara bovistae</i>	A beetle		pRDB3			CSh,t	Var	

Scientific name	Species Common Name/Description	Status				Ecology/ Distribution		Consn Rec ^y
		WCA	RDB	EC DIVE	Berne Bonn	Habitat	Distn	
<i>Cryptocephalus exiguus</i>	A leaf beetle		RDB1			Wt, Bog	A	nr
<i>Cyanostolus aeneus</i>	A beetle		RDB3			RM ^{@,t}		
<i>Curimopsis nigrata</i>	Mire pill beetle	WCA 5	RDB1			Bog	Y	nr
<i>Dicronychus equiseti</i>	A click beetle		RDB2			CDu	Wh	
<i>Donacia aquatica</i>	A reed beetle		RDB3			L,LM,D?	S,NW,Sc	
<i>Donacia bicolora</i>	A reed beetle		RDB2			L,LM,D	S,Wx	
<i>Donacia obscura</i>	A reed beetle		RDB2/pN			L,Wt	Var	nr
<i>Dromius longiceps</i>	A ground (carabid) beetle		RDB2/pN			Wt,C	cE	nr
<i>Dromius sigma</i>	A ground (carabid) beetle		RDB2/pN			Wt	Var	nr
<i>Dromius vectensis</i>	A ground beetle		pRDB3			CM,RM?,t	S,SW,Wx	
<i>Dryops anglicanus</i>	A water beetle		RDB3			Wt,D	A,Sc	
<i>Dryops griseus</i>	A water beetle		RDB3			Wt,D	A,S,Y	
<i>Dryops nitidulus</i>	A water beetle		pRDB3			DS,RM,St	Var	
<i>Dryops similaris</i>	A water beetle		pRDB3			Wt,L,P	Var	
<i>Dryops striatellus</i>	A water beetle		pRDB3			Bog,DS,Wt	Var	
<i>Drypta dentata</i>	A ground (carabid) beetle		RDB1			CM	S,Wx	nr
<i>Dyschirius angustatus</i>	A ground beetle		RDB3			CM,LM	Var	
<i>Dyschirius extensus</i>	A ground beetle		RDB3/pRDB1			CM	S	
<i>Dyschirius obscurus</i>	A ground (carabid) beetle		RDB1/pRDB2			LM	S,A?	
<i>Dytiscus dimidiatus</i>	A water beetle		pRDB3			D,P	Var	
<i>Elodes elongata</i>	A beetle		RDB3/pRDB1			RM	Wh	
<i>Enochrus isotae</i>	A water beetle		RDB3			Wt	A,S,T	
<i>Eubria palustris</i>	A beetle		RDB3			Wt,t	Wx,Wh	
<i>Galcruca interrupta</i>	A leaf beetle		RDB1			Wt	A,SW/Wx	
+ <i>Graphoderus bilineatus</i>	A water beetle		RL1/RDB1 IIa,IVa		II	D	A	
<i>Graphoderus cinereus</i>	A water beetle		RDB3			D,L,P	Var	
<i>Graphoderus zonatus</i>	A water beetle	WCA 5	RDB1			Bog,L	T	SR
<i>Graptodytes bilineatus</i>	A water beetle		RDB3			CP	Var	
<i>Graptodytes flavipes</i>	A water beetle		RDB2			Bog,P	Var	nr
<i>Gyrinus distinctus</i>	A water beetle		pRDB3			L,D	Var	
<i>Gyrinus suffriani</i>	A water beetle		pRDB3			PM	Var	
<i>Halacritus punctum</i>	A beetle		pRDBK			C	SW	
<i>Halipilus furcatus</i>	A water beetle		RDB1			P	A,T,Wx	
<i>Halipilus variegatus</i>	A water beetle		RDB3			WtP,Bog	A,S,Wx	

Scientific name	Species		Status			Ecology/ Distribution		Consm
	Common Name/Description	WCA	RDB	EC DIVE	Berne Bonn	Habitat	Distn	Rec ^y
<i>Haliphus varius</i>	A water beetle		RDB3/pRDBK			L	S	
<i>Helochares obscurus</i>	A water beetle		RDB3			Wt	A,S,T	
<i>Helophorus laticollis</i>	A water beetle		RDB2			Bog	S	nr
<i>Helophorus longitarsis</i>	A water beetle		RDB3			P,L	A,S,T	
<i>Helophorus tuberculatus</i>	A water beetle		RDB3			Bog	NW,ST,Wx,Y	
<i>Heterocerus hispidulus</i>	A beetle		RDB3			LM	A,S	
<i>Hippodamia tredecimpunctata</i>	13-spot ladybird		RDB3/RDBK			Wt	Var	
<i>Hister quadrimaculatus</i>	A beetle		RDB2/pRDBK			C,CSH,t	S	
<i>Hydaticus transversalis</i>	A water beetle		pRDB3			D,L	A,SW,Wh,Wx	
<i>Hydraena palustris</i>	A water beetle		RDB2			Wt	A	nr
X <i>Hydraena pulchella</i>	A water beetle		pRDB3			RM	Var	
<i>Hydraena pygmaea</i>	A water beetle		RDB3			St	NW,S,ST,SW	
<i>Hydrochara caraboides</i>	Lesser silver water beetle	WCA 5	RDB1			D,Wt	NW,Wx	
<i>Hydrochus brevis</i>	A water beetle		RDB3			Wt	A,NW,Wh	
<i>Hydrochus carinatus</i>	A water beetle		RDB3			Wt	A	
<i>Hydrochus elongatus</i>	A water beetle		RDB3			L,D	Var	
<i>Hydrochus ignicollis</i>	A water beetle		RDB3			Wt	A,S,Wh,Wx	
<i>Hydrochus megaphallus</i>	A water beetle		pRDB2			D	A	
<i>Hydrochus nitidicollis</i>	A water beetle		RDB3			RM@sh	SW	
<i>Hydrophilus piccus</i>	A water beetle		RDB3			D,Wt,P	Var	
<i>Hydroporus cantabricus</i>	A water beetle		pRDB3			P	Wx	
<i>Hydroporus elongatulus</i>	A water beetle		RDB3			Wt,P	A,Sc	
<i>Hydroporus glabriusculus</i>	A water beetle		RDB3			Wt,Bog	A,Sc	
<i>Hydroporus rufifrons</i>	A water beetle		RDB2			Wt,P	Var	nr
<i>Hydroporus scalesianus</i>	A water beetle		RDB2			Wt,L,Bog	A,N,NW	nr
<i>Hydrothassa hannoveriana</i>	A leaf beetle		RDB3			Wt,Bog	S,Y	
<i>Hypebaeus flavipes</i>	Beetle	WCA 5	RDB1			na	-	
<i>Hypera diversipunctata</i>	A weevil		RDB3			Wt,RM,t	A,Y,Sc	
<i>Hypera ononidis</i>	A weevil		RDBK			CDu,CSH,t S		
<i>Hypocaccus metallicus</i>	A beetle		RDB2/pRDBK			C,CSH	A,S	
<i>Laccobius simulatrix/tor</i>	A water beetle		RDB3/pRDB1			L	S	
<i>Laccophilus ponticus</i>	A water beetle		RDB2			D,Wt	S,Y	nr
<i>Laccornis oblongus</i>	A water beetle		pRDB3			Bog,P	Var	
<i>Lamia textor</i>	Pine sawyer		RDB2/pRDB1			Wt,RM,t	Var	
<i>Lathrobium dilutum</i>	A rove beetle		RDB3			RM@sh	Var	nr

Species		Status				Ecology/ Distribution		Consn
Scientific name	Common Name/Description	WCA	RDB	EC Dtvc	Berne Bonn	Habitat	Distn	Rec ^y
<i>Lathrobium rufipenne</i>	A rove beetle		RDB2			Wt,Bog	Var	nr
<i>Limobius mixtus</i>	A weevil		RDB2			C,Du?	S,SW?,Wx?	nr
<i>Limnebius aluta</i>	A water beetle		pRDB3			Wt	A,Wx	
<i>Limnebius crinifer</i>	A water beetle		RDB3/pRDB1			P	S	
<i>Limniscus violaceus</i>	Violet click beetle	WCA 5	RDB1	Ila		na	-	-
<i>Lionychus quadrillum</i>	A carabid beetle		RDB3			RM@s,sh	Var	
<i>Lixus algeris</i>	A weevil		RDB1			Wt,t	S	
<i>Lixus paraplecticus</i>	A weevil		RDB1			RM,Wt	A,S,Wx	
<i>Lixus scabricollis</i>	A weevil		RDBK			CSh	S	
<i>Lixus vilis</i>	A weevil		RDB1			CDu?,t	S	
<i>Longitarsus acruinosus</i>	A flea beetle		RDB1			C,RM	S,T,Wx	
<i>Longitarsus bearei</i>	A flea beetle		RDB1			C	S	
<i>Longitarsus nigerrimus</i>	A flea beetle		RDB1			PM,Bog	S,Wx	
<i>Lucanus cervus</i>	Stag beetle			Ila				
<i>Macronychus quadri- tuberculatus</i>	A water beetle		RDB3			R	ST,Wh	
<i>Macroplea appendiculata</i>	A reed beetle		RDB3			R,RM@,L		
<i>Malachius vulneratus</i>	A false soldier beetle		RDB3			SM,CWt	A,S	
<i>Microptilum palustre</i>	A beetle		RDB1			Wt	A	nr
<i>Microptilum pulchellum</i>	A beetle		RDB1			Wt	A,T	nr
<i>Mordellistena nanuloides</i>	A beetle		RDBK			SM,C	S	
<i>Nanophyes gracilis</i>	A weevil		pRDB3			Wt,t	S,T,Wx	
<i>Negastrius sabulicola</i>	A click beetle		RDB3			RM@ ^{sh}	Wh	
<i>Normandia nitens</i>	A water beetle		RDB2			R,RM@	ST,Wh	
<i>Oberca oculata</i>	A longhorn beetle		RDB1			Wt	A	nr
<i>Ochthebius aeneus</i>	A water beetle		RDB1			P,S	S	
<i>Ochthebius exaratus</i>	A water beetle		pRDB3			CL	A,S	
<i>Ochthebius poweri</i>	A water beetle		RDB3			C,St	Wh, SW	
<i>Ochthebius pusillus</i>	A water beetle		pRDB3			L,Wt	A,S,Wx	
<i>Omophlus rufitarsis</i>	A darkling beetle		RDB1			CSh/SM	Wx	nr
<i>Omophron limbatum</i>	A ground (carabid) beetle		RDB1			LM	S	
<i>Orthopterus brunripes</i>	A beetle		RDB3			Wt	Var	
<i>Oulema erichsoni</i>	A leaf beetle		RSB3/pRDB1			Bog,D	SW/Wx	
<i>Oxypoda riparia</i>	A rove beetle		RDB3			RM@s	T	
<i>Panagaeus cruxmajor</i>	A ground (carabid) beetle		RDB2/pRDB1			LM	A	nr

Scientific name	Species		Status			Ecology/ Distribution		Consn
	Common Name/Description	WCA	RDB	EC Dtve	Berne Bonn	Habitat	Distn	Rec ^y
<i>Paracymus aeneus</i>	A water beetle	WCA 5	RDB1			SM	A,S	
<i>Philonthus dimidiatipennis</i>	A rove beetle		RDB2			SM	A	
<i>Phytobius olssoni</i>	A weevil		RDB3			Wt,t	S,Wh	
<i>Plancustomus flavicollis</i>	A rove beetle		RDB2			FwM	S/T,Wx	
<i>Pogonus luridipennis</i>	A ground beetle		pRDB3			C,SM,RM	A,Wx	
<i>Polystichus connexus</i>	A ground (carabid) beetle		RDB2			CM,RM	S	
+ <i>Psammodius porcicollis</i>	A scarabid beetle		RDB1			C	SW,Wh	
<i>Psyllioides luridipennis</i>	A flea beetle		RDB1/pRDB2			CSh,t	Lu	
<i>Pterostichus aterrimus</i>	A ground (carabid) beetle		RDB1			Bog,Wt	A?,S/Wx	
<i>Ptilum affine</i>	A beetle		RDB1			Wt	A	nr
<i>Quedius balticus</i>	A rove beetle		RDB1			Wt	A	nr
+ <i>Rhantus aberratus</i>	A water beetle		RDB1			Wt,D	A	
<i>Rhinoncus albicinctus</i>	A weevil		RDB1			LM	T	
<i>Rhynchaenus decoratus</i>	A weevil		RDB3/pRDB1			Wt,RM	S/T	
<i>Rhynchaenus testaceus</i>	A weevil		pRDB2			Wt,RM	A	
+ <i>Rhyssalus germanus</i>	A beetle		RDBAp.			RM@s		
<i>Rypobius ruficollis</i>	A beetle		RDB3/pRDBK			C,Wt	S,Wx	
<i>Saprinus virescens</i>	A beetle		RDBK			Wt,RM,FM	Wh	
<i>Scopaeus gracilis</i>	A rove beetle		RDB3			RM@sh		
<i>Scopaeus laevigatus</i>	A rove beetle		RDB1			C,StM,PM	SW	
<i>Scopaeus minimus</i>	A rove beetle		RDB2			CSh	SW	
<i>Scopaeus minutus</i>	A rove beetle		RDB2			C,STM,PM	SW,Wx	
<i>Selatosomus angustulus</i>	A click beetle		RDB3			RM,t	Wh,Wx	
<i>Selatosomus nigricornis</i>	A click beetle		pRDB3			Wt,t	Var	
<i>Simpliocaria maculosa</i>	A pill beetle		RDB3/pRDBK			RM@	ST,Y	
<i>Sitona gemellatus</i>	A weevil		RDB1			C,CSh	SW/Wx	
<i>Spercheus emarginatus</i>	A water beetle		RDB1			P,Wt	A	
<i>Stenelmis canaliculata</i>	A water beetle		RDB2			LM,RM@	A,NW,Wh	
<i>Stenus incanus</i>	A rove beetle		RDB3			RM@sh		
<i>Stilbus atomarius</i>	A beetle		pRDBK			Wt,DM	A,S	
<i>Synaptus filiformis</i>	A click beetle		RDB3/pRDB1			RM,DM	Wx	
<i>Tachys edmondsi</i>	A ground beetle		RDB3/pRDB1			Bog	Wx	
<i>Tachys walkerianus</i>	A ground beetle		pRDB1			Bog	T	
<i>Thinobius major</i>	A rove beetle		RDB3			RM@sh,LM		
<i>Thinobius newberyi</i>	A rove beetle		RDB2			RM@sh	NW,Sc	

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		WCA	RDB	EC DIVE	Berne Bonn	Habitat		Distn
Trechus rivularis	A ground (carabid) beetle		RDB1/pRDB3			Wt	A,N,Y	nr
Trixagus elateroides	A beetle		pRDB3			C,E,CSH,SM	A,S,T	
Diptera								
Acanthocnema nigrimana	A fly	RDB3			RM@			
Acinia corniculata	A fly	RDB1				Wt,FM,t	sE	nr
Acrometopia wahlbergi	A silverfly	RDB2				Wt	NW,Wh	nr
Anasimyia interpuncta	A hoverfly	RDB2/pRDB3				DM,LM	A,T?	nr
Anthomyza bifasciata	A fly	RDB2				LM,DM	Var	nr
Antichaeta brevipennis	A fly	RDB2				Wt,LM,DM	Var	
Antichaeta obliviosa	A fly	pRDB2				L,DM	A	nr
Arctonopa melampodia	A crane fly	RDB1/pRDB2				RM@s	Var	
Asindulum nigrum	A fungus gnat	RDB2				Wt	A,T,Wx	nr
Atrichops crassipes	A fly	RDB3				R,RM@	S,T,Wh	
Atylotus latistriatus	A horse fly	RDB3				S,CM	A,S,Wx	
Atylotus plebius	A horse fly	RDB1				Bog	NW	nr
Atylotus rusticus	A horse fly	RDB1				Wt	A,S	nr
Calobata styliifera	A stilt-legged fly	RDB3				RM@sh	Sc	
Cephalops perspicus	A big-headed fly	RDB2				Wt	A	nr
Chalcosyrphus eunotus	A hoverfly	RDB2				R,RM@	Var	nr
Chelifera astigma	An empid fly	RDB1				RM@		
Chersodromia cursitans	An empid fly	RDB3				RM@s,LM		
Chrysops sepulchralis	A horse fly	RDB2/pRDB1				LM,Bog	Wx	
Chrysopilus erythrophthalmus	A snipe fly	RDB2				R,RM@	Wh/ST,Y	
Clinocera tenella	An empid fly	RDB3				R,RM@		
Colobaea pectoralis	A fly	RDB2				Wt,LM,DM,RM		Var
Cosmetopus dentimanus	A fly	RDB1				RM@	S,Wx	
Dasypodon diadema	A fly	RDB1				CDu	Wh,Wx	
Dialincura anilis	A fly	pRDB3				CDu	Var	nr
Dichactophora finlandica	A fly	RDB1/pRDB3			Wt,t	Var		
Dicronata simulans	A crane fly	RDB3				R,RM@	nE,nW,Sc	
Dolichopus plumitarsis	A metallic fly	RDB1				RM@		
Elliptera omissa	A crane fly	RDB1/pRDBK				R,RM@	Y	
Epitriptus arthriticus	A robber fly	RDB1				CDu,t	A,Wx	
Epitriptus cowini	A robber fly	RDB2,pRDBK				CDu,t	Wh	nr

Scientific name	Species		Status			Ecology/ Distribution		Consn
	Common Name/Description	WCA	RDB	EC Dtve	Berne Bonn	Habitat	Distn	Rec ^y
<i>Erioptera bivittata</i>	A crane fly	RDB2				CD	A,S	nr
<i>Erioptera edwardsii</i>	A crane fly	RDB1				RM@sh		
<i>Erioptera limbata</i>	A crane fly	RDB2				RM@s	S,Wh	nr
<i>Erioptera meigeni</i>	A crane fly	RDB3				RM@s	Y,Sc	
<i>Erioptera mejerei</i>	A crane fly	RDB2				Wt	Var	nr
<i>Erioptera nigrapalpis</i>	A crane fly	RDB3				RM@c	Var	
<i>Erioptera pusilla</i>	A crane fly	RDB1				RM@sh	Wh	nr
<i>Eristalis cryptarum</i>	A hoverfly	RDB2				RM,LM	swE	
<i>Fannia hirundinis</i>	A lesser housefly	RDBK				RM@		
<i>Gonomyia abbreviata</i>	A crane fly	RDB2/pRDB3				RM	Var	
<i>Gonomyia connexa</i>	A crane fly	RDB1/pRDB2				RM,StM	Wh,Sc	
<i>Gonomyia punctata</i>	A crane fly	RDB2				RM@s	Var	
<i>Gonomyia sexguttata</i>	A crane fly	RDB1				RM,StM	SW	
<i>Hybomitra expollicata</i>	A horse fly	RDB1				SPM,DM	A,Wx	
<i>Haematopota bigoti</i>	A fly	RDB3				SM	Var	nr
<i>Haematopota grandis</i>	A fly	RDB3				CWt,R	Var	nr
<i>Heleodramia irwini</i>	An empid fly	RDB1				RM@s		
<i>Hemicrodromia melangyna</i>	An empid fly	RDB2				RM@		
<i>Hilara barbipes</i>	An empid fly	RDB3				RM@		
<i>Hilara hirta</i>	An empid fly	RDB2				RM@		
<i>Hilara hirtella</i>	An empid fly	RDB2				RM@		
<i>Hilara medeterifrons</i>	An empid fly	RDB2				RM@		
<i>Hilara merula</i>	An empid fly	RDB1				RM@		
<i>Hilara pilosopectinata</i>	An empid fly	RDB1				RM@		
<i>Hilara reccedens</i>	An empid fly	RDB3				RM@		
<i>Hilara setosa</i>	An empid fly	RDB2				RM@		
<i>Hilara submaura</i>	An empid fly	RDB1				RM@		
<i>Hybomitra ciureai</i>	A horse fly	RDB3				CWt	A,S	nr
<i>Hybomitra expollicata</i>	A horse fly	RDB1/pRDB2				CDM,SM	A,S,Wx	
<i>Hybomitra lurida</i>	A horse fly	pRDB3				Bog,RM,LM	ST,Sc	
<i>Hybomitra muchfeldi</i>	A horse fly	pRDB3				Wt,Bog	A,Wh	
<i>Lejops vittata</i>	A hoverfly	RDB2				CWt,DM,P	A,T,Wx	
<i>Limonia bezzii</i>	A crane fly	RDB2				SL	A,S,Wx	nr
<i>Limonia danica</i>	A crane fly	RDB2/pRDB3				CWt	A,S,Wx	
<i>Limonia frontalis</i>	A crane fly	RDB1				Wt,RM?,t?	Wh	

Scientific name	Species		Status			Ecology/ Distribution		Consn	
	Common Name/Description		WCA	RDB	EC DIVE	Berne Bonn	Habitat	Distn	Rec ^y
<i>Limonia omissinervis</i>	A crane fly		RDB2				RM@s	Wh,Sc	
<i>Limnophila fasciata</i>	A crane fly		RDB1				LM,Wt	NW,Y	nr
<i>Limnophila pictipennis</i>	A crane fly		RDB2				LM,DM,RM	Var	nr
<i>Lispocephala rubricornis</i>	A muscid fly		RDB2				CDu	Var	nr
<i>Lipsothrix nigr stigma</i>	A crane fly		RDB1				Wt,RM	NW	
<i>Melanum fumipenne</i>	A fly		RDBK				RM@,Wt		
<i>Myopites eximia</i>	A fly		pRDB3				SM,CSh	sE	
<i>Nephrotoma quadristriata</i>	A crane fly		RDB3/pRDB2				CDu	Var	nr
<i>Ochthera schembrii</i>	A shore fly		RDB1				C,StM,RM	SW	
<i>Odontomyia angulata</i>	A soldier fly		RDB1				Wt,L,LM	A,Wx	
<i>Odontomyia argentata</i>	A soldier fly		RDB2				Wt,DM	Var	nr
<i>Odontomyia hydroleon</i>	A soldier fly		RDB1				Wt	Wh,Y	nr
<i>Odontomyia ornata</i>	A soldier fly		RDB2				P,D	Var	
<i>Orimarga virgo</i>	A crane fly		RDB3				St,t	Var	
<i>Oxycera analis</i>	A soldier fly		RDB2				Wt,t	Var	
<i>Oxycera dives</i>	A soldier fly		RDB2/pRDB3				St,t	nE,Sc	
<i>Oxycera pardalina</i>	A soldier fly		RDB2				RM ₁	Var	nr
<i>Oxycera terminata</i>	A soldier fly		RDB2				RM@,t	Var	
<i>Pamponerus germanicus</i>	A fly		pRDB3				CDu,t	Var	nr
<i>Paradelphomyia ecalcarata</i>	A crane fly		RDB3/pRDB2				St	Wh,ST?,SW	
<i>Paroxyna lhommei</i>	A fly		RDB1				CSh,t	S	nr
<i>Parhelophilus consimilis</i>	A hoverfly		RDB2				Wt	Var	
<i>Pherbellia argyra</i>	A fly		RDB2/pRDB3				Wt,LM,DM	A,S,Y	
<i>Pipizella maculipennis</i>	A hoverfly		RDB3				CW ₁ ,t	sE,Sc	
<i>Platypalpus articuloides</i>	An empid fly		RDB2				RM@,DM,LM		
<i>Platypalpus confinis</i>	An empid fly		RDB3				RM@,LM		
<i>Platypalpus melanocholicus</i>	An empid fly		RDB3				RM@		
<i>Platypalpus niveiseta</i>	An empid fly		RDB3				RM@		
<i>Platypalpus subtilis</i>	An empid fly		RDB3				RM@		
<i>Poecilobothrus ducalis</i>	A fly		RDB2				SMP,SD	S,Wx	nr
<i>Prionocera pubescens</i>	A crane fly		RDB1/pRDB2				Wt,P,D	Var	nr
<i>Prionocera</i>	A crane fly		RDB1/pRDB2				Wt,P,D	A,ST	nr
<i>Psacadina vittigera</i>	A fly		RDB2/pRDB3				Wt,LM	A,T	nr
<i>Psacadina zernyi</i>	A fly		RDB2				Wt,LM	A,S,T	
<i>Psicocephala rustica</i>	A stilleto fly		RDB3				RM@,Sh,Sd	Var	

Species		Status				Ecology/ Distribution		Consn
Scientific name	Common Name/Description	WCA	RDB	EC DIVE	Berne Bonn	Habitat	Distn	Rec ^y
<i>Pteromicra pectorosa</i>	A fly		RDB2			Wt,CDuP	A,SW?Wh?	nr
<i>Pteromicra leucopeza</i>	A fly		RDB2			Wt	Var	
<i>Rhabdomastix hilaris</i>	A crane fly		RDB3			RM@s	Var	nr
<i>Rhabdomastix inclinata</i>	A crane fly		RDB3/pRDB2			RM@s	ST,Y,Sc	
<i>Rhaphium penicillatum</i>	A metallic fly		RDB2			RM@		
<i>Salicella fasciata</i>	A snail-killing fly		RDB2			CDu	Var	nr
<i>Sciomyza dryomyzina</i>	A snail-killing fly		RDB2			Wt,FM	A,T,Wh,Y	nr
<i>Sphaerophoria loewi</i>	A hoverfly		RDB2			Wt	Var	
<i>Stratiomys chamaelon</i>	A soldier fly		RDB1			Wt,P,t	A,T	nr
<i>Stratiomys longicornis</i>	A soldier fly		RDB2			SM,SP	A,S	
<i>Symbalophthalmus pictipes</i>	An empid fly		RDB3			RM@		
<i>Tabanus bovinus</i>	A horse fly		pRDBK			Wt	Wx	
<i>Tabanus miki</i>	A horse fly		pRDBK			Wt,l	sE	
<i>Tachydromia acklandi</i>	An empid fly		RDB2			RM@	Sc	
<i>Tachydromia connexa</i>	An empid fly		RDB3			RM@		
<i>Tachydromia costalis</i>	An empid fly		RDB3			RM@		
<i>Tachydromia halidayi</i>	An empid fly		RDB3			RM@		
<i>Tachydromia lundstroemi</i>	An empid fly		RDB1			RM@		
<i>Tetanocera freyi</i>	A fly		RDB3			Wt	A,NW,S,Wh	
<i>Tephritis sp. (near seperata)</i>	A fly		RDBK			RM,l	A	
<i>Thereva fulva</i>	A stilleto fly		RDB3			CDu,CSd	S,Wh	
<i>Thereva handlirschi</i>	A stilleto fly		RDB2			RM@s,sh		
<i>Thereva inornata</i>	A stilleto fly		RDB3			RM@sh		
<i>Thereva lunulata</i>	A stilleto fly		RDB3			RM@,Sh,Sd	nE,Sc	
<i>Tipula coerulescens</i>	A crane fly		RDB3			St,RM@	NW,Y,Sc	
<i>Tipula gimmerthali</i>	A crane fly		RDB2/pRDB3			RM,StM	NW,Sc	
<i>Tipula marginata</i>	A crane fly		RDB3			Wt,RM	S,T?,Wx,Sc	
<i>Tipula trisulcata</i>	A crane fly		RDB2/pRDB3			Bog,RM	NW,Wh,Y,Sc	
<i>Vidulia cornuta</i>	A fly		pRDB3			Wt,RM	sE	
<i>Weidemannia lamellata</i>	An empid fly		RDB1			RM@		
<i>Weidemannia phantasma</i>	An empid fly		RDB3			RM@		
Ephemeroptera								
<i>Ephemera lineata</i>	A mayfly			pRDB2		R,RM@	T,SW,Wh	
<i>Heptagenia longicauda</i>	A mayfly			pRDB1		R,RM@	T	

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<i>Paraleptophlebia weneri</i>	A mayfly		pRDB3			R	A?,T,Wx	
<i>Potamanthus luteus</i>	A mayfly		pRDB2			R,RM@	NW,T,Wh	
Hemiptera								
<i>Aphrodes duffieldi</i>	A bug		RDBK			CSh	S	
<i>Calligypona reyi</i>	A bug		RDBK			CWt	A,S,Wx	
<i>Cicadetta montana</i>	New Forest Cicada	WCA 5	RDB1			na	-	-
<i>Cosmotettix costalis</i>	A bug		RDBK			Wt	A	nr
<i>Doratura impudica</i>	A bug		RDBK			CDu	A	nr
<i>Emblethis verbasci</i>	A bug		RDB3			CDu	S,SW	nr
<i>Geotomus punctulatus</i>	Shieldbug		RDB1			CDu	SW	
<i>Halticus macrocephalus</i>	Capsid bug		RDB1/pRDBK			Du	SW	
<i>Henesraris halophilus</i>	Groundbug		RDB2			SM	S,SW	nr
<i>Hydrometra gracilentra</i>	Lesser water measurer		RDB1/pRDB3			LM	A,S,Wx	nr
<i>Ischnodemus quadratus</i>	Clinchbug		RDB1			C,CDu	S	
<i>Jalla dumosa</i>	A bug		RDB1			CDu	S	
<i>Limotettix atricapillus</i>	A bug		RDBK			Bog,t	NW/Wh,Wx	nr
<i>Macrosteles cyane</i>	A bug		RDBK			P	A,S,T	
<i>Macrosteles lividus</i>	A bug		RDBK			Wt	A,Wx	nr
<i>Macrosteles oshanini</i>	A bug		RDBK			Wt	A	nr
<i>Metalimnus formosus</i>	A bug		RDBK			Wt	A	
<i>Mocuellus collinus</i>	A bug		RDBK			CDu	S	
<i>Monosynamma maritima</i>	A capsid bug		RDB3			Csh	S	
<i>Micronecta minutissima</i>	A corixid		RDB3			R,D	scE	
<i>Microvelia buenoi umbricola</i>	A bug		RDB3			Wt	A	nr
<i>Nabis brevis</i>	A bug		RDB3			Bog	Var	
<i>Nysius graminicola</i>	A bug		RDB3			CDu	Wx	nr
<i>Odontoscelis fuliginosa</i>	A bug		RDB3			CDu	Var	
<i>Orthotylus rubidus</i>	A capsid bug		RDB3			SM	Var	
<i>Pachybrachius luridus</i>	A bug		RDB3			Bog	Var	nr
<i>Paraliburnia clypealis</i>	A bug		RDBK			Wt	A,Wx,Sc	
<i>Peritrechus gracilicornis</i>	Groundbug		RDB1			Du,DSM	Wx	
<i>Pinosomus varius</i>	A bug		RDB3			CDu	S,Wh,Wx	nr
<i>Prostemma guttula</i>	A bug		RDB1			CDu	NW,S,Wh	
<i>Psammotettix maritimus</i>	A bug		RDBK			CDu	SW	nr
<i>Saldonia setulosa</i>	Shorebug		RDB2			CM	Wx	

Scientific name	Species Common Name/Description	Status				Ecology/ Distribution		Consn Rec ^y
		WCA	RDB	EC DIVE	Berne Bonn	Habitat	Distn	
<i>Tuponia crayoni?</i> (introduced)	Capsid bug		RDB2			C	S,Wx	
Hymenoptera								
<i>Evagetus pectinipes</i>	A spider wasp		RDB1			CDu	S	
<i>Miscophus ater</i>	A digger wasp		RDB2			CDu	S	
<i>Passaloecus clypealis</i>	A digger wasp		RDB2			Wt	A,S	nr
<i>Philanthus triangulum</i>	The bee wolf		RDB2			CDu,t	S,Wh?	nr
<i>Psen atratinus</i>	A digger wasp		RDB2			C	S	nr
<i>Rhopalum gracile</i>	A digger wasp		RDB2			Wt,RM	A	nr
Lepidoptera								
Butterflies								
<i>Apatura iris</i>	Purple Emperor	WCA 5*						
<i>Argynnis adippe</i>	High Brown Fritillary	WCA 5*	RDB2			na	-	
<i>Argynnis aglaja</i>	Dark Green Fritillary	Added species recommended by 1 consultee						
<i>Hipparchia semele</i>	Grayling	Added species recommended by 1 consultee						
<i>Aricia artaxerxes</i>	Northern Brown Argus	WCA 5*						
<i>Boloria euphrosyne</i>	Pearl-bordered Fritillary	WCA 5*						
<i>Carterocephalus palaemon</i>	Chequered Skipper	WCA 5*	RDB4			na	-	
<i>Coenonympha tullia</i>	Large Heath	WCA 5*						
<i>Cupido minimus</i>	Small Blue	WCA 5*						
<i>Erebia epiphron</i>	Mountain Ringlet	WCA 5*						
<i>Eurodryas aurinia</i>	Marsh Fritillary	WCA 5*		IIa	II	Wt		
<i>Hamearis lucina</i>	Duke of Burgundy Fritillary	WCA 5*						
<i>Hesperia comma</i>	Silver Spotted Skipper	WCA 5*						
<i>Leptidea sinapis</i>	Wood White	WCA 5*	RDB3					
<i>Lycena dispar</i>	Large Copper	WCA 5*		IIa,IVa	II	Wt	A	SR
<i>Lysandra bellargus</i>	Adonis Blue	WCA 5*						
<i>Lysandra coridon</i>	Chalkhill Blue	WCA 5*						
<i>Maculinea arion</i>	Large Blue	WCA 5*	RDB1	IVa	II	na	-	
<i>Melitaea cinxia</i>	Glanville Fritillary	WCA 5*	RDB3			C,t	S	
<i>Melictha athalia</i> (or <i>Melitaea athalia</i>)	Heath Fritillary	WCA 5	RDB2			na	-	
<i>Nymphalis polychloros</i>	Large Tortoiseshell	WCA 5*	RDB1			na	-	
<i>Papilio machaon</i>	Swallowtail	WCA 5	RDB2			Wt	A	SS
<i>Plebejus argus</i>	Silver-studded Blue	WCA 5*						

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	Common Name/Description	WCA	RDB	EC DIVE	Berne Bonn	Habitat	Distn	Rec ^y
<i>Strymonidia pruni</i>	Black Hairstreak	WCA 5*	RDB4			na	-	
<i>Strymonidia w-album</i>	White Letter Hairstreak	WCA 5*						
<i>Thecla betulae</i>	Brown Hairstreak	WCA 5*						
<i>Thymelicus acteon</i>	Lulworth Skipper	WCA 5*						
Moths								
<i>Acosmetia caliginosa</i>	Reddish Buff Moth	WCA 5	RDB1			na	-	
<i>Acronicta strigosa</i>	Marsh dagger		RDB1			Wt,t	A,ST	
<i>Acthes margarotana</i>			RDB2			CDu,Sh	A,S	
<i>Callimorpha quadripunctata</i>	Jersey tiger moth				IIa*			
<i>Clostera anachoreta</i>	Scarce chocolate-tip		RDB1			Sh,C	A,S,Wx	
<i>Deltote bankiana</i>	Silver barred		RDB2			Wt	A,S	nr
<i>Eugraphe subrosea</i>	Rosy marsh moth		RDB1			Wt,Bog	Wh	nr
<i>Eustroma reticulatum</i>	Netted carpet		RDB2			RM	NW,WH	nr
<i>Gortyna borelii</i>	Fisher's estuarine moth		RDB2			EM,Wt	A	nr
<i>Hadena irregularis</i>	Viper's Bugloss	WCA 5	RDB1			na	-	
<i>Parculype berberata</i>	Barberry Carpet Moth	WCA 5	RDB1			na	-	
<i>Pelosia obtusa</i>	Small dotted footman		RDB1			Wt	A	nr
<i>Perizoma sagittata</i>	Marsh carpet		RDB2			RM,Wt	A	nr
<i>Phragmataecia castaneae</i>	Reed leopard		RDB2			Wt	A,Wx	nr
<i>Priesterognatha penthinana</i>			RDB1			LM,Wt	NW	
<i>Sedina buettneri</i>	Blair's Wainscot		RDB1			CM		
<i>Siona lineata (Idaea lineata)</i>	Black-veined Moth	WCA 5	RDB1			na	-	
<i>Stenoptilia graphodactyla</i>			RDB2			Bog	S?/Wx	
<i>Thalera fimbrialis</i>	Sussex emerald	WCA 5	RDB1			C,t	S	SR
<i>Thetidia smaragdaria</i>	Essex Emerald Moth	WCA 5	RDB1			SM	A,S	SR
<i>Xanthorhoe biriviata</i>	Balsam carpet		RDB3			FM,RM@	sE	
<i>Zygaena viciae</i>	New Forest Burnet Moth	WCA 5	RDB1			na	-	
Neuroptera								
No species rare								
Odonata								
<i>Aeshna isosceles</i>	Norfolk Aeshna Dragonfly	WCA 5	RDB1			Wt,D,L	A	SS
	- species recommended by more than 1 consultee							
<i>Aeshna juncea</i>	Common hawket							Added species recommended by 1 consultee

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	Common Name/Description	WCA	RDB	EC Dive	Berne Bonn	Habitat	Distn	Rec ^y
Anax imperator	Emperor							
Brachytron pratense	Hairy dragonfly							
Coenagrion armatum	Norfolk coenagrion/damselfly		RDB1			P	A	
	- species recommended by more than 1 consultee							
Coenagrion hastulatum	Northern coenagrion /damselfly		RDB2			L	Sc	
	- species recommended by more than 1 consultee							
Coenagrion mercuriale	Southern coenagrion/damselfly		RDB3	IIa	II			
	- species recommended by more than 1 consultee							
Coenagrion pulchellum	Variable damselfly							
Coenagrion scitulum	Dainty coenagrion/damselfly		RDB1			L		
	- species recommended by more than 1 consultee							
Ceragrion tenellum	Small red							
Cordulia aenea	Downy emerald							
Gomphus vulgatissimus	Club-tailed dragonfly							
Ischnura pumilio	Scarce bluetail damselfly							
Lestes dryas	Scarce emerald		RDB2			P,D	A,S	
	- species recommended by more than 1 consultee							
Leucorrhinia dubia	White-faced dragonfly							
Libellula fulva	Scarce chaser		RDB3			L,RM@		
	- species recommended by more than 1 consultee							
Orthetrum coerulescens	Keeled skimmer							
Oxygastra curtisii	Orange-spotted emerald		RDB1	IIa,IVa	II	R		
	- species recommended by more than 1 consultee							
Somatochlora arctica	Northern emerald		RDB3					
	- species recommended by more than 1 consultee							
Sympetrum danae	Black darter							
Sympetrum flaveolum	Yellow winged darter							
	- species recommended by more than 1 consultee							
Orthoptera								
Dactylus verrucivorus	Wart-biter Grasshopper	WCA 5				na	-	-
Gryllotalpa gryllotalpa	Mole Cricket	WCA 5	RDB1			Wt,t	S,Wx	
Gryllus campestris	Field Cricket	WCA 5				na	-	-
Mogoplistes squamiger	Scaly cricket		RDB1			CM	Wx	
Sicthophyma grossum	Large marsh grasshopper		RDB2			Wt	Wx,T	
Plecoptera								
Isogenus nubecula	A stonefly		pRDB2			R,RM@	ST,Wh	
Isoperla obscura	A stonefly		RDPAp.			R,RM@	ST	

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	Common Name/Description	WCA	RDB	EC DIVE	Berne Bonn	Habitat	Distn	Rec ^y
Trichoptera								
<i>Adicella filicornis</i>	Caddis fly		RDB3			St	SW, Wh, Sc	
<i>Agrypnia crassicornis</i>	Caddis fly		RDB1			L	NW/Y	
<i>Cynus insolutus</i>	Caddis fly		RDB1			L	NW	
<i>Ernodes articularis</i>	Caddis fly		RDB3/pN			St	Var	
<i>Eretsis baltica</i>	Caddis fly		RDB3/pRDB2			LM, D	A, NW, S	nr
<i>Glossosoma intermedium</i>	Caddis fly		RDB3			R	NW	
<i>Grammotaulius nitidus</i>	Caddis fly		RDB1			Wt, P?	A	
<i>Hagenella clathrata</i>	Caddis fly		RDB1			Bog	A/ST/Wh, Sc	nr
<i>Hydropsyche bulgaromanorum</i>	Caddis fly		RDB1/Ap.			R, RM@	T	
<i>Hydropsyche exocellata</i>	Caddis fly		RDB1/Ap.			R, RM@	T	
<i>Hydropsyche fulvipes</i>	Caddis fly		RDB3/pN			St	Var	
<i>Hydropsyche saxonica</i>	Caddis fly		RDB1			R	T, ST	
<i>Hydroptila lotensis</i>	Caddis fly		RDB2			R, RM@	Wh	
<i>Hydroptila silvestris</i>	Caddis fly		RDBK			R?	NW, Sc	
<i>Hydroptila tigurina</i>	Caddis fly		RDBK			R, RM@	NW	
<i>Isonychia dubia</i>	Caddis fly		RDB2			St, R	T, S/Wx	
<i>Ithytrichia clavata</i>	Caddis fly		RDB3			R, RM@	NW, S, Wh, Sc	
<i>Leptocerus interruptus</i>	Caddis fly		RDB3			R, RM@	ST, SW, Wh	
<i>Leptocerus lusitanicus</i>	Caddis fly		RDB1/pRDB2			R, RM@	T	
<i>Limnephilus pati</i>	Caddis fly		RDB1			Wt	A	
<i>Limnephilus tauricus</i>	Caddis fly		RDB2/pRDB1			D, Wt	A?, T	
<i>Mesophylax aspersus</i>	Caddis fly		RDBK			St, R	A, Wx	
<i>Oecetis notata</i>	Caddis fly		RDB3			R, RM@	ST?, SW, T?, Wh	
<i>Oxyethira mirabilis</i>	Caddis fly		RDB3/pRDBK			Wt, P, BogP	Wh	
<i>Oxyethira sagittifera</i>	Caddis fly		RDB3/pL			L	nwE, Sc	
<i>Oxyethira trisella</i>	Caddis fly		pRDBK			L, R	Var	
<i>Plectonemia brevis</i>	Caddis fly		RDB3/pN			St	Var	
<i>Rhyacophila septentrionis</i>	Caddis fly		RDB3/pN			R, RM@	Var	
<i>Setodes argentipunctellus</i>	Caddis fly		RDB3			LM	Nw, Sc	
<i>Setodes punctatus</i>	Caddis fly		RDB3/pRDB2			R, RM@	Wh, St	
<i>Tinodes pallidulus</i>	Caddis fly		RDB2/pRDB1			St	A/ST, T	
<i>Tricholeiochiton fagesii</i>	Caddis fly		RDB3/pN			L, Bog	Var	
<i>Ylodes reuteri</i>	Caddis fly		RDB3/pRDB2			L, SM	Var	
<i>Ylodes simulans</i>	Caddis fly		pRDB3			R	ST?, Wh, Sc	

Species		Status		Ecology/ Distribution		Consn		
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Mollusca								
Anisus vorticulus	A snail		RDB2			D	eE	nr
Caecum armoricum	DeFolin's lagoon snail	WCA 5	RDBK			CM,M	Wx	nr
Catinella arenaria	Sandbowl Snail	WCA 5	RDB1			Wt,Du	NW,SW	SS
Gyraulus acronicus	A snail		RDB2			R	T	
Lacinaria biplicata	A snail		RDB3			RM	T (Var?)	nr
Lymnaca glabra	A snail		RDB2			P,D	Var	nr
X Margaritifera margaritifera	Freshwater Pearl Mussel - species recommended by more than 1 consultee	WCA 5****		IIa				
Marstoniopsis scholtzi	A snail		RDB3			D,R,RM@	Var	
Myxas glutinosa	Glutinous Snail	WCA 5	RDB1			D,L,R,RM@	Var	SS
Oxyloma sarsi	A snail		RDB2			Wt,RM@,LM	A,S,T	
Paludinella littorina	Lagoon snail	WCA 5	RDB3			SM,EM	Var	nr
Perforatella rubiginosa	A snail		RDB2			FM,Wt,RM@	S,T	nr
Pseudamnicola confusa	A snail		RDB1			E,SP,SD	T	nr
Pisidium pseudosphacrium	A bivalve		RDB3			D,L	S	nr
Pisidium tenuilineatum	A bivalve		RDB3			R,RM@,D,LS,A,T		nr
Segmentina nitida	A snail		RDB1			D	Var	nr
Sphacrium solidum	A bivalve		RDB1			R,RM@,D	A	
Succinea oblonga	A snail		RDB3			FM,LM,RM@,DM	nE,Sc	nr
Tenellia adspersa	Lagoon sea slug	WCA 5	RDBK			SL	Var	nr
Thyasira goudi	Northern hatchet-shell	WCA 5						
Truncatella subcylindrica	Looping snail		RDB3			SLM,SM,EM	Var	nr
Valvata macrosoma	A snail		RDB2			D	Var	nr
Vertigo angustior	A snail		RDB1	IIa		Wt	A,NW,Wh	nr
Vertigo geyeri	A snail		RDB1	IIa		Wt	NW	nr
Vertigo lilljeborgi	A snail		RDB3			Wt(RM,LM)	NW,Wh,Sc	nr
Vertigo moulisiana	A snail		RDB3	IIa		Wt	Var	nr
Myriapoda								
Trachysphaera lobata	A myriapod		RDBK			CM	S	nr
Nemertea								
Prostoma jenningsi	A ribbon worm		RDBK			L	NW	
Platyhelminthes								
No species rare								

Species		Status			Ecology/ Distribution		Consn		
Scientific name	Common Name/Description	WCA	RDB	EC DIVE	Berne	Bonn	Habitat	Distn	Rec ^y
Vertebrates									
Birds									
<i>Accipter gentilis</i>	Goshawk	WCA 1	2			II	na	-	
<i>Acrocephalus palustris</i>	Marsh warbler	WCA 1	2,3				Wt,t	sE/-	
	- species recommended by more than 1 consultee								
<i>Alcedo atthis</i>	Kingfisher	WCA 1		BI	II		RM,LM,DM	Var/Var	
	- species recommended by more than 1 consultee								
<i>Anas acuta</i>	Pintail	WCA 1*	1b,2,4b			II	FM,L	Var/Var	
<i>Anas querquedula</i>	Garganey	WCA 1	2			II	FM,Wt,L	sE/-	
<i>Anser albifrons flavirostris</i>	Greenland white-fronted goose	1b,4b	BI			II	Bog	-/Wh,Sc	
<i>Anser anser</i>	Greylag goose	WCA 1**	1b				Bog,LM	Sc,(E)/Var	
<i>Aquila chrysaetos</i>	Golden eagle	WCA 1	1a	BI		II	na	-	
<i>Ardea purpurea</i>	Purple heron	WCA 1		BI					
<i>Asio flammeus</i>	Short-eared owl			BI	II		Wt,Du,Bog,t	Var/Var	
<i>Aythya marila</i>	Scaup	WCA 1	2,4b			II	C	Sc/Var	
<i>Burhinus oedicnemus</i>	Stone curlew	WCA 1	1b,4b	BI	II	II	Na	-	
<i>Botaurus stellaris</i>	Bittern	WCA 1	2,3,4	BI	II		Wt,LM	A/E&W	
	- species recommended by more than 1 consultee								
<i>Bucephala clangula</i>	Goldeneye	WCA 1*	2			II	C	Sc/NW,Sc	
<i>Calcarius lapponicus</i>	Lapland Bunting	WCA 1	2				na	-	
<i>Calidris maritima</i>	Purple sandpiper	WCA 1	2,4a		II	II	na	-	
<i>Calidris temminckii</i>	Temminck's stint	WCA 1	2,4a		II	II	P,t	Sc/-	
<i>Carpodacus erythrinus</i>	Scarlet rosefinch	WCA 1	2				na	-	
<i>Certhia brachydactyla</i>	Short-toed treecreeper	WCA 1					na	-	
<i>Cettia cetti</i>	Cetti's warbler	WCA 1	2				Wt, LM		
	- species recommended by more than 1 consultee								
<i>Charadrius alexandrinus</i>	Kentish Plover	WCA 1	2		II	II	C,E,SL	(A,S)/-	
<i>Charadrius dubius</i>	Little Ringed Plover	WCA 1			II	II	RM,LM	cE,sE/-	
<i>Charadrius hiaticula</i>	Ringed Plover								
	Added species recommended by 1 consultee								
<i>Charadrius morinellus</i>	Dotterel	WCA 1	5	BI	II	II	na	-	
<i>Chlidonias niger</i>	Black tern	WCA 1	2	BI	II		C,Wt,L	pgc	
<i>Cinclus cinclus</i>	Dipper								
	Added species recommended by more than 1 consultee								
<i>Circus aeruginosa</i>	Marsh harrier	WCA 1	2	BI		II	Wt,LM	Var/sE	

Scientific name	Species Common Name/Description	Status					Ecology/ Distribution		Consn Rec ^y
		WCA	RDB	EC DIVE	Berne	Bonn	Habitat	Distn	
<i>Circus cyaneus</i>	Hen harrier	WCA 1	5	BI		II	Wt,SM,C,t nE,nW,Sc/Var		
<i>Circus pygargus</i>	Montagu's harrier	WCA 1	2	BI		II	Wt,LM,SM,t		
<i>Clangula hyemalis</i>	Long-tailed duck	WCA 1	4b			II	C	-/Sc	
<i>Coturnix coturnix</i>	Common quail	WCA 1	2				na	-	
<i>Crex crex</i>	Common crane	WCA 1	3	BI	II		na	-	
<i>Cygnus bewickii</i>	Bewick's swan	WCA 1	1b,4b	BI	II	II	E,L,FM	-/Var	
<i>Cygnus cygnus</i>	Whooper swan	WCA 1	1b,2	BI	II	II	L,SL,C,Wt	-/Var	
<i>Emberiza circlus</i>	Cirl Bunting	WCA 1	2,3,4a,4b				na		
<i>Eremophila alpestris</i>	Shorelark	WCA 1	2		II	II	C,SM,Du	-/Var	
<i>Falco columbarius</i>	Merlin	WCA 1	5	BI	II	II	C,E,t	Var/Var	
<i>Falco peregrinus</i>	Peregrine falcon	WCA 1	1a	BI	II	II	C,t	Var/Var	
<i>Falco rusticolus</i>	Gyr falcon	WCA 1				II			
<i>Falco subbuteo</i>	Hobby	WCA 1				II	na	-	
<i>Fringilla montifrigilla</i>	Brambling	WCA 1	2				na	-	
<i>Gallinago gallinago</i>	Snipe							Added species recommended by 1 consultee	
<i>Gavia artica</i>	Black-throated diver	WCA 1	1b,2	BI	II		C	Sc/GB	
<i>Gavia immer</i>	Great northern diver	WCA 1	1b,2	BI	II		C	Sc/GB	
<i>Gavia stellata</i>	Red-throated diver	WCA 1	1a,1b	BI	II		C	Sc/GB	
<i>Haematopus ostralegus</i>	Oystercatcher							Added species recommended by 1 consultee	
<i>Haliaeetus albicilla</i>	White-tailed eagle	WCA 1	2,RL3	BI		I,II	C	Sc/Scot	
<i>Himantopus himantopus</i>	Black-winged stilt	WCA 1	2	BI	II		FM,Wt,t	Var/-	
<i>Hydrobates pelagicus</i>	Storm petrel		1a,4a	BI	II		C	Wh,Sc/off	
<i>Ixobrychus minatus</i>	Little Bittern	WCA 1	2	BI	II		LM,DM	Var/-	
<i>Jynx torquilla</i>	Wryneck	WCA 1	2				na	-	
<i>Lanius collurio</i>	Red-backed shrike	WCA 1	2,3	BI	II		na	-	
<i>Larus melanocephalus</i>	Mediterranean gull	WCA 1	2,4a	BI	II		CWt,SL	Var/Var	
<i>Larus minutus</i>	Little gull	WCA 1	2						
<i>Limosa limosa</i>	Black-tailed godwit	WCA 1	2,4a,4b			II	Wt,C,SM,E	Var/Var	
<i>Locustella luscinioides</i>	Savi's warbler	WCA 1	2,4a				Wt,LM		
<i>Loxia spp.</i>	Crossbills	WCA 1	Var	BI (one sp.)	na	-			
<i>Lullula arborea</i>	Woodlark	WCA 1	2	BI			na	-	
<i>Luscinia svecica</i>	Bluethroat	WCA 1	2	BI	II		t,R/LM	Sc/eB	
<i>Melanitta fusca</i>	Velvet Scoter	WCA 1	4b			II	C	-/Sc	
<i>Melanitta nigra</i>	Common Scoter	WCA 1	2,4b			II	C	Sc/N,Wh,Sc	
<i>Merops apiaster</i>	Bee-eater	WCA 1	2		II	II	na	-	
<i>Milvus milvus</i>	Red kite	WCA 1	2,RLk	BI		II	na	-	
<i>Motacilla cinerea</i>	Grey wagtail							Added species recommended by more than 1 consultee	
<i>Motacilla flava</i>	Yellow wagtail							Added species recommended by more than 1 consultee	

Scientific name	Species Common Name/Description	Status					Ecology/ Distribution		Consn Rec ^y
		WCA	RDB	EC DIVE	Berne	Bonn	Habitat	Distn	
<i>Numenius phaeopus</i>	Whimbrel	WCA 1	5			II	P,t,E	Sc/Var	
<i>Nyctea scandiaca</i>	Snowy owl	WCA 1	2	BI	II		na	-	
<i>Oceanodroma leucorhoa</i>	Leach's Petrel	WCA 1	1a,4a	BI	II		C	Sc/off	
<i>Oriolus oriolus</i>	Golden oriole	WCA 1	2,4a		II		na	-	
<i>Pandion haliaetus</i>	Osprey	WCA 1	2	BI		II	L,R,E	Sc/-	
<i>Panurus biarmicus</i>	Bearded tit	WCA 1	4a		II		Wt,LM		
	- species recommended by more than 1 consultee								
<i>Parus cristatus</i>	Crested tit	WCA 1	4a		II		na	-	
<i>Pernis apivorus</i>	Honey Buzzard	WCA 1	2	BI		II	na	-	
<i>Phalaropus lobatus</i>	Red-necked phalarope	WCA 1	2,4a	BI		II	Wt,Bog,L	Sc/Var	
<i>Philomachus pugnax</i>	Ruff	WCA 1	2,4a	BI		II	FM,CM,SM,E,Wt	Var/Var	
<i>Phoenicurus ochruros</i>	Black redstart	WCA 1	2		II		na	-	
<i>Platalea leucorodia</i>	Spoonbill	WCA 1		BI		II			
<i>Plectrophenax nivalis</i>	Snow Bunting	WCA 1	2		II		na	-	
<i>Pluvialis apricaria</i>	Golden plover							Added species recommended by 1 consultee	
<i>Pluvialis squatarola</i>	Grey plover							Added species recommended by 1 consultee	
<i>Podiceps auritus</i>	Slavonian grebe	WCA 1	2,4a	BI	II		C	Sc/GB	
<i>Podiceps grisegena</i>	Red-necked grebe		2	BI			L,E,C	Var/Var	
<i>Podiceps nigricollis</i>	Black-necked grebe	WCA 1	2,4a		II		Wt,L	Var/Var	
<i>Porzana porzana</i>	Spotted Crane	WCA 1	2	BI	II		Wt,LM,RM,Bog	Var/Var	
<i>Pyrrhocorax pyrrhocorax</i>	Chough	WCA 1	2,4a	BI	II		na	-	
<i>Rallus aquaticus</i>	Water rail							Added species recommended by 1 consultee	
<i>Recurvirostra avosetta</i>	Avocet	WCA 1	2,4a,4b	BI	II	II	SL,SM,E,LM	A/Var	
<i>Regulus ignicapillus</i>	Firecrest	WCA 1	4a		II		na	-	
<i>Riparia riparia</i>	Sand martin							Added species recommended by more than 1 consultee	
<i>Serinus serinus</i>	Serim	WCA 1	2		II		na	-	
<i>Sterna albifrons</i>	Little tern	WCA 1	1a,4a	BI	II		C	Var/-	
<i>Sterna dougallii</i>	Roseate tern	WCA 1	1a,2,3,4a	BI	II	II ⁶	C	neE,nW/-	
<i>Sterna hirundo</i>	Common tern			BI	II		C,Sh,Du,L,RM	Var/-	
<i>Sterna paradisaea</i>	Arctic tern		1a	BI	II		C		
<i>Sterna sandvicensis</i>	Sandwich tern		1a,4a	BI	II		C,Sh	Var/Var	
<i>Sylvia undata</i>	Dartford warbler	WCA 1	2,4a	BI	II		na	-	
<i>Tringa glareola</i>	Wood sandpiper	WCA 1	2,4a	BI	II	II	Wt,Bog,LM,t	Sc/-	
<i>Tringa nebularia</i>	Greenshank	WCA 1	5			II	E,t	Sc/Var	
<i>Tringa ochropus</i>	Green sandpiper	WCA 1			II	II	RM,DM,LM,t	-/sE	
<i>Tringa totanus</i>	Redshank							Added species recommended by 1 consultee	
<i>Turdus iliacus</i>	Redwing	WCA 1	2				na	-	

Scientific name	Species Common Name/Description	WCA	RDB	Status			Ecology/ Distribution		Consn Rec ^y
				EC DIVE	Berne	Bonn	Habitat	Distn	
Turdus pilaris	Fieldfare	WCA 1	2				na	-	
Tyto alba	Barn owl - species recommended by more than 1 consultee	WCA 1	5		II		FM,t	Var	
Upupa epops	Hoopoe	WCA 1	2		II		na	-	
Vanellus vanellus	Lapwing - species recommended by more than 1 consultee								
Fish									
Acipenser sturio	Sturgeon	WCA 5	pRDB1/Sf	IIa*	IVa		REM	Var	
Alosa alosa	Allis Shad - species recommended by more than 1 consultee	WCA 5****	pRDB2/Sf	IIa			REM	Sc/Var?	
Alosa fallax	Twaite shad - species recommended by more than 1 consultee		pRDB2/Sf	IIa			REM	Var	
Cobitis taenia	Spined loach - species recommended by more than 1 consultee			IIa			D,R	Var	
Coregonus albula	Vendace - species recommended by more than 1 consultee	WCA 5					L	NW	NRA
Coregonus lavaretus	Whitefish - species recommended by more than 1 consultee	WCA 5					L	NW,Wh,Sc	NRA
Coregonus oxyrinchus	Houting		pRDB1/Sf	IIa,IVa			REM	scE	
Cottus gobio	Bullhead			IIa			R		
Gobius couchi	Couch's goby		pRDBK/AI				MIt,E	SW	
Gobius gasteveni	Steven's goby		pRDBK/AI				Moff(In)	SW	
Lampetra fluviatilis	River lamprey - species recommended by more than 1 consultee			IIa			RE		
Lampetra planeri	Brook lamprey			IIa			R		
Lota Lota	Burbot - species recommended by more than 1 consultee	WCA 5					D,L,R		
Osmerus eperlanus	Smelt								
Petromyzon marinus	Sea lamprey - species recommended by more than 1 consultee				IIa		M		
Salmo salar	Salmon - species recommended by more than 1 consultee				IIa		L,R,E,M		
Tripterygion atlanticus	Black-faced blenny				pRDBK/AI		MIn	Wx	
Amphibians									
Bufo bufo	Common Toad	WCA 5*							
Bufo calamita	Natterjack Toad	WCA 5*		IVa	II		DS,DP,P	Var	SS/SR
Rana temporaria	Common Frog	WCA 5*							

Scientific name	Species Common Name/Description	Status					Ecology/ Distribution		Consn Rec ^y
		WCA	RDB	EC DIVE	Berne	Bonn	Habitat	Distn	
<i>Triturus cristatus</i>	Great Crested (Warty) Newt	WCA 5		IIa,IVa	II		L,P	Var	
<i>Triturus helveticus</i>	Palmate Newt	WCA 5*							
<i>Triturus vulgaris</i>	Smooth Newt	WCA 5*							
Reptiles ²									
<i>Anguis fragilis</i>	Slow-worm	WCA 5***							
<i>Coronella austriaca</i>	Smooth Snake	WCA 5		IVa	II		na	-	-
<i>Lacerta agilis</i>	Sand Lizard	WCA 5		IVa	II		na	-	-
<i>Lacerta vivipara</i>	Viviparous Lizard	WCA 5***							
<i>Natrix natrix</i> (<i>Natrix helvetica</i>)	Grass Snake	WCA 5***							
<i>Vipera berus</i>	- species recommended by more than 1 Adder	consultee WCA 5***							
Mammals ³									
<i>Arvicola terrestris</i>	Water vole			Added species recommended by more than 1 consultee					
<i>Balaenoptera physalus</i>	Fin whale	WCA 5	RL2	IVa					
<i>Balaenoptera acutorostrata</i>	Minke whale	WCA 5		IVa					
<i>Barbastella barbastellus</i>	Barbastelle (bat)	WCA 5	RDB3	IIa,IVa	II	II	RM,LM	Var	-
<i>Delphinus delphis</i>	Common dolphin	WCA 5		IVa	II	II ^A			
	- species recommended by more than 1	consultee							
<i>Eptesicus serotinus</i>	Serotine (bat)	WCA 5	RDB2	IVa	II	II	na	-	-
<i>Felis silvestris</i>	Wild Cat	WCA 5		IVa	II		na	-	-
<i>Globicephala melaena</i>	Long-finned pilot whale	WCA 5		IVa	II				
<i>Grampus griseus</i>	Risso's dolphin	WCA 5		IVa	II	II ^A			
<i>Halichoerus grypus</i>	Grey seal	(Seals Act) IIa							
	- species recommended by more than 1	consultee							
<i>Lagenorhynchus acutus</i>	Atlantic white-sided dolphin	WCA 5		IVa	II	II ^A			
<i>Lagenorhynchus albirostris</i>	White-beaked dolphin	WCA 5		IVa	II	II ^A			
<i>Lutra lutra</i>	Common Otter	WCA 5	RDB1	II,IVa	II		RM,LM,DM,CM	Var	NRA
	- species recommended by more than 1	consultee							
<i>Martes martes</i>	Pine Marten	WCA 5					na	-	-
<i>Meles meles</i>	Badger	(Badgers Act)					RM,t		
<i>Mesoplodon bidens</i>	Sowerby's beaked whale	WCA 5		IVa	II				
<i>Muscardinus avellanarius</i>	Dormouse	WCA 5		IVa			na	-	-
<i>Myotis bechsteinii</i>	Bechstein's bat	WCA 5	RDB3	II,IVa	II	II	na	-	-
<i>Myotis brandtii</i>	Brandt's bat	WCA 5	RDB2	IVa	II	II	na	-	-
<i>Myotis daubentonii</i>	Daubenton's bat	WCA 5	RDB2	IVa	II	II	RM,LM,t	Var	
	- species recommended by more than 1	consultee							

Scientific name	Species		Status				Ecology/ Distribution		Consn
	Common Name/Description	WCA	RDB	EC DIVE	Berne	Bonn	Habitat	Distn	Rec ^y
+ <i>Myotis myotis</i>	Mouse-eared bat	WCA 5	RDB1	IIa,IVa	II	II	na	-	-
<i>Myotis mystacinus</i>	Whiskered bat	WCA 5	RDB2	IVa	II	II	na	-	-
	- species recommended by more than 1 consultee								
<i>Myotis nattereri</i>	Natterers's bat	WCA 5	RDB2	IVa	II	II	na	-	-
	- species recommended by more than 1 consultee								
<i>Neomys fodiens bicolor</i>	Water shrew	Added species recommended by more than 1 consultee							
<i>Nyctalus leisleri</i>	Leisler's bat	WCA 5	RDB2&3	IVa	II	II	RM,LM,t	Var	
<i>Nyctalus noctula</i>	Noctule (bat)	WCA 5	RDB2	IVa	II	II	LM	Var	
	- species recommended by more than 1 consultee								
<i>Orcinus orca</i>	Killer whale	WCA 5		IVa	II	II ⁵			
<i>Phoca vitulina</i>	Common seal	(Seals Act) IIa							
	- species recommended by more than 1 consultee								
<i>Phocaena phocaena</i>	Harbour porpoise	WCA 5		IIa,IVa	II	II ⁴			
	- species recommended by more than 1 consultee								
<i>Pipistrellus pipistrellus</i>	Pipistrelle (bat)	WCA 5	RDB2	IVa		II	na	-	-
<i>Plecotus auritus</i>	Brown long-eared bat	WCA 5	RDB2	IVa	II	II	na	-	-
	- species recommended by more than 1 consultee								
<i>Plecotus austriacus</i>	Grey long-eared bat	WCA 5	RDB&3	IVa	II	II	na	-	-
	- species recommended by more than 1 consultee								
<i>Rattus rattus</i>	Black rat		RDB2						
<i>Rhinolophus ferrumequinum</i>	Greater horseshoe bat	WCA 5	RDB1	IIa,IVa	II	II	RM,LM,t	Var	
<i>Rhinolophus hipposideros</i>	Lesser horseshoe bat	WCA 5	RDB1	IIa,IVa	II	II	RM,t	Var	
<i>Sciurus vulgaris</i>	Red Squirrel	WCA 5	RDB2				na	-	-
<i>Stenella coeruleoalba</i>	Striped dolphin	WCA 5		IVa	II				
<i>Tursiops truncatus (tursio)</i>	Bottle-nosed dolphin	WCA 5		IIa,IVa	II	II ⁴			
PLANTS									
Algae - Charophytes									
<i>Chara baltica</i>	Baltic stonewort		RDB2				SL,DuP	A,SW	nr
<i>Chara canescens</i>	Bearded stonewort	WCA 8	RDB1				(SL),L	A	
<i>Chara connivens</i>	Convergent stonewort		RDB2				SL,L	A,SW	nr
<i>Chara curta</i>	Lesser bearded stonewort		RDBK				L,DuP	A,SW,Wh,NW	nr
<i>Chara fragifera</i>	Strawberry stonewort		RDB3				P,l	SW	nr
<i>Chara intermedia</i>	Intermediate stonewort		RDB3				L,DuP	A	nr
<i>Chara rudis</i>	stonewort		RDB3				L,D,P	NW,N	nr

Scientific name	Species		Status					Ecology/ Distribution		Consn
	Common Name/Description	WCA	RDB	EC Dtvc	Berne	Bonn	Habitat	Distn	Rec ^y	
Lamprothamnium papulosum	Foxtail Stonewort	WCA 8					SLM	S,Wx	SS	
+ Nitella capillaris	Slimy-fruited stonewort		RDB1				D,P	A		
Nitella gracilis	Slender stonewort		RDB2				L,D,R	A,T,Wh	nr	
+ Nitella hyalina	Many-branched stonewort		RDB1				L,D,R	SW		
Nitella tenuissima	Dwarf stonewort		RDB1				P,D	A,Wh	nr	
Nitellopsis obtusa	Starry stonewort		RDB2				L	A	nr	
+ Tolypella intricata	Tassel stonewort		RDB2				P,D	A,Wx	nr	
Tolypella nidifica	Bird's nest stonewort		RDB1				SL,SD	A, Scot		
Tolypella prolifera	Great tassel stonewort		RDB2				D,R,P	A,S,Wx	nr	
Mosses										
Acaulon triquetrum	triangular pygmy-moss	WCA 8	pRDB1				na	-		
Barbula cordata	cordate beard-moss	WCA 8	pRDB1				na	-		
Barbula glauca	glaucous beard-moss	WCA 8	pRDB1				na	-		
Bartramia stricta	rigid apple-moss	WCA 8	pRDB2				na	-		
Bryum mamillatum	dune thread-moss	WCA 8	pRDB1				CDuS,t	A,NW,Y		
Bryum schleicheri	Schleicher's thread-moss	WCA 8	pRDB1				RM	Sc		
Buxbaumia viridis	green shield-moss	WCA 8	pRDB2	IIb	I		na	-		
Cryphaea lamyana	multi-fruited river-moss	WCA 8	pRDB2				RM	SW,Wh		
Cyclodictyon laetevirens	bright green cave-moss	WCA 8	pRDB2				C	Sc		
Ditrichum cornubicum	Cornish path-moss	WCA 8	pRDB1				na	-		
Hamatocaulis (Drepanocladus) vermicosus	slender green feather-moss	WCA 8		IIb	I		Wt, RM			
Grimmia unicolor	blunt-leaved grimmia	WCA 8	pRDB2				na	-		
Hypnum vaucheri	Vaucher's feather-moss	WCA 8	pRDB2				na	-		
Micromitrium tenerum	millimetre moss	WCA 8	pRDB1				LM	S,T,Wh		
Mielichhoferia miclichhoferi	alpine copper-moss	WCA 8	pRDB2				na	-		
Orthotrichum obtusifolium	blunt-leaved bristle-moss	WCA 8	pRDB1				na	-		
Plagiothecium piliferum	hair silk-moss	WCA 8	pRDB2				na	-		
Rhynchostegium rotundifolium	round-leaved feather-moss	WCA 8	pRDB1				na	-		
Saclania glaucescens	blue dew-moss	WCA 8	pRDB2				na	-		
Scorpidium turgescens	large yellow feather-moss	WCA 8	pRDB2				na	-		
Sphagnum balticum	Baltic bog-moss	WCA 8	pRDB2				Bog, BogP	Var		
Thamnobryum angustifolium	Derbyshire feather-moss	WCA 8	pRDB1				na	-		
Zygodon forsteri	knob-hole moss	WCA 8	pRDB1				na	-		
Zygodon gracilis	Nowell's limestone moss	WCA 8	pRDB2				na	-		

Species	Status	Ecology/	Consn						Distribution	Rec ^y
Scientific name	Common Name/Description	WCA	RDB	EC DIVE	Berne	Bonn	Habitat	Distn		
Liverworts										
<i>Adelanthus lindenbergianus</i>	Lindenberg's leafy liverwort	WCA 8	pRDB2				na	-		
<i>Geocalyx graveolens</i>	turpswort	WCA 8	pRDB2				na	-		
<i>Gymnomitrium apiculatum</i>	pointed frostwort	WCA 8	pRDB2				na	-		
<i>Jamesoniella undulifolia</i>	marsh earwort	WCA 8	pRDB1				Bog	Sw,Sc		
<i>Leciocolca ruthena</i>	Norfolk flapwort	WCA 8	pRDB1				Wt	A,T?		
<i>Marsupella profunda</i>	western rustwort	WCA 8	pRDB1	* IIb	I		na	-		
<i>Petalophyllum ralfsii</i>	petalwort	WCA 8	pRDB2	IIb	I		CDuS	Var		
<i>Riccia bifurca</i>	Lizard crystalwort	WCA 8	pRDB2				na	-		
<i>Southbya nigrella</i>	blackwort	WCA 8	pRDB2				na	-		
Lichens										
<i>Bryoria furcellata</i>	forked hair-lichen	WCA 8	pRDB2				na	-		
<i>Buellia asterella</i>	starry breck-lichen	WCA 8	pRDB2				na	-		
<i>Caloplaca lutcoalba</i>	orange-fruited elm-lichen	WCA 8	pRDB2				na	-		
<i>Caloplaca nivalis</i>	snow caloplaca	WCA 8	pRDB1				na	-		
<i>Catapyrenium psoromoides</i>	tree catapyrenium	WCA 8	pRDB1				na	-		
<i>Catillaria laurerei</i>	Laurer's catillaria	WCA 8	pRDB2				na	-		
<i>Cladonia stricta</i>	upright mountain cladonia	WCA 8	pRDB1				na	-		
<i>Collema dichotomum</i>	river jelly lichen	WCA 8	pRDB2				R,RM,(L,LM)	N,NW,Sc		
<i>Gyalecta ulmi</i>	elm gyalecta	WCA 8	pRDB2				na	-		
<i>Heterodermia leucomelos</i>	ciliate strap-lichen	WCA 8	pRDB2				na	-		
<i>Heterodermia propagulifera</i>	coralloid rosette-lichen	WCA 8	pRDB2				na	-		
<i>Lecanactis hemisphaerica</i>	churchyard lecanactis	WCA 8	pRDB2				na	-		
<i>Lecanora achariana</i>	tarn lecanora	WCA 8	pRDB2				LM	NW,Wh		
<i>Lecidea inops</i>	copper lecidea	WCA 8	pRDB2				na	-		
<i>Nephroma articum</i>	artic kidney-lichen	WCA 8	pRDB1				na	-		
<i>Pannaria ignobilis</i>	Caledonian pannaria	WCA 8	pRDB2				na	-		
<i>Parmelia miniarum</i>	New Forest parmelia	WCA 8	pRDB2				na	-		
<i>Parmentaria chilensis</i>	oil-stain parmentaria	WCA 8	pRDB2				na	-		
<i>Peltigera lepidophora</i>	ear-lobed dog-lichen	WCA 8	pRDB1				RM	Sc		
<i>Pertusaria bryontha</i>	alpine moss pertusaria	WCA 8	pRDB2				na	-		
<i>Physcia tribacoides</i>	southern grey physcia	WCA 8	pRDB2				na	-		
<i>Pseudocyphellaria lacerata</i>	ragged pseudocyphellaria	WCA 8	pRDB2				na	-		
<i>Psora rubiformis</i>	rusty alpine psora	WCA 8	pRDB2				na	-		

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<i>Solenopsora liparina</i>	serpantine solenopsora	WCA 8	pRDB2				na	-	
<i>Squamaria lentigera</i>	scaly breck-lichen	WCA 8	pRDB2				na	-	
<i>Teloschistes flavicans</i>	golden hair-lichen	WCA 8	pRDB2				na	-	
Vascular Plants									
<i>Ajuga chamaepitys</i>	Ground pine	WCA 8							
<i>Alisma gramineum</i>	Ribbon-leaved Water plantain	WCA 8	RDB1/NR				LM,DM	A	SS/SR
<i>Allium sphaerocephalon</i>	Round-headed Leek	WCA 8	RDB2				na	-	-
<i>Althaea hirsuta</i>	Rough Marsh-mallow	WCA 8	RDB1				na	-	-
<i>Alyssum alyssoides</i>	Small Alison	WCA 8	RDB1				na	-	-
<i>Andromeda polifolia</i>	Bog rosemary		Added species recommended by 1 consultee						
<i>Apium repens</i>	Creeping Marshwort	WCA 8	RDB1	IIb,IVb	I		FM,D,L	T	SS
<i>Arabis alpina</i>	Alpine Rock-cress	WCA 8	RDB3				na	-	-
<i>Arabis stricta/scabra?</i>	Bristol Rock-cress	WCA 8	RDB2				na	-	-
<i>Arenaria norvegica</i>	Norwegian Sandwort	WCA 8	RDB3/1				na	-	-
<i>Artemisia campestris</i>	Field Wormwood	WCA 8	RDB1				na	-	-
<i>Atriplex longipens</i>			RDB3				SM	A,SW,Wx	nr
<i>Bupleurum baldense</i>	Small Hare's ear	WCA 8	RDB1				na	-	-
<i>Bupleurum falcatum</i>	Sickle-leaved Hare's ear	WCA 8	RDB1				na	-	-
<i>Calamintha sylvatica</i>	Wood Calamint	WCA 8	RDB2				na	-	-
<i>Callitriche brutia</i>	A water starwort		NS				P,PM,LM,RM,t Var		
<i>Callitriche truncata</i>	A water starwort		NS				L,D,R		
+ <i>Carex davalliana</i>			RDB1				Bog	Wx,Y	
<i>Carex ppropinquata</i>	Fibrous tussock sedge		NS				Wt	A,NW,Y	
<i>Carex depauperata</i>	Starved Wood-sedge	WCA 8	RDB1				na	-	-
+ <i>Centaurium latifolium</i>	Broad-leaved centaury		RDB2				DuS	NW	
<i>Centaurium tenuiflorum</i>	Slender centaury	WCA 8	RDB2				na	-	-
<i>Cephalanthera rubra</i>	Red Helleborine	WCA 8	RDB1				na	-	-
<i>Ceratophyllum submersum</i>	Soft hornwort		NS				L,D	Var	
<i>Chenopodium vulvaria</i>	Stinking Goosefoot	WCA 8	RDB2				CM,t	Wx,S	
<i>Cicerbita alpina</i>	Alpine Sow-thistle	WCA 8	RDB3				na	-	-
<i>Cladium mariscus</i>	Great pond sedge		NS				Wt	Var	
<i>Corrigiola litoralis</i>	Strapwort	WCA 8	RDB2				L	SW	SS/SR
<i>Cotoneaster integerrimus</i>	Wild Cotoneaster	WCA 8	RDB1				na	-	-
<i>Crassula aquatica</i>	Pigmyweed	WCA 8	RDB2/NR				PM	Sc	
<i>Crepis foetida</i>	Stinking hawk's-beard	WCA 8	RDB2				na	-	-

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	Common Name/Description	WCA	RDB	EC DIVE	Berne	Bonn	Habitat	Distn	Rec ^y
<i>Cynoglossum germanicum</i>	Green Hound's-tongue	WCA 8	RDB2				na	-	-
<i>Cyperus fuscus</i>	Brown Galingale	WCA 8	RDB1				LM,DM	S,T,Wx	SS
<i>Cypripedium calceolus</i>	Lady's-slipper orchid	WCA 8	RDB1	IIb,IVb	I		na	-	-
<i>Cystopteris dickiana</i>	Dickie's bladder Fern	WCA 8	RDB1				SCa	Sc	
<i>Dactylorhiza lapponica</i>	Lapland marsh orchid	WCA 8					Wt?		
<i>Damasonium alisma</i>	Starfruit	WCA 8	RDB1/NR				LM	T	SS/SR
<i>Dianthus gratianopolitanus</i>	Cheddar Pink	WCA 8	RDB2				na	-	-
<i>Diapensia lapponica</i>	Diapensia	WCA 8	RDB2				na	-	-
<i>Drosera</i> spp	Sundew spp		Added species recommended by 1 consultee						
<i>Dryopteris cristata</i>	Crested buckler-fern		RDB2				Wt,DM,LM	A,T	nr
<i>Elatine hexandra</i>	Six-stamened waterwort		NS				L,LM,R,RM	Var	
<i>Elatine hydropiper</i>	Eight-stamened waterwort		RDB3/NS				L,D	Wh,Sc	nr
X <i>Eleocharis austriaca</i>	Northern spike-rush		RDB3				RM	N,NW,Y	nr
<i>Eleocharis parvula</i>	Dwarf spike-rush		RDB3				EM	S?,SW,Wx,Wh	nr
<i>Epipactis youngiana</i>	Young's Helleborine	WCA 8	RDB3				na	-	-
<i>Epipogium aphyllum</i>	Ghost Orchid	WCA 8	RDB3				na	-	-
<i>Equisetum ramosissimum</i>	Branched Horsetail	WCA 8	RDB1				RM,SW,t	A,Wx	SS
<i>Erica ciliaris</i>	Dorset heath		Added species recommended by 1 consultee						
<i>Erica tetralix</i>	Cross-leaved heath		Added species recommended by 1 consultee						
<i>Erigeron borealis</i>	Alpine Fleabane	WCA 8	RDB3				na	-	-
<i>Eriophorum gracile</i>	Slender Cottongrass	WCA 8	RDB2				Bog,Wt,LM	T,Wh,Wx	SS
<i>Eryngium campestre</i>	Field Eryngo	WCA 8	RDB2				na	-	-
<i>Euphorbia hyberna</i>	Irish Spurge		RDB3				RM,t	SW,Wx	nr
+ <i>Euphorbia peplis</i>	Purple Spurge		RDB1				CM	Lu	
<i>Euphrasia rivularis</i>	Snowdon eyebright		RDB3				RM,t	Wh,NW	nr
<i>Filago lutescens</i>	Red-tipped Cudweed	WCA 8	RDB2				na	-	-
<i>Filago pyramidata</i>	Broad-leaved Cudweed	WCA 8	RDB2				na	-	-
<i>Fumaria martinii</i>	Martin's Ramping-fumitory	WCA 8	RDB1				na	-	-
<i>Gagea bohemica</i>	Early Star-of-Bethlehem	WCA 8	RDB2				na	-	-
<i>Galium debile</i>	Slender marsh bedstraw		RDB3				P,LM,DM	Wx,SW?,Y?	nr
<i>Gentiana nivalis</i>	Alpine Gentian	WCA 8	RDB2				na	-	-
<i>Gentiana verna</i>	Spring Gentian	WCA 8	RDB3				na	-	-
<i>Gentianella anglica</i>	Early Gentian	WCA 8		II,IVb	I		Du,t	Var	
<i>Gentianella ciliata</i>	Fringed Gentian	WCA 8							
<i>Gentianella uglinosa</i>	Dune gentian	WCA 8	RDB2				DuS	Wh	nr

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Geranium purpureum forsteri			RDB1				CSh	S/Wx	
Gladiolus illyricus	Wild Gladiolus	WCA 8	RDB2				na	-	-
Gnaphalium luteoalbum	Jersey Cudweed	WCA 8	RDB1				Du,DuP,t	A	SS
+ Halimione pedunculata	Stalked orache	WCA 8	RDB1				SM	A,N,S,Wh	
Hieracium attenuatifolium	Weak-leaved hawkweed	WCA 8	n.c.						
Hieracium northroense	Northroe hawkweed	WCA 8	n.c.						
Hieracium zelandicum	Shetland hawkweed	WCA 8	n.c.						
Himantoglossum hircinum	Lizard Orchid	WCA 8	RDB2				na	-	-
Homogyne alpina	Purple Colt's-foot	WCA 8	RDB2				na	-	-
+ Hydrilla verticillata			RDB1/NR				L	NW	
Hydrocharis morsus-ranae	Frogbit		NS				D,L,LM	Var	
Hymenophyllum spp			Added species recommended by 1 consultee						
Iris spuria	Blue iris		RDB2				DM,t	A,SW/Wx	
Iris versicolor	Purple iris		RDB3				Wt,LM,RM	A,NW,Sc	
Isoetes echinospira			NS				L	wE,Wh,Sc	
Juncus mutabilis	Pigmy rush		RDB3				P	SW	nr
Juncus filiformis	Thread rush		RDB3				LM	nE,Sc	nr
Juncus subulatus			RDB3				SM	SW/Wx	nr
Lactuca saligna	Least Lettuce	WCA 8	RDB1				SM,CSh,SW	A/T,S	SS
Leersia oryoides	Cut-grass		RDB2				FM,DM,RM	sE	nr
Leucojum vernum	Spring snowflake		RDB2				RM,t	SW,Wx	
Leucojum aestivum	Summer snowflake/Loddon Lilly		RDB3				Wt	T,Wx	nr
Limonium bellidifolium	Matted sea lavender		RDB3				SM	A	nr
Limosella australis	Welsh mudwort	WCA 8	RDB3				P	Wh	nr
Liparis loeselii	Fen Orchid	WCA 8	RDB1	IIb,IVb	I		Wt	A,Wh	SS
Lloydia serotina	Snowdon Lily	WCA 8	RDB2				na	-	-
Ludwigia palustris	Hamphire purslane		RDB3/NR				P,D	NW,Wx	nr
Luronium natans	Floating-leaved water-plantain	WCA 8	NS	IIb,IVb	I		L,D	Var	
Lychnis alpina	Alpine Catchfly	WCA 8	RDB2				na	-	-
Lythrum hyssopifolia	Grass-poly	WCA 8	RDB2				FM	A,ST,S	SS
Matthiola sinuata	Sea stock		RDB2				Du,t	SW,Wh	nr
Melampyrum arvense	Field Cow-wheat	WCA 8	RDB1				na	-	-
Mentha pulegium	Pennyroyal	WCA 8	RDB2				FM,LM	Var	SS
Minuartia stricta	Teesdale Sandwort	WCA 8	RDB2				na	-	-
Myriophyllum verticillatum	Whorled water milfi=oil		NS				L,D,R	Var	

Scientific name	Species		Status				Ecology/ Distribution		Consn
	Common Name/Description	WCA	RDB	EC Dtvc	Berne	Bonn	Habitat	Distn	Rec ^y
<i>Najas flexilis</i>	Slender naiad	WCA 8	RDB3/NR	I Ib,IVb	I		L	NW,Sc	nr
<i>Najas marina</i>	Holly-leaved Naiad	WCA 8	RDB2/NR				L	A	SS
<i>Narthecium ossifragum</i>	Bog asphodel		Added species recommended by 1 consultee						
<i>Nuphar pumila</i>	Least water lilly		NS				L	NW,ST/Wh	
<i>Nymphoides peltata</i>	Fringed water lilly		NS ⁸				L,R	A,T	
<i>Oenanthe fluviatilis</i>	River water-dropwort		NS				L,D,R	E	
<i>Ononis reclinata</i>	Small Restharrow	WCA 8	RDB2				na	-	
<i>Ophioglossum lusitanicum</i>	Early/Least Adder's tongue	WCA 8	RBB3				na	-	
<i>Ophrys fuciflora</i>	Late Spider Orchid	WCA 8	RDB2				na	-	
<i>Ophrys sphegodes</i>	Early Spider Orchid	WCA 8	RDB2				na	-	
<i>Orchis militaris</i>	Military Orchid	WCA 8	RDB2				na	-	
<i>Orchis simia</i>	Monkey Orchid	WCA 8	RDB2				na	-	
<i>Oreopteris limbosperma</i>			Added species recommended by 1 consultee						
<i>Orobanche caryophyllacea</i>	Bedstraw Broomrape	WCA 8	RDB1				na	-	
<i>Orobanche loricata</i>	Oxtongue Broomrape	WCA 8	RDB1				na	-	
<i>Orobanche reticulata</i>	Thistle Broomrape	WCA 8	RDB1				na	-	
<i>Osmunda regalis</i>	Royal fern		Added species recommended by 1 consultee						
+ <i>Otanthus maritimus</i>	Cottonweed		RDB1				Du,CSh	Var	
<i>Petroraghia nanteuilii</i>	Childling Pink	WCA 8	RDB1				CM	S	SS
<i>Peucedanum officinale</i>	Hog's Fennel		RDB3				SM,CM	A,S	
<i>Phyllodoce caerulea</i>	Blue Heath	WCA 8	RDB2				na	-	-
<i>Phyteuma spicatum</i>	Spiked rampian	WCA 8	RDB3				na	-	-
X <i>Pilularia globulifera</i>	Pillwort		NS					Var	
<i>Poa infirma</i>	Early meadow-grass		RDB3				C,t	SW	nr
<i>Polygonatum verticillatum</i>	Whorled Solomon's-seal	WCA 8	RDB1				na	-	-
<i>Polygonum maritimum</i>	Sea Knotgrass	WCA 8	RDB1				CM	SW	SS
<i>Populus nigra</i>	Black poplar		Added species recommended by 1 consultee						
<i>Potamogeton acutifolius</i>	Sharp-leaved pondweed		NR				D,L,R?	A,S,T,Wx	
<i>Potamogeton coloratus</i>	Fen pondweed		NS				D,L,LM,R	Var	
<i>Potamogeton compressus</i>	Grass-wrack pondweed		NS				R,D	Var	
<i>Potamogeton epihydrus</i>	American pondweed		RDB3/NR				L,D	NW,Y,Sc	nr
X <i>Potamogeton nodosus</i>	Loddon pondweed		RDB3/NR				R	T,Wx	
<i>Potamogeton trichoides</i>	Hairlike pondweed		NS				D,L,R	Var	
<i>Potentilla rupestris</i>	Rock Cinquefoil	WCA 8	RDB2				na	-	-
<i>Pulicaria vulgaris</i>	Small Fleabane	WCA 8	RDB2				LM,P,t	sE	nr
<i>Pyrus cordata</i>	Plymouth Pear	WCA 8	RDB1				na	-	-

Species	Status	Ecology/	Consn	Distribution					
				WCA	RDB	EC DIVE	Berne	Bonn	Habitat
Scientific name	Common Name/Description								
Ranunculus ophioglossifolius	Adder's-tongue Spearwort	WCA 8	RDB1				L,Wt,t	T,Wx	SS
Ranunculus tripartitus	Three-lobed water-crowfoot		NR				D,P,t	sE,Wh	
Rhinanthus serotinus	Greater Yellow-rattle	WCA 8	RDB1				na	-	-
Rhynchosinapis wrightii	Lundy Cabbage	WCA 8	RDB3				C,t	Lu	nr
Romulea columnae	Sand Crocus	WCA 8	RDB2				na	-	-
Rorippa austriaca	Austrian yellow-cress		RDB3				DM,t	Var	
Ruppia cirrhosa	Spiral tasselweed		NS				C,SM,D,L	Var	
Rumex rupestris	Shore dock	WCA 8	RDB2	IIb,IVb	I		DuS,t	SW,Wh,Wx	
Sagittaria rigida	Canadian arrowhead		RDB2				D	SW	nr
Salvia pratensis	Meadow clary	WCA 8	RDB2				na	-	-
Saxifraga cernua	Drooping Saxifrage	WCA 8	RDB2				na	-	-
Saxifraga cespitosa	Tufted Saxifrage	WCA 8	RDB3				na	-	-
Saxifraga hirculus	Yellow marsh-saxifrage	WCA 8	RDB3	IIb,IVb I	na		-	-	-
X Scirpus holoschoenus	Round-headed club-rush		RDB3				RM	S,SW,Wh	nr
X Scirpus triquetrus	Triangular Club-rush	WCA 8	RDB1/NR				RM	A,S,SW,T	(SS)
(= Schoenoplectus triquetrus)									
Scleranthus perennis	Perennial knawel	WCA 8	RDB1				na	-	-
Scorzonera humilis	Viper's-grass	WCA 8	RDB2				Wt	Wx	SS
Scrophularia scorodonia	Balm-leaved figwort		RDB3				Wt,Du,t	SW	nr
Selinum carvifolia	Cambridge Milk-parsley	WCA 8	RDB2				Wt,FM	A	SS
+ Senecio congestus	Marsh fleawort		RDB1				D	A,S,Y	
Senecio paludosus	Fen ragwort	WCA 8	RDB2				D	A	SS/SR
Spartina alteriflora	Smooth cord-grass		RDB2				SM	S	
Stachys alpina	Limestone Woundwort	WCA 8	RDB1				na	-	-
Stachys germanica	Downy Woundwort	WCA 8	RDB1				na	-	-
Stratiotes aloides	Water soldier		NS ⁸				L,D	Var	
Succisa pratensis	Devil's-bit scabious								
Taraxacum hygrophilum			Added species recommended by 1 consultee				Wt	S	nr
Taraxacum glaucinum			RDB3				Du	Wh,NW	nr
Teucrium botrys	Cut-leaved Germander	WCA 8	RDB2				na	-	-
Teucrium scordium	Water Germander	WCA 8	RDB2				DuS,Wt,FWM	A,SW	SS
Thlaspi perfoliatum	Perfoliate penny-cress	WCA 8	RDB3/pRDB2				na	-	-
Trichomanes speciosum	Killamey Fern	WCA 8	RDB1	IIb,IVb	I		na	-	-
Valerionella eriocarpa	Hairy-fruited comsalad		RDB2				Du,t	Var	

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Veronica spicata	Spiked Speedwell	WCA 8	RDB2				na	-	-
Veronica triphyllos	Fingered Speedwell	WCA 8	RDB1				na	-	-
Viola persicifolia	Fen Violet	WCA 8	RDB1				Wt	A	SS/SR
Wolffia arrhiza	Rootless duckweed		NS				L	sE	
Woodsia alpina	Alpine Woodsia	WCA 8	RDB3				na	-	-
Woodsia ilvensis	Oblong Woodsia	WCA 8	RDB2				na	-	-
Plants on lists of Palmer and Newbold (1983)		Added species group recommended by more than 1 consultee							

Notes:

WCA 5 Current Schedule 5 of the Wildlife and Countryside Act 1981 - animals (other than birds) which are protected. It is normally an offence to kill, injure, take, possess or sell any of the listed animals (whether live or dead), to disturb the animal, or to damage, destroy or obstruct access to its place of shelter and protection.

WCA 5

- * Indicates species for which the offence relates to sale only
- ** Indicates species for which the offence relates to taking and sale only
- *** Indicates species for which the offence relates to killing, injuring and sale
- **** Indicates species for which the offence relates to killing and injuring only
- ***** Indicates species for which the offence relates to killing, injuring and taking only
- ***** Indicates species for which the offence relates to killing, injuring, taking, possession and sale only
- ***** Damage/destruction of place of shelter/protection

WCA 1 Current Schedule 1 of the Wildlife and Countryside Act 1981 - birds which are protected by special penalties.

- * During the close season
- ** During the close season in some Scottish areas only

WCA 8 Current Schedule 8 of the Wildlife and Countryside Act 1981. It is normally an offence to pick, uproot, sell or destroy any of the above mentioned plants and, unless authorised, to uproot any wild plant.

RDB1 Endangered (or considered possibly Extinct - see also +)
RDBAp. Extinct
RDBI Indeterminate (may be extinct)

Notes continued

RDB2	Vulnerable
RDB3	Rare
RDBK	Insufficiently Known
RDB4	Out of Danger
pRDB	RDB category provisional as identified by JNCC review and not formally published in RDB
RDB/pN	Published RDB category followed by provisional category such as RDB or Nationally Notable as in this example
RL	IUCN Red list
n.c.	genera not considered by RDB Book

RDB bird categories (Batten *et al.* 1990):

1a	Bird species breeding in internationally significant numbers (>20% of north-west Europe population)
1b	Non-breeding in internationally significant numbers (>20% of north-west Europe population)
2	Rare breeder (<300 pairs)
3	Declining breeder (>50% sustained decline since 1960)
4a	Localised breeder (>50% of the population in the ten most populated areas). Rare breeders are not included here unless they are additionally vulnerable because of confinement to vulnerable habitats
4b	Localised non-breeder (>50% of the population in the ten most populated areas).
5	Special category - show cause for concern or declining numbers but inadequate data to quantify extent of the problem
Var	Various of the above

RDB categories for mammals after Corbet and Southern (1977), a more up-to-date RDB text is in preparation

AI	Abundance indeterminate of pRDB fish identified by Potts and Swaby (1991)
NR	Nationally rare as identified from Aquatic Flora Database Project
NS	Nationally scarce as identified from Aquatic Flora Database Project
Sf	Scarce fish as identified by Potts and Swaby (1991)
Ila	EC Habitats Directive Annex II species
Ila*	EC Habitats Directive Annex II priority species
IVa	EC Habitats Directive Annex IV species
BI	EC Birds Directive Annex I

I	Appendix I of Berne Convention - strict protection for plant species
II	Appendix II of Berne Convention - strict protection for animal species and habitats
II	Appendix II of Bonn Convention on the conservation of migratory species of wild animals

Habitat (all relevant habitats utilised in England and Wales):

Bog	boggy heath, Bog
C	coastal

Notes continued

Ca	cave
D	dyke, ditch, canal
Du	sand dune
DuS	dune slacks
E	estuary
FM	flood meadow
Fw	Freshwater
In	Inshore
It	Intertidal
L	lake, pond, reservoir
M	margin
Ma	marine (fish)
na	not applicable and hence distribution and conservation not entered
Off	Offshore
P	pool
R	stream, river
RM@	regarded as a river margin species by Ball (undated)
RM@g	riverside clay
RM@g	riverside gravel
RM@ig	riverside interstitial gravel
RM@s	riverside sand
RM@sh	riverside shingle
S	saline, brackish
SCa	sea cave
Sh	shingle
SL	saline lagoon
SM	saltmarsh
St	small stream or trickle
SW	sea wall
t	terrestrial
Wt	wetland, fen, marsh

Distribution (current/recent):

A	Anglian Region
N	Northumbria Region
NW	North West Region
S	Southern Region
ST	Severn Trent Region
SW	South West Region

Notes continued

T	Thames Region
Wh	Welsh Region
Wx	Wessex Region
Y	Yorkshire Region
Var	Various Regions
Sc	Scotland
off	offshore (birds)
-	winter/summer outside UK (birds)
pge	passage migrant
nw	north west of UK
sE	southern England
sB	southern Britain
Lu	Lundy
SS	species considered in NCC/EN Recovery document and located in SSSI, pSSSI, National Park or NNR (Whitten 1990)
SR	Recovery project underway/completed. In addition a seed bank project is underway for all seed-bearing Schedule 8 (plant) species, except orchids.
nr	species found in at least protected location (eg NNR, SSSI, National Trust etc) but NOT considered in NCC/EN Recovery document (Whitten 1990)
NRA	Subject of past or present NRA R&D
+	RDB1 species considered to be extinct
1	Distribution of birds (breeding then wintering distribution, ie <i>Gavia stellata</i> breeds in Scotland only but is found around the UK coast in winter). Presence in Scotland is not recorded if present in a number of regions.
2	All turtles are included in WCA 5
3	All dolphins, porpoises, whales and bats are included in WCA 5
4	North Sea population.
5	Eastern North Atlantic population
6	Atlantic population
7	As identified from Aquatic Plants Database (native species and excluding introductions of such species). Species that have 'aquatic' habitats are not necessarily be included in Aquatic Plants Database
8	Nationally scarce with respect to natural distribution but widely introduced

APPENDIX B

PROJECT SPECIFICATIONS FOR THE DEVELOPMENT OF MANAGEMENT STRATEGIES FOR RARE SPECIES

Species management approaches will vary depending on the distribution of particular species, their ecology and habitat. Generic approaches may be useful for some species, i.e. maintaining water tables by exercising controls on abstraction would be a sensible policy to maintain wetland and pond species and communities. However, many rarer species may occur in isolated populations and the maintenance of such species requires detailed knowledge of the location of the population and control on all activities that may affect it. Some isolated populations remain in small colonies in a general area but may move from year-to-year so targeted site protection should bear this in mind.

It has been suggested (R Howell, personal communication) that when identifying research needs for rare and nuisance species, the following general considerations should be made:

- national conservation strategies;
- techniques for removing/relocating/eliminating nuisance species;
- techniques for establishing/encouraging establishing;
- legal aspects relating to any of the above (WCA licensing etc.);
- techniques for safeguarding/protecting/extending existing colonies/breeding sites, etc.

For species considered by Whitten (1990), proposals for the conservation of species (led by English Nature) have already been drafted. These species are indicated below. In some cases the research needs of some species refer to a publication edited by Lewis and Williams (1984). A second edition of this conservation manual is in preparation and may contain valuable information.

For some species, translocations are suggested. These should not be done without prior consultation and the necessary licensing from the JNCC and country agencies. It is recommended that liaison with relevant authorities should occur for all of the species or species groups.

Hirudo medicinalis - Medicinal Leech

This species has been considered by Whitten (1990) as a candidate for EN's Species Recovery programme and as such the NRA should interact closely with the programme in any conservation initiatives with this species. Fundamental research is not required and site management requirements of the species have already been identified. Dr J M Elliot (IFE) is a recognised expert on the species.

Limited research should include:

- compilation of a list of current locations in England and Wales;

- confirm site management requirements of the species;
- draw up general site management guidelines;
- monitor habitat condition and leech abundance at a variety of sites;
- consider translocation to suitable locations (although EN has not proposed translocation) including legal implications. If appropriate, identify sites and translocation methods.

Conservation actions:

- inform site managers of presence of species and its needs;
- translocation if appropriate.

Legislation:

WCA Schedule 5. The species is also listed in CITES appendices.

Eustroma reticulatum - Netted carpet

The larvae of Netted carpet *Eustroma reticulatum* feed on touch-me-not balsam *Impatiens noli-tangere* (Shirt 1987), a plant balsam species which was naturally found in the Lake District and North Wales but currently has a wider range. Balsam species in general are thought to be problem species in at least one region and plant control measures should consider effects on moth populations. The larvae of a further species, the endangered RDB1 *Pristerognatha penthinana*, also feeds on touch-me-not balsam, although was last recorded in 1914 in Cumbria (NRA NW). Also larvae of the Rare RDB3 Balsam carpet *Xanthorhoe biriviata* feed on orange balsam *Impatiens capensis*, a garden escape. These species should also be borne in mind.

Research needs:

- identify locations of important populations;
- produce recognition guidance for river managers for the netted carpet (and other balsam moth species);
- recommend balsam control measures that are sympathetic to these moth species.

Conservation actions:

- inform river managers of methods of identifying the moths in relevant areas and the need to control balsam sympathetically.

Legislation:

None.

Margaritifera margaritifera - Freshwater Pearl Mussel

The status and the conservation of the bivalve mussel was assessed by Young and Williams (1983). As such research needs are limited, but should include:

- compilation of a list of current locations in England and Wales;
- confirm site management requirements of the species;
- draw up general site management guidelines;
- monitor habitat condition and mussel abundance at a variety of sites.

Conservation actions:

- inform relevant managers of the presence of species and its needs.

Legislation:

WCA Schedule 5. EC Habitat Directive Annex II.

Cobitis taenia - Spined loach

Although Maitland and Campbell (1992) describe some aspects of the ecology of this species, there seem to have been no detailed studies carried out in the UK on the ecology of the spined loach. Maitland and Lyle (1991) conducted a conservation assessment of freshwater fishes in the British Isles and the species was regarded as between the eleventh and eighteenth most important species and decreasing in its area of distribution. Over 30 stocks were thought to occur (Maitland and Lyle 1991) and the species appears largely confined to the Anglian, Severn Trent and Thames Regions (Maitland 1972, Maitland and Campbell 1992).

Research needs:

- compilation of a list of current locations in England (and Wales);
- identify habitat requirements of the species and threats to its survival;
- draw up general management guidelines;
- monitor habitat condition and loach abundance at a variety of sites;
- consider translocation to suitable location, preferably within catchments of existing distribution. If appropriate, identify sites and translocation methods.

Conservation actions:

- inform relevant managers of the presence of species and its needs;
- translocation if appropriate.

Legislation:

EC Habitat Directive Annex II.

***Salmo salar* - Salmon**

The salmon is relatively widespread in the UK rivers, with a restricted distribution in south east and East Midlands. However, the species is more threatened much of in Europe (hence the EC Habitat Directive listing). In the UK the species is valued by both sport and commercial fisheries and regarded as an high profile indicator of water quality. The species is often the subject of various stocking and habitat rehabilitation works, regional byelaws and other enforcement measures to regulate exploitation. As such the species is already subject to a variety of species management. There are some concern as to the value and genetic integrity of stocks. Organisations such as the Atlantic Salmon Trust and NASCO are campaigning for the national and international conservation of stocks through managed exploitation.

Research/strategy:

- continue salmon management efforts;
- closer liaison between conservation and fisheries staff to both promote salmon conservation and secure the genetic integrity of stocks;
- support national and international conservation efforts.

Legislation:

- Habitat Directive Annex II.

***Natrix natrix* - Grass Snake**

The grass snake has a may be found in both aquatic and riparian habitats. It is an egg laying species and is generally distributed in warmer southern areas. It has been suggested that a dependence on suitably warm egg-laying sites, such as compost heaps, may limit its numbers in some areas (Lewis and Williams 1984).

Research needs:

- assessment of general distribution and habitats used in England and Wales;
- identify particular needs, ie provision of suitably located compost heaps for breeding;
- draw up general management guidelines;
- monitor the success of habitat improvement measures.

Conservation actions:

- inform relevant managers of the likely or actual presence of the species and its needs.

Legislation:

WCA Schedule 5.

Acrocephalus palustris - Marsh warbler

The marsh warbler is associated with damp areas with well developed herbaceous vegetation. The bird breeds regularly in the Severn-Trent Region and at scattered sites locations in the south of England. At an international level, Britain is at the most north-western part of the warblers range and this isolation seems to be the cause of a general decline from the 1970's (Batten *et al.* 1990). Local conservation measures have been proposed by Severn-Trent to protect sites with a long history of continuous use as breeding sites. Such an approach should be adopted nationally.

Research:

- identify the main sites used by breeding marsh warblers;
- review the success of the approach adopted by Severn-Trent Region;
- draw up general management guidelines for each of these sites using the Severn-Trent model, if appropriate.

Conservation actions:

- inform relevant managers of the presence of the bird and its needs.

Legislation:

WCA Schedule 1.

***Alcedo otthis* - Kingfisher**

The kingfisher is a resident associated with rivers, dykes and still waters. It is considered to have declined in general since the mid-1970s (Stroud and Glue 1991). The protection of nesting banks and excavation or construction of additional banks may be one of the most pragmatic ways of encouraging the species. Lewis and Williams (1984) discussed the nesting requirements and design of nesting banks. In some areas, such as the Thames Region, it has been suggested that (following storms of recent years) the root plates of fallen trees have provided additional nesting sites.

Research:

- mapping of the current distribution of the species in England and Wales, identifying areas with lower than expected populations;
- examine the success of artificially created nesting banks;
- draw up general management guidelines including consideration of the protection of suitable nesting locations and the design and siting of artificial or excavated nesting banks.

Conservation actions:

- inform relevant managers of the presence of the bird and its needs;
- provision of nesting banks in suitable locations and the monitoring of their success;
- Preserve fish stocks.

Legislation:

WCA Schedule 1. EC Birds Directive.

***Botaurus stellaris* - Bittern**

The bittern is a resident species largely confined to extensive lowland marsh areas dominated by *Phragmites australis*. Numbers of the species have declined since the 1950's.

Research:

- mapping of the current distribution of the species in England and Wales, identifying wetland areas of particular importance;
- research into the ecology of the bird;
- consideration of water quality impacts, particularly the bioaccumulation of pesticides, PCBs etc;
- draw up general management guidelines including the protection of reed beds.

Conservation:

- inform wetland managers of the presence of the species;
- protection and management of reed beds;

Legislation:

WCA Schedule 1. EC Birds Directive.

Cettia cetti - Cetti's warbler

This warbler is a recent colonist and resident to Britain and is associated with scrub in the margins of wetlands, rivers and gravel pits. It is currently thought that the species is currently limited by the severity of winters rather than habitat availability, which is currently under-utilised (Batten *et al.* 1990).

Research:

- identify the main sites used by Cetti's warblers;
- draw up general management guidelines for each of these sites.

Conservation actions:

- inform relevant managers of the presence of the bird and its needs.

Legislation:

WCA Schedule 1.

Cinclus cinclus - Dipper

This bird species is associated with fast flowing rivers with shallow riffle areas for feeding. The species has been reported to decline in streams subject to acidification (Ormerod 1985), but the overall population trend was considered to be stable or increasing by Stroud and Glue (1991). As such there is only a limited need for species management. Lewis and Williams (1984) discussed the nesting requirements and design of nestboxes for dippers and associated species.

Research:

- mapping of the current distribution of the species in England and Wales, identifying areas with lower than expected populations;
- examine the success of artificially installed nest boxes;
- draw up general management guidelines including consideration of the protection of suitable nesting locations and the design and siting of nest boxes.

Conservation actions:

- inform relevant managers of the presence of the bird and its needs;
- installation of nestboxes in suitable locations and the monitoring of their success.

Legislation:

None.

***Motacilla cinerea* - Grey wagtail**

This bird species is associated with fast flowing rivers and slow flowing rivers with faster flowing sections and waterfalls or weirs. The species has declined in general since the mid-1970s but increased over the period 1988-1989 (Stroud and Glue 1991). The provision of nestboxes may be one of the most pragmatic ways of encouraging the species. Lewis and Williams (1984) discussed the nesting requirements and design of nestboxes for grey wagtails and associated species.

Research:

- mapping of the current distribution of the species in England and Wales, identifying areas with lower than expected populations;
- examine the success of artificially installed nest boxes;
- draw up general management guidelines including consideration of the protection of suitable nesting locations and the design and siting of nest boxes.

Conservation actions:

- inform relevant managers of the presence of the bird and its needs;
- installation of nestboxes in suitable locations and the monitoring of their success.

Legislation:

None.

***Motacilla flava* - Yellow wagtail**

This wagtail is a summer visitor and associated with a variety of habitats, including wetlands, flood meadows and lake margins. The species has shown some decline in the 1980's after an earlier peak (Stroud and Glue 1991). The provision of nestboxes may be one of the most pragmatic ways of encouraging the species. Lewis and Williams (1984) discussed the nesting requirements and design of nestboxes for grey wagtails and associated species.

Research:

- mapping of the current distribution of the species in England and Wales, identifying areas with lower than expected populations;
- examine the success of artificially installed nest boxes;
- draw up general management guidelines including consideration of the protection of suitable nesting locations and the design and siting of nest boxes.

Conservation actions:

- inform relevant managers of the presence of the bird and its needs;
- installation of nestboxes in suitable locations and the monitoring of their success.

Legislation:

None.

Panurus biarmicus - Bearded tit

This bird species is a resident species largely confined to reed beds (*Phragmites australis*) in wetlands and lake margins. It is a vulnerable species due to its concentration in rather few sites (Batten *et al.* 1990).

Research:

- identify the main sites used by bearded tits;
- draw up general management guidelines for each of these sites;

Conservation actions:

- inform relevant managers of the presence of the bird and its needs.

Legislation:

WCA Schedule 1.

Riparia riparia - Sand martin

The sand martin, a summer visitor, is principally associated with aquatic habitats due to its breeding requirements of earth banks often besides rivers. Populations in the UK underwent a major decline beginning in the late 1960s but have shown a recent partial recovery (Stroud and Glue 1991). Lewis and Williams (1984) discussed the nesting requirements of the species and options to conserve nesting banks in flood defence operations.

Research:

- compilation of a list of current nesting bank locations in England and Wales;
- review nesting habitat requirements of the species and threats to nesting sites;
- examine the success of artificially created nesting banks;
- draw up general management guidelines including consideration of the protection of suitable nesting locations and the design and siting of artificial created banks, particularly where existing banks have recently been destroyed.

Conservation actions:

- inform relevant managers of the presence of the bird and its needs;
- creation of semi-natural and artificial nesting banks where feasible.

Legislation:

None.

***Tyto alba* - Barn owl**

This species is often associated with riparian or floodplain grassland where popular food items such as short-tailed voles may be found. Populations in the UK have been declining since the 1930s (Stroud and Glue 1991). Thames NRA have already been conducting some work to encourage this species in conjunction with a hawk trust.

Research:

- mapping of the current distribution of the species in England and Wales, identifying areas where the species is using and could potentially use riparian or floodplain habitats;
- examine the success of nest boxes to stimulate colonisation of suitable areas;
- draw up general management guidelines including grassland management and the consideration of the design and siting of nest boxes.

Conservation actions:

- inform relevant managers of the presence of the bird and its needs;
- installation of nestboxes in suitable locations and the monitoring of their success.

Legislation:

WCA Schedule 1.

Arvicola terrestris - Water vole

A recent review of the status of the water vole in Britain (Strachan and Jefferies 1993) found the mammal to be in general decline and the spread of mink was a suggested cause. The report also includes a number of recommendations for their conservation.

Research needs:

- identify flood defence activities in relation to bank maintenance and reprofiling that do minimal damage to, and where possible, improve vole habitat;
- draw up general management guidelines including consideration of the protection of existing vole sites;
- study the interaction between mink and water voles and identify methods for reducing the impacts of mink on vole populations;
- monitor the status of vole populations at a number of locations;
- consider locations for translocating voles to areas with seriously diminished populations.

Conservation actions:

- inform relevant managers of the presence of the mammal and its needs.

Legislation:

None.

Neomys fodiens bicolor - Water shrew

Little appears to be known about the status of the water shrew in England and Wales, studies generally requiring trapping programmes. However, it has been suggested that the mammal may have declined in general (Strachan personal communication).

Research needs:

- review status and habitat requirements of water shrews;
- identify flood defence activities in relation to bank maintenance and reprofiling that do minimal damage to and, where possible, improve shrew habitat;
- draw up general management guidelines;
- monitor the status of shrew populations at a number of locations.

Conservation actions:

- inform relevant managers of the presence of the mammal and its needs.

Legislation:

None.

TREAT AS GROUPS

Water beetles

A number of rare water beetles are known to be associated with key habitats (i.e. *Hydraena pulchella*, *Macronychus quadrituberculatus* and *Normandia nitens*). In addition, there should be support of the EN Species Recovery plans for *Graphoderus zonatus*, found in open water in peat bogs, habitats also occupied by natterjack toads.

Research needs:

- identify relevance of species for which there is little information;
- identify distribution, key sites, habitat requirements and key threats for relevant species;
- assess site loyalty;
- produce management guidelines;
- consider translocation as a management option including any legal implications.

Legislation:

None, except WCA Schedule 5 for *Graphoderus zonatus*.

Mayflies

Bratton (1990) considers the status of each of the mayflies selected (*Ephemera lineata*, *Heptagenia longicauda*, *Paraleptophlebia weneri*, *Potamanthus luteus*).

Research:

- ascertain distribution of species and how localised each species is;
- produce information sheet ("have you seen this mayfly?") to be circulated to biologists;
- identify habitat requirements;

- consider practicability, methods and sites of translocations, including any legal implications.

Conservation actions:

- encourage biologists in relevant areas to 'look out' for this species;
- inform river managers of sites of populations, particularly if localised.

Legislation:

None.

Damselflies and Dragonflies

A number of dragonfly species were identified. Only one, the Norfolk Aeshna *Aeshna isosceles* is included on Schedule 5 of the WCA and considered by Whitten (1990). This species was considered by Shirt (1987) along with the Northern coenagrion/damselfly *Coenagrion hastulatum* and Scarce emerald damselfly *Lestes dryas*. The Northern coenagrion/damselfly *Coenagrion hastulatum* is restricted to Scotland. The other species listed are Southern coenagrion/damselfly *Coenagrion mercuriale*, Variable damselfly *Coenagrion pulchellum*, Downy emerald *Cordulia aenia*, Scarce bluetail damselfly *Ischnura pumilio*, Scarce chaser *Libellula fulva* and Northern emerald *Somatochlora arctica*. Dragonflies are considered as a group in the NCC 'Guidelines for the selection of SSSIs' (NCC 1989). Severn-Trent Region have produced management requirements for a number of species and it is understood that NRA-funded research is currently underway at Loughborough University, although the exact nature of this is not known. The distribution of species may be ascertained through the Odonata Recording Scheme.

Three species which are thought to be extinct, the Norfolk coenagrion/damselfly *Coenagrion armatum*, Dainty coenagrion/damselfly *Coenagrion scitulum* and Orange-spotted emerald *Oxygastra curtisii* should be considered for inclusion in a research programme. These species were considered by Shirt (1987).

Research:

- describe the distribution of above species;
- produce dragonfly conservation guidelines for use by NRA staff, identifying the habitat needs of the above species, including water quality and threats to populations;
- consider translocation as an option including any legal implications.

Conservation actions:

- inform relevant managers of key sites;
- promote habitat maintenance and creation.

Legislation:

None, except *Aeshna isosceles* on WCA Schedule 5, and EC Habitat Directive listing for *Coenagrion mercuriale* Annex II and *Oxygastra curtisii* Annexes II and IV.

Shads - *Alosa alosa* Allis shad and *Alosa fallax* Twaite shad

Shad species migrate up the lower end of rivers to spawn and are thought to have been affected by river pollution and engineering. The twaite shad is the more common of the two species and is known to spawn in the Rivers Severn, Usk and Wye. As such the species may be vulnerable to developments such as proposed barrage schemes. The status and spawning sites of the Allis shad are uncertain and the species is regarded as one of two most threatened fish species in the British Isles (Maitland and Lyle 1992). The latter authors considered the conservation requirements of these and other rare fish species, including general fish conservation strategies (restricting live baiting etc).

Research requirements:

- identify rivers utilised and major spawning sites (particularly allis shad);
- further research on ecology of these species;
- draw up management plans for each species, including considerations of water quality, direct or indirect fisheries and engineering projects.

Conservation

- inform river (and estuary) managers of the presence of the species;
- establish monitoring/reporting schemes for these species.

Legislation:

WCA Schedule 5 (Allis shad only). EC Habitat Directive Annex II.

Lampreys - *Lampetra fluviatilis* River lamprey, *Lampetra planeri* Brook lamprey and *Petromyzon marinus* Sea lamprey

The brook lamprey spends its whole life in rivers and streams, but the river and sea lamprey are both anadromous fish spending some of their adult life in the sea and migrating into rivers to spawn. The three lamprey species were considered as between the eleventh and eighteenth most important fish species in a conservation assessment by Maitland and Lyle (1991). The sea and river lampreys may be threatened by estuarine development schemes, such as barrages, affecting migration. The larval stages of the two anadromous species seem to rarely be recorded in routine fish surveys, either through their absence, lack of recording of 'minor' species or difficulties differentiating the species from brook lampreys.

Research:

- identify main freshwater and estuarine habitats used by these species and freshwater spawning sites in particular;
- produce field notes for species identification;
- produce management guidelines for habitat (and species) protection.

Conservation:

- inform river (and estuary) managers of the presence of the species;
- establish monitoring/reporting schemes for these species.

Legislation:

EC Habitat Directive Annex II.

NB The brook lamprey could easily be excluded as a 'widespread' species. The species along with the bullhead and salmon are included on the provisional list due to EC Habitat Directive listing. The salmon was requested by more than one consultee for inclusion in the priority list for Phase 2.

Amphibians

The selection process eliminated the Natterjack toad *Bufo calamita* as this species, listed under the Schedule 5 of the WCA and considered by Whitten (1990), is currently the subject of a project under the Species Recovery Programme. However the species should still be actively conserved where possible and particularly in association with sea defence works. The species does not compete well with other amphibian species. The great crested or warty newt *Triturus cristatus* also appears on WCA Schedule 5 and is considered by Whitten (1990). The other native species are the common toad *Bufo bufo*, the common frog *Rana temporaria*, palmate newt *Triturus helveticus*, and smooth newt *Triturus vulgaris*.

Research needs:

- identification of important breeding centres for each species, including Natterjack toad;
- produce general guidelines on habitat protection, maintenance and creation.

Conservation actions:

- protect important habitats through maintenance of water levels etc;
- encourage the creation of new habitats, particularly to compensate for lost habitats;

- produce guidelines for the translocation of spawn to new sites including any legal implications;
- work closely with Species Recovery programme on Natterjack toads.

Legislation:

WCA Schedule 5. EC Habitat Directive listing for *Bufo calamita* Annex IV and *Trinurus cristatus* Annexes II and IV.

Bats

Many bat species, particularly Daubenton's, are associated with waterbodies. The project identified six species (*Myotis daubentonii* Daubenton's bat, *Myotis mystacinus* Whiskered bat, *Myotis nattereri* Natterers's bat, *Nyctalus noctula* Noctule, *Plecotus auritus* Brown long-eared bat and *Plecotus austriacus* Grey long-eared bat) but a pragmatic approach would be to have a general strategy for all bat species. The NCC (1989) identify some of the criteria for key sites utilised by bats.

All native British bats are listed in the Wildlife and Countryside Act 1981 and as such their roosting are legally protected. Whitten (1990) presented draft management plans for each species. Any specific conservation measures should be carried out in consultation with EN and CCW. A general approach to bat conservation seems most appropriate. Lewis and Williams (1984) discuss some of the general conservation measures that can be taken in relation to bats, such as maintaining suitable trees wherever possible and the installation of bat boxes.

Research needs:

- review riparian habitat features of importance to bats;
- produce general management guidelines for bats, including protection of trees and buildings, and siting and design of bat boxes.

Conservation actions:

- install bat boxes;
- monitor use of habitats and bat boxes.

Legislation:

WCA Schedule 5. EC Habitat Directive listing Annexes II and/or IV for all species.

Small cetaceans

The Common dolphin *Delphinus delphis* and Harbour porpoise *Phocaena phocaena* are both regularly seen around British shores, the former predominantly in the south and west and the latter in the north. Whitten (1990) described proposed general threats and conservation measures. The main areas of NRA jurisdiction are water quality (pollution control) and, in some areas, fisheries byelaws (control of netting/incidental catches).

Research/strategy:

- identify areas frequently used by these cetaceans;
- produce general management guidelines.

Conservation:

- inform relevant managers of the presence of these species;
- pollution control;
- net limitation if appropriate;
- inform relevant bodies of live and dead sightings.

Legislation:

WCA Schedule 5. EC Habitat Directive listing Annexes II and IV for Harbour Porpoise, Annex II for common dolphin.

Seals - *Halichoerus grypus* Grey seal and *Phoca vitulina* Common seal

The grey seal has populations largely centred in the south west and northern areas, the common seal populations are largely in the north and east (i.e. the Wash). Both seal species suffered from recent disease epidemics. Possible threats to seals are incidental netting, disturbance of haul-out areas, inadequate food (fish) supply, water quality, and persecution by commercial fishermen, fish farmers and anglers. Seals entering estuaries and freshwaters may be particularly vulnerable to the latter.

Research/strategy:

- identify areas frequently used by seals;
- produce general management guidelines.

Conservation:

- inform relevant managers of the presence of these species;
- pollution control;

- net limitation if appropriate;
- liaison with fishery interests.

Legislation:

Seals Act. EC Habitat Directive Annex II.

Plants

The project identified a number of plants which have been grouped but may be considered in isolation. Data on the status and distribution of some of the vascular plants is available through the Aquatic Flora Database project with the Biological Records Centre. For each of the species (Northern spike-rush *Eleocharis austriaca*, Grass-poly *Lythrum hyssopifolia*, Pillwort *Pilularia globulifera*, Loddon pondweed *Potamogeton nodosus*, Round-headed club-rush *Scirpus holoschoenus* and Triangular Club-rush *Scirpus triquetrus* (*Schoenoplectus triqueter*) a similar broad approach is proposed. Nigel Holmes has conducted transplantation work with Loddon pondweed (J. Hogger, personal communication).

Research:

- produce distribution maps and identify key sites;
- identify particular habitat needs and major threats;
- consider practicability and methods of translocation, preferably through propagation, including any legal implications;
- produce species management guidelines.

Conservation actions:

- inform relevant managers of key sites and management guidelines.

Legislation:

WCA Schedule 8 for *Cryphaea lamyana*, *Lythrum hyssopifolia*, *Pilularia globulifera*, *Potamogeton nodosus*, and *Scirpus triquetrus*.

In addition to the above research on plants it is also suggested that the work of Palmer and Newbold (1983) is updated to produce lists of regionally important aquatic plants, primarily utilising the Aquatic Flora Database.

APPENDIX C

PROVISIONAL NUISANCE SPECIES LIST

Problem species:

Scientific name	Common Name/Description	WCA	Functions Affected	Relevance	Subject to Research
Invertebrates					
<i>Artiposthia triangulata</i>	New Zealand flatworm	WCA 9		na	
<i>Astacus astacus</i>	Noble crayfish	WCA 9	C	IA	
<i>Astacus leptodactylus</i>	Turkish crayfish	WCA 9	C	IA	
<i>Pacifastacus leniusculus</i>	Signal crayfish	WCA 9	C	IA	
	Species recommended by more than 1 consultee				
<i>Procambarus clarkii</i>	Red swamp crayfish or crawfish		C	IA	
	Species recommended by more than 1 consultee				
<i>Eriocheir sinensis</i>	Chinese mitten crab		C,FD	U	
<i>Dreissena polymorpha</i>	Zebra mussel		C,(WR)	U	
	Giant whelk		C	U	
	Parasite species	Disease Acts	C,F	U	
Vertebrates					
Fish					
<i>Ambloplites rupestris</i>	Rock bass	WCA 9	C,F	U	
<i>Lepomis gibbosus</i>	Pumpkinseed	WCA 9	C,F	U	
<i>Micropterus salmoides</i>	Large-mouthed bass	WCA 9	C,F	U	
<i>Rhodeus sericeus</i>	Bitterling	WCA 9	C,F	U	
<i>Siluris glanis</i>	Wels	WCA 9	C,F	U	
<i>Stizostedion lucioperca</i>	Zander	WCA 9	C,F	U	
	Ornamental species		C,F	I	
<i>Oncorhynchus mykiss</i>	(Stocked) Rainbow trout		C,F	I	NRA

Appendix C continued

Scientific name	Common Name/Description	WCA	Functions Affected	Relevance	Subject to Research
<i>Salmo trutta</i>	(Stocked) Brown trout (Coarse) fish introductions			I	
Added species recommended by 1 consultee					
Amphibians					
<i>Alytes obstetricans</i>	Midwife toad	WCA 9	C	U	
<i>Bombina variegata</i>	Yellow-bellied toad	WCA 9	C	U	
<i>Hyla arborea</i>	European tree frog	WCA 9	C	U	
<i>Rana esculenta</i>	Edible frog	WCA 9	C	U	
<i>Rana ridibunda</i>	Marsh frog	WCA 9	C	U	
<i>Triturus alpestris</i>	Alpine newt	WCA 9	C	U	
<i>Triturus carnifex</i>	Italian crested newt	WCA 9	C	U	
<i>Xenopus laevis</i>	African clawed toad	WCA 9	C	U	
American Bullfrog			C	U	
Reptiles					
<i>Elaphe longissima</i>	Aescupalian snake	WCA 9		na	
<i>Emys orbicularis</i>	European pond terrapin	WCA 9	C	U	
<i>Podarcis muralis</i>	Common wall lizard	WCA 9		na	
Birds					
<i>Aix galericulata</i>	Mandarin duck	WCA 9	C	U	
<i>Aix sponsa</i>	Carolina wood duck	WCA 9	C	U	
<i>Alectoris chukar</i>	Chukar partridge	WCA 9		na	
<i>Alectoris graeca</i>	Rock partridge	WCA 9		na	

Appendix C continued

Scientific name	Common Name/Description	WCA	Functions Affected	Relevance	Subject to Research
<i>Alopochen aegyptiacus</i>	Egyptian goose	WCA 9	C	U	
<i>Branta canadensis</i>	Canada goose	WCA 9	C,WQ	I	RSPB?
<i>Chrysolophus amherstiae</i>	Lady Amherst's pheasant'	WCA 9		na	
<i>Chrysolophus pictus</i>	Golden pheasant	WCA 9		na	
<i>Colinus virginianus</i>	Bobwhite quail	WCA 9		na	
<i>Haliaetus albicilla</i>	White-tailed eagle	WCA 9 for species conservation			
<i>Lophura nycthemera</i>	Silver pheasant	WCA 9		na	
<i>Melopsittacus undulatus</i>	Budgerigar	WCA 9		na	
<i>Nycticorax nycticorax</i>	Night heron	WCA 9 for species conservation			
<i>Oxyura jamaicensis</i>	Ruddy duck	WCA 9	C	U	
<i>Psittacula krameri</i>	Ring-necked parakeet	WCA 9		na	
<i>Syrnaticus reevesii</i>	Reeve's pheasant	WCA 9		na	
<i>Tetrao urogallus</i>	Capercaillie	WCA 9 for species conservation			
<i>Tyto alba</i>	Barn owl	WCA 9 for species conservation			
Piscivorous birds (e.g. kingfisher, grebes, ducks, sawbills, cormorants, gulls)			C,F	IA	NRA
Mammals					
<i>Cervus nippon</i>	Sika deer	WCA 9		na	
<i>Cynomys spp.</i>	Prairie marmot	WCA 9		na	
<i>Glis glis</i>	Fat dormouse	WCA 9		na	
<i>Hystrix cristata</i>	Crested porcupine	WCA 9	C,FD?	na/U?	
<i>Hystrix hodgsonii</i>	Himalayan porcupine	WCA 9	C,FD?	na/U?	

Appendix C continued

Scientific name	Common Name/Description	WCA	Functions Affected	Relevance	Subject to Research
<i>Lutra lutra</i>	Otter		C,F	I	
<i>Macropus rufogriseus</i>	Red-necked wallaby	WCA 9		na	
<i>Meles meles</i>	Badger			Added species recommended by 1 consultee	
<i>Meriones unguiculatus</i>	Mongolian gerbil	WCA 9		na	
<i>Mustela vison</i>	American mink	WCA 9	C,F	I	
+ <i>Myocastor coypus</i>	Coypu	WCA 9	C,FD	IA?	MAFF?
<i>Rattus norvegicus</i>	Brown rat		C,F,WQ,FD	I	
<i>Rattus rattus</i>	Black rat	WCA 9	C,WQ	U?	
<i>Sciurus carolinensis</i>	Grey squirrel	WCA 9		na	
Algae					
<i>Asparagopsis armata</i>	Hooked asparagus seaweed	WCA 9		?	
<i>Codium fragile tomentosoides</i>	Green seafringers	WCA 9		?	
<i>Laminaria japonica</i>	Japanese kelp	WCA 9		?	
<i>Macrocystis angustifolia</i>	giant kelp	WCA 9		?	
<i>Macrocystis integrifolia</i>	giant kelp	WCA 9		?	
<i>Macrocystis laevis</i>	giant kelp	WCA 9		?	
<i>Macrocystis pyrifera</i>	giant kelp	WCA 9		?	
<i>Pilayella littoralis</i>	California red seaweed	WCA 9		?	
<i>Porphyra</i> spp.	Laver seaweeds EXCEPT native species: <i>Porphyra amethystea</i> , <i>Porphyra leucosticta</i> , <i>Porphyra linearis</i> , <i>Porphyra miniata</i> , <i>Porphyra purpurea</i> , <i>Porphyra umbilicalis</i>	WCA 9		?	

Appendix C continued

Scientific name	Common Name/Description	WCA	Functions Affected	Relevance	Subject to Research
Sargassum muticum	Japanese seaweed	WCA 9		?	
Undaria pinnatifida	Wakame	WCA 9		?	
Cladophora spp.			C,R	I	
Vaucheria spp.			C,FD,R	I	
Blue green algae			C,WQ,F,R	IA	NRA
Phytoplankton			C,WQ,F,R	I	
Vascular Plants					
Azolla filiculoides	Water fern Species recommended by more than 1 consultee		C,F,WQ,N	IA	NRA
Crassula helmsii	Australian reedswamp Species recommended by more than 1 consultee		C	IA	NRA
Heracleum mantegazzianum	Giant hogweed Species recommended by more than 1 consultee	WCA 9	C,FD?,GA	IA	NRA
Impatiens glandulifera	Himalayan balsam Species recommended by more than 1 consultee		C,FD,GA	IA	NRA
Impatiens spp.	Other balsam spp.		Added species recommended by 1 consultee		
Lemna miniscula	Duckweed		Added species recommended by 1 consultee		
Polygonum cuspidatum/ Reynoutria japonica	Japanese knotweed	WCA 9	C,FD,GA	IA	NRA
Mimulus guttatus	Monkey flower		Added species recommended by 1 consultee		
Spartina sp.	Cord grass		Added species recommended by 1 consultee		

Notes for Appendix C:

C	Conservation
F	Fisheries
FD	Flood Defence
N	Navigation
R	Recreation
WQ	Water quality
I	Important
IA	Important and addressed by research
U	Unimportant
na	not applicable
?	Unknown

APPENDIX D

PROJECT SPECIFICATIONS FOR THE DEVELOPMENT OF MANAGEMENT STRATEGIES FOR PROBLEM SPECIES

American mink - *Mustela vison*

The mink is a widespread introduced species originating from escaped animals from mink farms (for fur). The species is a generally destructive and unwelcome predator and has been implicated as contributing to the decline of the water vole, a species identified as an important 'rare' species.

Research/strategy:

- investigate publically acceptable control options, possibly targeted to safeguard threatened species such as the water vole.

Legislation:

WCA Schedule 9.

Zander - *Stizostedion lucioperca*

The zander, an introduced species, has been implicated in the decline of coarse fish stocks in the areas of its distribution.

Research/strategy:

- map the distribution of the species and monitor any increase in range;
- liaison with angling organisations and publicise the problems of illegal transfers.
- investigate publically acceptable control options (including voluntary culling), possibly targeted to safeguard more valuable fish stocks.

Legislation:

WCA Schedule 9.