Impact of gravel extraction on ERS invertebrate communities on the River Eden in 2008 – pilot study

Stephen M Hewitt & John Parker

April 2009

Contents

Summary

This pilot study was undertaken to assess the effectiveness of a method of evaluating the impact of gravel extraction on invertebrate communities of exposed riverine sediments (ERS). The study involved comparing the ERS insect communities of two pairs of sites, each containing a dug deposit alongside a nearby non-dug deposit. Pitfall trapping and timed hand-searching and sweep-netting were used to collect insects on each site.

10,468 specimens of 222 species were identified from the four ERS deposits in the survey. 41 insect species considered to be specialists of ERS were recorded.

One Nationally Rare/UKBAP species *(Rhabdomastix japonica)* and 24 Nationally Scarce species were recorded during the survey, as well as one species *(Hoplolabis yezoana)* which was only recently discovered in Britain (2004).

The results of the study on these four sites are largely inconclusive. This is not surprising given the small number of sites in the study and the large number of variables in addition to gravel extraction which will impact on the ERS communities at each site.

The number of ERS species between the gravel-extracted sites and the non-extracted sites did not differ significantly.

The number of specimens of ERS species was lower on the dug sites, suggesting that population levels may have been reduced on sites that have been extracted.

Survey of a greater number of gravel extraction and control sites is required to provide a significant sample size for analysis. Studies of ERS invertebrate communities before and after gravel extraction events should be undertaken wherever possible as this method could avoid 'data noise' from other factors acting unevenly across a range of sites. A more detailed study of ERS invertebrate species particular habitat requirements and dispersal powers is required to develop a model of the effect of gravel extraction on ERS invertebrate communities in different situations.

Introduction

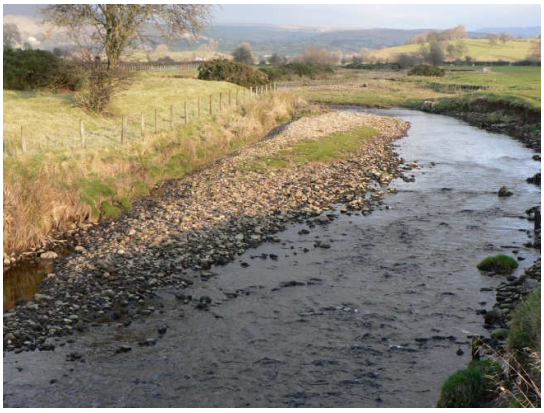
Invertebrate communities of exposed riverine sediments (ERS) have been widely studied in recent years. It has been established that a number of nationally rare and scarce invertebrates are obligate or high fidelity specialists of ERS. The River Eden has been shown to be of national significance for its ERS invertebrate communities. A number of factors have been reported to be damaging to ERS invertebrate habitat. Bates *et al (*2007) have shown that stock trampling can have a significant detrimental impact on ERS invertebrates. Concern has also been raised over the impact of gravel extraction on ERS invertebrate populations (e.g. Hewitt *et al* 2007).

This pilot study was undertaken to assess the effectiveness of a method of evaluating the impact of gravel extraction on ERS invertebrate communities. This involved comparing the ERS insect communities of two pairs of sites, each containing a dug deposit alongside a nearby non-dug deposit.

1. Methods

Two pairs of ERS deposits were identified; on the Kingwater at Kellwood, Brampton and on Swindale Beck at Hallgarth, Great Musgrave. One deposit of each pair had been recently subjected to gravel extraction. An adjacent deposit with similar characteristics was selected as a 'control' for each of the extracted deposits. 15 pitfall traps were set on each of the four deposits. Five traps were set on each of three different zones on each deposit – the top, side and toe of each bank. The traps were run over a two week period in late July/early August 2008 and emptied and reset at the end of the first week. Additionally timed sweeps and hand-searches (of 10 minutes each) were conducted on each partition of all deposits on two occasions over this period. Catches were identified and number of examples of each species recorded. The beetles were identified by John Read and the flies and bugs by John Parker and Stephen Hewitt.

2.1 Site descriptions:



Site A: Hallgarth upper NY77431345
A 180m² simple, humped, lateral shingle bar with some cobble and sand included along with an incipient backwater channel. It is deposited on the right bank of Swindale Beck upstream of the bridge over the beck at Hallgarth. The adjacent land use is pasture and there is low level ingress of stock onto the shoal. The deposit was dug out under licence in 2007(?) to repair adjacent eroding riverbanks. Subsequent flood events have re-profiled the deposit.

Site B: Hallgarth lower NY77461348
A 240m² flat lateral bar of shingle, cobble with a silt component around the lower end of a small backwater channel. Stabilising vegetation was established on 70% of the deposit with about 15% shaded from trees growing on the riverbank. The adjacent land use is pasture but there is no stock access. There were signs of some siltation, possibly resulting from the engineering works upstream at Site A. Furthermore this deposit was being eroded rather than accreting in the year of the survey, possibly limiting the amount of fines in the substrate.

Site C: Kellwood lower NY562636

A point bar of shingle with areas of partially vegetated sand on top of the bar and damp sand at the toe. This deposit had been subjected to unlicensed extraction in recent years and had been dug and tracked over in 2008.

Site D: Kellwood upper NY526637

A large and complex ERS deposit with a range of substrate types ranging from cobble and shingle to sand. Much of the sand was substantially vegetated in 2008 and the areas of shingle were somewhat scoured, giving the impression that the site was less favourable to ERS invertebrates than was the case when it was last surveyed in 2005.

2. Results and analysis

10,468 specimens of 222 species were identified from the four ERS deposits in the survey. Some Staphylinid beetles remain to be identified. Appendix 2 gives a full list of these species and the numbers recorded at each site. 41 insect species considered to be specialists of ERS were recorded. Table 1 presents the numbers of each of these species recorded in each sample in the survey.

Table 1. ERS specialists by site

	Site A (dug)			Site B (undug)			Site C (dug)			Site D (undug)			Total No. of Spmns.
Species	**A1 Hallgarth top of dug ERS bank**	**A2 Hallgarth, side of dug ERS bank**	**A3 Hallgarth, toe of dug ERS bank**	**B1 Hallgarth top of non-dug bank**	**B2 Hallgarth, side of non-dug bank**	**B3 Hallgarth, toe of non-dug bank**	**C1 Kellwood dug ERS top of bank**	**C2 Kellwood dug ERS side of bank**	**C3 Kellwodd dug ERS toe of bank**	**D1 Kellwood undug top of bank**	**D2 Kellwood undug side of bank**	**D3 Kellwood undug toe of bank**	
Cryptostemma alienum	13	10	11	37	35	17		1	23		8	1	156
Macrosaldula scotica	28	30	2	60	57	4	7	140	42		8		378
Saldula c-album	1	1	5	13	1	3					5	2	31
Saldula fucicola											1	1	2
Clivina collaris	2	1		8			1			4			16
Asaphidion flavipes										1	1		2
Asaphidion pallipes										1			1
Bracteon litorale								6	31	13	8	6	64
Bembidion punctulatum	5	11	4	11	19	21	1	216	23	1	114	75	501
Bembidion atrocaeruleum	99	41	2	155	34	8	21	135	112		42	16	665
Bembidion tibiale		2	2	2	4			3			37	30	80
Bembidion decorum	2	11	1	1	4	1		40	35		74	73	242
Bembidion femoratum										1			1
Bembidion saxatile			1					2			2		5
Bembidion schuppelii			1		1								2
Amara fulva							65			14	1		80
Helophorus arvernicus		1				3		1	9		12	7	33
Georissus crenulatus												1	1
Ochthebius bicolon					1								1
Ischnopoda leucopus									2			1	3
Tachyusa constricta								1	2			1	4

Species	Site A (dug)			Site B (undug)			Site C (dug)			Site D (undug)			Total No. of Spmns.
Aloconota cambrica	2	5	2	9	6	4	1	2	9			2	42
Deleaster dichrous	5	3		3	6	1		2	1			1	22
Bledius subterraneus	1			1				3		16	3		24
Ochthephilus omalinus						1					1		2
Stenus comma											2	1	3
Stenus guttula		2						2		1	5	9	19
Lathrobium angusticolle	1							1					2
Philonthus rubripennis		1							4		3		8
Aegialia insularis										3			3
Fleutiauxellus maritimus		1		3									4
Negastrius sabulicola							5						5
Zorochros minimus	30	2		301	4	6	343	3	3	856	5	37	1590
Hoplolabis vicina						1						8	9
Hoplolabis yezoana								1	1				2
Rhabdomastix japonica												1	1
Platypalpus melancholicus									1				1
Tachydromia halidayi							2						2
Tachydromia woodi										1			1
Lonchoptera nigrociliata								1					1
Athyroglossa glabra	1					1			1		1	5	9
Sub-site totals	**A1**	**A2**	**A3**	**B1**	**B2**	**B3**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	
No. specimens	**190**	**122**	**31**	**604**	**172**	**71**	**446**	**560**	**299**	**912**	**333**	**278**	**4018**
No. species	**13**	**15**	**10**	**13**	**12**	**13**	**9**	**18**	**16**	**12**	**20**	**20**	
Site totals	**Site A**			**Site B**			**Site C**			**Site D**			
No. specimens	**343**			**847**			**1305**			**1523**			**4018**
No. species	**20**			**19**			**26**			**31**			

The number of ERS species at each site gives a rough indication of the ERS interest of each site but does not take into account the greater conservation value of sites holding more rare and scarce species. Fowles *et al*. (1999) described a method of evaluating the conservation value of woodlands for saproxylic insects based on a system of awarding rarity scores to high-fidelity saproxylic species according to their national rarity status, the rarer species being awarded higher values. Sites could then be compared and ranked according to the sum of the rarity scores of the indicator species present. Sadler and Bell (2002) adapted this system for use with ERS beetles and this was updated in Bates (2005). This system has been adopted in this report and Table 2 presents the results of the analysis using ERS beetles.

Table 2. ERS quality scores using ERS specialist beetles recorded

SITE NAME	TOTAL ERS BEETLES	ERS QUALITY SCORE	ERS QI
Hallgarth A	16	49	306.25
Hallgarth B	16	36	225.00
Kellwood C	19	77	405.26
Kellwood D	24	75	312.50

We have further developed this system to include ERS specialist flies and bugs and the ERS Quality Scores based on all ERS species are presented in Table 3.

Table 3. ERS Quality Scores using all ERS insects recorded

SITE NAME	TOTAL ERS SPECIES	ERS QUALITY SCORE	ERS QI
Hallgarth A	20	57	285
Hallgarth B	19	41	215.79
Kellwood C	26	139	534.62
Kellwood D	31	140	451.61

The rarity scores accorded to each national status are: Common **(1)**, Unknown **(2)**, Local **(2)**, Very Local **(4)**, Regionally Notable Nr **(4)**, Notable/NotableB/ Lower Risk-nationally scarce (b) **(8)**, NotableA /RDBK/Lower Risk-nationally scarce(a) **(16)**, RDB3/RDBI/Lower Risk-near threatened LR(nt)/Data Deficient DD **(24)**, RDB2/RDB1/Endangered/Vulnerable **(32)**. Appendix 3 lists ERS specialist invertebrates in Britain based on Bates (2005) and Hewitt et al. (2007).

The ERS Quality Score (QS) is the sum of the rarity scores of the ERS specialist species recorded at each site. The ERS Quality Index (QI) is the ERS QS divided by the number of specialist species present. This is used as a balance to recording effort in comparing data from various sources using different methodologies. Within this study the methodology ensured equal recording effort at each site so the ERS QI value should not be necessary.

Our experience of using this system has revealed problems in relying on ERS QI values to rank sites. A minimum number of indicator species (?20+) must be present before the index can work effectively. The ERS QI also appears to penalise the more heterogeneous sites with the greatest diversity of specialist species, pulling these sites down in the rankings. For these reasons we have preferred to use the ERS QS as an indication of the relative value of ERS deposits for invertebrates.

Rare and scarce species recorded

One Nationally Rare/UKBAP species *(Rhabdomastix japonica)* and 24 Nationally Scarce species were recorded during the survey, as well as one species *(Hoplolabis yezoana)* which was only recently discovered in Britain (2004). These rare and scarce species are presented in Table 4.

Table 4. Rare and scarce species recorded during the survey (ERS specialists are shown in bold)

Species	Status	A1 Hallgarth top of dug ERS bank	A2 Hallgarth, side of dug ERS bank	A3 Hallgarth, toe of dug ERS bank	B1 Hallgarth top of non-dug bank	B2 Hallgarth, side of non-dug bank	B3 Hallgarth, toe of non-dug bank	C1 Kellwood dug ERS top of bank	C2 Kellwood dug ERS side of bank	C3 Kellwodd dug ERS toe of bank	D1 Kellwood undug top of bank	D2 Kellwood undug side of bank	D3 Kellwood undug toe of bank	Grand Total
Saldula fucicola	**Nb**											*	*	**2**
Asaphidion pallipes	**Nb**										*			**1**
Bracteon litorale	**Nb**								*	*	*	*	*	**5**
Bembidion saxatile	**Nb**			*					*			*		**3**
Bembidion schuppelii	**Na**			*		*								**2**
Amara fulva	**Nb**							*			*	*		**3**
Helophorus arvernicus	**Nb**		*				*		*	*		*	*	**6**
Ochthebius bicolon	**Nb**					*								**1**
Liocyrtusa minuta	N										*			1
Philhygra hygrobia	N						*							1
Deleaster dichrous	**Nb**	*	*		*	*	*		*	*			*	**8**
Lathrobium angusticolle	**Nb**	*							*					**2**
Aegialia insularis	**Nb**										*			**1**
Fleutiauxellus maritimus	**Nb**		*		*									**2**
Negastrius sabulicola	**Na**							*						**1**
Grypus equiseti	Nb										*			1
Hoplolabis yezoana	**DD**								*	*				**2**
Rhabdomastix japonica	**UKBAP**												*	**1**
Platypalpus melancholicus	**LR(NT)**									*				**1**
Platypalpus subtilis	LR(NS)				*		*	*		*	*		*	6
Tachydromia halidayi	**LR(NS)**							*						**1**
Tachydromia woodi	**LR(NT)**										*			**1**
Hilara albiventris	LR(NS)												*	1
Hilara biseta	LR(NS)			*										1
Lonchoptera meijerei	N		*			*	*							3
Lonchoptera nigrociliata	**N**								*					**1**
Sub-site totals		**2**	**4**	**3**	**3**	**4**	**5**	**4**	**7**	**6**	**8**	**5**	**7**	
Site totals		**9**			**12**			**17**			**20**			

3. Discussion

The timing of the survey in late July/early August was rather late in the season for a number of ERS specialist species. Coupled with this the weather throughout the season and during the survey was cool and wet. This resulted in lower numbers of specimens and species than might otherwise have been the case. None-the-less over 10,000 specimens were collected and identified.

Heavy rain resulted in many of the pitfall traps being washed out during the second week of the survey. Fortunately the traps had been lifted and reset after the first week and so a sample was recovered for all sites. Whilst the Hallgarth traps suffered more than the Kellwood traps from the flooding in the second week, the sites within each pair were equally impacted and thus the comparison of the effects of gravel extraction should not be affected.

The totals of ERS species given in table 1 indicate that the sites at Kellwood are significantly better for ERS species than those at Hallgarth – 26 and 31 ERS species recorded at Kellwood C and D respectively, compared to 20 and 19 for Hallgarth A and B. This is compatible with previous survey results (Hewitt et al 2007) although it could also have been affected by the loss of more pitfall traps from flooding on the Hallgarth sites during the second week of the survey. The Kellwood sites are 'better' than those at Hallgarth in terms of the variety and quality of ERS habitat present, their position within a very high quality meta-site formed by a series of good quality ERS deposits and by the generally lower levels of stock trampling on this meta-site.

Comparing ERS QS values between the sites again shows that the Kellwood sites are of greater ERS invertebrate value than the Hallgarth sites. At Hallgarth the extracted site had a higher ERS QS value than the corresponding non-extracted site. These figures are probably not significant and may result from wider margin of error due to relatively low numbers of ERS species recorded, or to genuinely better habitat diversity on the extracted site even after digging and compaction of part of the deposit. It is also possible that fine sediment washed downstream as a result of the gravel extraction at Site A had caused damaging siltation of the non-dug Site B.

It is worth noting that a previous study at Kellwood D in 2005 (Hewitt et al. 2007) recorded 52 ERS species, compared with 33 in the present study. Furthermore, only 22 ERS species were recorded in both surveys. This supports the expectation that ERS communities can change significantly from one year to the next and/or that single season surveys do not record the full ERS community. The restricted timing of the survey to a two week period in late summer will also have reduced the number of species recorded.

The greatest number of specimens was generally recorded on the tops of the deposits. However, this result can be largely accounted for by just one species – the small click beetle, *Zorochros minumus* was the most numerous species in the pitfall traps and shows a preference for drier, finer sediments on top of the deposits. 65 *Amara fulva* from the top of the dug Site C at Kellwood is a startling figure for this scarce beetle. However the sandy deposit in which they were trapped was an undisturbed corner of the deposit, which had escaped being dug or tracked over. In terms of numbers of species recorded, the tops of the deposits appear to generally have fewer ERS species than the sides and toes of the bars.

The number of ERS species between the gravel-extracted sites and their corresponding control site do not differ significantly – 20:19 for the dug:non-dug Hallgarth pair and 28:33 for the dug:non-dug Kellwood pair. This of course is a very small sample size and many more sites would need to be sampled to establish any trends.

The number of specimens of ERS species was lower on the dug sites, suggesting that population levels may be reduced on sites that have been extracted – 344:858 dug:non-dug at Hallgarth and 1307:1534 dug:non-

dug at Kellwood. However it must be noted that the control sites were not (and could never be) identical in every respect to the dug sites prior to extraction and therefore any differences between the sites could be the result of several factors other than gravel extraction.

4. Conclusion

The results of the study on these four sites are largely inconclusive. This is not surprising given the small number of sites in the study and the large number of variables in addition to gravel extraction which will impact on the ERS communities at each site.

The impact of gravel extraction will vary according to the degree of extraction and tracking over the deposit involved, the variety of micro-habitats available on the deposit and the degree to which each of these has been damaged and the position of the deposit in relation to other good quality ERS from which species could readily recolonise.

The apparent impact of gravel extraction may also be partially or wholly masked by other detrimental impacts such as human trampling or stock poaching which will significantly reduce the number of ERS invertebrates present.

The only way to counter this, using this methodology, would be to sample a significantly greater number of sites to see if a significant pattern is established. Whether there is a sufficient number of suitable extraction and control sites available to study is in doubt. The number of licences granted to extract shingle on the Eden is low. Although un-licensed gravel extraction on a small scale is widespread this is much more difficult to monitor and access permission is unlikely to be granted to survey such sites. Ironically it may actually be easier to find suitable survey sites on the River Irwell, which has been the subject of an ERS Habitat Assessment project along with the R. Eden(Hewitt & Parker 2009) and which has received ongoing removal of ERS deposits by the Environment Agency as part of flood alleviation work. These sites are well recorded and accessible. Furthermore stock-trampling is a much less significant issue on the Irwell, although human trampling is very widespread. The major drawback with such a survey on the Irwell is that it is presently unknown to what degree ERS invertebrates have survived on that river in the light of 100 years of industrial degradation.

Since 10,000 specimens were collected at two pairs of sites late in the season of a poor summer, it can be expected that a survey of 10 site-pairs would result in up to 100,000 insects to identify. Running 20 sets of traps for just one week in June, together with single sweep and hand-search samples, might still be expected to accumulate in the order of 75,000 specimens.

5. Further Work

A larger study of many more extracted and non-extracted ERS deposits could be undertaken. This will be expensive in time and resources and unless extraneous impacts can be factored out, may still not prove conclusive. The Eden may be too prone to other factors to be a useful river on which to study the impact of gravel extraction in isolation. The River Irwell might be more suitable but it should first be established whether there is any ERS invertebrate interest on that river to study.

Another option may be to require invertebrate survey of ERS deposits which are the subject of extraction licence applications, both before and after the extraction occurs. One such site on the Eden at Lazonby is presently the subject of just such an application and NE with support from EA has requested the landowner get a detailed survey prior to the extraction at this stage. Follow up surveys immediately after the

extraction and a year or two later would begin to provide valid data on the effect of gravel extraction at individual sites. A number of sites would have to be treated in this way to built up a significant data set.

Many of the impacts of gravel extraction will be subtle and may be felt some distance from the site of the extraction. For example removing sediment from the system may reduce the quality of ERS habitat downstream of an extraction site. The connectivity of a deposit within a series of ERS deposits acting as a meta-site and the dispersal powers of different ERS species will also play a role in the effect of gravel extraction. More work is required on how ERS species utilise different micro-habitats on ERS deposits and to what degree they are able to move between deposits to colonise preferred substrates as they develop. Such information could then be applied to a study of the size, distribution and connectivity of different ERS substrates within a stretch of river to begin to model the effects of gravel extraction on specialist invertebrate communities.

6. Acknowledgements

This study was commissioned by Buglife and funded by the Environment Agency. We are grateful to Vicky Kindemba and Alan Stubbs for helpful comments on an early draft of this report.

7. References

Bates, A.J. (2005) The ecology and conservation of beetles (Coleoptera) living on exposed riverine sediments.PhD Thesis. *Sch. Geography & Envir. Science, Uni. Birmingham*.

Bates, A.J., Sadler, J.P. & Fowles, A.P. and Butcher, C.R. (2005) Spatial dynamics of beetles living on exposed riverine sediments in the upper River Severn: method development and preliminary results. *Aquatic Conserv.: Mar. Freshw. Ecosyst.* **15**: 159-174.

Bates, A.J., Sadler, J.P. & Fowles, A.P. (2006a) Condition-dependant dispersal of a patchily distributed riparian ground beetle in response to disturbance. *Oecologia* **150**: 50-60.

Bates, A.J., Sadler, J.P. & Fowles, A.P. (2007) Livestock trampling reduces the conservation value of beetle communities on high quality exposed riverine sediments. *Biodivers. Conserv.***16**: 1491-1509.

Drake, M., Godfrey, A., Hewitt, S.M. & Parker, J. (2007) *Sandy River Flies Project,* draft final report (February 2007). Buglife.

Falk, S. (1991) A review of the scarce and threatened flies in Great Britain (Part 1) *Reasearch & survey in nature conservation* No. 39. NCC.

Falk, S. & Crossley, R. (2005) *A review of the scarce and threatened flies of Great Britain. Part 3: Empidoidea*. JNCC

Fowles, A.P., Alexander, K.N.A. & Key, R.S. (1999) The Saproxylic Quality Index: evaluating wooded habitats for the conservation of dead-wood Coleoptera. *The Coleopterist* **8(3)**: 121-141.

Godfrey, A. (1999) A review of Diptera from exposed riverine sediments based on literature records. *Dipterists Digest* **6**: 63-82.

Hewitt, S.M., Atty, D.B., Parker, J. & Sinclair, M. (2000) *Cumbrian river shingle invertebrates survey – Interim report of work conducted in 1999 (River Eden catchment)*, Carlisle Natural History Society.

Hewitt, S., Atty, D., Parker, J., Read, J. & Sinclair, M. (2005) *Survey of the insects of exposed riverine sediments on the rivers Eden and Derwent in Cumbria in 2004*. Report to English Nature and the Environment Agency.

Hewitt, S., Atty, D., Parker, J., Read, J. & Sinclair, M. (2007) *Survey of the invertebrates of exposed riverine sediments on Cumbrian rivers in 2005 – including a review of recent ERS invertebrate data for Cumbria*. Report to Natural England (Cumbria Team) and the Environment Agency (Penrith Office).

Lott, D. A., (2006) Riparian beetles from four river catchments in Northumberland and Durham. *The Coleopterist* **15.**1. 35-42.

Sadler, J. & Bell, D. (2002) *Invertebrates of Exposed Riverine Sediments – Phase 3: Baseline communities*. Environment Agency: Bristol.

Appendix 1. All species by site (ERS specialists are shown in **bold)**

)

	GroupA			GroupB			GroupC			GroupD			Grand Total
Species	**A1 Hallgarth top of dug ERS bank**	**A2 Hallgarth, side of dug ERS bank**	**A3 Hallgarth, toe of dug ERS bank**	**B1 Hallgarth top of non-dug bank**	**B2 Hallgarth, side of non-dug bank**	**B3 Hallgarth, toe of non-dug bank**	**C1 Kellwood dug ERS top of bank**	**C2 Kellwood dug ERS side of bank**	**C3 Kellwodd dug ERS toe of bank**	**D1 Kellwood undug top of bank**	**D2 Kellwood undug side of bank**	**D3 Kellwood undug toe of bank**	
Oniscus asellus	1												1
Cryptostemma alienum	**13**	**10**	**11**	**37**	**35**	**17**		**1**	**23**		**8**	**1**	**156**
Microvelia reticulata			1										1
Velia saulii			4				1		6		1	13	25
Gerris lacustris												1	1
Hydrometra stagnorum												1	1
Macrosaldula scotica	**28**	**30**	**2**	**60**	**57**	**4**	**7**	**140**	**42**		**8**		**378**
Saldula c-album	**1**	**1**	**5**	**13**	**1**	**3**					**5**	**2**	**31**
Saldula fucicola											**1**	**1**	**2**
Saldula saltatoria								4			2		6
Anthocoris nemorum								2		2	1	1	6
Platambus maculatus				1									1
Nebrioporus elegans	1	4	8	2		7			1	1			24
Oreodytes septentrionalis	2	4	5			22	1	2	2	2		4	44
Stictotarsus 12-pustulatus	1	1	1										3
Carabus nemoralis							1						1
Carabus problematicus							1	1		9	1		12
Cychrus caraboides										1			1
Nebria (Nebria) brevicollis	1						5	5	29	56	26	41	163
Nebria rufescens	1	1	1	1				3	2		1	15	25
Elaphrus (Elaphrus) cupreus									1				1
Loricera pilicornis										2	1		3
Clivina collaris	**2**	**1**		**8**			**1**			**4**			**16**
Trechus (Trechus) obtusus											1		1
Asaphidion flavipes										**1**	**1**		**2**
Asaphidion pallipes										**1**			**1**
Bracteon litorale								**6**	**31**	**13**	**8**	**6**	**64**
Bembidion punctulatum	**5**	**11**	**4**	**11**	**19**	**21**	**1**	**216**	**23**	**1**	**114**	**75**	**501**
Bembidion prasinum	1	2				1		8			12	11	35
Bembidion atrocaeruleum	**99**	**41**	**2**	**155**	**34**	**8**	**21**	**135**	**112**		**42**	**16**	**665**
Bembidion tibiale		**2**	**2**	**2**	**4**			**3**			**37**	**30**	**80**
Bembidion bruxellense						1							1
Bembidion decorum	**2**	**11**	**1**	**1**	**4**	**1**		**40**	**35**		**74**	**73**	**242**

	GroupA			GroupB			GroupC			GroupD			Grand Total
Bembidion femoratum										**1**			**1**
Bembidion saxatile			**1**					**2**			**2**		**5**
Bembidion tetracolum	9	6	2	3			2	5	30	20	45	5	127
Bembidion schuppelii			**1**		**1**								**2**
Patrobus atrorufus		2		1						1			4
Pterostichus (Platysma) niger		3	1		1		1	1	6	76	4	2	95
Pterostichus melanarius	3	8	1				2	2	12	33	7	15	83
Pterostichus nigrita										4	3	2	9
Abax parallelepipedus									1				1
Calathus (Calathus) fuscipes							3	1		13			17
Calathus melanocephalus									1				1
Paranchus albipes	1	5	5	7	1	6		11	16	2	62	69	185
Platynus assimilis										2			2
Agonum (Europhilus) gracile									1				1
Agonum (Agonum) muelleri										5	16	1	22
Amara fulva							**65**			**14**	**1**		**80**
Curtonotus aulicus	1						1	1					3
Harpalus rufipes							4			3		1	8
Helophorus aequalis									1				1
Helophorus arvernicus		**1**				**3**		**1**	**9**		**12**	**7**	**33**
Helophorus brevipalpis		2	2		1	1		2	4			4	16
Georissus crenulatus												**1**	**1**
Anacaena globulus			1									3	4
Laccobius striatulus			1						1			3	5
Megasternum concinnum			1							5			6
Hydraena gracilis												1	1
Hydraena riparia			2		1				1				4
Ochthebius bicolon					**1**								**1**
Leiodes ferruginea										2			2
Leiodes rufipennis										4			4
Liocyrtusa minuta										4			4
Tachinus rufipes			1										1
Ischnopoda leucopus									**2**			**1**	**3**
Tachyusa constricta								**1**	**2**			**1**	**4**
Aloconota cambrica	**2**	**5**	**2**	**9**	**6**	**4**	**1**	**2**	**9**			**2**	**42**
Aloconota gregaria					1								1
Geostiba circellaris										3			3
Philhygra hygrobia						1							1
Deleaster dichrous	**5**	**3**		**3**	**6**	**1**		**2**	**1**			**1**	**22**
Bledius subterraneus	**1**			**1**				**3**		**16**	**3**		**24**
Ochthephilus omalinus						**1**					**1**		**2**
Anotylus rugosus				1			1			5	2		9
Stenus (Hypostenus) similis												1	1
Stenus (Hypostenus) tarsalis												1	1
Stenus (Stenus) boops									1				1
Stenus (Stenus) comma											**2**	**1**	**3**
Stenus (Stenus) guttula		**2**						**2**		**1**	**5**	**9**	**19**

	GroupA			GroupB			GroupC			GroupD			Grand Total
Stenus (Tesnus) brunnipes	1												1
Lathrobium angusticolle	**1**							**1**					**2**
Philonthus laminatus		3											3
Philonthus rubripennis		**1**							**4**		**3**		**8**
Quedius (Quedius) fuliginosus										1			1
Gauropterus fulgidus										1			1
Aegialia insularis										**3**			**3**
Clambus armadillo						1							1
Cyphon palustris												1	1
Elmis aenea			3									1	4
Esolus parallelepipedus	2			1									3
Limnius volckmari	1	5	1	1		3			1	2	1		15
Oulimnius tuberculatus			6	1					1	1		3	12
Dryops (Dryops) ernesti			1			1						1	3
Heterocerus marginatus									1				1
Hypnoidus riparius	1			1						17			19
Agriotes obscurus										2			2
Agriotes pallidulus											1		1
Fleutiauxellus maritimus		**1**		**3**									**4**
Negastrius sabulicola							**5**						**5**
Zorochros minimus	**30**	**2**		**301**	**4**	**6**	**343**	**3**	**3**	**856**	**5**	**37**	**1590**
Coccinella septempunctata										1			1
Phyllotreta undulata		1					1				1	1	4
Longitarsus succineus							1						1
Longitarsus suturellus				1									1
Neocrepidodera ferruginea	1						1		1	1			4
Hippuriphila modeeri									1				1
Chaetocnema hortensis							2						2
Grypus equiseti										1			1
Notaris acridulus										1			1
Cionus scrophulariae										1			1
Euophryum confine				1									1
Sitona (Sitona) lepidus										1			1
Nephrotoma appendiculata				1									1
Nephrotoma flavipalpis						1							1
Tipula paludosa										1			1
Tipula couckei	2	1	2		2	6	1		2		1	1	18
Tipula lateralis	3		4			1				1		1	10
Tipula montium	3		1						1	2		1	8
Hoplolabis vicina						**1**						**8**	**9**
Hoplolabis yezoana								**1**	**1**				**2**
Molophilus crassipygus				2		5						8	15
Molophilus pusillus				2		1							3
Rhabdomastix japonica												**1**	**1**
Eloeophila apicata				1									1
Neolimnomyia nemoralis						1							1
Beris geniculata										1			1

	GroupA			GroupB			GroupC			GroupD			Grand Total
Hybos culiciformis							1						1
Platypalpus annulatus							12			13		6	31
Platypalpus calceatus							7			1			8
Platypalpus interstinctus						2							2
Platypalpus longicornis										1			1
Platypalpus maculipes				2			2					1	5
Platypalpus melancholicus									**1**				**1**
Platypalpus minutus							1			2			3
Platypalpus notatus		1		12	1								14
Platypalpus pallidiventris				2		2	13		1	5		1	24
Platypalpus subtilis				3		1	1		5	3		5	18
Tachydromia aemula							1						1
Tachydromia halidayi							**2**						**2**
Tachydromia woodi										**1**			**1**
Clinocera stagnalis			6		2	16		1					25
Dolichocephala irrorata						1							1
Wiedemannia bistigma		2											2
Wiedemannia insularis		1											1
Empis livida						1				1			2
Hilara albiventris												1	1
Hilara apta					2								2
Hilara biseta			2										2
Hilara chorica	2	8	14	6	8	3	5		23	2	4	32	107
Hilara cornicula						5						1	6
Hilara fuscipes						2							2
Hilara manicata												2	2
Hilara monedula										1			1
Hilara nigrina					1							1	2
Hilara obscura	168	131	444	73	470	727	52	24	613	8	27	205	2942
Hilara quadrivittata			1										1
Chelifera diversicauda				1		1							2
Chelifera precabunda				5	1	1							7
Argyra argentina						1						1	2
Argyra argyria												2	2
Argyra atriceps												2	2
Argyra ilonae												1	1
Argyra perplexa												1	1
Chrysotus gramineus			1	9	3	11	4			3		3	34
Dolichopus longicornis				1						1	3	3	8
Dolichopus plumipes	2		1			3			1			1	8
Dolichopus subpennatus						1			1	2	1	6	11
Dolichopus trivialis							1			1			2
Dolichopus ungulatus									2				2
Hercostomus aerosus												4	4
Hercostomus celer												32	32
Sybistroma obscurellum												3	3
Hydrophorus praecox			1										1

	GroupA			GroupB			GroupC			GroupD			Grand Total
Anepsiomyia flaviventris												1	1
Campsicnemus									1				1
Campsicnemus curvipes	1	7	4	6	2	23						5	48
Campsicnemus marginatus		1				9			1			2	13
Sympycnus aeneicoxa												1	1
Sympycnus desoutteri	1	12	1	24	9	56	7		16		3	1	130
Syntormon pallipes				1		3							4
Teuchophorus						9						15	24
Teuchophorus calcaratus						2			1			9	12
Teuchophorus monacanthus			6		7	14						1	28
Lonchoptera bifurcata				1	7	36							44
Lonchoptera lutea	2	5		3	6	49			1		4	7	77
Lonchoptera meijerei		2			1	1							4
Lonchoptera nigrociliata								**1**					**1**
Eupeodes corollae							1			1			2
Lejogaster metallina								1					1
Melanostoma mellinum										1			1
Melanostoma scalare							2			1			3
Neoascia podagrica	4			2		1	2			2	3	2	16
Platycheirus albimanus				1		2	1						4
Platycheirus clypeatus							1			3			4
Platycheirus granditarsus										1			1
Riponnensia splendens						1							1
Syritta pipiens	1					1						1	3
Cnodacophora sellata							1						1
Nemopoda nitidula										2			2
Sepsis cynipsea	1		1	2			2						6
Sepsis fulgens									1	8			9
Sepsis punctum	4						3			1		2	10
Sepsis violacea							2			3			5
Themira lucida				1				1					2
Themira minor		1		2	1	2					3	5	14
Themira putris									1		1		2
Themira superba				2		2		1		1			6
Parydra quadripunctata						2						1	3
Parydra aquila									1				1
Parydra coarctata			24	4	11	98			15	1	1	7	161
Scatella paludum		8	17		27	16		114	1		1	2	186
Scatella stagnalis	2	1	3	2				1			1		10
Scatella tenuicosta		7	4	1	14	10		2	1		6	3	48
Discocerina obscurella					3								3
Ditrichophora calceata						1						3	4
Ditrichophora palliditarsis					1	3		2	4	1	2	44	57
Athyroglossa glabra	**1**					**1**			**1**		**1**	**5**	**9**
Hydrellia griseola		2		2		3						5	12
Hydrellia maura	8	65	15	78	145	349	1	21	139	17	74	112	1024
Hydrellia obscura				1					1				2

	GroupA			GroupB			GroupC			GroupD			Grand Total
Notiphila cinerea											2	2	4
	422	424	631	879	901	1601	598	776	1253	1289	658	1036	10468

Appendix 2. Invertebrates with high or total fidelity to ERS

2a. High fidelity ERS beetles *(as listed by Bates 2005)*

SPECIES	STATUS	SCORE	FIDELITY
COLEOPTERA			
CARABIDAE			
Acupalpus flavicollis (Sturm.)	RDB3	24	2
Agonum micans Nicolai	Common	1	2
Amara fulva (Mueller)	Notable B	8	2
Amara quenseli (Schoenherr)	RDB3	24	2
Asaphidion flavipes (L.)	Common	1	2
Asaphidion pallipes (Duft.)	Notable B	8	2
Bembidion andreae (F.)	Local	2	2
Bembidion articulatum (Panz.)	Very Local	4	2
Bembidion atrocoeruleum Steph.	Common	1	1
Bembidion bipunctatum (L.)	Notable B	8	2
Bembidion decorum (Zenk.)	Common	1	1
Bembidion dentellum (Thun.)	Local	2	2
Bembidion femoratum Sturm	Common	1	2
Bembidion fluviatile Dejean	Notable B	8	2
Bembidion geniculatum Heer	Notable B	8	1
Bembidion litorale (Ol.)	Notable B	8	1
Bembidion lunatum (Duft.)	Notable B	8	2
Bembidion monticola Strm.	Notable B	8	1
Bembidion prasinum (Duft.)	Local	2	1
Bembidion punctulatum Drap.	Common	1	1
Bembidion quadripustulatum Serville	Notable B	8	2
Bembidion saxatile Gyll.	Notable B	8	2
Bembidion schueppeli	Notable B	8	1
Bembidion semipunctatum	RDB3	24	1
Bembidion stomoides Dej.	Notable B	8	1
Bembidion testaceum	RDB2	32	1
Bembidion tibiale (Duft.)	Common	1	1
Bembidion virens	RDB3	24	1
Chlaenius vestitus (Payk.)	Local	2	2
Clivina collaris (Hbst.)	Common	1	2
Dyschirius aeneus (Dejean)	Notable B	8	2
Dyschirius angustatus (Ahrens)	RDB3	24	2
Lionychus quadrillum (Duft.)	RDB3	24	2
Pelophilus borealis (Payk.)	RDB3	24	2
Perileptus areolatus (Creutz.)	Notable B	8	1
Tachys bistriatus (Duft.)	Notable B	8	2
Tachys parvulus Dej.	Notable B	8	2
Thalassophilus longicornis	Notable A	16	1
DYTISCIDAE			
Bidessus minutissimus (Germ.)	RDB3	24	1
GEORISSIDAE			
Georissus crenulatus (Rossi)	Notable B	8	2
HYDROCHIDAE			
Hydrochus nitidicollis Muls.	RDB3	24	1
HELOPHORIDAE			
Helophorus arvernicus Muls.	Common	1	1
HYDRAENIDAE			
Hydraena gracilis Germar	Common	1	1
Hydraena nigrita Germar	Local	2	1
Hydraena rufipes Curt.	Notable B	8	2

Ochthebius bicolon Germar	Common	1	2
PTILIDAE			
Actidium aterrimum (Motschulsky)	RDBK	16	1
Ptenidium brenskei Flach	Notable	8	1
Ptenidium longicorne Fuss	Local	2	1
STAPHYLINIDAE			
Aloconota (s.str.) cambrica (Woll.)	Local	2	1
Aloconota (s.str.) currax (Kr.)	Local	2	1
Aloconota eichhoffi (Scriba)	Notable A	16	1
Aloconota (s.str.) insecta (Thomson)	Local	2	2
Aloconota planifrons Waterhouse	RDBI	24	2
Aloconota (s.str.) sulcifrons (Steph.)	Local	2	2
Atheta (Philhygra) debilis (Erichson)	Notable	8	2
Atheta (Acrotona) exigua (Erichson)	RDBK	16	2
Atheta (Philhygra) scotica (Elliman)	Notable	8	1
Bibloplectus minutissimus (Aube)	RDBK	16	2
Bledius annae Sharp	Notable B	8	1
Bledius arcticus Sahlberg	Notable	8	1
Bledius defensus Fauvel	Notable	8	1
Bledius erraticus Erichson	RDBK	16	2
Bledius subterraneus Erichson	Local	2	2
Bledius terebrans (Schiodte)	RDBK	16	2
Bledius pallipes (Gravenhorst)	Common	1	1
Brachygluta pandellei (Saulcy)	Notable A	16	1
Carpelimus obesus (Kiesenwetter)	Notable	8	2
Carpelimus similis (Smetana)	Notable B	8	2
Carpelimus subtilicornis (Erichson)	Notable B	8	2
Carpelimus subtilis (Erichson)	Notable	8	2
Chiloporata longitarsis (Erichson)	Local	2	2
Chiloporata rubicunda (Erichson)	Notable	8	1
Deleaster dichrous (Grav.)	Common	1	2
Erichsonius signaticornis Muls. & Rey	Notable	8	2
Gabrius astutoides Strand	RDB3	24	2
Gnypeta carbonaria (Mann.)	Local	2	2
Gnypeta velata (Erichson)	Notable	8	2
Hydrosmecta delicatula (Sharp)	Notable A	16	1
Hydrosmecta eximia (Sharp)	Notable B	8	1
Hydrosmecta fragilis (Kr.)	Notable B	8	1
Hydrosmecta thinobioides (Kr.)	Very Local	4	1
Hydrosmectina delicatisssima Bernhauer	RDBK	16	1
Hydrosmectina septentrionum Benick	Notable B	8	1
Ilyobates bennetti Donisthorpe	Notable	8	2
Ilyobates propinquus (Aube)	Notable	8	2
Lathrobium angusticolle Bois.	Notable B	8	1
Lathrobium dilutum Erichson	RDB3	24	1
Lathrobium ripicola Czwal.	Notable B	8	2
Medon ripicola (Kraatz)	Notable A	16	2
Meotica anglica Benick	Notable A	16	1
Neobisnius prolixus Er.	Notable A	16	2
Ocalea latipennis Sharp	Notable	8	1
Ochthephilus andalusiacus (Fagel)	Notable B	8	2
Ochthephilus angustior (=venustulus) (Bernhauer)	Notable	8	1
Ochthephilus aureus (Fauv.)	Common	1	2
Ochthephilus omalinus (Er.)	Local	2	2
Oxypoda exoleta Erichson	Notable B	8	2
Philonthus rubripennis Steph.	Very Local	4	1
Quedius plancus Erichson	Notable A	16	2

Scopaeus gracilis (Sperk)	RDB3	24	1
Stenus biguttatus	Notable B	8	2
Stenus comma LeConte	Local	2	2
Stenus fossulatus*	RDB3	24	2
Stenus guttula Mueller	Common	1	2
Stenus incanus Erichson	RDB3	24	1
Tachyusa atra (Gravenhorst)	Very Local	4	2
Tachyusa coarctata Erichson	Notable B	8	1
Tachyusa constricta Erichson	Local	2	1
Tachyusa leucopus (Marsham)	Local	2	1
Tachyusa scitula Erichson	RDBK	16	2
Tachyusa umbractica Erichson	RDBK	16	1
Thinobius bicolor Joy	Notable A	16	1
Thinobius ciliatus (=praetor) Keisenwetter	Notable A	16	1
Thinobius longipennis (Heer)**	RDBK	16	1
Thinobius major Kraatz	RDB3	24	1
Thinobius newberyi Scheerpeltz	RDB2	32	1
Thinobius strandi (=crinifer) Smetana	Notable A	16	1
Thinodromus arcuatus (Stephens)	Local	2	1
SCARABAEIDAE			
Aegialia sabuleti (Panzer)	Notable B	8	2
HETEROCERIDAE			
Heterocerus marginatus (F.)	Local	2	2
DRYOPIDAE			
Dryops nitidulus (Heer)	RDB3	24	2
ELATERIDAE			
Fleutiauxellus maritimus (Curt.)	Notable B	8	1
Negastrius arenicola (Boheman)	RDB2	32	1
Negastrius pulchellus (L.)	RDBI	24	1
Negastrius sabulicola (Boh.)	RDB3	24	1
Zorochros minimus (Bois.& Lac)	Common	1	1
COCCINELLIDAE			
Coccinella quinquepunctata L.	Notable B	8	1
CURCULIONIDAE			
Baris lepidii Germ.	Notable A	16	2

* *Stenus fossulatus* is added at the sugestion of Adam Bates (pers com). This rare species of riparian landslips has also occurred on shingle in Cumbria. Its status in Shirt (1987) is RDB1, however in the light of recent discoveries in Cumbria and south east Scotland, we have revised this down to RDB3 for the purposes of this report.

** *Thinobius longipennis* is given status 'unknown' in Bates (2005). However recent work by Lott (2006) has demonstrated that this species is rare in Britain and, at the suggestion of Adam Bates (pers com), we have given this species a status of RDBK for the purposes of this report.

2b. **Provisional list of flies associated with ERS** *(as listed by Hewitt* et al. *2007)*

SPECIES	JNCC STATUS	OLD SCORE	IUCN STATUS	REVISED STATUS	NEW SCORE	FIDELITY
ASILIDAE						
Rhadiurgus variabilis	pRDB3	24		LR(nt)		1
DOLICHOPODIDAE						
Asyndetus latifrons	NEW			Data Deficient	24	2
Diaphorus hoffmannseggii	RDBI	24	LR(nt)		24	1
Rhaphium elegantulum	Local	2			2	2
Rhaphium fractum	Notable/Nb	8	LR(ns)		8	2(3)
Rhaphium gravipes	Notable/Nb	8	LR(ns)	LR(ns)b	8	2
Rhaphium nasutum	Local	2			2	2
Rhaphium patulum	Notable/Nb	8	LR(ns)		8	2
Rhaphium penicillatum	pRDB3	24	LR(nt)		24	2(3)
Rhaphium suavis	NEW			Data Deficient	24	2
EMPIDIDAE						
Heleodromia irwini	pRDB1	32	Data Deficient		24	2
Hilara biseta	Notable	8	LR(ns)		8	2
EPHYDRIDAE						
Athyroglossa glabra	Local	2			2	2
Athyroglossa ordinata	pRDB1	32			32	1
Hecamedoides unispinosus	pRDB2	32			32	1
Scatella obsoleta	pRDB2	32			32	1
HYBOTIDAE						
Platypalpus melancholicus	pRDB3	24	LR(nt)		24	2(3)
Tachydromia acklandi	pRDB3	24	LR(nt)	*LR(ns)a*	16	1
Tachydromia calcarata	NEW			Data Deficient	24	1
Tachydromia costalis	pRDB3	24	LR(nt)	*LR(ns)a*	16	1
Tachydromia edenensis	NEW			*LR(nt)*	24	1
Tachydromia halidayi	Notable/Nb	8	LR(ns)	LR(ns)b	8	1
Tachydromia morio	Unknown	2		*Local*	2	1
Tachydromia rhyacophila	NEW			Data Deficient	24	1
Tachydromia woodi	RDB I	24	LR(nt)		24	2(3)
LIMONIIDAE						
Arctoconopa melampodia	pRDB2	32		LR(nt)	24	2(3)
Erioptera meigeni	RDB3	24			24	2
Hexatoma bicolor	Local	2		Local	2	2
Hexatoma fuscipennis	Local	2		Local	2	2
Hoplolabis areolata	Local	2		Local	2	2
Hoplolabis vicina	Local	2		Local	2	1
Hoplolabis yezoana	NEW			LR(ns)a	16	1
Dicranomyia omissinervis	RDB2	32		LR(nt)	24	1
Rhabdomastix edwardsi	Local	2		Local	2	2
Rhabdomastix eugeni	NEW			Data Deficient	24	1
Rhabdomastix laeta	NEW			Data Deficient	24	1
Rhabdomastix japonica	RDB3	24			24	1
LONCHOPTERIDAE						
Lonchoptera nigrociliata	Notable/Nb	8		LR(ns)b	8	2
PEDICIIDAE						
Dicranota gracilipes	Notable/Nb	8			8	2
Dicranota robusta	Notable/Nb	8			8	2
Dicranota simulans	RDB3	24			24	2
STRATIOMYIDAE						
Oxycera terminata	RDB2	32			32	1
TABANIDAE						
Tabanus cordiger	Notable/Nb	8		LR(ns)b	8	2
THEREVIDAE						
Cliorismia rustica	RDB3	24		LR(ns)a	16	1
Spiriverpa lunulata	RDB3	24		LR(ns)b	8	1
TIPULIDAE						
Nephrotoma aculeata	pRDB2	32			32	2
Nephrotoma analis	Local	2		Local	2	2
Nephrotoma dorsalis	Notable/Nb	8		LR(ns)b	8	1
Nephrotoma lunulicornis	Notable/Nb	8		LR(ns)b	8	1
Tipula (Lindnerina) bistilata	RDB2	32			32	2
Tipula (Lunatipula) laetabilis	RDB2	32			32	2

Notes on ERS Diptera list

The statuses of the rare and threatened British Empidoidea (Dolichopodidae, Empididae and Hybotidae) were revised by Falk & Crossley (2005) using the IUCN categories. These statuses are shown in the IUCN status column for the ERS specialist Empidoidea. Statuses of most of the other ERS specialists in the list have not beeen reviewed since Falk (1991) or Shirt (1987).

Much new information has been collected in recent years and even the Falk & Crossley statuses for ERS species are beginning to appear unrepresentative. We have revised the status categories (and corresponding scores) for those species where we have additional recent information available. Where recent information appears to support the existing status we have repeated that status in the revised status column. Where we have insufficient additional information on which to base a revision we have left the column blank and the score will be that corresponding to the original status of the species. The IUCN status Lower Risk (nationally scarce) (LR(ns)) roughly corresponds to the JNCC status Nationally Scarce (Na/Nb) but does not differentiate between the Na and Nb categories. We have added 'a' or 'b' to LR(NS) statuses in our Revised Status column to signify Na or Nb status in order to retain compatibility within the scoring system.

Species with Fidelity 3 in brackets arguably have only a moderate fidelity to ERS. Opinions of workers in the field differ. Further study is required to clarify the suite of high fidelity ERS Diptera in the UK.

Arguably, there is a narrow strip of ERS along the waters' edge of large stretches of active river zones, utilised by a number of Dipteran species, including species with aquatic larvae that use the substrate at the water margin for oviposition and pupation. These species are excluded from the list of high fidelity ERS Diptera given here since they are not restricted to aggregations of ERS, but might be included in further revisions in discussion with other workers. Species that could be considered include: *Tipula couckei, Antocha vitripennis, Eleophila apicata, Erioptera limbata, Rhabdomastix inclinata, Symplecta hybrida, Atherix ibis, Ibisia marginata, Hilara apta, H. pseudochorica, H. setosa, Wiedemannia phantasma, W. bistigma, Campsicnemus marginatus, Dolichopus longicornis, Rhaphium riparium, R. rivale, Teucophorus calcaratus.*

2c. Bugs and spiders with a high or total fidelity to ERS

Bugs *(as listed by Hewitt et al., 2005)*

Cryptostemma alienum	Dipsocoridae	Local
Saldula scotica	Saldidae	Common
Saldula c-album	Saldidae	Common
Saldula melanoscela	Saldidae	(new to Britain 2000)
Saldula fucicola	Saldidae	Notable/Nb

Spiders *(as listed by Sadler & Bell (2002)*

Pardosa agricola (Thorell, 1856)	Lycosidae	Local
Arctosa cinerea (Fabricius, 1777)	Lycosidae	Notable/Nb
Diplocephalus connatus Bertkau, 1889	Linyphiidae	RDB2
Caviphantes saxetorum (Hull, 1916)	Linyphiidae	Na