Supporting Information

Appendix S1: methodology for building reduced time series models

Communities were able to vary in multiple dimensions according to time, location and habitat. There was therefore high potential for complex species response patterns. To avoid any erroneous pre-suppositions about latent community dynamics we assumed no a priori knowledge about the temporal and spatial scale of trends. An initial model building process was thus used to simplify the fine-scale temporal trends amongst individual transects into the most parsimonious components of broader variation in the dataset. As a first step in this process, carabid communities were classified according to their time-independent biogeographical variation. This was done to assess how biodiversity varied across regions and habitats for subsequent comparison with temporal trends, and to investigate the level of species turn-over across space to inform models investigating the effects of time. For example, it is productive to test the interactive effects between time and locations with low rates of species turnover because enough species will be shared across the relevant transects to compare how their temporal trends vary across space. However, higher rates of species turnover would necessitate separate analyses between communities which share few species because there is no valid spatial comparison between the temporal trends of species with strongly diverging geographical distributions. Communities were classified using a hierarchical, agglomerative flexible clustering algorithm to find similar groups of transects using matrices of their chi-squared distances, with a beta level of zero to ensure conservation of space amongst clusters (Lance & Williams, 1967). The most appropriate level of clustering in the resulting dendrogram was found using the methods described by Dufrêne and Legendre (1997). Detrended correspondence analyses (DCA) were also conducted to aid interpretation of the time-independent biogeographical classification and to calculate the lengths of gradients in the ordinations produced, as an estimate of species turn-over across space. DCA and all subsequent multivariate modelling was done using the CANOCO V4.5 program (Ter Braak & Šmilauer, 2002). Captures at Moor House were extremely low and species turn-over high compared to most other sites, subsequently this site was removed from further analyses. Snowdon and Cairngorm sites were also removed from the model building process due to their shorter time series. Trends at the latter two sites were investigated in a separate analysis, instructed by the final models for the full time-series. Time series models were built by an iterative process of progressively simplifying from large numbers of terms describing single or grouped transects, and their interactions with time, using partial redundancy analyses (pRDA) (Ter Braak 1995). This technique was chosen for all multivariate time series modelling because gradient lengths representing solely the effect of time on axes were found to be short (SD < 1.8), and RDA is most appropriate when species turn-over rates are low and their responses are predominantly monotonic (Ter Braak 1995). Initial terms for transects, or their groups, were selected from the seventh level of the biogeographical cluster analysis, at an early stage in the process of hierarchical cluster agglomeration. Time and terms for transects, or their groups, were set as covariables in pRDAs and the ordination of transect term by time interactions examined in biplots, together with their marginal eigenvalues, conditional eigenvalues and inflation factors in forward selection (Ter Braak & Šmilauer, 2002). Groups of transects with high covariance for their interaction terms (Inflation Factors > 15.0), and similar correlation scores with canonical axes (< 0.5), were joined to form new terms, but only if their interaction terms were insignificant ($P > 0.05$) in pRDAs reduced to such transects. Analyses were progressively re-run under these conditions until no larger transect groups could be formed and their conditional eigenvalues under forward selection represented high proportions (> 0.85) of their marginal eigenvalues, suggesting independence of their effects

(Ter Braak & Šmilauer, 2002). The final transect groups achieved, representing region by habitat combinations with anticipated independence in their temporal trends, were used as terms in simplified models investigating community variation over time.

References

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Table S1. Descriptions of the habitats where pitfall trap transects are located, with transects listed within the region by habitat (*RH*) groups used in analyses. Site locations are as follows: Wytham, Oxfordshire, England (Lat. 51°78'N; Long. 1°33'W); Alice Holt, Surrey, England (Lat. 51°15'N; Long. 0°90'W); Rothamsted, Hertfordshire, England (Lat. 51°80'N; Long. 0°37'W); Drayton, Warwickshire, England (Lat. 52°19'N; Long. 1°76'W); North Wyke, Devon, England (Lat. 50°78'N; Long. 3°91'W); Hillsborough, County Down, Northern Ireland (Lat. 54°45'N; Long. 6°08'W); Porton Down, Wiltshire, England (Lat. 51°13'N; Long. 1°64'W); Snowdon, Gwynedd, Wales (Lat. 53°08'N; Long. 4°03'W); Glensaugh, Grampian, Scotland (Lat. 56°85'N; Long. 2°50'W); Sourhope, Borders, Scotland (Lat. 55°49'N; Long. 2°21'W), and; Cairngorms, Highland, Scotland (Lat. 57°12'N; Long. 3°83'W), where, Lat. = latitude, and Long. = longitude. Total counts of carabids in the data sets used for analyses are given for each transect. Three transects were located at each site and are identified by number labels (1, 2 or 3). The total area of the broad habitat type represented by each *RH* group that is present at each of its constituent sites is given, together with the minimum distance to each transects nearest neighbour within those habitats at sites (when more than one transect is present within an *RH* group at a given site). In some instances, transects cover two *RH* groups at sites, in which case the minimum distance to each transects nearest neighbour in another *RH* group is given. More detailed descriptions of the sites, and their climates, topography and habitats are given in; Sykes, J.M. & Lane, A.M.J. (1996) *The UK Environmental Change Network: Protocols for Standard Measurements at Terrestrial Sites*. The Stationary Office, London.

Transects listed by their region by habitat (*RH*) groups (bold), sites (italics), number labels and habitat descriptions	Total count	*RH* group area at site (ha.)	Separation within *RH* group at site (m)	Separation between *RH* groups at sites (m)
Northern Moorland				
Sourhope 2- upland, dry peat moorland with heather	1,817	41	1076	2578
Sourhope 3- upland, wet peat moorland with heather	4,839	‘ ’	1076	3225
Glensaugh 2- upland, dry peat moorland with heather	1,543	41	1090	839
Glensaugh 3- upland, wet peat moorland with heather	1,293	‘ ’	1090	1690
Mean transect count	2,373			
Western Pasture				
North Wyke 1- edge of permanent pasture field next to hedgerow	3,938	193	70	-
North Wyke 2- open edge of permanent pasture field	4,039	‘ ’	70	-
North Wyke 3- edge of permanent pasture field bordering a river	11,925	‘ ’	730	-
Hillsborough 2- open edge of permanent pasture field	10,984	190	600	500
Hillsborough 3- within field location in permanent pasture	9,937	‘ ’	600	900
Mean transect count	8,165			
Open Southern				
Drayton 1- open grass margin next to permanent pasture field	3,767	36	110	-
Drayton 2- open, grass margin bordering an arable field	10,903	‘ ’	40	-
Drayton 3- open, grass margin bordering an arable field	11,840	‘ ’	40	-
Rothamsted 3- open extensively managed, ungrazed grassland	8,679	21	-	550
Mean transect count	8,797			
Southern Downland				
Porton Down 1- short, calcareous grassland with scrub	2,285	1091	100	-
Porton Down 2- short/medium, calcareous grassland with scrub	4,927	‘ ’	100	-
Porton Down 3- rank, tall calcareous grassland with Juniper	3,530	‘ ’	100	-
Mean transect count	3,581			
Woodland and Southern Hedgerow				
Wytham 1- large, previously coppiced broad-leafed woodland	8,104	292	780	-
Wytham 2- base of hedgerow bordering an arable field	1,609	‘ ’	780	-
Wytham 3- large, eighteenth century beech plantation	5,283	‘ ’	1100	-
Alice Holt 1- large, oak woodland, with hazel and hawthorn understory	16,556	140	10	-
Alice Holt 2- large, oak woodland, with hazel and hawthorn understory	15,428	‘ ’	10	-
Alice Holt 3- large, oak woodland, with hazel and hawthorn understory	15,202	‘ ’	10	-
Rothamsted 1- base of hedgerow bordering an arable field	51,828	19	955	864
Rothamsted 2- small, climax deciduous woodland	10,846	‘ ’	955	550
Hillsborough 1- small, mixed woodland with conifers and Sycamore	1,912	200	-	500
Mean transect count	14,085			
Northern Pasture				

Sourhope 1- permanent pasture, based on mineral grassland	6,331	15	-	2578
Glensaugh 1- permanent pasture, based on mineral grassland	8,521	39	-	839
Mean transect count	7,426			
Montane- high elevation habitats (10 year time-series)				
Snowdon 1- grazed, upland calcareous grassland	12,679	569	80	-
Snowdon 2- grazed, upland mineral/acid grassland	4,413	‘’	80	-
Snowdon 3- grazed, upland mineral/acid grassland	1,637	‘’	380	-
Cairngorms 1- small and thin, upland coniferous woodland	753	1000	1400	-
Cairngorms 2- high altitude, dry heathland with heather	2,834	‘’	600	-
Cairngorms 3- high altitude bog	601	‘’	600	-
Mean transect count	3,820			

Table S2. Partial redundancy analysis (pRDA) models of temporal trends in carabid communities, using the Euclidean distance measure. The effects of time (*T*), are shown and its interaction with region by habitat (*RH*) groups: northern moorland (NM), western pasture (WP), southern open (SO), southern downland (SD), woodland and southern hedgerows (WSH), and northern pasture (NP). Hypotheses tested by the models are: for model M1, a composite hypothesis that there has been directional changes in carabid communities whether common across all *RH* groups, different between them, or only present in one or more *RH* groups (because this model explains the full temporal variation explained by all the terms, the fit of subsequent models, testing sub-sets of these terms in more specific hypotheses, is assessed by the percentage of the variance in this model that they account for); for model M2, the hypothesis that there is a trend towards an overall directional change in community composition regardless of its consistency across *RH* groups; for model M3, the hypothesis that trends vary between two or more *RH* groups, and; for models M4-9, the hypothesis that trends within individual RH groups, each tested in turn, are unique and therefore different from the singular trends of all other *RH* groups. Permutation designs used in models are: P1, global Monte Carlo test of all canonical axes, where whole plot samples, represented by individual transects, are freely exchanged and dependence across whole plots is maintained; P2, Monte Carlo test of the first canonical axis, where individual years within transects are considered as split-plots and are permuted within whole plots represented by each transect, and; P3, Monte Carlo test of the first canonical axis, where whole plot samples, represented by individual transects, are freely exchanged and dependence across whole plots is maintained (all permutation tests used 999 randomisations). The species-environment correlations with the axes used for Monte Carlo tests are given, where f = first canonical axis, and g = all canonical axes (global test). Transect identifiers (Tran ID) are used as covariables. The ordination diagram for model M2, shows that the significant overall community trend is characterised by declines for most species. Ordination diagrams for model M3 are shown in Fig. S1a, b (below). They reveal that multiple axes are required to represent the significant divergent responses between *RH* groups: the trend in northern moorland was expressed on the first axis and represented declines for most species, whereas species appeared to be increasing in southern downland on the second axis, with the third axis represented contrasting trends for western pasture and southern open groups, which although predominately representing species declines in each case, differed in terms of the effects on individual species, and the number of them affected, with noticeably more taxa undergoing population reductions in the former group. Other *RH* groups explained proportionately less temporal variation and were represented by higher axes.

					Species-	% full	Permutation tests		
			Permutation	% residual	environment	M1 model	Independent	Forward selection	
Model	Explanatory variables	Covariables	design	var. exp.	correlation	var. exp	*F*-value	% var. exp.	*F*-value
M1	*T*, *T**(NM+WP+SO+SD+WSH+NP)	Tran ID	P1	0.172 (g)	0.791	-	**12.83****	-	-
M2	*T*	Tran ID	P2	0.031 (f)	0.658	0.178	**11.59****	-	-
M3	*T**(NM+WP+SO+SD+WSH+NP)	Tran ID, *T*	P1	0.146 (g)	0.772	0.822	**12.72****	-	-
M4	*T**NM	Tran ID, *T*, *T**(WP+SO+SD+NP)	P3	0.048 (g)	0.738	0.172	**18.33****	0.324	**19.26****
M5	*T**WP	Tran ID, *T*, *T**(NM+SO+SD+WSH)	P3	0.035 (g)	0.583	0.125	**12.92****	0.541	**13.07****
M6	*T**SO	Tran ID, *T*, *T**(NM+WP+SD+WSH)	P3	0.031 (g)	0.631	0.156	**11.19****	0.757	**12.51****
M7	*T**SD	Tran ID, T, T*(NM+WP+SO+WSH)	P3	0.027 (g)	0.734	0.133	**10.77****	0.919	**10.77****
M8	*T**WSH	Tran ID, T, T*(NM+WP+SO+SD)	P3	0.014 (g)	0.581	0.067	**4.59***	1.000	**4.59***
M9	*T**NP	Tran ID, T, T*(NM+WP+SO+SD)	P3	0.014 (g)	0.581	0.067	**4.59***	-	-

Significant permutation tests are indicated by bold *F*-values, where: * $P < 0.05$**;** ** $P < 0.01$.

Table S3. Multiple general linear regression models investigating links between the ecological and biogeographical traits of species and their temporal trends. Analyses use a dependent variable formed from the temporal trend coefficients estimated by linear mixed models (parameterised in Table S4a) and trait characteristics as independent variables. Two analyses were conducted for each type of trait; one investigating simple linear trends, and another investigating linear trends amongst region by habitat (*RH*) groups (see Table S2 for abbreviations), where parameters are represented by intercepts for *RH* groups (in italics), presented as differences from the group listed first which is held as a reference level, and slopes for the relevant trait and its interaction with *RH* groups, presented as differences from the slope for the group listed first, which is held as a reference level for the other slopes. Additionally, where the second type of model indicated differences between *RH* groups, single models within each *RH* group were run to assess the within group significance of the trait effect. Only models with significant effects are shown. Traits were assessed as follows: breeding period, defined as spring and autumn breeding and, in this case only, analysed with a two-way, randomised block design analysis of variance (ANOVA); dispersal power, expressed on an ordinal scale, where; 1 = high, 2 = intermediate, 3 = low, and 4 = very low; degree of habitat specialisation, expressed on an ordinal scale, where; 1 = strongly eurytopic, 2 = moderately eurytopic, 3 = limited habitat preference, and 4 = stenotopic; size, quantified by a continuous variable for beetle length in millimetres; microclimate moisture preference, expressed on an ordinal scale, where; 1 = highly hygrophilous, 2 = moderately hygrophilous, 3 = wide tolerance, 4 = moderately xerophilous, and 5 = strongly xerophilous; micro-habitat shade tolerance, expressed on an ordinal scale, where; 1 = strong preference for shady situations, 2 = moderate preference for shady situations, 3 = no preference for shade or light, or a moderate preference for open situations, and 4 = strong preference for open situations; diurnal activity, expressed on an ordinal scale, where; 1 = strongly nocturnal, 2 = intermediate activity between day and night, and 3 = mainly day active; latitudinal distribution in the United Kingdom (UK), expressed on an ordinal scale, where; 1 = present up to the fourth most southerly 100 km latitudinal band in the UK (around the latitude that Manchester lies on), 2 = present up to the seventh most southerly 100 km latitudinal band in the UK (around the latitude that Stirling lies on), and 3 = present up to the most northerly 100 km latitudinal band in the UK; latitudinal distribution in Europe, expressed on an ordinal scale, where; 1= primarily in southern and central Europe, 2 = distributed throughout Europe, from the Mediterranean region to Scandinavia, 3 = primarily in central Europe, 4 = primarily in central and northern Europe, and 5 = primarily in northern Europe, and; latitudinal distribution in Scandinavia, expressed on an ordinal scale, where; 1 = not present in Scandinavia (only recorded in more southerly European countries), 2 = southerly distribution (recorded in Denmark and southern regions of other countries up to 60 degrees latitude), 3 = intermediate distribution (recorded in regions up to 64 degrees latitude), and 4 = recorded in regions above 64 degrees latitude (usually within the arctic circle). Results given are *F* tests of terms in an accumulated ANOVA, derived from the relevant multiple regression, together with their coefficients and standard errors (s.e.). Species trait information was drawn from the following sources: Holland, J.M. (2002) *The Agroecology of Carabid Beetles*. Intercept, Andover; Hurka, K. (1996) *Carabidae of the Czech and Slovak Republics*. Zlin, Kabourek; Lindroth, C.H. (1985) *The Carabidae (Coleoptera) of Fennoscandia and Denmark, Fauna Entomologica Scandinavica, Volume 15, parts 1 and 2*. Scandinavian Science Press, Copenhagen; Luff, M.L. (1998) *Provisional Atlas of the Ground Beetles (Coleoptera, Carabidae) of Britain*. Biological Records Centre, Huntingdon, and; Luff, M.L. (2007) *Handbooks for the Identification of British Insects, 4th Vol., Part 2*, 2nd edn. Royal Entomological Society, St. Albans.

	Accumulated ANOVA		Parameterisation of regression model			
Trait, trend type	Term	*F*-value (df)	Parameter	Coefficient	s.e.	*t*-value (df)
Breeding period (BRE)						
Simple linear trend	BRE	**5.39*** $_{(1,66)}$	*Intercept*	-0.0298	0.0060	**-4.94***** $_{(66)}$
			BRE	0.0226	0.0098	**2.32*** $_{(66)}$
Dispersal power (DISP)						
Simple linear trend	DISP	**5.09*** $_{(1,66)}$	*Intercept*	-0.0435	0.0110	**-3.96***** $_{(66)}$

			DISP	0.0103	0.0046	$\mathbf{2.26^{*}}_{(66)}$
Trends amongst *RH* groups	*RH*	$\mathbf{7.35^{***}}_{(5,134)}$	*SO*	-0.0552	0.0170	$\mathbf{-3.24^{**}}_{(134)}$
	DISP	$1.94_{(1,134)}$	*SD*	0.1157	0.0370	$\mathbf{3.13^{**}}_{(134)}$
	RH.DISP	$1.35_{(5,134)}$	*NM*	0.0164	0.0250	$0.66_{(134)}$
			NP	0.0432	0.0329	$1.31_{(134)}$
			WSH	0.0378	0.0250	$1.51_{(134)}$
			WP	0.0293	0.0228	$1.28_{(134)}$
			SO.DISP	0.0185	0.0075	$\mathbf{2.47^{*}}_{(134)}$
			SD.DISP	-0.0305	0.0141	$\mathbf{-2.16^{*}}_{(134)}$
			NM.DISP	-0.0176	0.0100	$-1.75_{(134)}$
			NP.DISP	-0.0112	0.0130	$-0.86_{(134)}$
			WSH.DISP	-0.0113	0.0104	$-1.09_{(134)}$
			WP.DISP	-0.0212	0.0107	$-1.97_{(134)}$
Trends within *RH* groups						
Southern open	DISP	$\mathbf{6.93^{*}}_{(1,28)}$	*Intercept*	-0.0582	0.0176	$\mathbf{-3.31^{**}}_{(28)}$
			DISP	0.0203	0.0077	$\mathbf{2.63^{*}}_{(28)}$
Size (SIZE)						
Simple linear trend	SIZE	$\mathbf{6.66^{*}}_{(1,66)}$	*Intercept*	-0.0411	0.0090	$\mathbf{-4.54^{***}}_{(66)}$
			SIZE	0.0022	0.0008	$\mathbf{2.58^{*}}_{(66)}$
Trends amongst *RH* groups	*RH*	$\mathbf{8.36^{***}}_{(5,134)}$	*NM*	-0.0346	0.0143	$\mathbf{-2.43^{*}}_{(134)}$
	SIZE	$\mathbf{7.25^{**}}_{(1,134)}$	*NP*	-0.0122	0.0269	$-0.45_{(134)}$
	RH.SIZE	$\mathbf{4.23^{**}}_{(5,134)}$	*SD*	0.1031	0.0295	$\mathbf{3.50^{***}}_{(134)}$
			SO	-0.0298	0.0197	$-1.51_{(134)}$
			WP	-0.0004	0.0203	$-0.02_{(134)}$
			WSH	0.0277	0.0204	$1.36_{(134)}$
			NM.SIZE	-0.0002	0.0011	$-0.21_{(134)}$
			NP.SIZE	0.0047	0.0020	$\mathbf{2.32^{*}}_{(134)}$
			SD.SIZE	-0.0031	0.0021	$-1.44_{(134)}$
			SO.SIZE	0.0055	0.0017	$\mathbf{3.23^{**}}_{(134)}$
			WP.SIZE	0.0008	0.0020	$0.40_{(134)}$
			WSH.SIZE	0.0011	0.0016	$0.68_{(134)}$
Trends within *RH* groups						
Southern open	SIZE	$\mathbf{20.93^{***}}_{(1,28)}$	*Intercept*	-0.0644	0.0122	$\mathbf{-5.26^{***}}_{(28)}$
			SIZE	0.0053	0.0012	$\mathbf{4.57^{***}}_{(28)}$
Northern pasture	SIZE	$\mathbf{6.14^{***}}_{(1,13)}$	*Intercept*	-0.0468	0.0245	$-1.92_{(13)}$
			SIZE	0.0053	0.0012	$\mathbf{2.48^{*}}_{(13)}$
Microclimate moisture preference (HYGRO)						
Simple linear trend	HYGRO	$0.66_{(1,66)}$	*Intercept*	-0.0312	0.0133	$-2.35_{(66)}$

			HYGRO	0.0038	0.0047	0.81 $_{(66)}$
Trends amongst *RH* groups	*RH*	**7.74*** $_{(5,134)}$**	*SO*	0.0384	0.0282	1.36 $_{(134)}$
	HYGRO	2.03 $_{(1,134)}$	*SD*	-0.0157	0.0506	-0.31 $_{(134)}$
	RH.HYGRO	**2.86* $_{(5,134)}$**	*NM*	-0.0215	0.0354	-0.61 $_{(134)}$
			NP	0.0382	0.0609	0.63 $_{(134)}$
			WSH	-0.0500	0.0505	-0.99 $_{(134)}$
			WP	-0.1008	0.0339	**-2.98** $_{(134)}$**
			SO.HYGRO	-0.0191	0.0094	**-2.04* $_{(134)}$**
			SD.HYGRO	0.0211	0.0149	1.41 $_{(134)}$
			NM.HYGRO	-0.0058	0.0125	-0.46 $_{(134)}$
			NP.HYGRO	-0.0011	0.0202	-0.05 $_{(134)}$
			WSH.HYGRO	0.0230	0.0176	1.31 $_{(134)}$
			WP.HYGRO	0.0321	0.0118	**2.71** $_{(134)}$**
Trends within *RH* groups						
Southern open	HYGRO	**4.33* $_{(1, 28)}$**	*Intercept*	0.0360	0.0286	1.26 $_{(28)}$
			HYGRO	-0.0199	0.0096	**-2.08* $_{(28)}$**
Northern moorland	HYGRO	**9.81** $_{(1, 25)}$**	*Intercept*	0.0259	0.0215	1.20 $_{(25)}$
			HYGRO	-0.0247	0.0079	**-3.13** $_{(25)}$**
Western pasture	HYGRO	**4.57* $_{(1, 32)}$**	*Intercept*	-0.0635	0.0170	**-3.74*** $_{(32)}$**
			HYGRO	-0.0247	0.0079	**2.14* $_{(32)}$**
Shade tolerance (SHAD)						
Simple linear trend	SHAD	0.02 $_{(1,66)}$	*Intercept*	-0.0191	0.0142	-1.35 $_{(66)}$
			SHAD	-0.0007	0.0045	-0.15 $_{(66)}$
Trends amongst *RH* groups	*RH*	**8.70*** $_{(5,132)}$**	*SO*	0.0388	0.0209	1.86 $_{(132)}$
	SHAD	3.03 $_{(1,132)}$	*SD*	-0.0758	0.0435	-1.74 $_{(132)}$
	RH.SHAD	**3.26** $_{(5,132)}$**	*NM*	-0.0701	0.0305	**-2.30* $_{(132)}$**
			NP	0.0758	0.0526	1.44 $_{(132)}$
			WSH	-0.0427	0.0285	-1.50 $_{(132)}$
			WP	-0.0475	0.0294	-1.62 $_{(132)}$
			SO.SHAD	-0.0176	0.0063	**-2.80** $_{(132)}$**
			SD.SHAD	0.0414	0.0129	**3.21** $_{(132)}$**
			NM.SHAD	0.0154	0.0099	1.56 $_{(132)}$
			NP.SHAD	-0.0195	0.0169	-1.15 $_{(132)}$
			WSH.SHAD	0.0198	0.0088	**2.24* $_{(132)}$**
			WP.SHAD	0.0105	0.0089	1.17 $_{(132)}$
Trends within *RH* groups						
Southern open	SHAD	**7.02* $_{(1,28)}$**	*Intercept*	0.0388	0.0221	1.76 $_{(28)}$
			SHAD	-0.0176	0.0066	**-2.65* $_{(28)}$**

Southern downland	SHAD	**5.60*** $_{(1,9)}$	*Intercept*	-0.0550	0.0390	-1.41 $_{(9)}$
			SHAD	0.0282	0.0119	**2.37*** $_{(9)}$
Northern pasture	SHAD	**4.93*** $_{(1,12)}$	*Intercept*	0.1146	0.0513	**2.24*** $_{(12)}$
			SHAD	-0.0371	0.0167	**-2.22*** $_{(12)}$
Diurnal activity (DI)						
Simple linear trend	DI	**6.22*** $_{(1,66)}$	*Intercept*	0.0026	0.0106	0.25 $_{(66)}$
			DI	-0.0136	0.0055	**-2.49*** $_{(66)}$

Significant terms and parameters are indicated by bold *F* and *t*-values, where: * *P* < 0.05**; **** *P* < 0.01; *** *P* < 0.001.

Table S4. Parameterisation of mixed models fitted using residual maximum likelihood (REML) criteria. Models evaluate temporal effects, for: (a) individual species and total abundance of carabids, their genera totals, and their trends amongst region by habitat (*RH*) groups, in the full, fifteen year time-series; (b) individual species and total abundance of carabids at all upland sites in a reduced, ten year time-series. Additionally, (c) gives a summary of species trends across these models, where species are listed by their abbreviations, which are given in brackets after their full names in (a) and (b), with the groups are ordered by species trend directions and strengths; these groups show the species represented by each of the bars in Figs. 4 and 5a of the main paper, and also give a summary of the species population changes causing the community trends and functional responses shown in Fig. 6 in the main paper. Models assessing linear effects of time (YEAR) are fitted for all taxa (indicated by 'single line' in model descriptions); species limited to single habitat categories for analyses, due to low abundance across the data set, have only this type of model fitted, indicated by abbreviations in square brackets after the species name referring to the *RH* group in question, where: NM = northern moorland; WP = western pasture; SO = southern open; SD = southern downland; WSH = woodland and southern hedgerows. Additionally, species analysed in more than one *RH* group have a second model fitted incorporating a factor for *RH* groups and their interactions with time, with parameters given for trends in relevant *RH* groups, indicated by the previous abbreviations, and additionally; NP = northern pasture. Where two models are given for a species, the one with the most parsimonious fit is highlighted by bold text. Models have random and fixed components; a model selection process determined final model structure (see main text); a first order auto-regressive (AR1) term is incorporated in the random model when appropriate (indicated by 'auto err' in model descriptions); all other models have an independent error structure (indicated by 'ind err' in the model description). Analyses assessing multiple *RH* groups select the best fitting model according to the slopes and shapes of their trend lines, either: lines fitted with different slopes (indicated by 'diff. lines' in the model description); lines with different slopes fitted but with a common non-linear trend (indicated by 'diff. lines/c. spline' in the model description); lines with different slopes and different non-linear trends fitted (indicated by 'diff. lines/splines' in the model description); lines with the same slopes fitted, but with different intercepts (indicated by 'parallel lines' in the model description); lines with the same slopes and a common non-linear trend fitted, but with different intercepts (indicated by 'parallel lines/c. spline' in the model description); a common linear trend fitted across *RH* groups, in which case only such a model is shown, either with a significant slope (indicated by 'single line, sig.', in the model description, followed by the *RH* groups that the trend applies to in brackets, see abbreviations above) or with a slope not significantly different from a flat line (indicated by 'single line, flat', in the model description, followed by the *RH* groups that the trend applies to in brackets); or a single trend line fitted to multiple *RH* groups, but with a spline term describing non-linear effects (indicated by 'single line + spline' in model descriptions). Standard errors (s.e.) of the coefficients (Coeff.) for AR1 terms, and the intercepts of the year or *RH* groups are given, together with lower (L) and upper (U) 95% confidence intervals (CI) for the YEAR, and *RH* by YEAR trend coefficients (Coeff.). In parallel line models, an average is given for the standard errors of the intercepts across *RH* groups. The percentage changes (Ch.) in populations averaged over ten year periods, estimated from the parameters in fixed models are given for each taxa. Where non-linear effects are also present for year or *RH* group trends, the shape of the best fitting curve is indicated by a superscript next to the relevant term in the parameterisation of the fixed model: D = monotonic decreasing, where; D1= a strong linear decline in the first third of the time series followed by a substantially weaker decline or a flat response, D2 = a continuous decline which is stronger in the first half of the time series, giving rise to a shallow concave curve, D3 = a strong linear decline in the first two-thirds to three-quarters of the time series, followed by a weaker decline or a flat response, D4 = a continuous decline which is stronger in the second half of the time series, giving rise to a shallow convex curve, and D5 = a sigmoid shape where the decline is strongest in the middle part of the time series; I = monotonic increasing, where; I1 = a strong linear increase in the first two-thirds of the time series, followed by a substantially weaker increase or a flat response, I2 = a strong linear increase in the first third of the time series, followed by a substantially weaker increase or a flat response, I3 = a continuous increase which is stronger in the second half of the time series giving rise to a shallow concave curve, I4 = a predominantly flat response in the first quarter to half of the time series, followed by a strong linear increase, and I5 = a sigmoid shape with the increase strongest in the middle part of the time series; U = a unimodal response, where; U1 = a fairly flat response in the first half of the time series followed by an incomplete peak in the second half of the time series which represents only a partial decline in the last part of the time series compared to the increase prior to the peak, U2 = an incomplete peak in the first half of the time series representing only a partial increase in the first part of the time series compared to the decrease after the peak, followed by a fairly flat response in the second half of the time series, U3 = a peak around the middle of the time series giving rise to no strong net increases or decreases, and U4 = a complete peak in the first third of the time-series followed by consistent declines during the last two-thirds of the time series; B = a bimodal response, where; B1 = a decline from a peak in the first half of the time series followed by an increase to a second, higher peak, B2 = a decline from a peak in the first half of the time series followed by an increase to a second lower peak, B3 = fairly even peaks in each half of the time series giving rise to no strong net increases or decreases, B4 = a fully bimodal response, but with uneven peaks, the highest being in the first half of the time series, B5 = a fully bimodal response, but with uneven peaks, the highest being in the second half of the time series, and B6 = consistent declines across three-quarters of the time series, followed by a much smaller increase in the last quarter of the time series; C = complex non-linear responses with multiple peaks and troughs, where; C1 = an overall increasing trend clearly predominates, C2 = an overall decreasing trend clearly predominates, C3 = there is no obvious overall trend, and; in limited cases where a species has a linear trend within an *RH* group in these different spline models, such a trend is indicated by the following superscripts above the relevant *RH* groups; L = a significant slope, and F = a non-significant response, approximating to a flat-line. Species in (a) and (b) are listed and ranked in order of trend strength (rank number is given in brackets after the species name), from the one with the strongest decline to the one with the strongest increase. In all models, total carabid abundance, *y*, is analysed on a $\log_{10}(y+1)$ scale. Abbreviations describing the site terms in Table (b) are: CA = Cairngorms, GL = Glensaugh, SN = Snowdon, and SO = Sourhope. Carabid nomenclature and systematics follow: Luff, M.L. (2007) *Handbooks for the Identification of British Insects*, *4th Vol., Part 2*, 2nd edn. Royal Entomological Society, St. Albans, where the taxonomic authorities of the genera are; *Carabus* Linnaeus., *Leistus* Frölich., *Trechus* Clairville., *Bembidion* Latreille., *Pterostichus* Bonelli., *Calathus* Bonelli., *Agonum* Bonelli., *Amara* Bonelli., and *Harpalus* Latreille., and of the species are; *Cychrus caraboides* (Linnaeus), *Carabus arvensis* Herbst., *C. glabratus* Paykull., *C. nemoralis* Muller., *C. nitens** Linnaeus., *C. problematicus* Herbst., *C. violaceus* Linnaeus., *Leistus ferrugineus* (Linnaeus), *L. fulvibarbis* Dejean., *L. terminatus* (Hellwig in Panzer), *L. rufomarginatus* (Duftschmid), *L. spinibarbis* (Fabricius), *Nebria brevicollis* (Fabricius), *N. salina* Fairmaire & Laboulbene., *Notiophilus aquaticus* (Linnaeus), *N. biguttatus* (Fabricius), *N. germinyi* Fauvel., *Loricera pilicornis* (Fabricius), *Clivina fossor* (Linnaeus), *Patrobus assimilis* Chaudoir., *P. atrorufus* (Strom), *Trechus obtusus* Erichson., *T. quadristriatus* (Schrank), *Bembidion aeneum* Germar., *B. biguttatum* (Fabricius), *B. guttula* (Fabricius), *B. lampros* (Herbst), *B. lunulatum* (Geoffroy in Fourcroy), *B. obtusum* Audinet-Serville., *B. properans* (Stephens), *B. quadrimaculatum* (Linnaeus), *Stomis pumicatus* (Panzer), *Poecilus cupreus* (Linnaeus), *Pterostichus adstridctus* Eschscholtz., *P. diligens* (Sturm), *P. macer* (Marsham), *P. madidus* (Fabricius), *P. melanarius* (Illiger), *P. niger* (Schaller), *P. nigrita* (Paykull), *P. strenuus* (Panzer), *P. vernalis* (Panzer), *P. rhaeticus* Heer., *Abax parallelepipedus* (Piller & Mitterpacher), *Calathus fuscipes* (Goeze), *C. melanocephalus* (Linnaeus), *C. micropterus* (Duftschmid), *C. rotundicollis* Dejean., *Laemostenus terricola* (Herbst), *Oxypselaphus obscurus* (Herbst), *Anchomenus dorsalis* (Pontoppidan), *Agonum fuliginosum* (Panzer), *A. emarginatum* (Gyllenhal), *A. muelleri* (Herbst), *Amara communis* (Panzer), *A. lunicollis* Schiodte., *A. plebeja* (Gyllenhal), *Harpalus latus* (Linnaeus), *H. rufipes* (De Geer), *Ophonus rufibarbis* (Fabricius), *Bradycellus harpalinus* (Audinet-Serville), *B. ruficollis* (Stephens), *Licinus depressus** (Paykull), *Badister bullatus* (Schrank), *Panagaeus bipustulatus** (Fabricius), *Demetrias atricapillus* (Linnaeus), *Microlestes maurus* (Sturm), *Syntomus obscuroguttatus* (Duftschmid) and *S. truncatellus* (Linnaeus). All these species are relatively common, except species marked with asterisks, which are designated as being Nationally Scarce (B) (none of the species analysed were Biodiversity Action Plan or Red Data Book taxa); Hyman, P.S. & Parsons, P.M. (1992) *A Review of the Scarce and Threatened Coleoptera of Great Britain*, *Part 1*. Joint Nature Conservation Committee, Peterborough.

(a)

Taxa, model type	Random model		Fixed model									Full model
	AR1 term		Tests of terms in the fixed model		Parameterisation of fixed model							Deviance
	Coeff.	s.e.	Term	*F*-value (df)	Term	Intercept	s.e.	Coeff.	L CI	U CI	% Ch.	(df)
Carabus arvensis (1) (C. arv) [NM]												
Ind err - single line	-	-	YEAR	14.32** $_{(1,13)}$	YEAR	0.958	0.119	-0.104	-0.158	-0.050	-66.7	1.20 $_{(12)}$
Pterostichus adstrictus (2) (P.ads) [NM]												
Auto err - single line	0.585	0.243	YEAR	16.09* $_{(1,2.3)}$	YEAR	1.053	0.277	-0.098	-0.144	-0.051	-64.3	-26.31 $_{(24)}$
Demetrias atricapillus (3) (D. atr) [SO]												
Ind err - single line	-	-	YEAR	124.60*** $_{(1,36.2)}$	YEAR^{U2}	0.507	0.067	-0.094	-0.111	-0.078	-62.7	-56.51 $_{(40)}$
Pterostichus rhaeticus (4) (P. rha) [WP]												
Ind err - single line	-	-	YEAR	82.41*** $_{(1,7.2)}$	YEAR^{D1}	0.303	0.043	-0.091	-0.110	-0.071	-61.3	-17.94 $_{(11)}$
Agonum emarginatum (5) (A. ema) [WP]												
Auto err - single line	0.754	0.592	YEAR	5.19* $_{(1,5.19)}$	YEAR^{D1}	1.143	0.229	-0.087	-0.162	-0.012	-59.9	-17.22 $_{(11)}$
Leistus terminatus (6) (L. ter)												
Auto err - single line	0.782	0.053	YEAR	18.84*** $_{(1,35.8)}$	YEAR	0.637	0.114	-0.080	-0.116	-0.044	-56.4	-127.93 $_{(130)}$
Auto err – diff. lines/c. spline	0.496	0.097	YEAR	34.02*** $_{(1,18.8)}$	NM^{D1}	0.584	0.139	-0.077	-0.100	-0.055	-55.1	-144.36 $_{(127)}$
			RH	0.76 $_{(1,7)}$	WSH^{D1}	0.328	0.259	0.005	-0.036	0.046	5.1	
			YEAR.*RH*	12.29** $_{(1,21.5)}$								
Bembidion biguttatum (7) (B. big) [WP]												
Auto err - single line	0.412	0.144	YEAR	13.37** $_{(1,11.9)}$	YEAR	0.464	0.101	-0.078	-0.120	-0.036	-55.7	-23.09 $_{(40)}$
Trechus obtusus (8) (T. obt)												
Auto err - single line, sig. (NM/WP)	0.518	0.108	YEAR	17.37*** $_{(1,16.8)}$	YEAR	0.581	0.112	-0.075	-0.110	-0.040	-54.1	-45.72 $_{(85)}$
Bembidion aeneum (9) (B. aen) [WP]												
Ind err - single line	-	-	YEAR	38.17*** $_{(1,17.3)}$	YEAR^{U2}	0.304	0.122	-0.065	-0.086	-0.044	-48.9	-21.24 $_{(25)}$
Bembidion properans (10) (B. pro) [WP]												
Ind err - single line	-	-	YEAR	39.04*** $_{(1,35.7)}$	YEAR^{D1}	0.210	0.062	-0.064	-0.088	-0.039	-48.3	-44.41 $_{(40)}$
Calathus micropterus (11) (C. mic) [NM]												
Auto err - single line	0.850	0.068	YEAR	4.71* $_{(1,16.5)}$	YEAR	0.952	0.205	-0.062	-0.117	-0.006	-48.2	-65.23 $_{(55)}$
Calathus melanocephalus (12) (C. mel)												
Auto err - single line	0.584	0.087	YEAR	20.29*** $_{(1,23)}$	YEAR	0.845	0.168	-0.062	-0.089	-0.035	-47.4	-99.38 $_{(145)}$
Auto err – diff. lines/c. spline	0.419	0.095	YEAR	58.05*** $_{(1,22.5)}$	SO^{U2}	0.679	0.291	-0.090	-0.151	-0.029	-60.9	-97.84 $_{(136)}$
			RH	5.96* $_{(4,5)}$	NP^{U2}	1.726	0.206	-0.066	-0.109	-0.023	-49.4	
			YEAR.*RH*	3.26* $_{(4,25.6)}$	NM^{U2}	0.558	0.146	-0.106	-0.136	-0.075	-67.2	
					WSH^{B3}	0.563	0.291	0.015	-0.046	0.076	16.3	
					WP^{U2}	0.728	0.206	-0.066	-0.109	-0.023	-49.9	

Bembidion lunulatum (13) (B. lun)												
Auto err - single line	0.225	0.095	YEAR	$\mathbf{20.46^{***}}_{(1,34.9)}$	YEAR	0.316	0.059	-0.060	-0.085	-0.034	-45.9	$-44.17_{(85)}$
Auto err – diff. lines/splines	-0.544	0.092	YEAR	$\mathbf{202.72^{***}}_{(1,45.8)}$	SO^{U2}	0.325	0.037	-0.029	-0.040	-0.017	-25.2	$-84.93_{(81)}$
			RH	$0.13_{(1,4.1)}$	WP^{U2}	0.305	0.037	-0.092	-0.104	-0.081	-62.0	
			YEAR.*RH*	$\mathbf{57.01^{***}}_{(1,44.2)}$								
Leistus fulvibarbis (14) (L. ful)												
Ind err - single line, sig. (WSH/WP)	-	-	YEAR	$\mathbf{22.72^{***}}_{(1,43)}$	YEAR	0.423	0.051	-0.056	-0.080	-0.033	-44.0	$-38.60_{(41)}$
Microlestes maurus (15) (M. mau) [SO]												
Auto err - single line	0.817	0.098	YEAR	$\mathbf{6.90^{*}}_{(1,8.8)}$	YEAR^{U2}	0.260	0.131	-0.054	-0.093	-0.014	-42.3	$-72.35_{(39)}$
Bradycellus ruficollis (16) (B. ruf) [NM]												
Ind err - single line	-	-	YEAR	$\mathbf{29.14^{***}}_{(1,52.3)}$	YEAR^{D3}	0.376	0.087	-0.051	-0.069	-0.032	-40.5	$-57.26_{(55)}$
Pterostichus vernalis (17) (P. ver) [WP]												
Ind err - single line	-	-	YEAR	$\mathbf{27.98^{***}}_{(1,69)}$	YEAR	0.706	0.086	-0.048	-0.066	-0.030	-38.9	$-66.78_{(71)}$
Anchomenus dorsalis (18) (A. dor)												
Auto err - single line	0.561	0.112	YEAR	$3.65_{(1,14.6)}$	YEAR	0.784	0.188	-0.046	-0.093	0.001	-37.4	$-2.91_{(85)}$
Auto err - single line + spline (SO/WSH)	0.494	0.110	YEAR	$4.26_{(1,14.1)}$	YEAR^{U4}	0.801	0.188	-0.042	-0.081	-0.002	-34.9	$-6.93_{(84)}$
*Panagaeus bipustulatus** (19) (P. bip) [SD]												
Ind err - single line	-	-	YEAR	$\mathbf{13.24^{***}}_{(1,38.1)}$	YEAR^{D1}	0.895	0.195	-0.040	-0.062	-0.019	-33.8	$-34.84_{(40)}$
Bradycellus harpalinus (20) (B. har) [NM]												
Ind err - single line	-	-	YEAR	$\mathbf{18.84^{***}}_{(1,32.7)}$	YEAR^{U2}	0.217	0.040	-0.040	-0.058	-0.022	-33.4	$-42.07_{(40)}$
Bembidion quadrimaculatum (21) (B. qua) [WP]												
Ind err - single line	-	-	YEAR	$\mathbf{12.59^{***}}_{(1,43)}$	YEAR^{D1}	0.176	0.048	-0.039	-0.061	-0.018	-33.0	$-44.09_{(41)}$
Agonum muelleri (22) (A. mue) [WP]												
Ind err - single line	-	-	YEAR	$\mathbf{23.45^{***}}_{(1,65.6)}$	YEAR^{D1}	0.546	0.214	-0.037	-0.052	-0.022	-31.5	$-78.38_{(70)}$
Clivina fossor (23) (C. fos)												
Ind err - single line	-	-	YEAR	$\mathbf{25.01^{***}}_{(1,83)}$	YEAR	0.308	0.048	-0.037	-0.051	-0.023	-31.4	$-106.21_{(86)}$
Ind err – diff. lines/splines	-	-	YEAR	$\mathbf{37.75^{***}}_{(1,71.5)}$	NP^{D3}	0.453	0.116	-0.072	-0.101	-0.043	-52.5	$-108.54_{(80)}$
			RH	$1.09_{(2,3)}$	WSH^{D2}	0.222	0.116	-0.022	-0.051	-0.007	-19.9	
			YEAR.*RH*	$\mathbf{3.53^{*}}_{(2,71.5)}$	WP^{D2}	0.293	0.058	-0.032	-0.046	-0.018	-27.8	
Bembidion lampros (24) (B. lam)												
Ind err - single line	-	-	YEAR	$\mathbf{14.99^{***}}_{(1,125)}$	YEAR	0.840	0.183	-0.036	-0.055	-0.018	-30.9	$-30.85_{(131)}$
Ind error – single line + spline	-	-	YEAR	$\mathbf{17.95^{***}}_{(1,121)}$	SO^{D1}	0.840	0.183	-0.036	-0.053	-0.019	-30.9	$-47.52_{(130)}$
					WSH^{D1}	0.840	0.183	-0.036	-0.053	-0.019	-30.7	
					WP^{D1}	0.840	0.183	-0.036	-0.053	-0.019	-27.1	
Leistus rufomarginatus (25) (L. ruf) [WSH]												
Auto err - single line	0.442	0.160	YEAR	$3.75_{(1,9.3)}$	YEAR	0.572	0.261	-0.036	-0.073	0.000	-30.8	$-30.67_{(55)}$

Harpalus latus (26) (H. lat)												
Ind err - single line, sig. (NP/NM)	-	-	YEAR	$\mathbf{7.69^{**}}_{\mathbf{(1,28)}}$	YEAR	0.207	0.056	-0.036	-0.061	-0.011	-30.6	-28.51 $_{(26)}$
Leistus ferrugineus (27) (L. fer)												
Ind err - single line	-	-	YEAR	$\mathbf{18.93^{***}}_{\mathbf{(1,97)}}$	YEAR	0.543	0.085	-0.035	-0.050	-0.019	-29.8	-88.07 $_{(101)}$
Ind err – diff. lines/splines*	-	-	YEAR	$\mathbf{26.00^{***}}_{\mathbf{(1,87)}}$	SO^{D2}	0.500	0.153	-0.051	-0.071	-0.030	-40.7	-88.52 $_{(95)}$
			RH	0.17 $_{(2,4)}$	WSH^{B3}	0.524	0.187	-0.011	-0.036	0.014	-10.7	
			YEAR.*RH*	2.90 $_{(2,87)}$	WP^{D4}	0.634	0.187	-0.034	-0.059	-0.009	-29.2	
Ophonus rufibarbis (28) (O. ruf)												
Ind err - single line	-	-	YEAR	$\mathbf{12.69^{***}}_{\mathbf{(1,55)}}$	YEAR	0.433	0.072	-0.035	-0.054	-0.016	-29.7	-57.95 $_{(56)}$
Ind err – diff. lines	-	-	YEAR	$\mathbf{13.75^{***}}_{\mathbf{(1,54)}}$	SO	0.540	0.063	-0.013	-0.038	0.013	-11.8	-54.44 $_{(54)}$
			RH	5.82 $_{(1,2)}$	WSH	0.325	0.063	-0.057	-0.083	-0.031	-44.2	
			YEAR.*RH*	$\mathbf{5.60^{*}}_{\mathbf{(1,54)}}$								
Amara plebeja (29) (A. ple) [WP]												
Ind err - single line	-	-	YEAR	$\mathbf{24.93^{***}}_{\mathbf{(1,59.1)}}$	YEAR^{B4}	0.289	0.053	-0.032	-0.045	-0.019	-27.8	-100.21 $_{(70)}$
Loricera pilicornis (30) (L. pil)												
Auto err - single line	0.349	0.072	YEAR	$\mathbf{15.08^{***}}_{\mathbf{(1,53.2)}}$	YEAR	0.589	0.094	-0.028	-0.042	-0.014	-24.9	-214.66 $_{(235)}$
Auto err – diff. lines/c. spline	0.289	0.072	YEAR	$\mathbf{19.20^{***}}_{\mathbf{(1,50.4)}}$	SO^{C2}	0.307	0.223	-0.011	-0.045	0.023	-10.7	-206.95 $_{(226)}$
			RH	2.59 $_{(4,11)}$	NP^{C2}	0.468	0.223	0.003	-0.032	0.037	2.5	
			YEAR.*RH*	$\mathbf{3.97^{**}}_{\mathbf{(4,55.7)}}$	NM^{C2}	0.665	0.182	-0.050	-0.078	-0.022	-40.0	
					WSH^{C2}	0.289	0.158	-0.002	-0.026	0.023	-1.7	
					WP^{C2}	0.895	0.141	-0.053	-0.074	-0.031	-41.7	
Patrobus assimilis (31) (P. ass) [NM]												
Ind err - single line	-	-	YEAR	$\mathbf{5.84^{*}}_{\mathbf{(1,32.2)}}$	YEAR^{B4}	0.357	0.101	-0.024	-0.043	-0.004	-21.2	-34.58 $_{(40)}$
Bembidion obtusum (32) (B. obt)												
Ind err - single line, flat (SO/WSH)	-	-	YEAR	1.74 $_{(1,28)}$	YEAR	0.299	0.074	-0.023	-0.056	0.011	-20.8	-12.63 $_{(26)}$
Amara lunicollis (33) (A. lun)												
Ind err - single line	-	-	YEAR	$\mathbf{5.35^{*}}_{\mathbf{(1,69)}}$	YEAR	0.679	0.193	-0.023	-0.042	-0.003	-20.4	-50.66 $_{(71)}$
Ind err – single line + spline (SO/NP/NM/WP)	-	-	YEAR	$\mathbf{6.32^{*}}_{\mathbf{(1,63.8)}}$	YEAR^{D1}	0.679	0.193	-0.023	-0.040	-0.005	-20.8	-56.90 $_{(70)}$
Bembidion guttula (34) (B. gut)												
Auto err - single line	0.460	0.115	YEAR	2.43 $_{(1,17.5)}$	YEAR	0.632	0.149	-0.022	-0.050	0.006	-19.9	-60.99 $_{(115)}$
Auto err – diff. lines/splines*	0.318	0.117	YEAR	2.01 $_{(1,18)}$	SO^{B3}	0.341	0.234	-0.037	-0.069	-0.004	-31.1	-63.49 $_{(111)}$
			RH	2.48 $_{(1,6)}$	WP^{C2}	0.8072	0.181	-0.001	-0.027	0.024	-1.2	
			YEAR.*RH*	2.80 $_{(1,18)}$								
Carabus violaceus (35) (C. vio)												
Ind err - single line	-	-	YEAR	$\mathbf{7.88^{**}}_{\mathbf{(1,195)}}$	YEAR	0.721	0.080	-0.018	-0.031	-0.006	-16.9	-121.39 $_{(206)}$

Ind err – diff. lines/splines	-	-	YEAR	$\mathbf{15.90^{***}}_{(1,171.5)}$	SO^{I4}	0.454	0.088	0.063	0.044	0.083	84.7	-211.97 $_{(196)}$
			RH	$\mathbf{10.36^{**}}_{(4,9)}$	SD^{D1}	0.455	0.108	-0.020	-0.044	0.004	-18.6	
			YEAR.*RH*	$\mathbf{41.82^{***}}_{(4,171.5)}$	NP^{I4}	0.371	0.152	0.048	0.014	0.082	59.5	
					NM^{L}	0.803	0.076	-0.098	-0.115	-0.081	-64.5	
					WSH^{D1}	1.059	0.076	-0.015	-0.032	0.002	-14.4	
Nebria salina (36) (N. sal) [NP]												
Ind err - single line	-	-	YEAR	1.30 $_{(1,13)}$	YEAR	0.264	0.064	-0.017	-0.046	0.012	-15.7	-15.03 $_{(12)}$
Pterostichus diligens (37) (P. dil) [NM]												
Ind err - single line	-	-	YEAR	0.82 $_{(1,27)}$	YEAR	0.879	0.186	-0.016	-0.050	0.018	-14.7	-10.09 $_{(26)}$
Pterostichus macer (38) (P. mac) [SO]												
Ind err - single line	-	-	YEAR	0.64 $_{(1,13)}$	YEAR	1.017	0.080	-0.015	-0.051	0.021	-13.9	-9.17 $_{(12)}$
Pterostichus strenuus (39) (P. str)												
Auto err - single line	0.403	0.074	YEAR	3.09 $_{(1,44.8)}$	YEAR	0.726	0.102	-0.013	-0.028	0.002	-12.3	-230.31 $_{(205)}$
Auto err – diff. lines	0.312	0.080	YEAR	3.72 $_{(1,45.3)}$	NP	0.712	0.187	0.040	-0.008	0.087	48.0	-232.46 $_{(199)}$
			RH	$\mathbf{14.91^{***}}_{(3,10)}$	NM	0.398	0.084	-0.034	-0.055	-0.013	-29.2	
			YEAR.*RH*	$\mathbf{6.05^{***}}_{(3,45.3)}$	WSH	0.545	0.108	0.027	0.000	0.054	30.1	
					WP	1.158	0.084	-0.025	-0.046	-0.004	-22.2	
Pterostichus nigrita (40) (P. nigr)												
Auto err - single line, flat (NM/WP)	0.605	0.089	YEAR	0.59 $_{(1,20.4)}$	YEAR	0.412	0.087	-0.013	-0.046	0.020	-12.1	-80.37 $_{(70)}$
Amara communis (41) (A. com)												
Ind err - single line	-	-	YEAR	1.46 $_{(1,83)}$	YEAR	0.572	0.240	-0.012	-0.031	0.007	-11.1	-45.37 $_{(86)}$
Ind err - diff. lines	-	-	YEAR	1.70 $_{(1,82)}$	SO	1.767	0.095	-0.085	-0.128	-0.042	-58.9	-46.51 $_{(80)}$
			RH	$\mathbf{64.08^{***}}_{(3,82)}$	NP	0.320	0.095	0.018	-0.025	0.061	19.5	
			YEAR.*RH*	$\mathbf{4.86^{**}}_{(3,82)}$	NM	0.456	0.095	0.014	-0.029	0.057	15.1	
					WP	0.296	0.055	-0.006	-0.031	0.019	-5.7	
Pterostichus melanarius (42) (P. mel)												
Auto err - single line	0.440	0.071	YEAR	1.12 $_{(1,45.7)}$	YEAR	1.412	0.182	-0.010	-0.030	0.009	-10.0	-113.70 $_{(220)}$
Auto err – diff. lines	0.333	0.081	YEAR	1.53 $_{(1,42.9)}$	SO	1.790	0.355	0.010	-0.022	0.043	10.5	-99.28 $_{(212)}$
			RH	0.99 $_{(4,10)}$	SD	0.274	0.710	-0.044	-0.108	0.020	-36.1	
			YEAR.*RH*	$\mathbf{4.42^{**}}_{(4,42.9)}$	NP	1.060	0.710	0.069	0.005	0.133	95.4	
					WSH	1.372	0.355	0.008	-0.024	0.041	8.3	
					WP	1.448	0.318	-0.051	-0.080	-0.023	-41.3	
Carabus problematicus (43) (C. pro)												
Auto err - single line	0.705	0.057	YEAR	0.37 $_{(1,40.1)}$	YEAR	0.409	0.085	-0.009	-0.039	0.020	-8.9	-142.84 $_{(145)}$
Auto err – diff. lines/splines	0.410	0.100	YEAR	2.43 $_{(1,21.3)}$	SD^{B3}	0.326	0.174	-0.012	-0.051	0.027	-11.6	-136.47 $_{(137)}$
			RH	1.10 $_{(3,6)}$	NP^{I3}	0.324	0.174	0.054	0.016	0.094	70.2	
			YEAR.*RH*	$\mathbf{12.09^{***}}_{(3,22.7)}$	NM^{D3}	0.525	0.123	-0.073	-0.101	-0.046	-53.5	

					WSH^{I3}	0.151	0.174	0.034	-0.004	0.074	41.5	
Stomis pumicatus (44) (S. pum) [SO]												
Ind err - single line	-	-	YEAR	$0.26_{(1,43)}$	YEAR	0.320	0.047	-0.006	-0.027	0.016	-5.4	$-45.77_{(41)}$
Oxypselaphus obscurus (45) (O. obs) [WP]												
Ind err - single line	-	-	YEAR	$0.31_{(1,41)}$	YEAR	0.646	0.362	-0.005	-0.023	0.013	-5.0	$-51.04_{(41)}$
Pterostichus niger (46) (P. nig)												
Auto err - single line	0.425	0.082	YEAR	$0.18_{(1,34.4)}$	YEAR	0.404	0.054	-0.004	-0.024	0.016	-4.3	$-141.40_{(145)}$
Auto err – diff. lines	0.361	0.088	YEAR	$0.20_{(1,32.5)}$	SO	0.349	0.196	-0.019	-0.076	0.039	-17.0	$-112.23_{(137)}$
			RH	$0.47_{(4,5)}$	NP	0.310	0.139	0.053	0.012	0.093	67.0	
			YEAR.*RH*	$\mathbf{2.80^{*}}_{(4,32.5)}$	NM	0.345	0.196	-0.053	-0.110	0.004	-42.2	
					WSH	0.279	0.196	-0.007	-0.064	0.050	-6.5	
					WP	0.484	0.088	-0.014	-0.039	0.012	-12.8	
Poecilus cupreus (47) (P. cup)												
Auto err - single line	0.536	0.097	YEAR	$0.09_{(1,21)}$	YEAR	0.748	0.099	-0.004	-0.031	0.023	-3.9	$-92.94_{(145)}$
Auto err – parallel lines/c. spline	0.435	0.094	YEAR	$0.49_{(1,23.5)}$	SO^{B3}	0.879	0.134	0.007	-0.013	0.028	7.2	$-110.61_{(142)}$
			RH	$\mathbf{4.99^{*}}_{(2,7)}$	WSH^{B3}	0.496	0.116	-	-	-	-	
					WP^{B3}	1.027	0.134	-	-	-	-	
T. quadristriatus (48) (T. qua)												
Auto err - single line	0.528	0.093	YEAR	$0.04_{(1,22.2)}$	YEAR	1.101	0.169	-0.004	-0.039	0.032	-3.7	$-24.86_{(115)}$
Auto err – diff. lines/c. spline	0.358	0.113	YEAR	$2.07_{(1,18.5)}$	SO^{C1}	1.560	0.196	-0.085	-0.125	-0.044	-58.9	$-27.15_{(110)}$
			RH	$4.31_{(2,5)}$	WSH^{C1}	0.853	0.240	0.021	-0.028	0.071	23.1	
			YEAR.*RH*	$\mathbf{8.25^{**}}_{(2,21)}$	WP^{C1}	0.819	0.196	0.021	-0.019	0.062	23.1	
Badister bullatus (49) (B. bul)												
Ind err - single line	-	-	YEAR	$0.05_{(1,69)}$	YEAR	0.431	0.052	-0.002	-0.017	0.014	-1.8	$-88.73_{(71)}$
Ind err – parallel lines/c. spline	-	-	YEAR	$0.05_{(1,68.5)}$	SO^{U3}	0.418	0.043	-0.002	-0.017	0.013	-2.0	$-89.16_{(68)}$
			RH	$\mathbf{4.26^{*}}_{(2,68.5)}$	WSH^{U3}	0.303	0.074	-	-	-	-	
					WP^{U3}	0.600	0.074	-	-	-	-	
Cychrus caraboides (50) (C. car)												
Ind err - single line	-	-	YEAR	$0.23_{(1,111)}$	YEAR	0.483	0.127	0.003	-0.008	0.013	2.5	$-172.69_{(116)}$
Ind err – diff. lines	-	-	YEAR	$0.24_{(1,109)}$	NM	0.427	0.234	-0.008	-0.024	0.009	-7.4	$-160.88_{(112)}$
			RH	$0.24_{(2,5)}$	WSH	0.574	0.203	0.017	0.003	0.031	18.7	
			YEAR.*RH*	$\mathbf{4.75^{*}}_{(2,109)}$	WP	0.288	0.406	-0.026	-0.054	0.003	-22.9	
Carabus glabratus (51) (C. gla) [NM]												
Ind err - single line	-	-	YEAR	$0.04_{(1,27)}$	YEAR	0.803	0.131	0.004	-0.033	0.041	4.1	$-6.55_{(26)}$
Pterostichus madidus (52) (P. mad)												
Auto err - single line	0.540	0.061	YEAR	$0.32_{(1,49.8)}$	YEAR	1.797	0.202	0.004	-0.010	0.019	4.4	$-297.93_{(265)}$

Auto err – parallel lines	0.541	0.061	YEAR	0.32 $_{(1,49.6)}$	SO	2.536	0.558	0.004	-0.010	0.019	4.1	-309.22 $_{(260)}$
			RH	**5.57**** $_{(5,12)}$	SD	0.926	0.322	-	-	-	-	
					NP	2.150	0.395	-	-	-	-	
					NM	0.716	0.395	-	-	-	-	
					WSH	2.363	0.197	-	-	-	-	
					WP	1.196	0.395	-	-	-	-	
Notiophilus biguttatus (53) (N. big)												
Ind err - single line	-	-	YEAR	0.32 $_{(1,111)}$	YEAR	0.673	0.111	0.004	-0.011	0.019	4.5	-90.52 $_{(116)}$
Ind err – diff. lines/splines	-	-	YEAR	0.48 $_{(1,83.7)}$	SO^{C3}	0.491	0.172	-0.017	-0.042	0.007	-16.0	-82.78 $_{(108)}$
			RH	2.51 $_{(3,4)}$	NM^{B2}	0.409	0.172	-0.017	-0.042	0.008	-15.8	
			YEAR.*RH*	**5.37**** $_{(3,83.7)}$	WSH^{C1}	0.837	0.141	0.015	-0.005	0.035	16.1	
					WP^{U1}	1.074	0.244	0.059	0.024	0.094	76.7	
Notiophilus aquaticus (54) (N. aqu)												
Ind err - single line	-	-	YEAR	0.35 $_{(1,69)}$	YEAR	0.525	0.052	0.007	-0.017	0.031	7.3	-31.33 $_{(71)}$
Ind err – diff. lines/splines	-	-	YEAR	0.87 $_{(1,58.1)}$	SD^{I1}	0.600	0.043	0.054	0.035	0.074	70.0	-72.90 $_{(67)}$
			RH	**7.85**** $_{(1,58.1)}$	NM^{D1}	0.412	0.052	-0.064	-0.088	-0.040	-48.3	
			YEAR.*RH*	**57.97***** $_{(1,58.1)}$								
Patrobus atrorufus (55) (P. atr) [NM]												
Ind err - single line	-	-	YEAR	0.05 $_{(1,13)}$	YEAR	0.406	0.142	0.007	-0.057	0.071	7.4	5.72 $_{(12)}$
Carabus nemoralis (56) (C. nem) [WSH]												
Auto err - single line	0.448	0.132	YEAR	0.25 $_{(1,13.2)}$	YEAR	0.691	0.121	0.007	-0.021	0.036	7.4	-66.03 $_{(70)}$
Nebria brevicollis (57) (N. bre)												
Auto err - single line	0.611	0.052	YEAR	1.05 $_{(1,57.6)}$	YEAR	1.263	0.136	0.011	-0.010	0.031	11.2	-169.23 $_{(340)}$
Auto err – diff. lines/splines	0.416	0.061	YEAR	3.67 $_{(1,56.9)}$	SO^{D2}	0.968	0.287	-0.030	-0.065	0.005	-26.3	-173.17 $_{(330)}$
			RH	2.41 $_{(4,18)}$	SD^{I1}	1.028	0.332	0.086	0.045	0.126	127.8	
			YEAR.*RH*	**9.09***** $_{(4,57.6)}$	NP^{I5}	0.712	0.406	0.068	0.019	0.117	93.1	
					WSH^{I5}	1.255	0.191	0.029	0.005	0.052	32.8	
					WP^{D1}	1.904	0.257	-0.041	-0.072	-0.010	-34.3	
Calathus rotundicollis (58) (C. rot)												
Auto err - single line, flat (SO/WSH/WP)	0.333	0.144	YEAR	1.37 $_{(1,14)}$	YEAR	1.198	0.416	0.016	-0.011	0.044	17.5	-41.28 $_{(70)}$
Syntomus obscuroguttatus (59) (S. obs)												
Ind err - single line, flat (SO/WP)	-	-	YEAR	4.37* $_{(1,69)}$	YEAR	0.558	0.271	0.020	0.001	0.039	21.9	-50.50 $_{(71)}$
Ind err – diff. lines/splines*	-	-	YEAR	**7.49**** $_{(1,52.5)}$	SO^{B3}	0.265	0.445	0.005	-0.018	0.027	4.7	-57.42 $_{(67)}$
			RH	0.73 $_{(1,3)}$	WP^{B5}	0.754	0.363	0.030	0.012	0.049	34.8	
			YEAR.*RH*	2.96 $_{(1,52.5)}$								
Abax parallelepipedus (60) (A. par)												
Auto err - single line	0.465	0.088	YEAR	**6.14*** $_{(1,28.4)}$	YEAR	1.825	0.263	0.022	0.005	0.039	23.9	-170.42 $_{(145)}$

Auto err - diff. lines/splines	0.302	0.099	YEAR	**22.30***** $_{(1,27.2)}$	SO^{B1}	0.855	0.506	0.072	0.048	0.096	100.8	-189.11 $_{(141)}$
			RH	4.46 $_{(1,8)}$	WSH^{C1}	2.050	0.253	0.014	0.002	0.026	15.3	
			YEAR.*RH*	**17.86***** $_{(1,27.3)}$								
Leistus spinibarbis (61) (L. spi)												
Ind err - single line	-	-	YEAR	**17.05***** $_{(1,103)}$	YEAR	0.324	0.032	0.030	0.016	0.044	34.7	-117.36 $_{(101)}$
Ind err - diff. lines/splines*	-	-	YEAR	**20.24***** $_{(1,89)}$	SO^{B1}	0.369	0.076	0.016	-0.019	0.050	17.0	-101.94 $_{(95)}$
			RH	0.51 $_{(2,89)}$	SD^{I1}	0.340	0.044	0.044	0.024	0.064	54.1	
			YEAR.*RH*	1.69 $_{(2,89)}$	WSH^{B1}	0.292	0.044	0.021	-0.001	0.041	23.0	
*Licinus depressus** (62) (L. dep) [SD]												
Auto err - single line	0.391	0.191	YEAR	7.37* $_{(1,7.2)}$	YEAR	0.471	0.152	0.035	0.010	0.060	40.9	-60.93 $_{(40)}$
Calathus fuscipes (63) (C. fus)												
Auto err - single line	0.659	0.082	YEAR	2.55 $_{(1,22.1)}$	YEAR	1.837	0.124	0.037	-0.008	0.082	43.5	-40.20 $_{(85)}$
Auto err – diff. lines/splines	0.383	0.119	YEAR	**4.87*** $_{(1,16.6)}$	SO^{F}	1.464	0.160	0.008	-0.059	0.075	8.3	-40.69 $_{(79)}$
			RH	**4.19*** $_{(2,11.5)}$	SD^{I1}	1.887	0.093	0.095	0.057	0.134	148.5	
			YEAR.*RH*	**11.64***** $_{(2,16.7)}$	NP^{D2}	2.027	0.113	-0.054	-0.101	-0.006	-42.5	
Agonum fuliginosum (64) (A. ful) [NM]												
Ind err-single line	-	-	YEAR	**7.02**** $_{(1,7.02)}$	YEAR	0.8651	0.070	0.043	0.011	0.075	52.2	-15.94 $_{(26)}$
H. rufipes (65) (H. ruf)												
Auto err - single line	0.274	0.141	YEAR	**8.39*** $_{(1,17.1)}$	YEAR	0.785	0.115	0.045	0.015	0.076	56.0	-5.40 $_{(100)}$
Auto err - parallel lines	0.259	0.141	YEAR	**8.69**** $_{(1,17.6)}$	SO	0.587	0.099	0.046	0.015	0.076	56.8	-7.80 $_{(99)}$
			RH	**9.26*** $_{(1,5)}$	WSH	1.046	0.114	-	-	-	-	
*Carabus nitens** (66) (C. nit) [NM]												
Ind err - single line	-	-	YEAR	**21.95**** $_{(1,5.8)}$	YEAR^{B5}	0.437	0.055	0.060	0.035	0.085	78.4	-5.11 $_{(11)}$
Notiophilus germinyi (67) (N. ger) [SD]												
Auto err - single line	0.678	0.137	YEAR	**8.17*** $_{(1,7.7)}$	YEAR	0.810	0.127	0.066	0.021	0.112	98.6	-48.74 $_{(40)}$
Laemostenus terricola (68) (L. terr) [SD]												
Auto err - single line	0.423	0.162	YEAR	**68.47***** $_{(1,8.7)}$	YEAR	0.512	0.072	0.081	0.062	0.100	117.1	-90.07 $_{(40)}$
Total abundance												
Auto err - single line	0.605	0.045	YEAR	**10.25**** $_{(1,79.1)}$	YEAR	2.348	0.125	-0.017	-0.028	-0.007	-15.8	-647.62 $_{(445)}$
Auto err - diff. lines/splines	0.287	0.055	YEAR	**24.37***** $_{(1,89.9)}$	SO^{D2}	2.683	0.247	-0.013	-0.030	0.004	-12.3	-695.52 $_{(433)}$
			RH	**6.70***** $_{(5,24)}$	SD^{I1}	2.281	0.285	0.046	0.026	0.065	56.8	
			YEAR.*RH*	**25.09***** $_{(5,90.4)}$	NP^{F}	2.615	0.349	-0.025	-0.049	-0.001	-22.4	
					NM^{D2}	1.427	0.187	-0.064	-0.077	-0.051	-48.4	
					WSH^{F}	2.740	0.165	0.015	0.003	0.026	16.1	
					WP^{D2}	2.573	0.221	-0.039	-0.055	-0.024	-32.8	
Trechus spp.												
Auto err - single line	0.570	0.076	YEAR	**7.64*** $_{(1,30.5)}$	YEAR	0.995	0.135	-0.040	-0.068	-0.012	-33.5	-70.31 $_{(175)}$

Auto err – diff. lines	0.477	0.089	YEAR	$\mathbf{11.49^{**}}_{(1,26.9)}$	SO	1.565	0.188	-0.068	-0.116	-0.019	-53.4	-57.34 $_{(167)}$
			RH	3.95 $_{(4,7)}$	NP	0.306	0.325	-0.069	-0.153	0.015	-52.6	
			YEAR.*RH*	$\mathbf{3.45^{*}}_{(4,26.9)}$	NM	0.754	0.188	-0.093	-0.142	-0.045	-63.8	
					WSH	0.851	0.230	0.030	-0.029	0.090	29.8	
					WP	0.976	0.188	-0.004	-0.052	0.044	-7.3	
Leistus spp.												
Auto err - single line	0.604	0.060	YEAR	$\mathbf{20.68^{***}}_{(1,46.7)}$	YEAR	0.640	0.084	-0.040	-0.057	-0.023	-33.4	-297.74 $_{(310)}$
Auto err – diff. lines/splines	0.320	0.070	YEAR	$\mathbf{37.69^{***}}_{(1,51)}$	SO^{D1}	0.660	0.238	-0.038	-0.065	-0.011	-32.0	-314.52 $_{(300)}$
			RH	0.30 $_{(4,16)}$	SD^{I1}	0.426	0.238	0.038	0.011	0.066	45.8	
			YEAR.*RH*	$\mathbf{13.66^{***}}_{(4,52.9)}$	NM^{L}	0.589	0.156	-0.075	-0.092	-0.057	-53.9	
					WSH^{F}	0.647	0.168	-0.009	-0.028	0.010	-8.8	
					WP^{D1}	0.812	0.291	-0.051	-0.085	-0.018	-40.9	
Bembidion spp.												
Ind err - single line	-	-	YEAR	$\mathbf{17.33^{***}}_{(1,153)}$	YEAR	1.028	0.174	-0.036	-0.053	-0.019	-30.7	-32.46 $_{(161)}$
Ind err – diff. lines/splines	-	-	YEAR	$\mathbf{28.61^{***}}_{(1,128.8)}$	SO^{C2}	0.717	0.238	-0.076	-0.101	-0.051	-54.6	-61.52 $_{(155)}$
			RH	$\mathbf{5.81^{*}}_{(2,8)}$	WSH^{F}	0.574	0.238	0.016	-0.009	0.041	17.3	
			YEAR.*RH*	$\mathbf{13.25^{***}}_{(2,128.8)}$	WP^{U2}	1.488	0.184	-0.043	-0.063	-0.024	-35.7	
Agonum spp.												
Auto err - single line	0.524	0.070	YEAR	$\mathbf{4.53^{*}}_{(1,39)}$	YEAR	0.852	0.112	-0.027	-0.052	-0.002	-23.9	-83.49 $_{(205)}$
Auto err – diff. lines/splines	0.314	0.084	YEAR	$\mathbf{7.62^{**}}_{(1,34.8)}$	SO^{U2}	0.754	0.224	-0.067	-0.100	-0.035	-50.1	-74.40 $_{(197)}$
			RH	0.43 $_{(3,10)}$	NM^{I2}	0.857	0.317	0.039	-0.007	0.085	46.2	
			YEAR.*RH*	$\mathbf{6.51^{**}}_{(3,37.3)}$	WSH^{I2}	0.690	0.259	0.016	-0.021	0.054	17.4	
					WP^{D2}	1.021	0.200	-0.040	-0.070	-0.011	-33.8	
Amara spp.												
Auto err - single line	0.362	0.077	YEAR	$\mathbf{5.20^{*}}_{(1,46)}$	YEAR	0.705	0.120	-0.018	-0.034	-0.003	-16.9	-173.63 $_{(220)}$
Auto err – diff. lines/splines	0.214	0.090	YEAR	$\mathbf{9.55^{**}}_{(1,36.8)}$	SO^{D1}	0.801	0.247	-0.043	-0.067	-0.019	-35.6	-153.88 $_{(210)}$
			RH	0.58 $_{(4,10)}$	SD^{I1}	0.260	0.349	0.025	-0.009	0.059	28.0	
			YEAR.*RH*	$\mathbf{3.74^{*}}_{(4,36.9)}$	NP^{D5}	0.589	0.349	-0.030	-0.063	0.004	-26.1	
					NM^{B1}	0.928	0.349	0.013	-0.021	0.046	13.7	
					WP^{D5}	0.745	0.221	-0.027	-0.048	-0.006	-23.9	
Pterostichus spp.												
Auto err - single line	0.521	0.047	YEAR	$\mathbf{7.04^{**}}_{(1,86.9)}$	YEAR	1.792	0.142	-0.015	-0.026	-0.004	-13.8	-517.67 $_{(445)}$
Auto err – diff. lines	0.432	0.052	YEAR	$\mathbf{8.51^{**}}_{(1,76.3)}$	SO	2.381	0.238	0.008	-0.018	0.034	8.9	-520.98 $_{(435)}$
			RH	$\mathbf{10.87^{***}}_{(5,24)}$	SD	0.998	0.275	-0.048	-0.078	-0.018	-39.0	
			YEAR.*RH*	$\mathbf{6.16^{***}}_{(5,83.8)}$	NP	2.188	0.337	0.016	-0.021	0.052	17.8	
					NM	0.869	0.180	-0.036	-0.056	-0.017	-30.3	
					WSH	2.310	0.159	0.011	-0.006	0.028	12.9	

Taxa, model type	Coefficient	s.e.	Term	F-value (df)	Term	Intercept	s.e.	Coeff.	L CI	U CI	% Ch.	Deviance (df)
					WP	2.019	0.213	-0.040	-0.063	-0.017	-33.5	
Carabus spp.												
Auto err - single line	0.627	0.056	YEAR	1.57 $_{(1,46.9)}$	YEAR	0.831	0.100	-0.012	-0.031	0.007	-11.5	-260.52 $_{(265)}$
Auto err – diff. lines/splines	0.349	0.069	YEAR	1.33 $_{(1,49.1)}$	SO^{B1}	0.462	0.237	0.061	0.032	0.090	80.4	-259.81 $_{(255)}$
			RH	1.46 $_{(4,13)}$	SD^{L}	0.661	0.291	-0.019	-0.055	0.016	-17.8	
			YEAR.*RH*	**14.44*** $_{(4,50.4)}$**	NP^{I5}	0.497	0.291	0.039	0.004	0.075	47.0	
					NM^{L}	1.017	0.184	-0.068	-0.091	-0.046	-50.8	
					WSH^{F}	0.979	0.168	-0.001	-0.021	0.019	-0.9	
Calathus spp.												
Auto err - single line	0.777	0.057	YEAR	0.16 $_{(1,30.1)}$	YEAR	1.375	0.167	-0.006	-0.036	0.024	-5.8	-163.68 $_{(250)}$
Auto err – diff. lines/splines	0.500	0.075	YEAR	2.39 $_{(1,31.5)}$	SO^{F}	1.662	0.589	0.007	-0.062	0.077	7.5	-164.87 $_{(238)}$
			RH	2.38 $_{(5,11)}$	SD^{I1}	1.888	0.340	0.093	0.053	0.133	143.3	
			YEAR.*RH*	**11.39*** $_{(5,32.6)}$**	NP^{D2}	2.237	0.416	-0.057	-0.106	-0.008	-44.5	
					NM^{D2}	1.078	0.294	-0.094	-0.129	-0.059	-62.8	
					WSH^{L}	1.330	0.294	0.025	-0.010	0.060	27.8	
					WP^{U2}	0.692	0.340	-0.041	-0.082	-0.001	-34.3	
Harpalus spp.												
Auto err - single line	0.296	0.105	YEAR	2.64 $_{(1,28.6)}$	YEAR	0.719	0.122	0.019	-0.004	0.042	20.6	-47.41 $_{(145)}$
Auto err - parallel lines	0.290	0.105	YEAR	2.69 $_{(1,29.1)}$	SO	0.779	0.103	0.019	-0.004	0.042	38.0	-49.93 $_{(141)}$
			RH	**6.68* $_{(4,5)}$**	SD	0.299	0.206	-	-	-	40.9	
					NP	0.226	0.206	-	-	-	-20.1	
					NM	0.220	0.206	-	-	-	-46.1	
					WSH	1.108	0.119	-	-	-	42.2	

Significant terms and parameters are indicated by bold *F*-values, where: * *P* < 0.05**;** ** *P* < 0.01; *** *P* < 0.001.

Note: *when different splines were required the 'different lines, fixed model' was selected regardless of the statistical non-significance of the *RH*.YEAR interaction and in some cases main effect terms.

(b)

	Random model		Fixed model									Full model
	AR1 term		Tests of terms in the fixed model		Parameterisation of fixed model							Deviance
Taxa, model type	Coefficient	s.e.	Term	*F*-value (df)	Term	Intercept	s.e.	Coeff.	L CI	U CI	% Ch.	(df)
Total carabids												
Auto err – single line	0.716	0.133	YEAR	**8.90* $_{(1,11.5)}$**	YEAR	2.049	0.139	-0.064	-0.106	-0.022	-48.4	-107.22 $_{(95)}$
Auto err – single line (CA & SN)	0.673	0.201	YEAR	**9.72* $_{(1,5.6)}$**	YEAR	2.167	0.214	-0.096	-0.157	-0.036	-63.6	-41.35 $_{(55)}$
Auto err – diff. lines/splines	0.455	0.135	YEAR	**45.81*** $_{(1,13)}$**	CA^{B2}	1.763	0.228	-0.119	-0.165	-0.074	-71.8	-104.74 $_{(87)}$

			SITE	2.15 $_{(3,6)}$	GL^{D5}	1.724	0.280	-0.021	-0.077	0.034	-19.1	
			YEAR.SITE	**4.39*** $_{(3,13.7)}$	SN^{D5}	2.479	0.228	-0.128	-0.174	-0.083	-74.6	
					SO^{D5}	1.961	0.280	-0.041	-0.096	0.015	-34.2	
Patrobus atrorufus (1) (P. atr)												
Ind err - single line	-	-	YEAR	**50.05***** $_{(1,26)}$	YEAR	0.965	0.219	-0.214	-0.273	-0.155	-91.0	-1.02 $_{(26)}$
Ind err – diff. lines/c. spline	-	-	YEAR	**143.68***** $_{(1,21.9)}$	CA^{U2}	1.182	0.063	-0.276	-0.319	-0.233	-96.0	-17.44 $_{(23)}$
			SITE	**35.81***** $_{(1,21.9)}$	SO^{U2}	0.531	0.089	-0.089	-0.150	-0.029	-60.8	
			YEAR.SITE	**24.34***** $_{(1,21.9)}$								
Carabus arvensis (2) (C. arv)												
Ind err - single line	-	-	YEAR	**81.66***** $_{(1,35)}$	YEAR	0.896	0.096	-0.170	-0.207	-0.133	-84.5	-30.50 $_{(36)}$
Ind err – diff. lines	-	-	YEAR	**107.30***** $_{(1)}^{a}$	SN	0.986	0.055	-0.203	-0.240	-0.166	-89.6	-35.37 $_{(34)}$
			SITE	**10.83***** $_{(1)}^{a}$	SO	0.627	0.095	-0.073	-0.138	-0.009	-53.2	
			YEAR.SITE	**11.66***** $_{(1)}^{a}$								
Calathus melanocephalus (3) (C. mel)												
Auto err - single line	0.659	0.195	YEAR	**9.54*** $_{(1,6)}$	YEAR	0.826	0.232	-0.117	-0.192	-0.043	-71.3	-21.70 $_{(45)}$
Auto err - single line + spline (CA/GL/SO)	0.560	0.172	YEAR	**22.16**** $_{(1,7.5)}$	YEAR^{B6}	0.750	0.234	-0.142	-0.200	-0.083	-71.3	-27.42 $_{(44)}$
Pterostichus niger (4) (C. nig) [SN]												
Ind err - single line	-	-	YEAR	**24.48***** $_{(1,26)}$	YEAR	0.999	0.129	-0.083	-0.116	-0.050	-58.0	-33.64 $_{(26)}$
Carabus violaceus (5) (C. vio)												
Ind err - single line	-	-	YEAR	**34.00***** $_{(1,71)}$	YEAR	0.590	0.085	-0.076	-0.101	-0.050	-54.5	-70.67 $_{(76)}$
Ind err - single line (CA & SN)	-	-	YEAR	**15.97***** $_{(1,44)}$	YEAR	0.569	0.133	-0.068	-0.102	-0.035	-50.7	-35.75 $_{(46)}$
Ind err – diff. lines/c. spline	-	-	YEAR	**51.88***** $_{(1,63.3)}$	CA^{B2}	0.693	0.141	-0.037	-0.071	-0.003	-31.3	-68.00 $_{(69)}$
			SITE	0.91 $_{(3,4)}$	GL^{B2}	0.537	0.173	-0.085	-0.126	-0.044	-58.8	
			YEAR.SITE	**3.09*** $_{(3,63.3)}$	SN^{B2}	0.384	0.173	-0.115	-0.157	-0.074	-70.6	
					SO^{B2}	0.797	0.245	-0.096	-0.154	-0.037	-63.4	
Pterostichus madidus (6) (P. mad)												
Auto err - single line	0.728	0.177	YEAR	3.89 $_{(1,5.9)}$	YEAR	1.985	0.478	-0.076	-0.151	-0.001	-54.4	-26.76 $_{(35)}$
Auto err – diff. lines	0.433	0.198	YEAR	**9.10*** $_{(1,7.5)}$	GL	0.786	0.647	0.057	-0.040	0.154	73.6	-28.78 $_{(31)}$
			SITE	4.65 $_{(1,2)}$	SN	2.396	0.373	-0.118	-0.175	-0.062	-71.7	
			YEAR.SITE	**9.39*** $_{(1,7.5)}$								
Pterostichus nigrita (7) (P. nigr)												
Auto err - single line, flat (SN/SO)	0.632	0.172	YEAR	4.26 $_{(1,8.3)}$	YEAR	0.5455	0.134	-0.073	-0.142	-0.004	-53.0	-29.51 $_{(25)}$
Carabus problematicus (8) (C. pro)												
Ind err - single line	-	-	YEAR	**10.67**** $_{(1,44)}$	YEAR	0.687	0.161	-0.057	-0.092	-0.023	-44.6	-31.69 $_{(46)}$
Ind err - single line (CA & SN)	-	-	YEAR	**4.17*** $_{(1,35)}$	YEAR	0.677	0.208	-0.042	-0.083	-0.002	-35.0	-19.58 $_{(36)}$

Ind err – diff. lines/splines	-	-	YEAR	$\mathbf{65.37}^{***}_{(1,28.7)}$	CA^{B2}	0.744	0.278	-0.007	-0.025	0.011	-6.4	-72.49 $_{(40)}$
			SITE	$0.00_{(2,2)}$	SN^{D3}	0.475	0.482	-0.149	-0.180	-0.118	-80.1	
			YEAR.SITE	$\mathbf{39.37}^{***}_{(2,28.7)}$	SO^{D3}	0.729	0.482	-0.118	-0.150	-0.087	-71.6	
Syntomus truncatellus (9) (S. tru) [CA]												
Ind err - single line	-	-	YEAR	$2.35_{(1,8)}$	YEAR	0.647	0.102	-0.054	-0.124	0.015	-42.8	-3.43 $_{(7)}$
Calathus micropterus (8) (C. mic)												
Ind error - single line, flat (CA/GL/SO)	-	-	YEAR	$1.94_{(1,44)}$	YEAR	0.914	0.172	-0.028	-0.068	0.012	-25.0	-18.22 $_{(46)}$
Cychrus caraboides (9) (C. car)												
Ind err - single line, flat (CA/GL/SO)	-	-	YEAR	$1.40_{(1,35)}$	YEAR	0.463	0.097	-0.019	-0.051	0.012	-17.5	-41.52 $_{(36)}$
Carabus glabratus (10) (C. gla)												
Ind err - single line, flat (CA/GL)	-	-	YEAR	$0.11_{(1,26)}$	YEAR	0.680	0.146	0.009	-0.043	0.060	8.9	-10.18 $_{(26)}$

Significant terms and parameters are indicated by bold *F*-values, where: * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

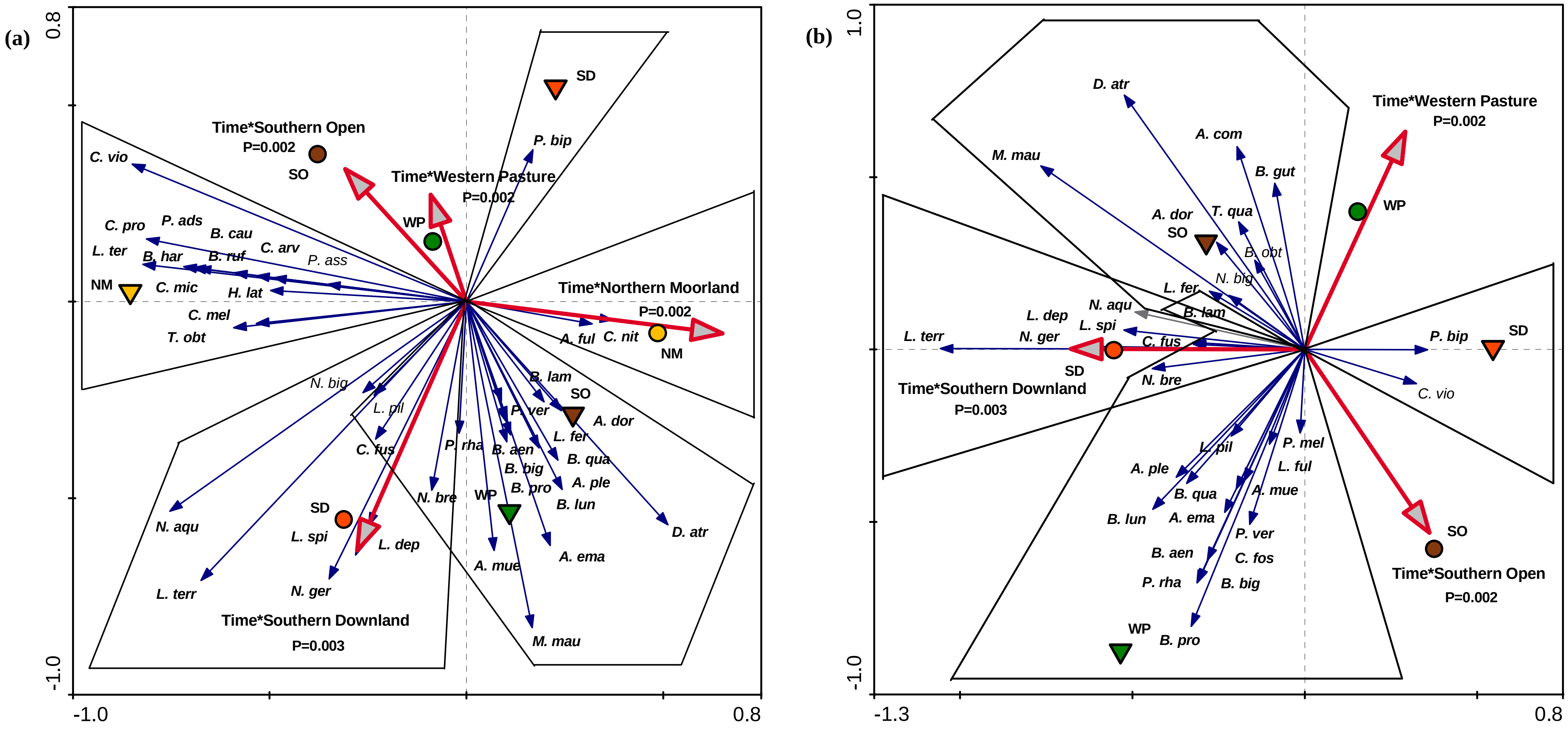
Note: [a] algorithm for computing residual degrees of freedom for *F*-values failed; Wald tests (approximately distributed as chi-squared) are given instead.

(c)

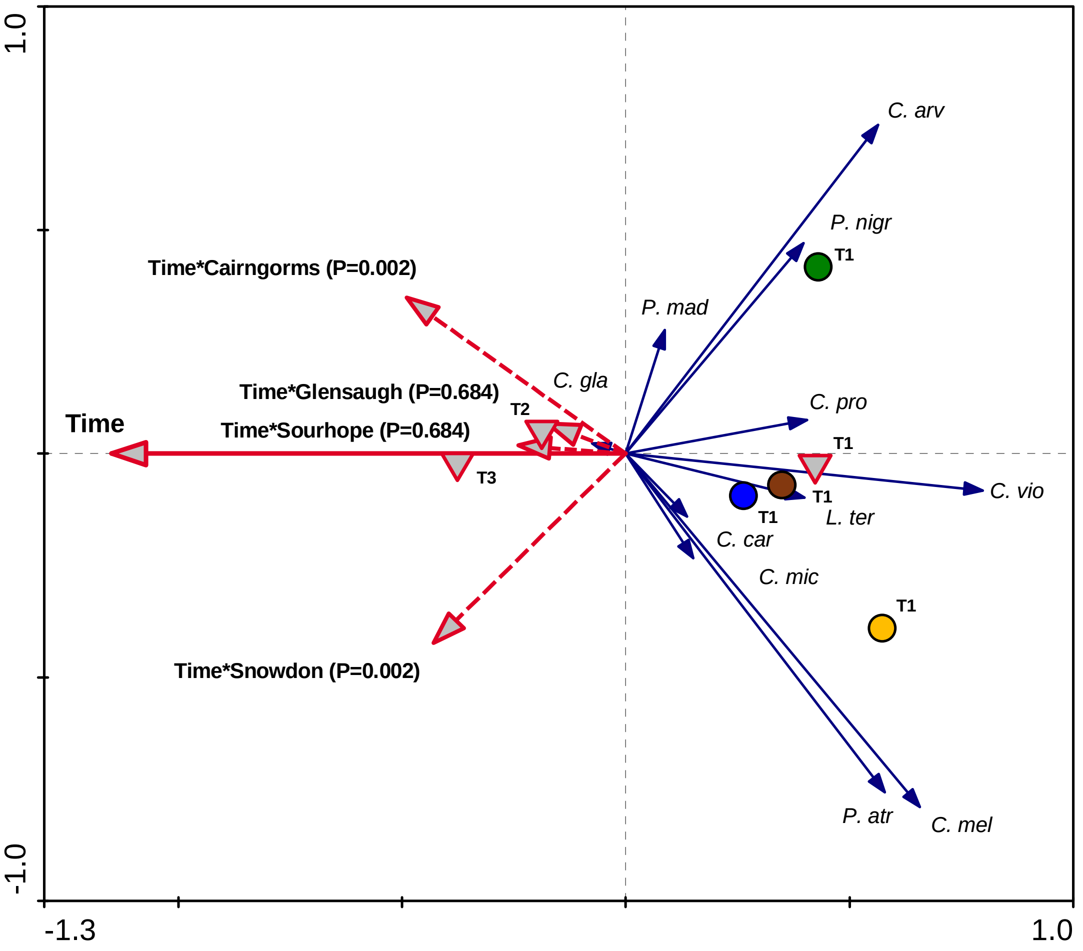
	Region by habitat category						
Trend strength	Northern Moorland	Western Pasture	Southern Open	Southern Downland	Woodland & Southern Hedgerow	Northern Pasture	Montane
< -90							P. atr
< -80							C. arv
< -70							P. mad, C. mel
< -60	C. mel, C. arv, C. vio, P. ads	B. lun, P. rha	D. atr, C. mel				
< -50	L. ter, T. obt, C. pro	A. ema, B. big, T. obt	T. qua, A. com			C. fos	P. nig, P. nigr, C. vio
< -40	N. aqu, C. mic, P. nig, B. ruf, L. pil	C. mel, B. aen, B. pro, L. ful	M. mau, L. fer		O. ruf, L. ful	C. mel, C. fus	S. tru
< -30	B. har, H. lat	P. ver, N. bre, B. qua, A. meu	A. dor, B. gut, B. lam	P. mel, P. bip	A. dor, B. lam, L. ruf	H. lat	C. pro
< -20	P. str, P. ass, A. lun	B. lam, L. fer, C. fos, A. ple, C. car, P. str, A. lun	N. bre, B. lun, A. lun, B. obt		B. obt	A. lun	C. mic
< -10	N. big, P. dil, P. nigr	P. nig, P. nigr	P. nig, N. big, P. mac, O. ruf, L. pil	C. vio, C. pro	C. fos, C. vio, L. fer	N. sal	C. car
< 0	C. car	A. com, O. obs, B. gut	S. pum, B. bul	P. mad	P. nig, B. bul, L. pil		
< 10	P. mad, C. gla, P. atr	B. bul, P. mad, P. cup	S. obs, P. mad, P. cup,		P. mad, L. ter, P. cup,	L. pil, P. mad	C. gla

			C. fus		C. nem, P. mel	
< 20	A. com	C. rot	P. mel, L. spi, C. rot		A. par, N. big, C. mel, C. rot, C. car	A. com
< 30		T. qua			L. spi, T. qua	
< 40		S. obs			P. str, N. bre	
< 50				L. dep	C. pro	P. str
< 60	A. ful		H. ruf	L. spi	H. ruf	C. vio
< 70						P. nig
< 80	C. nit	N. big		N. aqu		C. pro
< 90			C. vio			
< 100				N. ger		N. bre, P. mel
> 100			A. par	L. terr, N. bre, C. fus		

Figure S1. Biplot diagrams of pRDA models for: the model investigating the interactive effects of region by habitat groups (model M3 in Table S2), where; (a) shows the first and second canonical axes, and; (b) shows the second and third canonical axes, and; (c) a model investigating the effects of time, and its interaction with sites, on the first canonical axis in a reduced, ten year time-series for which full data from all upland sites were available (first and second axes are shown). Blue vectors in all diagrams show species ordinations (see Tables S4a, b above for species abbreviations). All the canonical axes shown in pRDA biplots (a) and b) are significant: first axis (eigenvalue = 0.012, *F*-value= 19.97, *P* = 0.002); second axis (eigenvalue = 0.009, *F*-value = 15.66, *P* = 0.002), and; third axis (eigenvalue = 0.007, *F*-value = 11.48, *P* = 0.002). Interaction terms between time and region by habitat groups with the highest intra-set scores on these axes, and *P*-values <0.01, are shown by bold red vectors pointing in the direction of increases in time. Symbols show the centroid positions of sample years in the first (triangles) and last (circles) third of the time series in plots (a) and (b) for region by habitat groups, where: yellow = northern moorland, green = western pasture, brown = southern open, and orange = southern downland (see Table S2 for group abbreviations). Envelopes in diagrams (a) and (b) indicate species with significant trends in mixed models, according to the region by habitat categories and directions indicated by the symbols within them (see Table S4a above); species with the lowest fifteen percent fit to the axes in diagrams are not shown. In biplot (c) the quantitative effects of time, constrained to the first canonical axis, are shown by the bold red vector and the effects of time, and its interaction with sites (broken red line vectors) are projected passively onto the diagram, as are the centroid positions of groups of samples covering all sites at different times in the time series, which are shown by grey triangles, where; T1 = the earliest third, T2 = the middle third and T3 = the last third, of the time series. The centroid positions of subsets of samples within individual sites in the earliest third of the time series are also passively projected onto the diagram and are shown by circles; Glensaugh (blue), Sourhope (brown), Snowdon (green) and the Cairngorms (yellow). The first axis in biplot (c), testing the overall effect of time across all sites, was significant using a Monte Carlo test with design P2 (eigenvalue = 0.057, *F*-value = 20.46, *P* = 0.004), and site by time interactions were significant when tested in a separate model (investigating only site by time interaction terms after allowing for overall effects of time and the terms for sites) for the Cairngorms (eigenvalue = 0.049, *F*-value = 23.87, *P* = 0.002) and Snowdon (eigenvalue = 0.029, *F*-value = 14.25, *P* = 0.002) sites, but non-significant for the Glensaugh (eigenvalue = 0.002, *F*-value = 1.06, *P* = 0.684) and Sourhope (eigenvalue = 0.002, *F*-value = 1.06, *P* = 0.684) sites, when evaluated by Monte Carlo tests using P3 permutation designs. See Table S2 above for descriptions of Monte Carlo test designs.


(a)
0.8
-1.0
-1.0
0.8
Time*Southern Open
P=0.002
SO
Time*Western Pasture
P=0.002
WP
SD
P. bip
C. vio
C. pro
P. ads
B. cau
C. arv
P. ass
L. ter
B. har
B. ruf
NM
C. mic
H. lat
C. mel
T. obt
Time*Northern Moorland
P=0.002
A. ful
C. nit
NM
N. big
L. pil
C. fus
P. rha
B. lam
SO
P. ver
A. dor
L. fer
B. aen
B. qua
B. big
B. pro
A. ple
B. lun
N. bre
WP
D. atr
SD
N. aqu
L. spi
L. dep
A. mue
A. ema
L. terr
N. ger
M. mau
Time*Southern Downland
P=0.003
(b)
1.0
-1.0
-1.3
0.8
D. atr
Time*Western Pasture
P=0.002
A. com
M. mau
B. gut
WP
A. dor
T. qua
SO
B. obt
N. big
L. fer
N. aqu
B. lam
L. dep
L. spi
L. terr
N. ger
C. fus
P. bip
SD
SD
N. bre
C. vio
Time*Southern Downland
P=0.003
L. pil
P. mel
A. ple
L. ful
B. qua
A. mue
B. lun
A. ema
P. ver
SO
B. aen
C. fos
Time*Southern Open
P=0.002
P. rha
B. big
WP
B. pro

(c)


1.0
-1.0
-1.3
1.0
C. arv
P. nigr
T1
P. mad
Time*Cairngorms (P=0.002)
C. gla
Time*Glensaugh (P=0.684)
T2
Time
Time*Sourhope (P=0.684)
C. pro
T1
T3
C. vio
T1
T1
L. ter
C. car
C. mic
T1
Time*Snowdon (P=0.002)
P. atr
C. mel