**Supplementary Material**

Supplementary text 1

This method has options to fit by maximum likelihood (ML) or by residual maximum likelihood (REML). The ML method is appropriate to use when comparing different fixed effects structures and the REML when forming the final model because it reduces bias in the estimated random effects. Therefore we use ML for the sequential fitting process to determine the relevant fixed effects and then refitted the final model using REML. The sequential fitting was done by fitting the factors in perceived order or importance, that was first *vegetation,* second *eastings, northings* and an interaction of the two, and third *adjacent*. *Vegetation*, as in the species models, denotes the actual vegetation at the transect point, whether crop, grass/scrub, or experimental margin. *Eastings* and *northings* capture the large-scale spatial trend across a landscape level, as opposed to the autocorrelation between points which is assumed to be a stationary process. *Adjacent* denotes the habitat adjacent to the transect. Terms were retained if there was evidence that adding fixed effects to a simpler model achieved a significant improvement by computing the log-ratio statistic:

where and denote, respectively the maximised log-likelihoods from fitting the model with the additional fixed effects, and the simpler model without them. Under the null hypothesis, where the additional fixed effects are not related to the dependent variable, this statistic is asymptotically distributed as chi-square with degrees of freedom equal to the number of additional fixed effects. Here we assumed a significance threshold of .

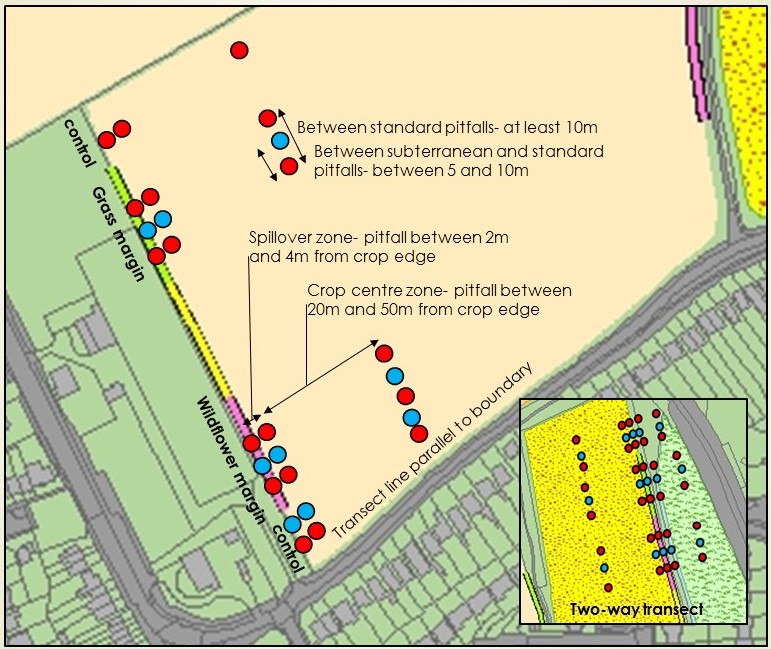


Figure S1: example of typical transect layout for one way (Margin 02), and (insert) two way transects (Margin 04).

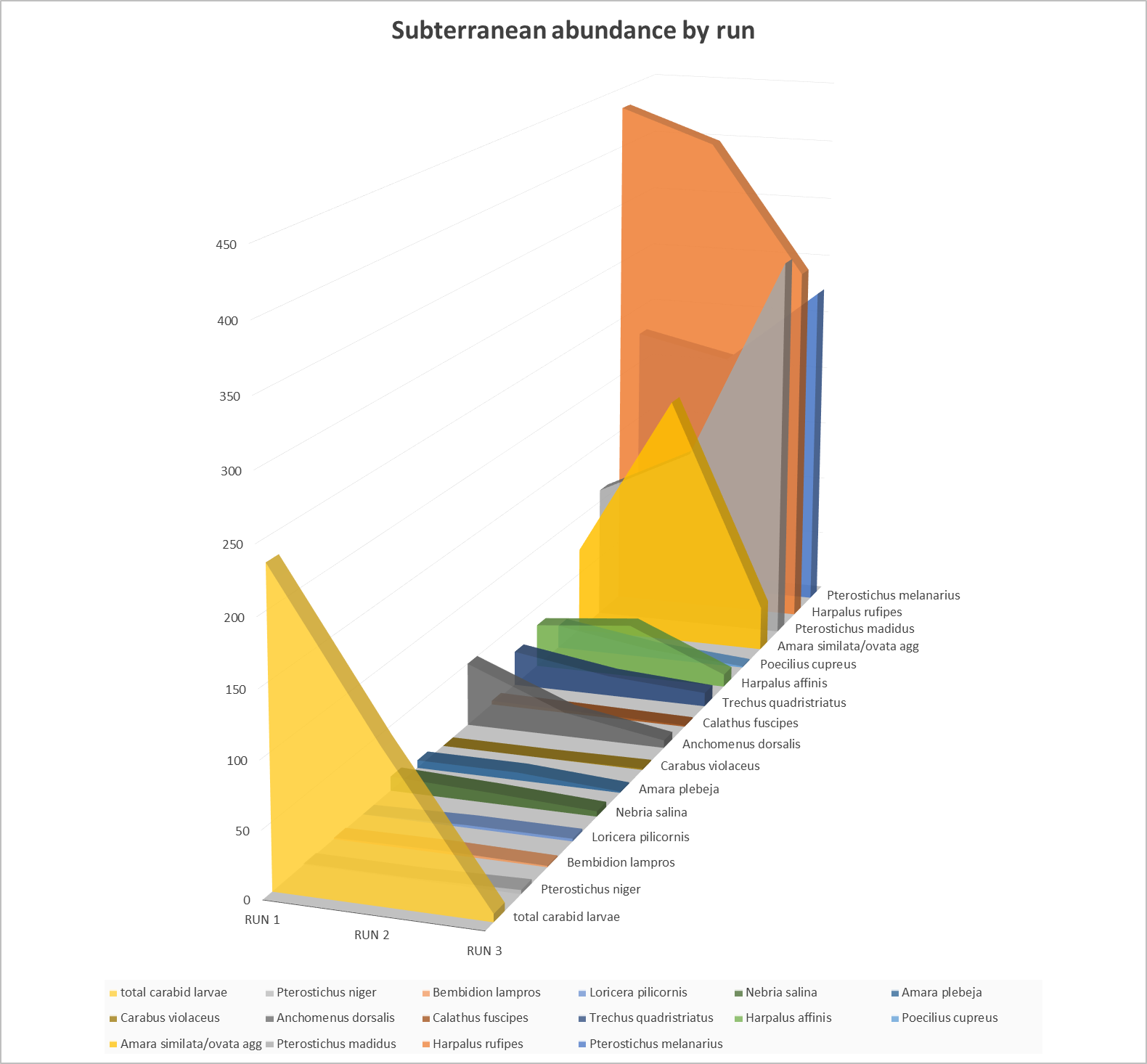
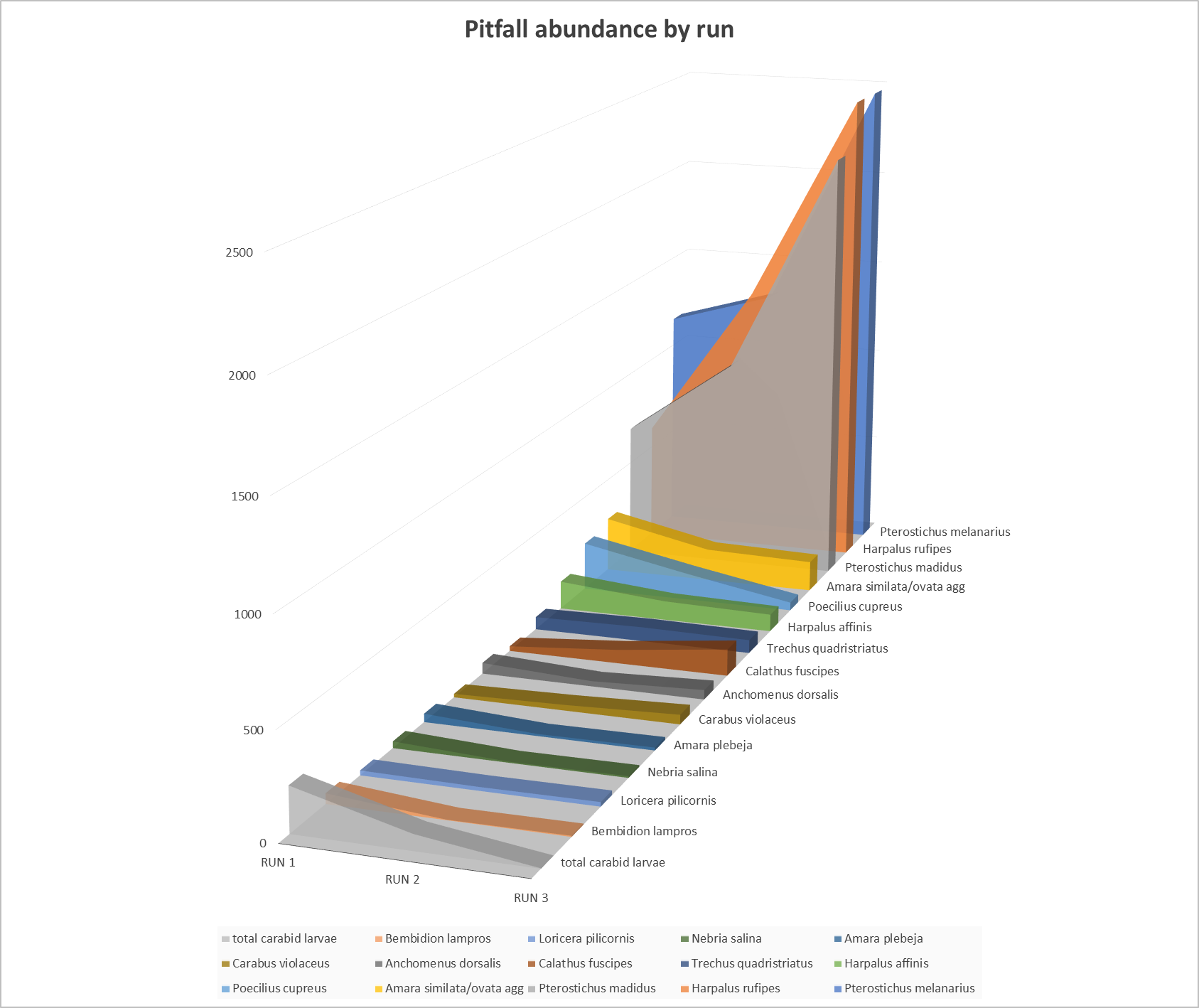


Figure S2: Top 15 carabid species trapped and carabid larvae, abundance by runs and trap type.

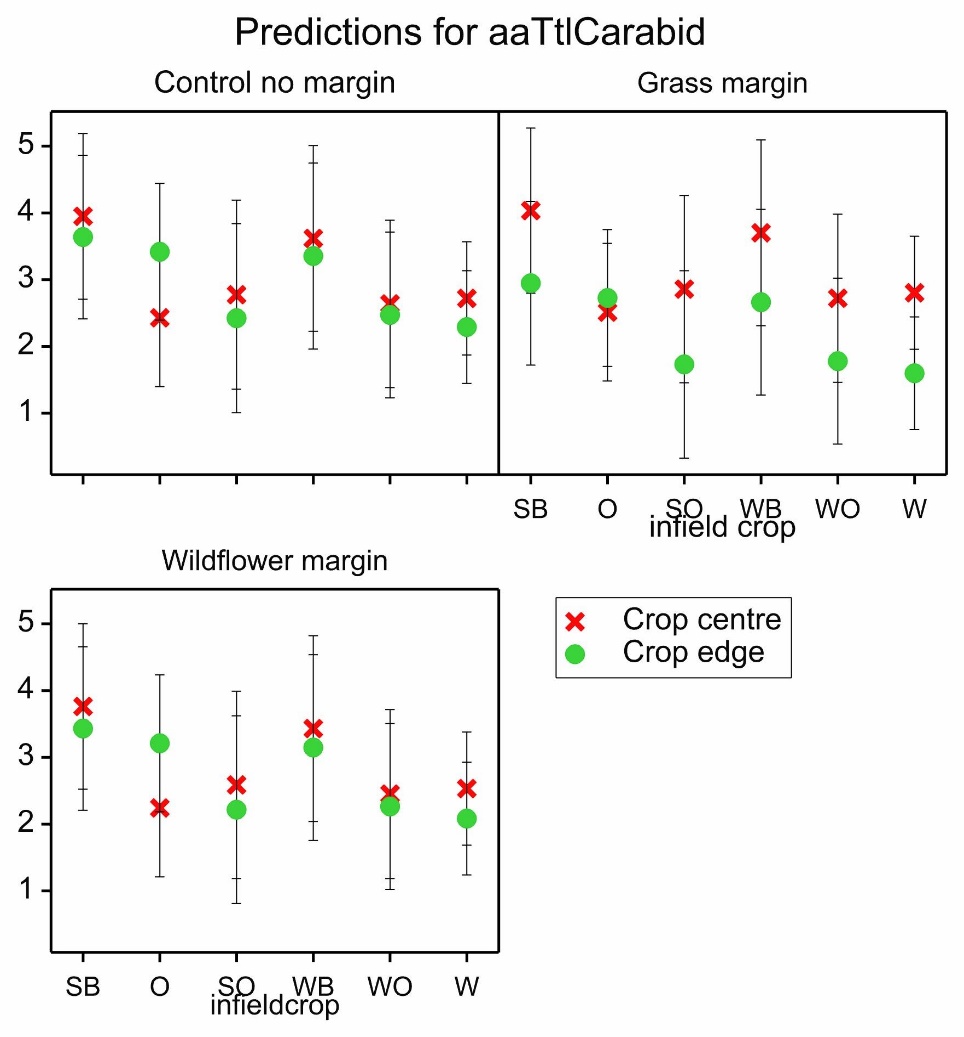
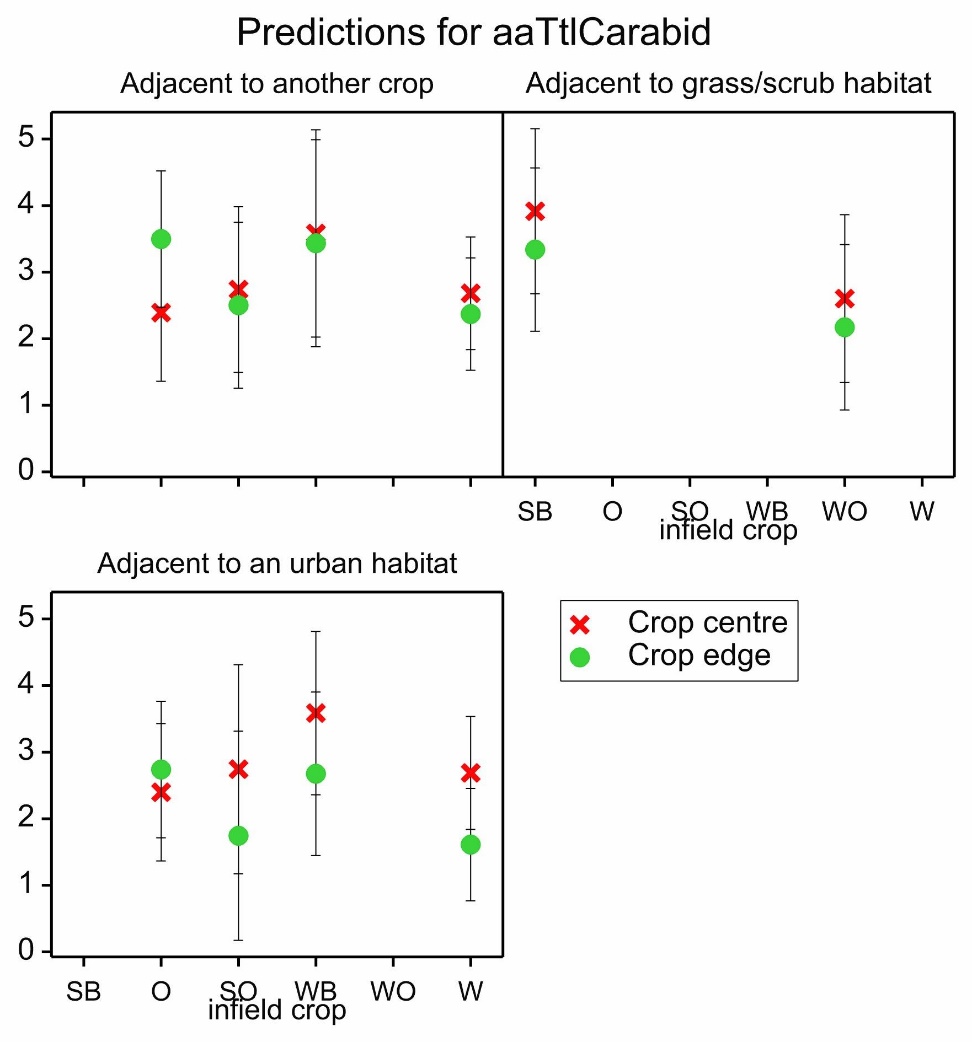
 

Figure S3: Fitted linear mixed model predictions for pooled-carabid abundance in the crop area by A) margin type, and B) adjacent habitat. Predicted means with effective standard error bars. Crop centre= between 20m and 50m from edge, Crop edge = between 2m and 4m from field boundary, SB= spring barley, O=oats, SO= spring oilseed rape, WO= winter oilseed rape, W=wheat.

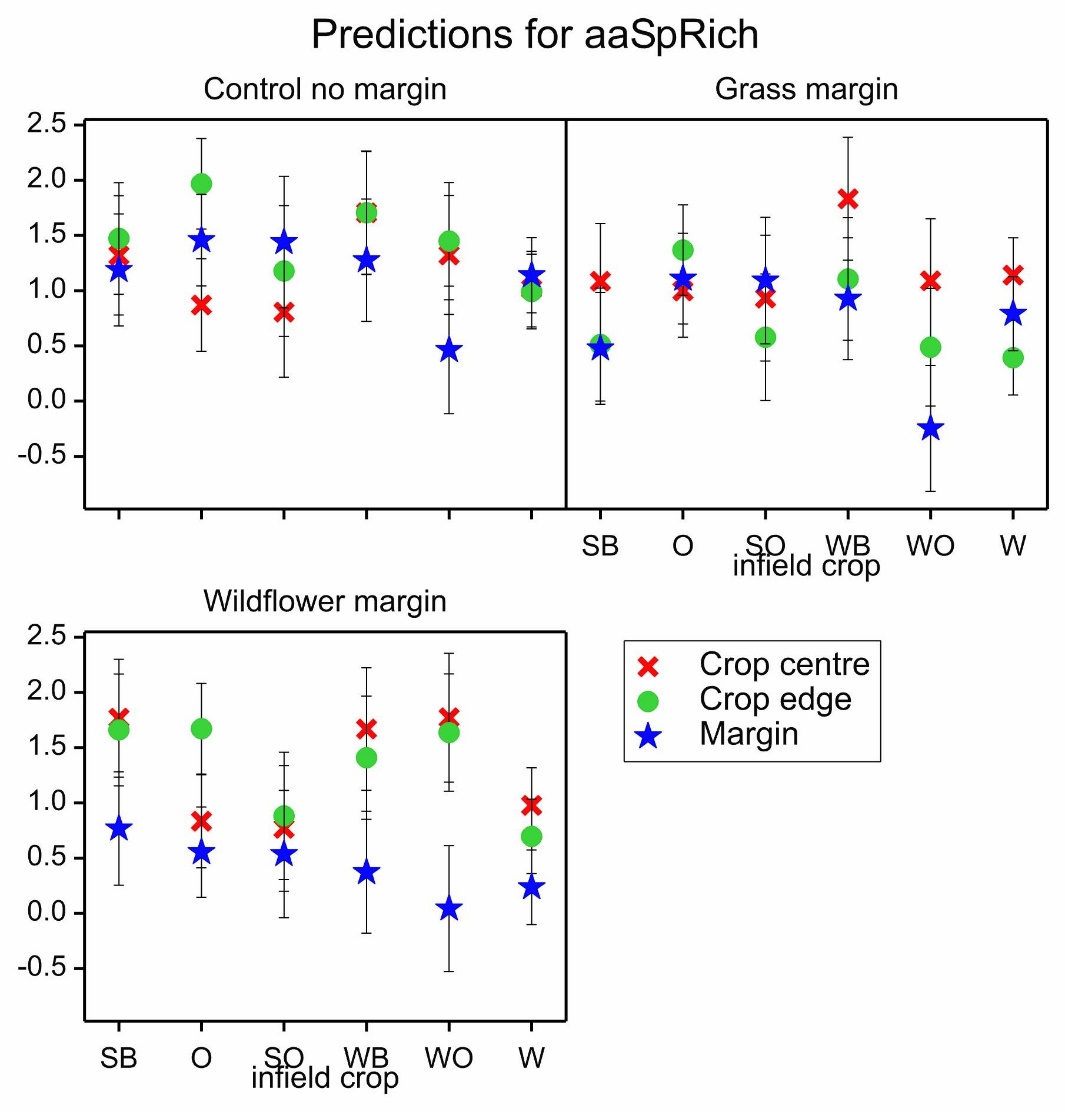
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Figure S4: Fitted Linear Mixed Model (LMM) predictions for species richness in the crop area and experimental margins by margin type, predicted means with effective standard error bars. Crop centre= between 20m and 50m from edge, Crop edge = between 2m and 4m from field boundary, SB= spring barley, O=oats, SO= spring oilseed rape, WO= winter oilseed rape, W=wheat.

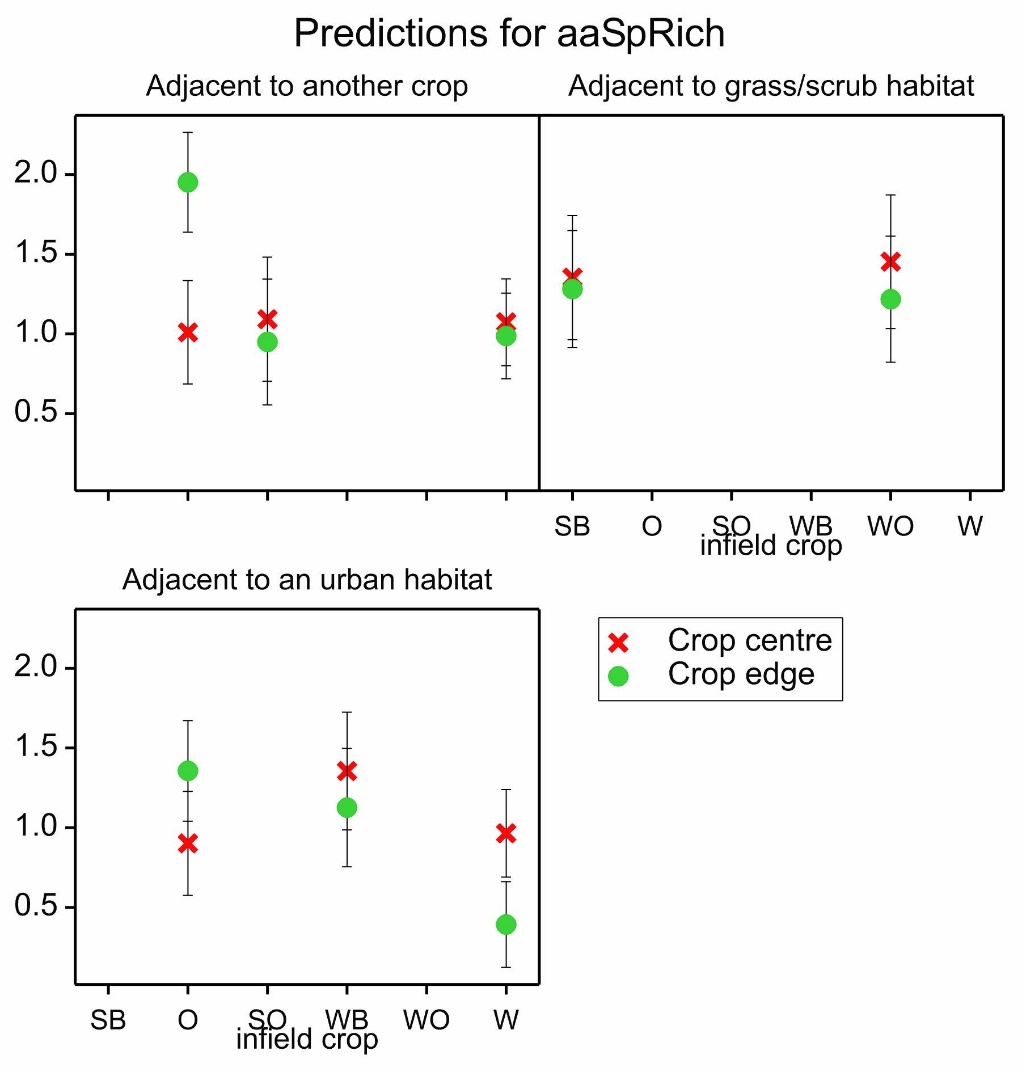
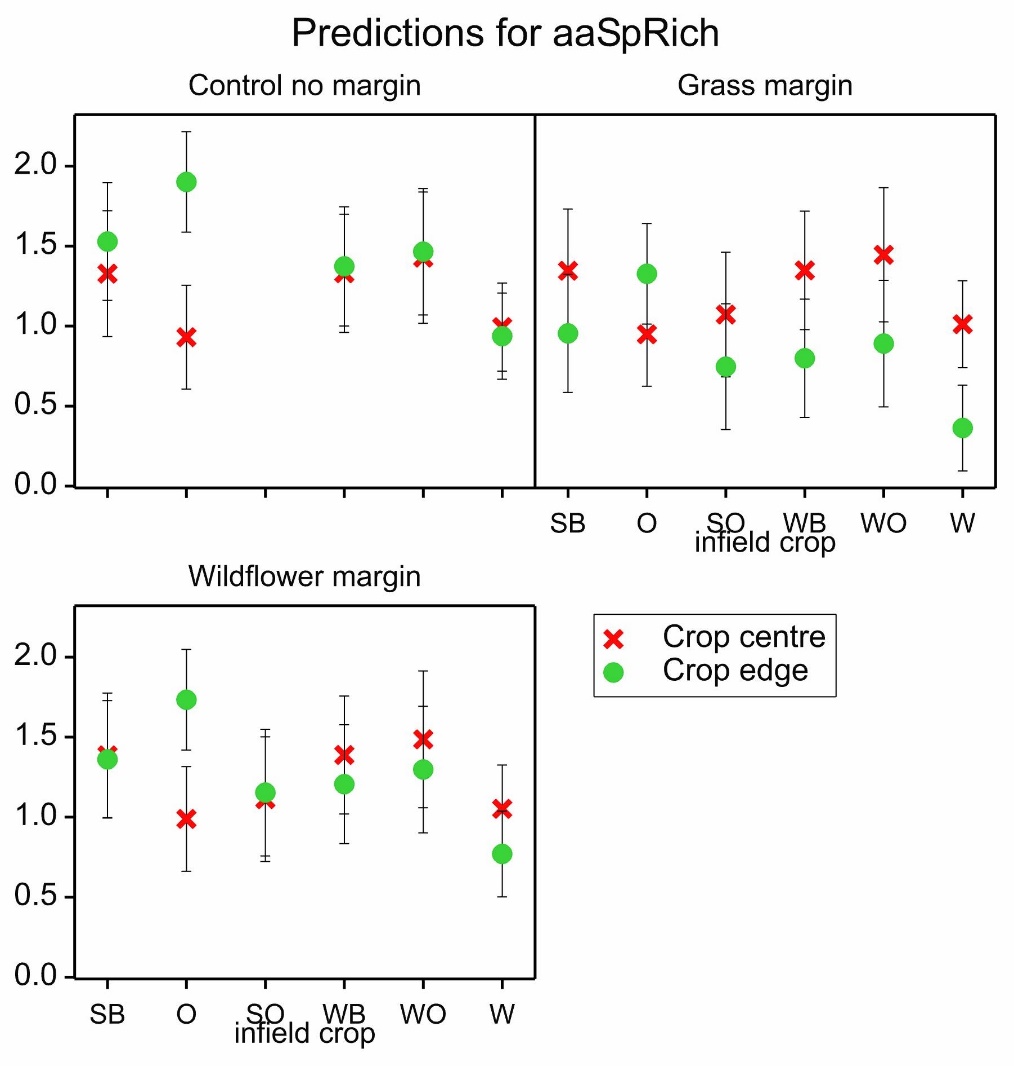
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Figure S5: Fitted linear mixed model predictions for carabid species richness in the crop area by a) margin and b) adjacent habitat, predicted means with effective standard error bars. Crop centre= between 20m and 50m from edge, Crop edge = between 2m and 4m from field boundary, SB= spring barley, O=oats, SO= spring oilseed rape, WO= winter oilseed rape, W=wheat.

Chart, scatter chart, box and whisker chart

Description automatically generated

Figure S6: Fitted linear mixed model predictions for *Poecilus cupreus* abundance, predicted means with effective standard error bars. Centre= Habitat centre, Edge= Habitat edge, GS= grass/scrub, M= margin, SB= spring barley, O=oats, SO= spring oilseed rape, WO= winter oilseed rape, W=wheat.

**Table S1:** Sown margin seed mixes used in the study. Common name followed by the Latin name and percentage contained within each mix.

|  |
| --- |
| **Grass margin mix** |
| Common bent – *Agrostis capillaris* (10%) |
| *Crested dogstail* – *Cynosurus cristatus* (50%) |
| Slender creepin*g red-fescue* – *Festuca rubra* (35%) |
| *Smaller cat's-tail* – *Phleum bertolonii* (5%) |
| **Wildflower margin mix** |
| Common bent – *Agrostis capillaris* (8 %) |
| *Crested* dogstail – *Cynosurus cristatus* (40 %) |
| *Slendercreeping red-fescue ­– Festuca rubra* (28 %) |
| Smaller cat's-tail – *Phleum bertolonii* (4 %) |
| Yarrow – *Achillea millefolium* (1.2 %) |
| Common knapweed – *Centaurea nigra* (3 %) |
| Wild carrot – *Daucus carota* (1 %) |
| Field scabious – *Knautia arvensis* (0.6 %) |
| Oxeye daisy – *Leucanthemum vulgare* (1.6 %) |
| Birdsfoot trefoil – *Lotus corniculatus* (2 %) |
| Musk mallow – *Malva moschata* (0.8 %) |
| Cowslip – *Primula veris* (0.4 %) |
| Selfheal – *Prunella vulgaris* (3 %) |
| Meadow buttercup – *Ranunculus acris* (3.2 %) |
| Red campion – *Silene dioica* (2 %) |
| Wild red clover – *Trifolium pratense* (0.2 %) |
| Tufted vetch – *Vicia cracca* (1 %) |

**Table S2**: Selected margins for standard pitfall transects, with infield, boundary, and adjacent habitat variables. Margins with subterranean traps are indicated by \*. Areas not sampled indicated in italics. OSR= Oilseed rape.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Margin | | Infield crop | Sowing time | Adjacent habitat | Boundary |
| One-way margins | M1 w | 1st wheat | Winter | Urban | Hedge |
| M1 g | 1st wheat | Winter | Urban | Hedge |
| M2 w **\*** | S oats | Spring | Urban scrub | Gappy trees |
| M2 g **\*** | S oats | Spring | Urban scrub | Gappy trees |
| M7 w | W barley | Winter | Urban | Hedge |
| M7 g | W barley | Winter | Urban | Hedge |
| M14 w **\*** | 1st wheat | Winter | Urban | Hedge |
| M14 g **\*** | 1st wheat | Winter | Urban | Hedge |
| Two-way margins | M3 w | S oats | Spring | W OSR | Gappy trees |
| M3 g | S oats | Spring | W OSR | Gappy trees |
| M4 w **\*** | W OSR | Winter | Grass/scrub | Hedge |
| M4 g **\*** | W OSR | Winter | Grass /scrub | Fence |
| M9 w **\*** | S barley | Spring | Grass/bioenergy | none |
| M9 g **\*** | S barley | Spring | Grass/bioenergy | none |
| M11 w **\*** | 1st wheat | Winter | 1st wheat | track |
| M11 g **\*** | 1st wheat | Winter | 1st wheat | track |
| M12 w | 1st wheat | Winter | 1st wheat | Track |
| M12 g | 1st wheat | Winter | 1st wheat | Track |
| M13 w | S OSR | Spring | 1st wheat | Hedge |
| M13 g | S OSR | Spring | 1st wheat | Hedge |

**Table S3**: Full species list and abundances by run.  


**Table S4**: Linear Mixed Model (LMM) predictions for crop area models.

LMM crop area abundance:

Fixed term Wald statistic n.d.f. F statistic d.d.f. F pr

infieldcrop 1.26 5 0.25 3.0 0.915

position 7.09 1 7.09 44.5 0.011

margintype 2.81 2 1.40 44.5 0.274

adjacent 0.19 1 0.19 16.0 0.274 infieldcrop.position 18.97 5 3.79 45.7 0.006

position.margintype 6.98 2 3.49 45.0 0.039 position.adjacent 5.08 1 5.08 44.9 0.029

LMM crop area species richness:

Fixed term Wald statistic n.d.f. F statistic d.d.f. F pr

infieldcrop 1.91 5 0.38 3.0 0.838

position 0.26 1 0.26 44.3 0.612

margintype 8.65 2 4.33 16.1 0.031

adjacent 0.86 1 0.86 3.0 0.423

infieldcrop.position 26.62 5 5.32 46.0 <0.001

position.margintype 9.37 2 4.69 44.9 0.014

position.adjacent 5.59 1 5.59 45.3 0.022

LMM crop area abundance plus margins:

Fixed term Wald statistic n.d.f. F statistic d.d.f. F pr

infieldcrop 1.05 5 0.21 4.1 0.942

position 43.98 2 21.99 93.3 <0.001

margintype 5.53 2 2.11 16.4 0.092

infieldcrop.position 36.86 10 3.68 97.4 <0.001

position.margintype 25.42 4 6.36 94.3 <0.001

LMM crop area species richness plus margins:

Fixed term Wald statistic n.d.f. F statistic d.d.f. F pr

infieldcrop 1.31 5 0.26 3.1 0.909

position 13.11 2 6.55 93.5 0.002

margintype 16.26 2 8.13 11.1 0.007

adjacent 2.31 1 2.31 3.0 0.226

infieldcrop.position 25.23 10 2.52 97.8 0.010

position.margintype 19.22 4 4.80 94.5 0.001

Margintype.adjacent 18.12 4 4.53 12.5 0.017

**Table S5**: Summary of species model predictions. Greatest predicted abundance for each species x margin or species x crop is shaded in orange, and the smallest is shaded in blue. Standard error in italics. M= margin, C=control, G=grass, W=wildflower, PF=pitfall, ST=subterranean trap. \*=inestimable prediction.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | M | Grass/scrub | | | Spring Barley | | | Oats | | | Spring OSR | | | Winter Barley | | | Winter OSR | | | Wheat | | |
| Centre | | Edge | Centre | | Edge | Centre | | Edge | Centre | | Edge | Centre | | Edge | Centre | | Edge | Centre | | Edge |
| *P. melanarius* | C | -0.40  *0.48* | -2.33  *0.63* | | -2.08  *0.59* | 1.44  *0.75* | | 1.16  *0.74* | -2.27  *0.62* | | -0.51  *0.60* | \* | | \* | 1.93  *0.85* | | 1.33  *0.87* | 0.78  *0.54* | | -0.44  *0.54* | 0.07  *0.50* | | -0.95  *0.50* |
| G | -1.57  *0.47* | -1.51  *0.63* | | -2.38  *0.60* | 2.33  *0.74* | | 0.86  *0.72* | -1.39  *0.61* | | -0.82  *0.60* | -1.70  *0.87* | | -3.96  *0.87* | 2.81  *0.85* | | 1.03  *0.86* | 1.66  *0.55* | | -0.74  *0.54* | 0.95  *0.49* | | -1.26  *0.50* |
| W | -2.04  *0.47* | -1.91  *0.63* | | -1.69  *0.59* | 1.92  *0.74* | | 1.55  *0.71* | -1.79  *0.61* | | -0.13  *0.61* | -2.10  *0.87* | | -3.27  *0.87* | 2.41  *0.85* | | 1.71  *0.87* | 1.26  *0.55* | | -0.05  *0.54* | 0.55  *0.50* | | -0.57  *0.49* |
| *H. rufipes* | C | -0.05  *0.50* | -0.90  *0.61* | | | 1.29  *0.69* | | | 1.01  *0.60* | | | \* | | | 1.91  *0.80* | | | 0.49  *0.54* | | | 0.40  *0.51* | | |
| G | -0.18  *0.50* | -1.03  *0.61* | | | 1.16  *0.69* | | | 0.88  *0.60* | | | 0.02  *0.79* | | | 1.78  *0.80* | | | 0.36  *0.54* | | | 0.27  *0.51* | | |
| W | -0.59  *0.50* | -1.44  *0.60* | | | 0.75  *0.68* | | | 0.47  *0.60* | | | -0.39  *0.79* | | | 1.36  *0.80* | | | -0.04  *0.54* | | | -0.14  *0.51* | | |
| *P. madidus* | C PF | -0.21  *0.33* | 0.60  *0.59* | | 0.73  *0.57* | 1.13  *0.80* | | 2.08  *0.77* | 1.46  *0.60* | | 1.58  *0.57* | \* | | \* | 1.94  *0.89* | | 0.49  *0.94* | -1.28  *0.46* | | -0.58  *0.48* | 0.81  *0.41* | | -0.10  *0.42* |
| C ST | -0.95  *0.37* | 0.14  *0.62* | | -0.01  *0.60* | 0.39  *0.81* | | 1.34  *0.79* | 0.72  *0.62* | | 0.85  *0.59* | \* | | \* | \* | | \* | -2.02  *0.49* | | -1.32  *0.49* | 0.07  *0.44* | | -0.84  *0.45* |
| G PF | 0.47  *0.30* | 1.07  *0.63* | | 0.71  *0.60* | 0.78  *0.76* | | 1.23  *0.76* | 1.21  *0.58* | | 0.84  *0.57* | 0.56  *0.85* | | -1.27  *0.85* | 1.47  *0.94* | | -0.47  *0.88* | -1.83  *0.50* | | -1.63  *0.50* | 0.52  *0.38* | | -0.88  *0.38* |
| G ST | -0.26  *0.35* | 0.33  *0.65* | | -0.03  *0.62* | 0.04  *0.77* | | 0.49  *0.77* | 0.47  *0.60* | | 0.10  *0.60* | \* | | \* | \* | | \* | -2.57  *0.53* | | -2.37  *0.53* | -0.21  *0.42* | | -1.62  *0.41* |
| W PF | -1.31  *0.31* | 0.35  *0.63* | | 1.25  *0.57* | -0.07  *0.80* | | 1.64  *0.73* | -0.06  *0.58* | | 0.83  *0.59* | -1.35  *0.84* | | -1.93  *0.85* | 1.02  *0.89* | | 0.33  *0.94* | -1.99  *0.52* | | -0.53  *0.48* | -0.02  *0.39* | | -0.17  *0.39* |
| W ST | -2.05  *0.36* | -0.39  *0.64* | | 0.51  *0.59* | -0.81  *0.81* | | 0.90  *0.76* | -0.80  *0.60* | | 0.09  *0.61* | \* | | \* | \* | | \* | -2.73  *0.55* | | -1.27  *0.51* | -0.75  *0.42* | | -0.91  *0.42* |
| *P. cupreus* | PF | -2.31  *0.27* | -2.08  *0.45* | | -2.16  *0.42* | -0.56  *0.56* | | -0.73  *0.53* | -2.71  *0.41* | | -1.10  *0.41* | -2.67  *0.63* | | -2.67  *0.63* | -0.39  *0.58* | | -0.66  *0.60* | -1.40  *0.37* | | -2.27  *0.36* | -2.19  *0.31* | | -2.31  *0.31* |
| ST | -2.89  *0.39* | -3.12  *0.51* | | -3.20  *0.50* | -3.22  *0.65* | | -3.39  *0.65* | -2.64  *0.64* | | -1.03  *0.63* | \* | | \* | \* | | \* | -1.13  *0.51* | | -2.00  *0.50* | -2.94  *0.45* | | -3.06  *0.46* |
|  |  | M | Grass/scrub | | | Spring Barley | | | Oats | | | Spring OSR | | | Winter Barley | | | Winter OSR | | | Wheat | | |
|  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |
| Total carabid larvae | C PF | -1.27  *0.48* | -1.56  *0.55* | | | -2.34  *0.60* | | | -0.87  *0.54* | | | -1.69  *0.67* | | | -1.64  *0.66* | | | -1.65  *0.51* | | | -1.81  *0.49* | | |
| C ST | 0.05  *0.52* | -0.24  *0.57* | | | -1.02  *0.63* | | | 0.45  *0.57* | | | -0.37  *0.70* | | | -0.32  *0.70* | | | -0.33  *0.54* | | | -0.49  *0.53* | | |
| G PF | -1.72  *0.48* | -2.01  *0.54* | | | -2.79  *0.60* | | | -1.32  *0.54* | | | -2.14  *0.66* | | | -2.09  *0.66* | | | -2.09  *0.51* | | | -2.26  *0.49* | | |
| G ST | -0.40  *0.51* | -0.68  *0.57* | | | -1.47  *0.62* | | | 0.01  *0.57* | | | -0.82  *0.70* | | | -0.76  *0.69* | | | -0.77  *0.54* | | | -0.93  *0.52* | | |
| W PF | -1.87  *0.48* | -2.16  *0.54* | | | -2.94  *0.60* | | | -1.47  *0.54* | | | -2.29  *0.66* | | | -2.24  *0.66* | | | -2.25  *0.51* | | | -2.41  *0.49* | | |
| W ST | -0.55  *0.52* | -0.84  *0.57* | | | -1.62  *0.62* | | | -0.15  *0.57* | | | -0.97  *0.69* | | | -0.92  *0.69* | | | -0.93  *0.55* | | | -1.09  *0.52* | | |

**Table S6**: Fitted models for spatial factors on carabid abundance.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | Fixed Effects |  |  | a | Effective range |
| Total abundance standard pitfall traps | | | | | |
| REML fitted | Run + Vegetation + Easting + Northing + Easting.Northing | 3.3579 | 1.2674 | 39.4187 | 118.09 |
| Total abundance subterranean pitfall traps | | | | | |
| REML  fitted | Run + Vegetation + Easting + Northing + Easting.Northing + Adjacent | 0.0011 | 0.0000 | 2.3168 | 353.14 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | Fixed Effects |  |  | a | Effective range |
| *Pterostichus melanarius* abundance | | | | | |
| REML fitted | Run + Vegetation + Adjacent | 2.0574 | 1.2567 | 44.6234 | 133.68 |
| *Harpalus rufipes* abundance | | | | | |
| REML fitted | Run + Vegetation + Easting + Northing + Easting.Northing | 0.9564 | 0.0008 | -0.0007 | 446.91 |
| *Pterostichus madidus* abundance | | | | | |
| REML fitted | Run + Vegetation + Easting + Northing + Easting.Northing = Adjacent | 1.4165 | 1.5227 | 178.0322 | 533.3369 |
| *Amara eurynota* abundance | | | | | |
| REML fitted | Run + Vegetation + Adjacent | 0.3602 | -0.1309 | 0.4341 | 42.04 |
| *Poecilus cupreus* abundance | | | | | |
| REML fitted | Run + Vegetation + Easting + Northing + Easting.Northing = Adjacent | 0.4593 | 0.0179 | 89.4625 | 268.0057 |
| Total carabid larvae abundance | | | | | |
| REML fitted | Run + Vegetation | -0.0674 | 0.3113 | 0.0259 | 942.73 |