**Importance of functional classification in the use of carabids for the environmental risk assessment of the GE crops and other agricultural practices**

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**Table S1** Taxonomic affiliation and functional traits of captured carabids (Larochelle 1990, Hůrka 1996). Body size categories (mid-range value) included 1 (˃ 22 mm), 2 (11–21.9 mm), 3 (6–10.9 mm) and 4 (˂ 5.9 mm). Habitat affinity categories included silvicolous species preferring woodlands, open biotopes species preferring open areas and eurytopic species adaptable to various environmental conditions. Four categories of humidity affinity were recognized: hygrophilous species preferring moist places, mesophilous species preferring moderate humidity and avoid extremes of moisture or dryness, xerophilous species preferring dry habitats. Breeding period encompassed spring, autumn or from spring thorough summer to autumn. Food specialization involved carnivory, omnivory and granivory.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Tribus | Species | Body size | Habitat affinity | Humidity affinity | Breeding period | Food specialization |
| Bembidiini |
|  | *Bembidion femoratum* (Sturm, 1825) | 4 | eurytopic | mesophilous | spring | carnivorous |
|  | *Bembidion lampros* (Herbst, 1784) | 4 | open biotopes | eurytopic | spring | carnivorous |
|  | *Bembidion properans* (Stephens, 1828) | 4 | open biotopes | hygrophilous | spring | carnivorous |
|  | *Bembidion quadrimaculatum* (Linnaeus, 1761) | 4 | open biotopes | eurytopic | spring | carnivorous |
| Carabini |
|  | *Carabus granulatus* (Linnaeus, 1758) | 2 | silvicolous | hygrophilous | spring | carnivorous |
|  | *Carabus violaceus* (Linnaeus, 1758) | 1 | silvicolous | eurytopic | autumn | carnivorous |
| Clivinini |
|  | *Clivina fossor (*Linnaeus, 1758) | 3 | open biotopes | hygrophilous | spring | carnivorous |
| Harpalini |
|  | *Anisodactylus binotatus* (Fabricius, 1787) | 3 | open biotopes | mesophilous | spring | omnivorous |
|  | *Anisodactylus signatus* (Panzer, 1797) | 2 | open biotopes | hygrophilous | spring | omnivorous |
|  | *Harpalus affinis* (Schrank, 1781) | 3 | open biotopes | eurytopic | spring/summer/autumn | omnivorous |
|  | *Harpalus rubripes* (Dufischmid, 1812) | 3 | open biotopes | eurytopic | spring | omnivorous |
|  | *Ophonus azureus* (Fabricius, 1775) | 3 | open biotopes | xerophilous | autumn | granivorous |
| Lebiini |
|  | *Microlestes maurus* (Sturm, 1827) | 4 | eurytopic | eurytopic | spring | omnivorous |
| Licinini |
|  | *Badister bullatus* (Schrank, 1798) | 4 | eurytopic | hygrophilous | spring | carnivorous |
| Loricerini |
|  | *Loricera pilicornis* (Fabricius, 1775) | 3 | eurytopic | hygrophilous | spring/summer/autumn | carnivorous |
| Nebtriini |
|  | *Nebria brevicollis* (Fabricius, 1792) | 2 | eurytopic | hygrophilous | autumn | carnivorous |
| Notiophilini |
|  | *Notiophilus aquaticus* (Linnaeus, 1758) | 4 | silvicolous | hygrophilous | spring/summer/autumn | carnivorous |
| Platynini |
|  | *Agonum gracilipes* (Duftschmid, 1812) | 3 | silvicolous | eurytopic | spring | carnivorous |
|  | *Agonum muelleri* (Herbst, 1784) | 3 | eurytopic | hygrophilous | spring | carnivorous |
|  | *Agonum sexpunctatum* (Linnaeus, 1758) | 3 | eurytopic | hygrophilous | spring | carnivorous |
|  | *Agonum versutum* (Sturm, 1824) | 3 | silvicolous | hygrophilous | spring | carnivorous |
|  | *Anchomenus dorsalis* (Pontoppidan, 1763) | 3 | open biotopes | hygrophilous | spring | carnivorous |
|  | *Calathus fuscipes* (Goeze, 1777) | 2 | open biotopes | xerophilous | autumn | carnivorous |
|  | *Calathus melanocephalus* (Linnaeus, 1758) | 3 | open biotopes | mesophilous | autumn | carnivorous |
|  | *Platynus assimilis* (Paykull, 1790) | 3 | silvicolous | hygrophilous | spring | carnivorous |
| Pterostichini |
|  | *Poecilus cupreus* (Linnaeus, 1758) | 2 | eurytopic | eurytopic | spring | omnivorous |
|  | *Poecilus versicolor* (Sturm, 1824) | 3 | open biotopes | hygrophilous | spring | carnivorous |
|  | *Pseudoophonus rufipes* (De Geer, 1774) | 2 | open biotopes | eurytopic | autumn | omnivorous |
|  | *Pterostichus melanarius* (Illiger, 1798) | 2 | eurytopic | mesophilous | autumn | carnivorous |
|  | *Pterostichus niger* (Schaller, 1783) | 2 | silvicolous | hygrophilous | autumn | carnivorous |
|  | *Pterostichus nigrita* (Paykull, 1790) | 2 | eurytopic | hygrophilous | spring | carnivorous |
|  | *Pterostichus strenuus* (Panzer, 1796) | 3 | silvicolous | hygrophilous | spring | carnivorous |
| Trechini |
|  | *Trechus quadristriatus* (Schrank, 1781) | 4 | open biotopes | mesophilous | autumn | carnivorous |
| Zabrini |
|  | *Amara aenea* (De Geer, 1774) | 3 | open biotopes | xerophilous | spring | omnivorous |
|  | *Amara aulica* (Panzer, 1796) | 3 | open biotopes | mesophilous | autumn | omnivorous |
|  | *Amara communis* (Panzer, 1797) | 3 | open biotopes | hygrophilous | spring | omnivorous |
|  | *Amara eurynota* (Panzer, 1797) | 3 | open biotopes | mesophilous | spring | omnivorous |
|  | *Amara ingenua* (Duftschmid, 1812) | 3 | open biotopes | mesophilous | spring | omnivorous |

**Table S2** Testing the assumption of the initial similarity of experimental plots prior to maize sowing in 2009. Results of one-way ANOVA of differences in the activity abundance and species number of carabids assigned to the categories of functional traits (further as functional categories). The results of *F*-tests were complemented by the degrees of freedom and degrees of freedom of the error (within-group degrees of freedom, *df*). A two-sided *P*-value of 5 % was used to determine the level of significance.

|  |  |  |  |
| --- | --- | --- | --- |
| Trait | Category | Activity abundance | Number of species |
| *F* | *df* | *P* | *F* | *df* | *P* |
| Body size |
|  | 1† |  |  |  |  |  |  |
|  | 2 | 0.66 | 4,20 | 0.626 | 0.47 | 4,20 | 0.759 |
|  | 3 | 1.49 | 4,20 | 0.244 | 1.20 | 4,20 | 0.342 |
|  | 4 | 0.50 | 4,20 | 0.736 | 0.50 | 4,20 | 0.736 |
| Habitat affinity |
|  | eurytopic | 0.43 | 4,20 | 0.785 | 0.56 | 4,20 | 0.697 |
|  | open biotopes | 1.68 | 4,20 | 0.194 | 0.86 | 4,20 | 0.505 |
|  | silvicolous | 0.96 | 4,20 | 0.450 | 1.17 | 4,20 | 0.355 |
| Humidity affinity |
|  | eurytopic | 0.44 | 4,20 | 0.775 | 1.70 | 4,20 | 0.190 |
|  | hygrophilous | 0.86 | 4,20 | 0.502 | 1.44 | 4,20 | 0.258 |
|  | mesophilous | 0.96 | 4,20 | 0.450 | 0.27 | 4,20 | 0.894 |
|  | xerophilous | 1.89 | 4,20 | 0.152 | 2.13 | 4,20 | 0.115 |
| Breeding period |
|  | spring | 0.67 | 4,20 | 0.619 | 0.66 | 4,20 | 0.629 |
|  | summer | 1.60 | 4,20 | 0.213 | 1.60 | 4,20 | 0.213 |
|  | autumn | 0.79 | 4,20 | 0.546 | 1.22 | 4,20 | 0.333 |
| Food specialization |
|  | carnivorous | 1.06 | 4,20 | 0.404 | 1.33 | 4,20 | 0.295 |
|  | granivorous† |  |  |  |  |  |  |
|  | omnivorous | 0.48 | 4,20 | 0.749 | 1.40 | 4,20 | 0.270 |

†Insufficient numbers individuals and species for statistical comparisons

**Table S3** Testing the assumption of the initial similarity of experimental plots. Results of Monte Carlo permutation tests (MCPT, *F*-test, 5 % *P*-value of significance level) of correlation between functional categories and plot positions (G, GE maize; N, near-isogenic; I, near-isogenic + insecticide; A, reference; B, reference) in carabids captured prior to maize sowing in 2009.

|  |  |  |
| --- | --- | --- |
| Environmental variable | Explained variability (%) | MCPT |
| *F* | *P* |
| G | 0.7 | 0.82 | 0.701 |
| N | 1.1 | 1.31 | 0.573 |
| I | 1.2 | 1.47 | 0.491 |
| A | 0.8 | 0.98 | 0.625 |
| B | 1.3 | 1.58 | 0.491 |

**Table S4** The activity abundance and number of species of carabids captured in plots with different treatments (G, GE maize; N, near-isogenic; I, near-isogenic + insecticide; A, reference; B, reference).

|  |  |  |
| --- | --- | --- |
| Year | Treatment | Total |
| G | N | I | A | B |
| Activity abundance |  |
|  | 2009 | 2248 | 2276 | 1632 | 1917 | 2383 | 10,456 |
|  | 2010 | 894 | 980 | 865 | 956 | 1018 | 4713 |
|  | 2011 | 325 | 305 | 282 | 302 | 369 | 1583 |
|  | Total | 3467 | 3561 | 2779 | 3175 | 3770 | 16,752 |
| Number of species |  |
|  | 2009 | 14 | 13 | 11 | 15 | 16 | 26 |
|  | 2010 | 15 | 17 | 17 | 18 | 18 | 29 |
|  | 2011 | 19 | 16 | 13 | 16 | 19 | 28 |
|  | Total | 24 | 23 | 21 | 26 | 26 | 38 |

**Table S5** Spearman rank correlation coefficients (*r*) with Bonferroni correction of significance level (*P* = 0.005) for rank activity abundance curves (Whittaker plots) of carabid species in plots with different treatments (G, GE maize; N, near-isogenic; I, near-isogenic + insecticide; A, reference; B, reference).

|  |  |  |  |
| --- | --- | --- | --- |
| Year | Treatment comparison | Spearman rank correlation coefficient (*r*) | *P* |
| 2009 | G x N | 0.999 | < 10-4 |
|  | G x I | 0.984 | < 10-4 |
|  | G x A | 0.976 | < 10-4 |
|  | G x B | 0.980 | < 10-4 |
|  | N x I | 0.991 | < 10-4 |
|  | N x A | 0.977 | < 10-4 |
|  | N x B | 0.985 | < 10-4 |
|  | I x A | 0.979 | < 10-4 |
|  | I x B | 0.986 | < 10-4 |
|  | A x B | 0.996 | < 10-4 |
| 2010 | G x N | 0.986 | < 10-4 |
|  | G x I | 0.968 | < 10-4 |
|  | G x A | 0.983 | < 10-4 |
|  | G x B | 0.991 | < 10-4 |
|  | N x I | 0.965 | < 10-4 |
|  | N x A | 0.967 | < 10-4 |
|  | N x B | 0.967 | < 10-4 |
|  | I x A | 0.984 | < 10-4 |
|  | I x B | 0.970 | < 10-4 |
|  | A x B | 0.984 | < 10-4 |
| 2011 | G x N | 0.977 | < 10-4 |
|  | G x I | 0.972 | < 10-4 |
|  | G x A | 0.985 | < 10-4 |
|  | G x B | 0.967 | < 10-4 |
|  | N x I | 0.992 | < 10-4 |
|  | N x A | 0.989 | < 10-4 |
|  | N x B | 0.993 | < 10-4 |
|  | I x A | 0.965 | < 10-4 |
|  | I x B | 0.986 | < 10-4 |
|  | A x B | 0.985 | < 10-4 |

**Table S6** The results of repeated measures analysis of variance (RM ANOVA). Effects of treatments on the carabid number of species, overall activity abundance, and activity abundances of five dominant species. Significant difference is highlighted bold (*F*-, *df*- and *P*-values are explained in Table S2). The Tukey’s HSD post hoc test followed significant tests to specify between which treatments the difference was found. The results of post-hoc Tukey HSD tests are given only for the significantly different treatments (G: GE maize; I: near-isogenic hybrid treated with insecticide; B: reference hybrid).

|  |  |  |
| --- | --- | --- |
| Parameter | Treatment comparison | Interaction: no. of species/overall activity abundance/activity abundances of dominant species x sample date |
| *F* | *df* | *P* | Tukey HSD† | *F* | *df* | *P* |
| **Number of species** | **5.51** | **4,20** | **0.004** | **I x G: 0.019; I x B: 0.004** | 0.84 | 4,20 | 0.788 |
| Overall activity abundance | 0.52 | 4,20 | 0.721 |  | 1.20 | 4,20 | 0.170 |
| *Pterostichus melanarius* | 0.40 | 4,20 | 0.807 |  | 1.27 | 56,280 | 0.106 |
| *Poecilus cupreus* | 0.49 | 4,20 | 0.745 |  | 0.81 | 56,280 | 0.828 |
| *Calathus fuscipes* | 0.77 | 4,20 | 0.560 |  | 0.63 | 44,220‡ | 0.964 |
| *Carabus granulatus* | 1.14 | 4,20 | 0.366 |  | 0.87 | 44,220‡ | 0.702 |
| *Trechus quadristriatus* | 0.58 | 4,20 | 0.681 |  | 0.26 | 44,220‡ | 0.999 |

†Treatment with significantly lower abundance is stated as the first one

‡Species with lower *df* were not trapped in all sample dates

**Table S7** The results of chi-square (*χ2*) test for trend accompanied by degrees of freedom (*df*) with Bonferroni correction of significance level (*P* = 0.005) for Boltzmann sigmoidal growth model of species accumulations curves (rarefaction) for overall carabid abundance in plots with different treatments (G, GE maize; N, near-isogenic; I, near-isogenic + insecticide; A, reference; B, reference).

|  |  |  |
| --- | --- | --- |
| Treatment comparison | *χ2* (*df* = 1) | *P* |
| G x N | 1213.56 | < 10-3 |
| G x I | 31.18 | < 10-3 |
| G x A | 505.95 | < 10-3 |
| G x B | 35.04 | < 10-3 |
| N x I | 179.31 | < 10-3 |
| N x A | 26.81 | < 10-3 |
| N x B | 856.11 | < 10-3 |
| I x A | 90.72 | < 10-3 |
| I x B | 15.13 | < 10-3 |
| A x B | 421.66 | < 10-3 |

**Table S8** The results of Monte Carlo permutation tests (MCPT, *F*-test, 5 % *P*-value of significance level) showing correlation of all carabid species activity abundance with experimental treatments (G, GE maize; N, near-isogenic; I, near-isogenic + insecticide; A, reference; B, reference) and time variables. Significant differences are highlighted bold.

|  |  |  |
| --- | --- | --- |
| Environmental variable | Explained variability (%) | MCPT |
| *F* | *P* |
| G | 0 | 0.74 | 0.871 |
| N | 0 | 1.18 | 0.805 |
| I | 0.1 | 0.81 | 0.820 |
| A | 0 | 0.73 | 0.843 |
| B | 0 | 0.86 | 0.316 |
| **2009** | **6.8** | **146.51** | **0.001** |
| 2010 | 0.4 | 7.43 | 0.564 |
| **2011** | **6.2** | **131.01** | **0.001** |
| **Sample date** | **11.7** | **264.27** | **0.001** |

**Table S9** The results of repeated measures (RM) ANOVA (*F*-, *df*- and *P*-values are explained in Table S2, Tukey HSD test in Table S6). Effects of treatments on the activity abundances of carabids belonging to different functional categories. Significant differences are highlighted bold. The results of post-hoc Tukey HSD tests are given only for significantly different treatments (G, GE maize; N, near-isogenic; I, near-isogenic + insecticide; A, reference; B, reference; maize growth stage: VE, germination).

|  |  |  |  |
| --- | --- | --- | --- |
| Trait | Category | Effect of category | Interaction: category x sample date |
| *F* | *df* | *P* | Tukey HSD† | *F* | *df* | *P* | Tukey HSD† |
| Body size |
|  | 1‡ |  |  |  |  |  |  |  |  |
|  | 2 | 0.41 | 4,20 | 0.797 |  | 1.17 | 60,300 | 0.202 |  |
|  | 3 | **3.65** | **4,20** | **0.022** | **I x G: 0.041** | **1.89** | **60,300** | **< 10-3** | **2009: VE:****N x G: < 10-4; I x G: < 10-4; B x G: 0.006; N x A: < 10-4; I x A: < 10-3; B x A: 0.028** |
|  | 4 | 1.45 | 4,20 | 0.253 |  | 0.37 | 56,280§ | ˃0.999 |  |
| Habitat affinity |
|  | eurytopic | 0.44 | 4,20 | 0.779 |  | 1.21 | 56,280§ | 0.162 |  |
|  | **open biotopes** | **4.07** | **4,20** | **0.014** | **I x B: 0.019** | 0.80 | 60,300 | 0.848 |  |
|  | silvicolous | 1.25 | 4,20 | 0.322 |  | 0.86 | 52,260§ | 0.731 |  |
| Humidity affinity |
|  | eurytopic | 1.71 | 4,20 | 0.188 |  | 0.75 | 56,280§ | 0.904 |  |
|  | hygrophilous | 2.35 | 4,20 | 0.089 |  | 1.22 | 56,280§ | 0.155 |  |
|  | mesophilous | 0.46 | 4,20 | 0.766 |  | 1.26 | 60,300 | 0.112 |  |
|  | xerophilous | 0.94 | 4,20 | 0.461 |  | 0.64 | 44,220§ | 0.960 |  |
| Breeding period |
|  | spring | 2.39 | 4,20 | 0.085 |  | 0.81 | 60,300 | 0.833 |  |
|  | summer | 2.79 | 4,20 | 0.055 |  | 1.37 | 52,260§ | 0.059 |  |
|  | autumn | 0.48 | 4,20 | 0.750 |  | 1.22 | 60,300 | 0.142 |  |
| Food specialization |
|  | carnivorous | 0.49 | 4,20 | 0.740 |  | 1.27 | 60,300 | 0.105 |  |
|  | granivorous‡ |  |  |  |  |  |  |  |  |
|  | omnivorous | 1.05 | 4,20 | 0.401 |  | 0.82 | 60,300 | 0.816 |  |

†Treatment with significantly lower abundance is stated as the first one

‡Not enough number of species for statistical comparison

§Functional categories with lower *df* were not trapped in all sample dates



**Fig. S1** Seasonal dynamics of the number of carabid species in the most species-rich categories of functional traits and carabids with affinity to silvicolous habitats in plots with five different treatments (G, GE maize; N, near-isogenic; I, near-isogenic + insecticide; A, reference; B, reference). Means ± SE per 1 plot and 1 day are displayed. The black and grey arrows indicate maize sowing and harvest, respectively. The points in graphs represents sample dates (chronological order): prior to sowing, at maize stages VE, V6 (missing in 2009), VT and R5, and after harvest. The dashed lines indicate sample dates on x-axis.

**Table S10** The results of repeated measures (RM) ANOVA (*F*-, *df*- and *P*-values are explained in Table S2, Tukey HSD test in Table S6). Effects of treatments on the number of carabid species in functional categories. Significant differences are highlighted bold. The results of post-hoc Tukey HSD tests are given only for significantly different treatments (G, GE maize; I, near-isogenic + insecticide; A, reference; B, reference; maize growth stage V6, six leaves unfolded).

|  |  |  |  |
| --- | --- | --- | --- |
| Trait | Category | Effect of category | Interaction: category x sample date |
| *F* | *df* | *P* | Tukey HSD† | *F* | *df* | *P* | Tukey HSD† |
| Body size |
|  | 1‡ |  |  |  |  |  |  |  |  |
|  | 2 | 0.78 | 4,20 | 0.552 |  | 1.20 | 60,300 | 0.163 |  |
|  | **3** | **3.27** | **4,20** | **0.032** | **I x B: 0.019** | 0.72 | 60,300 | 0.937 |  |
|  | 4 | 1.08 | 4,20 | 0.394 |  | 0.64 | 56,280§ | 0.976 |  |
| Habitat affinity |
|  | eurytopic | 0.43 | 4,20 | 0.784 |  | 0.79 | 56,280§ | 0.852 |  |
|  | **open biotopes** | **3.95** | **4,20** | **0.016** | **I x B: 0.010** | 0.94 | 60,300 | 0.611 |  |
|  | silvicolous | 2.56 | 4,20 | 0.070 |  | **1.55** | **52,260**§ | **0.014** | **2011: V6:** **I x G: 0.002; A x G: 0.002** |
| Humidity affinity |
|  | eurytopic | 2.06 | 4,20 | 0.125 |  | 0.67 | 56,280§ | 0.964 |  |
|  | **hygrophilous** | **5.30** | **4,20** | **0.004** | **I x G: 0.007; I x B: 0.020** | 0.99 | 56,280§ | 0.496 |  |
|  | mesophilous | 1.36 | 4,20 | 0.284 |  | 0.96 | 56,280§ | 0.554 |  |
|  | xerophilous | 1.64 | 4,20 | 0.203 |  | 1.25 | 40,200§ | 0.160 |  |
| Breeding period |
|  | **spring** | **4.23** | **4,20** | **0.012** | **I x B: 0.006** | 0.58 | 60,300 | 0.994 |  |
|  | summer | 1.00 | 4,20 | 0.430 |  | 0.91 | 52,260§ | 0.656 |  |
|  | autumn | 1.12 | 4,20 | 0.376 |  | 1.16 | 60,300 | 0.218 |  |
| Food specialization |
|  | **carnivorous** | **5.39** | **4,20** | **0.004** | **I x G: 0.006; I x B: 0.014** | 1.02 | 60,300 | 0.434 |  |
|  | granivorous‡ |  |  |  |  |  |  |  |  |
|  | omnivorous | 2.84 | 4,20 | 0.051 |  | 0.83 | 60,300 | 0.813 |  |

†Treatment with significantly lower abundance is stated as the first one in each compared pair

‡Not enough number of species for statistical comparison

§Functional categories with lower *df* were not trapped in some sample dates

**Table S11** Significant results of the chi-square (*χ2*) test for trend accompanied by degrees of freedom (*df*) with Bonferroni correction of significance level (*P* = 0.005) for Boltzmann sigmoidal growth model of species accumulations curves (rarefaction) for the carabid functional categories in plots with different treatments (G, GE maize; N, near-isogenic; I, near-isogenic + insecticide; A, reference; B, reference).

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Trait | Category† | Treatment comparison | *χ2* (*df* = 1) | *P* |  | Trait | Category† | Treatment comparison | *χ2* (*df* = 1) | *P* |
| Body size |  |  | I x A | 184.31 | < 10-3 |
|  | 1‡ |  |  |  |  |  | I x B | 94.24 | < 10-3 |
|  | 2 | G x N | 11.22 | < 10-3 |  |  | A x B | 41.94 | < 10-3 |
|  | N x A | 17.87 | < 10-3 |  |  | xerophilous | n.s. § |  |  |
|  | N x B | 10.01 | 0.002 |  | Breeding period |  |  |  |
|  | A x B | 8.62 | 0.003 |  |  | *spring* | G x N | 29.58 | < 10-3 |
|  | *3* | G x A | 69.18 | < 10-3 |  |  | G x A | 139.96 | < 10-3 |
|  | A x B | 103.80 | < 10-3 |  |  | G x B | 10.33 | 0.001 |
|  | 4 | n.s. § |  |  |  |  | N x I | 10.66 | 0.001 |
| Habitat affinity |  |  | N x B | 51.08 | < 10-3 |
|  | eurytopic | G x N | 326.87 | < 10-3 |  |  | A x B | 112.57 | < 10-3 |
|  | G x I | 23.85 | < 10-3 |  |  | summer | n.s. § |  |  |
|  | G x A | 51.23 | < 10-3 |  |  | autumn | G x N | 10.38 | 0.001 |
|  | G x B | 14.81 | < 10-3 |  |  | G x B | 26.17 | < 10-3 |
|  | N x I | 59.54 | < 10-3 |  |  | N x A | 14.59 | < 10-3 |
|  | N x A | 440.08 | < 10-3 |  |  | N x B | 80.98 | < 10-3 |
|  | N x B | 776.67 | < 10-3 |  |  | I x B | 12.18 | < 10-3 |
|  | I x A | 149.20 | < 10-3 |  |  | A x B | 8.23 | 0.004 |
|  | I x B | 61.14 | < 10-3 |  | Food specialization |
|  | A x B | 20.74 | < 10-3 |  |  | *carnivorous* | G x N | 209.70 | < 10-3 |
|  | *open biotopes* | G x A | 81.23 | < 10-3 |  |  | G x B | 16.08 | < 10-3 |
|  | G x B | 12.50 | < 10-3 |  |  | N x I | 13.93 | < 10-3 |
|  | N x A | 47.76 | < 10-3 |  |  | N x A | 64.48 | < 10-3 |
|  | I x A | 21.01 | < 10-3 |  |  | N x B | 469.26 | < 10-3 |
|  | A x B | 42.57 | < 10-3 |  |  | I x B | 24.95 | < 10-3 |
|  | silvicolous | n.s. § |  |  |  |  | A x B | 26.95 | < 10-3 |
| Humidity affinity |  |  | granivorous‡ |  |  |  |
|  | eurytopic | G x B | 10.90 | 0.001 |  |  | omnivorous | G x N | 26.06 | < 10-3 |
|  | *hygrophilous* | G x B | 15.58 | < 10-3 |  |  | G x A | 159.92  | < 10-3 |
|  | A x B | 19.31 | < 10-3 |  |  | G x B | 64.93 | < 10-3 |
|  | mesophilous | G x N | 573.09 | < 10-3 |  |  | N x I | 17.11 | < 10-3 |
|  | G x A | 303.28 | < 10-3 |  |  | N x A | 68.16 | < 10-3 |
|  | G x B | 227.35 | < 10-3 |  |  | I x A | 82.48 | < 10-3 |
|  | N x I | 270.25 | < 10-3 |  |  | I x B | 14.83 | < 10-3 |
|  | N x B | 124.90 | < 10-3 |  |  | A x B | 53.77 | < 10-3 |

†Categories with highest activity abundance, underlined; Categories with highest number of species, italic

‡Not enough number of individuals and species for statistical comparison

§n.s.: no significant differences among treatments

**Table S12** The results of Monte Carlo permutation tests (MCPT, *F*-test, 5 % *P*-value of significance level) showing correlation of the carabid functional categories with experimental treatments (G, GE maize; N, near-isogenic; I, near-isogenic + insecticide; A, reference; B, reference) and time variables. Significant differences are highlighted bold.

|  |  |  |
| --- | --- | --- |
| Environmental variable | Explained variability (%) | MCPT |
| *F* | *P* |
| G | 0 | 0.41 | 0.858 |
| N | 0 | 0.55 | 0.895 |
| I | 0.1 | 1.73 | 0.427 |
| A | 0 | 0.88 | 0.665 |
| B | 0.1 | 2.09 | 0.365 |
| **2009** | **14.3** | **332.98** | **0.001** |
| 2010 | 0.2 | 3.82 | 0.750 |
| **2011** | **10.6** | **236.53** | **0.001** |
| **Sample date** | **14.2** | **330.81** | **0.001** |