**Supporting information**

**Structural elements enhanced by retention forestry promote forest and non-forest specialist bees and wasps**

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**Contents**

Figure S1 Map of the study area including plot geolocations 2

Figure S2 Species accumulation curve 3

Table S1 Summary information of species collected, habitat and red list status 4-5

Table S2 Spearman coefficients for pairwise comparisons of environmental variables 6

Table S3 Results of Moran’s I calculations 7

Table S4 Results of variance inflation factor calculations 8

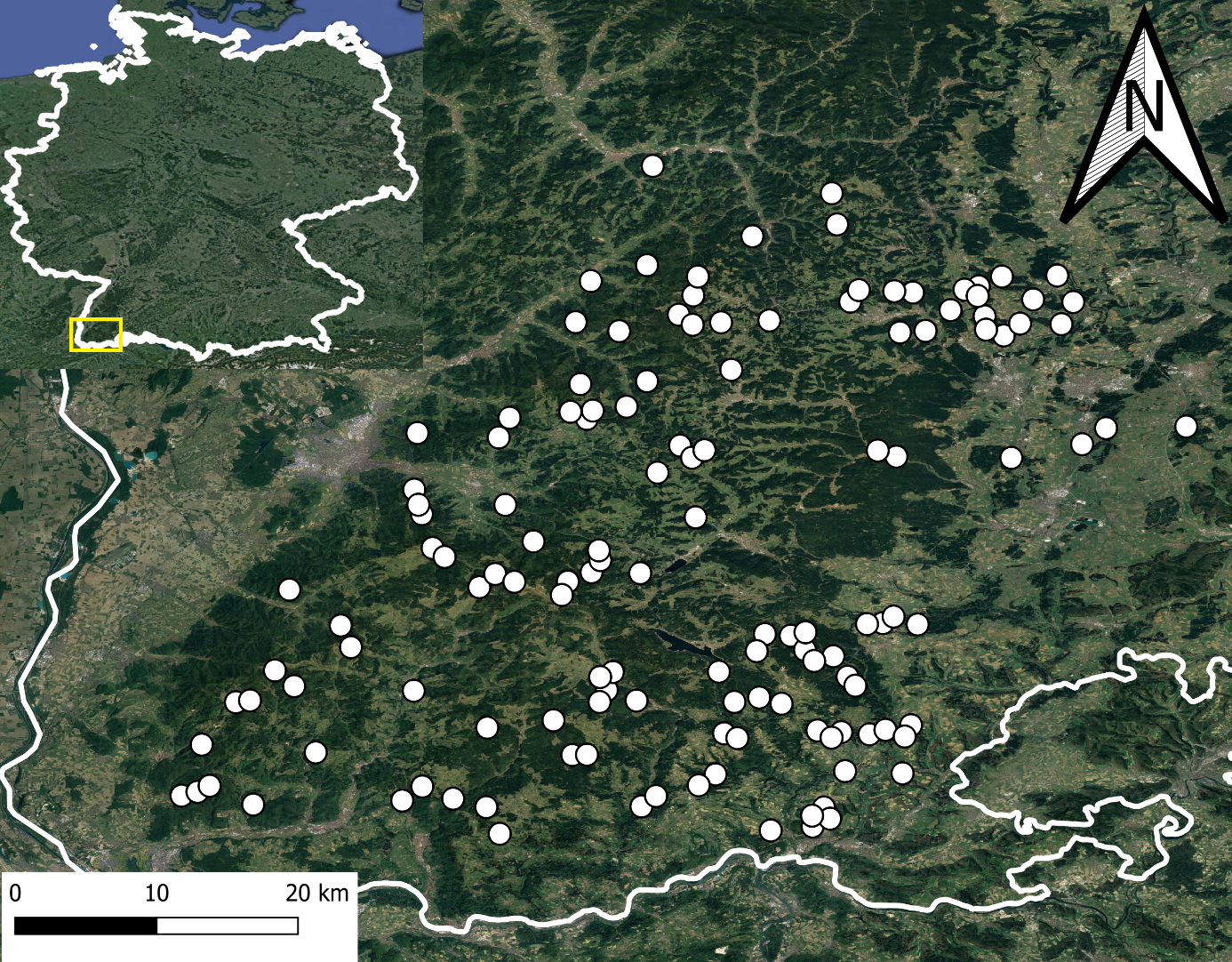
Table S5 Regression coefficients of biodiversity models 9

Table S6 Results of fitting environmental variables to ordination of all species 10

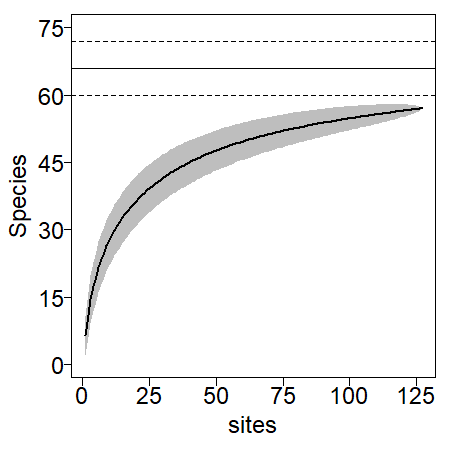
Table S7 Results of fitting environmental variables to ordination of forest specialists 11

Table S8 Results of fitting environmental variables to ordination of non-forest specialists 12

References cited in supporting information 13-14

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**Figure. S1**. Map of the 135 ConFoBi research plots in the southern Black Forest, Baden-Württemberg, Germany. White points correspond to plot geolocations (latitude and longitude of plot centers).

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**Figure S2.** Species accumulation curve of cavity-nesting Hymenoptera sampled over 127 sites in the southern Black Forest. Observed cumulative species richness is represented by the solid line, with 95% CI shown as a grey polygon. Total species richness (extrapolated) based on jackknife1 estimators is represented by a horizontal line (solid) with 95% CI (dashed lines). In total, 57 species (86% of expected total species richness) were collected.

**Table S1**. Species collected and corresponding habitat specialization, number of nests, total abundance and red list status. Commonly used synonyms and identification literature are listed for relevant taxa. Red list status is indicated if applicable, with corresponding German red list value and category in parentheses. The five most common species by abundance are listed in bold.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Species | Habitat specialization | Nests | Abundance | Identification/  classification literature | Red-list status |
| *Agenioideus*  *cinctellus* | Non-forest specialist | 6 | 12 | Day (1988) |  |
| *Ampulex*  *fasciata* | Forest specialist | 3 | 9 | Blösch, (2000), Jacobs (2007) | 3, threatened |
| *Ancistrocerus*  *antilope*  *claripennis*  *gazella*  *longispinosus*  *nigricornis*  *scoticus*  ***trifasciatus***  sp. | Forest specialist  Forest specialist  Forest specialist  Forest specialist  Non-forest specialist  Forest specialist  **Forest specialist**  unassigned | 6  17  4  1  6  5  **341**  59 | 17  67  4  5  16  9  **1142**  199 | Schmid-Egger (1994), Bellmann (2010) | 2, endangered |
| *Auplopus*  *carbonarius* | Forest-specialist | 9 | 39 | Day (1988) |  |
| *Chelostoma*  *florisomne* | Non-forest specialist | 4 | 29 | Amiet et al. (2004) |  |
| *Deuteragenia (Dipogon)*  *bifasciata (bifasciatus)*  ***subintermedia (subintermedius)***  *variegata (variegatus)*  sp. | Forest specialist  **Forest specialist**  Forest specialist  unassigned | 112  **916**  95  40 | 298  **2449**  272  53 | Day (1988) |  |
| *Discoelius*  *zonalis* | Forest specialist | 22 | 69 | Schmid-Egger (1994) | 3, threatened |
| *Ectemnius*  *rubicola* | Non-forest specialist | 3 | 4 | Blösch (2000), Jacobs (2007) |  |
| Eumeninae sp. | unassigned | 188 | 671 |  |  |
| *Heriades*  *truncorum*  sp. | Forest specialist  unassigned | 144  3 | 601 | Amiet et al. (2004), Westrich (2018), Amiet & Krebs (2012) |  |
| *Hylaeus*  *communis*  *confusus*  ***difformis***  *hyalinatus*  *leptocephalus*  *signatus*  sp. | Non-forest specialist  Forest specialist  **Forest specialist**  Non-forest specialist  Non-forest specialist  Forest specialist  unassigned | 71  13  **206**  3  1  19  22 | 271  54  **778**  19  2  71  46 | Amiet et al. (1999), Westrich (2018), Amiet & Krebs (2012) |  |
| *Isodontia*  *mexicana* | Non-forest specialist | 8 | 23 | Blösch (2000), Jacobs (2007), Scaramozzino (1991) |  |
| *Megachile*  *alpicola*  *lapponica*  *ligniseca*  *versicolor*  sp. | Forest specialist  Forest specialist  Forest specialist  Forest specialist  unassigned | 1  16  3  24  4 | 8  73  12  117  19 | Amiet et al. (2004), Westrich (2018), Amiet & Krebs (2012) | 2, endangered |
| *Nitela*  *borealis*  *spinolae* | Forest specialist  Forest specialist | 21  2 | 38  5 | Blösch (2000), Jacobs (2007) |  |
| *Osmia*  *bicornis*  *cerulescens*  *leaiana* | Non-forest specialist  Non-forest specialist  Non-forest specialist | 13  1  13 | 68  3  112 | Amiet et al. (2004), Westrich (2018), Amiet & Krebs (2012) | 3, threatened |
| *Passaloecus*  *corniger*  *eremita*  ***insignis***  *singularis*  sp. | Forest specialist  Forest specialist  **Forest specialist**  Forest specialist  unassigned | 200  21  **208**  5  33 | 337  31  **1248**  18  52 | Blösch (2000), Jacobs (2007) |  |
| *Pemphredon*  *beaumonti*  *lugens*  *lugubris*  sp. | Forest specialist  Forest specialist  Forest specialist  unassigned | 1  51  3  6 | 2  190  7  15 | Blösch (2000), Jacobs (2007) | Not assessed |
| *Rhopalum*  *clavipes* | Forest specialist | 17 | 116 | Blösch (2000), Jacobs (2007) |  |
| *Spilomena*  *differens* | Non-forest specialist | 5 | 33 | Blösch (2000), Jacobs (2007) |  |
| *Symmorphus*  *allobrogus*  *bifasciatus*  *connexus*  *crassicornis*  *debilitatus*  *fuscipes*  *gracilis*  *murarius*  sp. | Forest specialist  Forest specialist  Non-forest specialist  Forest specialist  Non-forest specialist  Non-forest specialist  Forest specialist  Non-forest specialist  unassigned | 79  90  2  90  2  2  140  21  16 | 165  243  8  235  2  7  325  44  31 | Schmid-Egger (1994), Bellmann (2010) | 3, threatened  2, endangered |
| *Trypoxylon*  *beaumonti*  *clavicerum*  *deceptorium*  ***figulus***  *kolazyi*  *kostylevi*  *minus*  sp. | Non-forest specialist  Forest specialist  Non-forest specialist  **Non-forest specialist**  Non-forest specialist  Non-forest specialist  Forest specialist  unassigned | 30  226  5  **1522**  7  22  28  105 | 78  548  16  **4452**  11  63  82  180 | Blösch (2000), Jacobs (2007) | Not assessed |

**Table S2.** Spearman correlation coefficients (*ρ*) for all pairwise comparisons of environmental variables. Abbreviations are as follows: DBH, diameter at breast height; ENL, effective number of layers or 1-meter forest strata; SSCI, stand structural complexity index.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Canopy cover (%) | Deadwood DBH (lying) | Deadwood DBH (standing) | Deciduous tree share (%) | ENL | Elevation | Forest cover | Herb cover (%) | SSCI | Understory species richness |
| Canopy cover (%) | 1 | -0.38 | 0.05 | 0.25 | -0.11 | -0.34 | <-0.01 | -0.24 | 0.03 | -0.11 |
| Deadwood DBH (lying) |  | 1 | <0.01 | 0.25 | 0.05 | 0.09 | 0.15 | 0.12 | 0.05 | 0.12 |
| Deadwood DBH (standing) |  |  | 1 | -0.10 | -0.07 | 0.09 | 0.10 | -0.12 | -0.01 | 0.03 |
| Deciduous tree share (%) |  |  |  | 1 | -0.32 | -0.28 | 0.08 | -0.29 | 0.29 | 0.03 |
| ENL |  |  |  |  | 1 | 0.02 | 0.04 | 0.41 | -0.19 | 0.12 |
| Elevation |  |  |  |  |  | 1 | 0.13 | 0.21 | -0.02 | -0.18 |
| Forest cover |  |  |  |  |  |  | 1 | -0.16 | <-0.01 | -0.22 |
| Herb cover (%) |  |  |  |  |  |  |  | 1 | -0.19 | 0.20 |
| SSCI |  |  |  |  |  |  |  |  | 1 | 0.05 |
| Understory species richness |  |  |  |  |  |  |  |  |  | 1 |

**Table S3.** Results of Moran’s I calculations for assessing potential spatial autocorrelation in model residuals. Each model contained the same set of forest variables summarized in Table 1.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Model** | **Observed Moran’s I** | **Expected Moran’s I** | **Standard deviation** | **P value** |
| Total abundance | -0.024 | -0.008 | 0.005 | 0.845 |
| Total diversity | -0.013 | -0.008 | 0.005 | 0.845 |
| Total richness | -0.024 | -0.008 | 0.005 | 0.998 |
| Forest specialist abundance | -0.019 | -0.008 | 0.005 | 0.994 |
| Forest specialist diversity | -0.013 | -0.008 | 0.005 | 0.876 |
| Forest specialist richness | -0.018 | -0.008 | 0.005 | 0.987 |
| Non-forest specialist abundance | -0.020 | -0.008 | 0.005 | 0.995 |
| Non-forest specialist diversity | -0.011 | -0.008 | 0.005 | 0.771 |
| Non-forest specialist richness | -0.013 | -0.008 | 0.005 | 0.843 |

**Table S4.** Results of variance inflation factor calculations for each environmental variable included in analyses of abundance, Shannon diversity and species richness of cavity-nesting Hymenoptera. Calculations were performed using the “vif” function (R package “car”). Abbreviations are as follows: DBH, diameter at breast height; ENL, effective number of layers or 1-meter forest strata; SSCI, stand structural complexity index.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Abundance | Forest specialist abundance | Non-forest specialist abundance | Diversity | Forest specialist diversity | Non-forest specialist diversity | Richness | Forest specialist richness | Non-forest specialist richness |
| Canopy cover (%) | 1.488 | 1.480 | 1.489 | 1.504 | 1.504 | 1.504 | 1.413 | 1.407 | 1.422 |
| Deadwood DBH sum (standing) | 1.082 | 1.082 | 1.083 | 1.081 | 1.081 | 1.081 | 1.105 | 1.110 | 1.127 |
| Deadwood DBH sum (lying) | 1.453 | 1.433 | 1.468 | 1.465 | 1.465 | 1.465 | 1.395 | 1.393 | 1.417 |
| Deciduous tree share (%) | 1.667 | 1.666 | 1.687 | 1.659 | 1.659 | 1.659 | 1.723 | 1.723 | 1.819 |
| ENL | 1.358 | 1.360 | 1.357 | 1.352 | 1.352 | 1.352 | 1.439 | 1.450 | 1.542 |
| Elevation | 1.364 | 1.360 | 1.389 | 1.357 | 1.357 | 1.358 | 1.402 | 1.412 | 1.426 |
| Forest cover (%) | 1.167 | 1.169 | 1.162 | 1.166 | 1.167 | 1.166 | 1.214 | 1.222 | 1.287 |
| Herb cover (%) | 1.474 | 1.474 | 1.470 | 1.478 | 1.478 | 1.478 | 1.471 | 1.486 | 1.453 |
| SSCI | 1.149 | 1.148 | 1.163 | 1.141 | 1.141 | 1.141 | 1.182 | 1.184 | 1.197 |
| Understory species richness | 1.195 | 1.196 | 1.182 | 1.201 | 1.201 | 1.201 | 1.204 | 1.211 | 1.241 |

**Table S5**. Regression coefficients of negative binomial generalized linear models (abundance), linear models (diversity), and negative binomial generalized linear models (species richness), analyzing values for each among total cavity-nesting Hymenoptera, forest specialist and non-forest specialist taxa. Significant fixed effects are displayed in bold.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Abundance | Forest specialist abundance | Non-forest specialist abundance | Diversity | Forest specialist diversity | Non-forest specialist diversity | Richness | Forest specialist richness | | Non-forest specialist richness | |
|  | Est. z-value  ±SE p-value | Est. z-value  ±SE p-value | Est. z-value  ±SE p-value | Est. t-value  ±SE p-value | Est. t-value  ±SE p-value | Est. t-value  ±SE p-value | Est. z-value  ±SE p-value | | Est. z-value  ±SE p-value | | Est. z-value  ±SE p-value | |
| Canopy cover (%) | **-0.296 -4.336**  **0.068 < 0.001** | **-0.254 -3.973**  **0.064 < 0.001** | **-0.472 -2.905**  **0.162 0.004** | **-0.141 -2.832**  **0.049 0.005** | **-0.113 -2.267**  **0.049 0.025** | **-0.087 -2.310**  **0.038 0.023** | **-0.169 -3.505**  **0.048 < 0.001** | | **-0.152 -3.187**  **0.048 0.001** | | **-0.234 -2.811**  **0.083 0.005** | |
| Deadwood DBH sum (standing) | **0.248 4.283**  **0.058 < 0.001** | **0.199 3.677**  **0.054 < 0.001** | **0.349 2.530**  **0.138 0.011** | 0.077 1.814  0.042 0.072 | **0.097 2.292**  **0.042 0.024** | 0.040 1.255  0.032 0.212 | **0.148 3.458**  **0.043 < 0.001** | | **0.133 3.137**  **0.042 0.002** | | **0.189 2.480**  **0.077 0.013** | |
| Deadwood DBH sum (lying) | -0.111 -1.631  0.068 0.103 | **-0.142 -2.229**  **0.064 0.026** | -0.006 -0.037  0.161 0.971 | -0.033 -0.680  0.049 0.498 | -0.045 -0.917  0.049 0.361 | -0.039 -1.061  0.037 0.291 | -0.057 -1.098  0.052 0.272 | | -0.050 -0.966  0.052 0.334 | | -0.099 -1.033  0.097 0.302 | |
| Deciduous tree share (%) | -0.052 -0.714  0.072 0.475 | 0.042 0.621  0.067 0.535 | **-0.372 -2.131**  **0.174 0.033** | -0.041 -0.774  0.052 0.440 | -0.063 -1.200  0.052 0.233 | 0.069 1.744  0.039 0.084 | -0.025 -0.457  0.054 0.648 | | -0.033 -0.613  0.053 0.539 | | 0.042 0.435  0.096 0.664 | |
| ENL | 0.056 0.869  0.065 0.385 | 0.071 1.171  0.061 0.242 | -0.042 -0.269  0.154 0.788 | 0.037 0.779  0.047 0.437 | 0.045 0.961  0.047 0.338 | 0.017 0.481  0.036 0.631 | 0.039 0.813  0.048 0.416 | | 0.025 0.536  0.047 0.592 | | 0.084 0.996  0.084 0.319 | |
| Elevation | **-0.563 -8.607**  **0.065 < 0.001** | **-0.484 -7.902**  **0.061 < 0.001** | **-0.878 -5.583**  **0.157 < 0.001** | **-0.282 -5.960**  **0.047 < 0.001** | **-0.309 -6.534**  **0.047 < 0.001** | **-0.093 -2.583**  **0.036 0.011** | **-0.347 -7.018**  **0.049 < 0.001** | | **-0.315 -6.426**  **0.049 < 0.001** | | **-0.416 -4.623**  **0.090 < 0.001** | |
| Forest cover (%) | -0.046 -0.767  0.060 0.443 | 0.039 0.698  0.056 0.485 | -0.228 -1.596  0.143 0.110 | -0.031 -0.707  0.044 0.481 | 0.013 0.307  0.044 0.759 | -0.053 -1.588  0.033 0.115 | -0.032 -0.749  0.042 0.454 | | 0.006 0.142  0.042 0.887 | | **-0.156 -2.097**  **0.069 0.036** | |
| Herb cover (%) | **0.156 2.302**  **0.068 0.021** | **0.153 2.414**  **0.064 0.016** | 0.224 1.384  0.162 0.166 | 0.025 0.503  0.049 0.616 | 0.039 0.781  0.049 0.436 | 0.042 1.117  0.037 0.266 | -0.065 1.296  0.049 0.195 | | 0.061 1.219  0.049 0.223 | | 0.049 0.567  0.086 0.570 | |
| SSCI | **0.261 4.373**  **0.059 < 0.001** | **0.193 3.463**  **0.056 < 0.001** | **0.468 3.280**  **0.143 0.001** | **0.113 2.596**  **0.043 0.011** | **0.144 3.321**  **0.043 0.001** | 0.034 1.028  0.033 0.306 | **0.163 3.864**  **0.042 < 0.001** | | **0.159 3.866**  **0.041 < 0.001** | | **0.159 2.103**  **0.076 0.036** | |
| Understory species richness | 0.108 1.773  0.061 0.076 | 0.100 1.756  0.057 0.079 | 0.140 0.965  0.145 0.334 | **0.103 2.324**  **0.045 0.022** | 0.085 1.913  0.045 0.058 | 0.042 1.232  0.034 0.221 | **0.094 2.157**  **0.044 0.031** | | 0.081 1.867  0.043 0.062 | | 0.147 1.948  0.075 0.051 | |

**Table S6**. Summary results from permutation tests (‘envfit’, 1000 permutations) fitting forest variables to NMDS (‘metaMDS’, 1000 permutations) of all species of cavity-nesting Hymenoptera. Significant correlations (p<0.05) are displayed in bold.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Forest Variable** | **NMDS1** | **NMDS2** | **R2** | **p value** |
| **Canopy cover** | **-0.996** | **-0.086** | **0.151** | **< 0.001** |
| Deadwood DBH (lying) | 0.999 | -0.017 | 0.012 | 0.496 |
| Deadwood DBH (standing) | 0.993 | -0.119 | 0.004 | 0.774 |
| Deciduous tree share (%) | 0.293 | 0.956 | 0.017 | 0.369 |
| ENL | 0.864 | -0.503 | 0.001 | 0.927 |
| **Elevation** | **-0.708** | **-0.706** | **0.072** | **0.011** |
| Forest cover | -0.902 | -0.432 | 0.024 | 0.238 |
| **Herb cover (%)** | **0.972** | **-0.233** | **0.065** | **0.027** |
| **SSCI** | **0.775** | **0.632** | **0.073** | **0.007** |
| **Understory species richness** | **0.999** | **0.038** | **0.064** | **0.021** |

**Table S7**. Summary results from permutation tests (‘envfit’, 1000 permutations) fitting forest variables to NMDS (‘metaMDS’, 1000 permutations) of forest specialist cavity-nesting Hymenoptera. Significant correlations (p<0.05) are displayed in bold.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Forest Variable** | **NMDS1** | **NMDS2** | **R2** | **p value** |
| **Canopy cover** | **-0.945** | **0.327** | **0.184** | **< 0.001** |
| Deadwood DBH (lying) | 0.909 | -0.417 | 0.051 | 0.055 |
| Deadwood DBH (standing) | -0.818 | 0.575 | 0.003 | 0.876 |
| **Deciduous tree share (%)** | **0.670** | **-0.742** | **0.053** | **0.038** |
| ENL | 0.662 | -0.749 | 0.002 | 0.912 |
| **Elevation** | **-0.623** | **0.782** | **0.056** | **0.032** |
| Forest cover | -0.329 | 0.944 | 0.006 | 0.713 |
| Herb cover (%) | 0.999 | -0.040 | 0.047 | 0.067 |
| **SSCI** | **0.482** | **-0.876** | **0.056** | **0.033** |
| **Understory species richness** | **0.945** | **-0.328** | **0.081** | **0.008** |

**Table S8**. Summary results from permutation tests (‘envfit’, 1000 permutations) fitting forest variables to NMDS (‘metaMDS’, 1000 permutations) of non-forest specialist cavity-nesting Hymenoptera. Significant correlations (p<0.05) are displayed in bold.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Forest Variable** | **NMDS1** | **NMDS2** | **R2** | **p value** |
| Canopy cover | 0.750 | 0.661 | 0.011 | 0.567 |
| Deadwood DBH (lying) | -0.969 | -0.249 | 0.019 | 0.364 |
| Deadwood DBH (standing) | 0.333 | -0.943 | 0.028 | 0.243 |
| Deciduous tree share (%) | 0.221 | 0.975 | 0.003 | 0.894 |
| ENL | -0.587 | 0.809 | 0.004 | 0.804 |
| Elevation | -0.931 | -0.556 | 0.035 | 0.191 |
| **Forest cover** | **-0.498** | **0.867** | **0.061** | **0.044** |
| Herb cover (%) | 0.939 | -0.344 | 0.026 | 0.284 |
| SSCI | 0.223 | -0.975 | 0.028 | 0.261 |
| **Understory species richness** | **0.888** | **-0.461** | **0.071** | **0.027** |

**References cited in supporting information**

Amiet, F., Neumeyer, R., Müller, A., 1999. Fauna Helvetica 4: Apidae II, Colletes, Dufourea, Hylaeus, Nomia, Nomioides, Rhophitoides, Rophites, Sphecodes, Systropha. Schweizerische Entomologische Gesellschaft (SEG), Neuchâtel, Switzerland.

Amiet, F., Herrmann, M., Müller, A., Neumeyer, R., 2004. Fauna Helvetica 9: Apidae IV, Anthidium, Chelostoma, Coelioxys, Dioxys, Heriades, Lithurgus, Megachile, Osmia, Stelis. Schweizerische Entomologische Gesellschaft (SEG), Neuchâtel, Switzerland.

Amiet, F., Krebs, A., 2012. Bienen Mitteleuropas, Gattungen, Lebensweise, Beobachtung. Haupt Berne, Switzerland.

Bellmann, H., 2010. Bienen, Wespen, Armeisen. Kosmos Verlags GmbH & Co. Stuttgart, Germany.

Blösch, M., 2000. Hymenoptera II: Die Grabwespen Deutschlands, Lebensweise, Verhalten, Verbreitung. Goecke & Evers, Keltern, Germany.

Day, M.C., 1988. Spider wasps. Hymenoptera: Pompilidae. R. Entomol. Lond. 60p.

Jacobs, H.J., 2007. Hymenoptera III: Die Grabwespen Deutschlands. Goecke & Evers, Keltern, Germany.

Scaramozzino, P.L., Currado, I., Vergano, G., Tromellini, C., 1991. Nesting behavior of adventive *Isodontia mexicana* (Saussure)in Piedmont (Italy Northwest) (Hymenoptera: Sphecidae). Ethol. Ecol. Evol. Special issue 1, 39-42. https://doi.org/10.1080/03949370.1991.10721906.

Schmid-Egger, C., 1994. Bestimmungsschlüssel für die deutschen Arten der solitären Faltenwespen (Hymenoptera: Eumeninae). Deutscher Jugendbund für Naturbeobachtung (DJN), Hamburg, Germany.

Schmid-Egger, C., 2010. Rote Liste der Wespen Deutschlands. Ampulex - Zeitschrift für aculeate Hymenopteren, Band 1.

Westrich, P., Schwenninger, H.R., Herrmann, M., Klatt, M., Klemm, M., Prosi, R., Schanowski, A., 2000. Rote Liste der Bienen Baden-Württembergs. Landesanstalt für Umweltschutz.

Westrich, P., Frommer, U., Mandery, K., Riemann, H., Ruhnke, H., Saure, C., Voith, J., 2011. Rote Liste und Gesamtartenliste der Bienen (Hymenoptera, Apidae) Deutschlands. In: Binot-Hafke, M., Balzer, S., Becker, N., Gruttke, H., Haupt, H., Hofbauer, N., Ludwig, G., Matzke-Hajek, G., Strauch, M. Rote Liste gefährdeter Tiere, Pflanzen und Pilze Deutschlands. Band 3: Wirbellose Tiere (Teil 1). – Münster (Landwirtschaftsverlag). – Naturschutz und Biologische Vielfalt 70 (3): 373-416.

Westrich, P., 2018. Die Wildbienen Deutschlands. Eugen Ulmer KG, Stuttgart, Germany.