**Appendix A**

**Details for the definitions and calculations of beta-sim (βsim) and beta-morisita (βmorisita) indexes:**

(a) presence–absence metric, beta-sim (Simpson, 1949; Lennon et al., 2001; Koleff et al., 2003):

 (1)

In Equation (1), *a* represents the number of species shared between the focal and contrasted assemblages, *b* represents the number of species unique to the contrasted assemblage, and *c* represents the number of species unique to the focal assemblage and absent from the contrasted assemblage.

(b) abundance-based metric, beta-morisita (Morisita, 1959):

 (2)

 (3)

 (4)

 represents the number of individuals of species *i* in assemblage *j*.  represents the number of individuals of species *i* in assemblage *k*.  represents the total number of individuals in assemblage *j*.  represents the total number of individuals in assemblage *k*.



Koleff, P., Gaston, K.J., Lennon, J.J., 2003. Measuring beta diversity for presence-absence data. Journal of Animal Ecology 72, 367-382.

Lennon, J.J., Koleff, P., Greenwood, J.J.D., Gaston, K.J., 2001. The geographical structure of British bird distributions: diversity, spatial turnover and scale. Journal of Animal Ecology 70, 966-979.

Morisita, M., 1959. Measuring the dispersion of individuals and analysis of the distribution pattern. Memories of the Faculty of Science, Kyushu University, Series E (Biology) 2, 215-235.

Simpson, E.H., 1949. Measurement of diversity. Nature 163, 688.

Figure S1 Sketch map of the sampling area (a) and sampling plots (b, c) with elevation marked (d) on Dongling Mountain. The 10 transects (with lengths ranging from 80 to 180 m according to the oak distributions) each occupy a different elevational segment of the slopes, together forming a single montane forest elevational gradient. For each transect (T), we show in brackets the the total number of the 10 × 10 m plots (n).

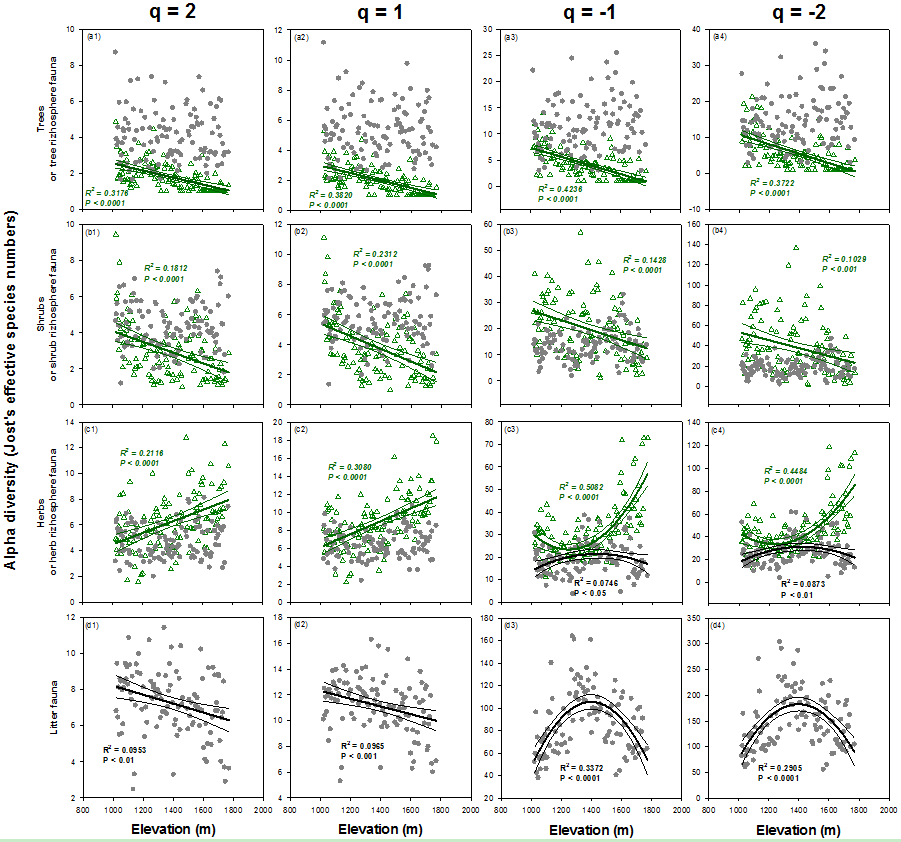


Figure S2 Elevational alpha diversity of soil fauna and plants (Jost's effective species numbers) on Dongling Mountain, China. Gray filled circles represent soil fauna and green hollow triangles represent plants. The higher the q value is, the higher is the weight of abundant species reflected by the diversity index. q = 2 and q = 1 represent elevational diversity patterns of abundant taxa. q = -1 and q = -2 represent elevational diversity patterns of rare taxa. Dark green regression lines refer to plants, whereas the black regression lines refer to soil fauna. R2 and p values are presented when elevational diversity patterns are found. Dark green italic text shows R2 and p values for plants, and black bold text shows R2 and p values for soil fauna. Regression lines are only included where significant correlations were detected.

**Table S1** Total number of individuals (abundance) of litter fauna and rhizosphere fauna caught on the elevational gradient on Dongling Mountain. We were unable to identify all the invertebrates to species level or genus level because of the large samples and amounts of larvae, and therefore we analyzed the taxa diversity at family or morphospecies level.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Class | Order | Family | Litter faun | Tree rhizosphere fauna | Shrub rhizposphere fauna | Herb rhizosphere fauna |
| Arachnida | Acariformes | Oribatida *sp1.* | 2275 | 130 | 220 | 489 |
| Arachnida | Acariformes | Oribatida *sp2.* | 9123 | 185 | 253 | 1116 |
| Arachnida | Acariformes | Oribatida *sp3.* | 1143 | 22 | 21 | 159 |
| Arachnida | Acariformes | Oribatida *sp4.* | 984 | 189 | 356 | 244 |
| Arachnida | Acariformes | Prostigmata *spp* | 411 | 3 | 10 | 34 |
| Arachnida | Araneae | Amaurobiidae | 2 |  |  |  |
| Arachnida | Araneae | Anyphaonidae | 13 |  |  |  |
| Arachnida | Araneae | Clubionidae | 80 | 1 | 2 | 2 |
| Arachnida | Araneae | Dysderidae | 21 |  |  |  |
| Arachnida | Araneae | Gnaphosidae | 79 |  |  | 1 |
| Arachnida | Araneae | Hahniidaee | 4 |  |  |  |
| Arachnida | Araneae | Leptonetidae | 3 |  |  |  |
| Arachnida | Araneae | Oonopidae | 71 |  |  |  |
| Arachnida | Araneae | Philodromidae | 16 |  |  |  |
| Arachnida | Araneae | Salticidae | 29 | 2 |  |  |
| Arachnida | Araneae | Segestriidae | 1 |  |  |  |
| Arachnida | Araneae | Sparassidae | 67 | 1 |  | 1 |
| Arachnida | Araneae | Theridiidae | 1 |  |  |  |
| Arachnida | Araneae | Thomisidae | 1 |  |  |  |
| Arachnida | Araneae | Titanoecidae | 25 |  |  |  |
| Arachnida | Araneae | Zodariidae | 37 | 1 |  |  |
| Arachnida | Araneae | Zoropsidae | 2 |  |  | 1 |
| Arachnida | Opiliones | Phalangidae | 1 |  |  |  |
| Arachnida | Opiliones | Phalangiidae | 13 |  |  |  |
| Arachnida | Parasiformes | Mesostigmata *spp.* | 14251 | 1078 | 1720 | 2854 |
| Arachnida | Pseudoscorpiones | Cheiridiidae | 43 |  |  |  |
| Arachnida | Pseudoscorpiones | Neobisiidae | 53 |  |  |  |
| Chilopoda | Geophilomorpha | Geophilidae | 44 | 4 | 6 | 12 |
| Chilopoda | Lithobiomorpha | Lithobiomorpha *spp* | 214 |  |  |  |
| Collembola | Collembola | Entomobryidae | 4042 | 12 | 14 | 20 |
| Collembola | Collembola | Isotomidae | 7114 | 489 | 580 | 1297 |
| Collembola | Collembola | Neanridae | 2091 | 47 | 46 | 101 |
| Collembola | Collembola | Sminthuridae | 852 |  |  |  |
| Collembola | Collembola | Tomoceridae | 2943 | 1 | 1 | 1 |
| Diplopoda | Giomerida | Glomeridae | 11 |  |  |  |
| Diplopoda | Spirostreptida | Onychiuridae | 12 | 1 | 3 |  |
| Diplopoda | Spirobolida | Pseudospirobolellus avernus | 12 | 1 | 2 | 2 |
| Diplura | Diplura | Campodeidae | 70 |  |  |  |
| Gastropoda | Mesogastropoda | Bradybaenidae | 1 |  |  |  |
| Gastropoda | Mesogastropoda | Cyclophoridae | 16 |  | 1 |  |
| Insecta | Coleoptera adults | Carabidae | 21 |  | 1 | 1 |
| Insecta | Coleoptera adults | Cicindelidae adult | 15 | 2 | 4 |  |
| Insecta | Coleoptera adults | Curculionidae adult | 9 |  |  | 1 |
| Insecta | Coleoptera adults | Discolomatidae adult | 1 |  |  |  |
| Insecta | Coleoptera adults | Geotrupidae adults | 4 |  |  |  |
| Insecta | Coleoptera adults | Lucanidae adult | 1 | 1 |  |  |
| Insecta | Coleoptera adults | Mycetophagidae adult | 12 | 1 |  |  |
| Insecta | Coleoptera adults | Mycetophagidae larvae | 2 |  |  |  |
| Insecta | Coleoptera adults | Pselaphidae adult |  |  | 1 |  |
| Insecta | Coleoptera adults | Ptiliidae adult | 23 |  |  | 1 |
| Insecta | Coleoptera adults | Scarabaeidae | 22 | 3 | 2 | 5 |
| Insecta | Coleoptera adults | Scydmaeninae adult |  | 1 | 1 |  |
| Insecta | Coleoptera adults | Siovanidae | 30 | 1 | 1 |  |
| Insecta | Coleoptera adults | Staphylinidae adult | 155 | 3 | 4 | 6 |
| Insecta | Coleoptera larvae | Anthicidae | 1 |  |  |  |
| Insecta | Coleoptera larvae | Cantharidae | 230 | 3 | 10 | 39 |
| Insecta | Coleoptera larvae | Chrysomelidae larvae |  | 1 | 1 | 3 |
| Insecta | Coleoptera larvae | Cleridae larvae | 7 | 5 | 21 | 8 |
| Insecta | Coleoptera larvae | Curculionidae | 29 |  | 1 | 6 |
| Insecta | Coleoptera larvae | Dermestidae larvae | 44 |  | 1 | 1 |
| Insecta | Coleoptera larvae | Elateridae | 7 |  |  |  |
| Insecta | Coleoptera larvae | Pselaphidae larvae | 34 | 8 | 12 | 14 |
| Insecta | Coleoptera larvae | Scolytidae | 13 | 28 | 28 | 41 |
| Insecta | Coleoptera larvae | Silphidae | 68 |  | 4 |  |
| Insecta | Coleoptera larvae | Tenebrionidae | 43 | 11 | 19 | 1 |
| Insecta | Coleoptera larvae | Throscidae larvae | 6 | 2 | 3 | 6 |
| Insecta | Collembola | Onychiuridae | 6492 | 23 | 56 | 235 |
| Insecta | Dermaptera | Chelisochidae | 3 | 3 | 2 |  |
| Insecta | Diptera | Anisopodidae |  |  |  | 1 |
| Insecta | Diptera | Asilidae | 15 |  | 1 | 4 |
| Insecta | Diptera | Bibionidae | 220 | 1 | 22 | 5 |
| Insecta | Diptera | Bombyliidae | 25 | 12 | 8 | 8 |
| Insecta | Diptera | Ceratopogonidae | 215 | 5 | 5 | 7 |
| Insecta | Diptera | Clusiidae | 28 | 6 | 6 | 12 |
| Insecta | Diptera | Diadocidiidae | 2743 | 577 | 634 | 713 |
| Insecta | Diptera | Dolichopodidae | 45 | 8 | 8 | 8 |
| Insecta | Diptera | Empididae | 53 | 64 | 77 | 82 |
| Insecta | Diptera | Hyperoscelididae | 5 | 3 | 12 | 4 |
| Insecta | Diptera | Limoniidae | 1 |  |  |  |
| Insecta | Diptera | Milichiidae | 28 |  |  |  |
| Insecta | Diptera | Muscidae | 5 |  |  |  |
| Insecta | Diptera | Mycetophilidae | 13 | 11 | 4 | 11 |
| Insecta | Diptera | Pachyneuridae | 59 |  |  |  |
| Insecta | Diptera | Phoridae | 697 | 21 | 57 | 52 |
| Insecta | Diptera | Platypezidae | 32 | 2 | 1 | 4 |
| Insecta | Diptera | Scatopsidae | 7 | 4 | 2 | 6 |
| Insecta | Diptera | Sciaridae | 141 | 16 | 8 | 11 |
| Insecta | Diptera | Therevidae |  | 1 |  |  |
| Insecta | Diptera | Tipulidae | 61 | 1 |  | 4 |
| Insecta | Diptera | Trichoceridae |  |  | 1 |  |
| Insecta | Diptera | Xylophagidae | 12 |  | 2 |  |
| Insecta | Hemiptera | Acanthosomatidae | 1 | 1 |  | 2 |
| Insecta | Hemiptera | Cydnidae | 6 |  |  |  |
| Insecta | Hemiptera | Hebridae | 94 | 2 |  |  |
| Insecta | Hemiptera | Pyrrhocoridae | 19 |  | 1 |  |
| Insecta | Hemiptera | Reduviidae | 26 |  |  |  |
| Insecta | Hemiptera | Scutelleridae | 1 |  |  |  |
| Insecta | Hemiptera | Tingidae | 11 |  | 1 |  |
| Insecta | Hemiptera | Veliidae | 12 |  |  |  |
| Insecta | Homoptera | Aphididae | 96 |  | 1 | 3 |
| Insecta | Homoptera | Cicadellidae | 20 | 34 | 17 | 17 |
| Insecta | Homoptera | Cicadidae | 12 |  |  |  |
| Insecta | Homoptera | Margarodidae | 185 |  | 35 | 5 |
| Insecta | Homoptera | Meenoplidae | 2 |  |  |  |
| Insecta | Hymenoptera | Formicidae | 1589 | 41 | 75 | 159 |
| Insecta | Hymenoptera | Pergidae | 84 | 1 | 3 | 3 |
| Insecta | Lepidoptera | Geometridae | 2 |  |  | 1 |
| Insecta | Lepidoptera | Hepialidae | 23 |  |  | 2 |
| Insecta | Lepidoptera | Lymantridae | 6 |  |  | 1 |
| Insecta | Lepidoptera | Lyonetiidae | 9 |  |  |  |
| Insecta | Lepidoptera | Noctuidae | 4 |  |  |  |
| Insecta | Lepidoptera | Notodontidae | 27 |  |  |  |
| Insecta | Lepidoptera | Psychidae | 36 |  | 1 |  |
| Insecta | Lepidoptera | Pyralidae | 39 |  | 8 | 2 |
| Insecta | Lepidoptera | Tortricidae | 23 |  |  |  |
| Insecta | Neuroptera | Chrysopidae | 8 |  |  |  |
| Insecta | Orthoptera | Acrididae | 1 |  |  |  |
| Insecta | Psocoptera | Amphientomidae | 106 | 3 | 5 | 4 |
| Insecta | Psocoptera | Epipsoeidae | 2 |  |  |  |
| Insecta | Psocoptera | Sphaeropsocidae |  |  |  | 15 |
| Insecta | Thysanura | Phlaeothripidae | 127 | 7 | 7 | 4 |
| Insecta | Thysanura | Thysanoptera larvae | 8 |  |  |  |
| Malacostraca | Isopoda | Armadillidiidae | 56 |  |  | 1 |
| Malacostraca | Isopoda | Oniscidae | 8 |  |  |  |
| Oligochaeta | Plesiopora | Enchytraediae | 1377 | 197 | 375 | 348 |
| Oligochaeta | Opisthopora | Lumbricidae | 31 | 31 | 5 | 10 |
| Protura | Eosentomata | Eosentomidae | 19 | 13 |  | 13 |
| Symphyla | Symphyla | Scolopendrellidae | 101 | 45 | 37 | 49 |
| Symphyla | Symphyla | Scutigerellidae |  | 3 | 4 |  |
| Total abundance | | | 62019 | 3373 | 4830 | 8273 |
|

**Table S2** Regression results of alpha diversity (Rényi's diversity) of plants and soil fauna against elevation.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Response variables | q value | Linear model | | |  | Quadratic model | | |
| R2 | p value | AIC |  | R2 | p value | AIC |
| Trees | 2 | **0.4123** | **4.02E-14** | **-56.526** |  | 0.4382 | 3.99E-14 | -57.483 |
|  | 1 | **0.4429** | **2.16E-15** | **66.205** |  | 0.4550 | 7.87E-15 | 65.791 |
|  | 0 | **0.4966** | **2.20E-16** | **303.410** |  | 0.5013 | 2.20E-16 | 304.378 |
|  | -1 | **0.4525** | **8.38E-16** | **7.895** |  | 0.4526 | 9.95E-15 | 9.874 |
|  | -2 | **0.4203** | **1.91E-14** | **56.277** |  | 0.4209 | 2.03E-13 | 58.156 |
| Tree rhizosphere fauna | 2 | 0.0005 | 8.10E-01 | -182.595 |  | 0.0005 | 9.71E-01 | -180.596 |
|  | 1 | 0.0007 | 7.91E-01 | 82.986 |  | 0.0007 | 9.65E-01 | 84.985 |
|  | 0 | 0.0094 | 3.13E-01 | 545.661 |  | 0.0096 | 5.98E-01 | 547.642 |
|  | -1 | 0.0239 | 1.07E-01 | -32.957 |  | 0.0243 | 2.68E-01 | -31.007 |
|  | -2 | 0.0296 | 7.24E-02 | -6.929 |  | 0.0307 | 1.89E-01 | -5.053 |
| Shrubs | 2 | **0.1739** | **5.83E-06** | **-42.443** |  | 0.1765 | 3.08E-05 | -40.781 |
|  | 1 | **0.2308** | **1.09E-07** | **143.193** |  | 0.2387 | 4.59E-07 | 144.056 |
|  | 0 | **0.2633** | **9.92E-09** | **549.689** |  | 0.2644 | 7.35E-08 | 551.534 |
|  | -1 | **0.1574** | **1.77E-05** | **39.743** |  | 0.1669 | 5.71E-05 | 40.497 |
|  | -2 | **0.1214** | **1.91E-04** | **91.726** |  | 0.1303 | 5.70E-04 | 92.604 |
| Shrub rhizosphere fauna | 2 | 0.0002 | 8.73E-01 | -196.579 |  | 0.0045 | 7.88E-01 | -195.044 |
|  | 1 | 0.0032 | 5.55E-01 | 61.197 |  | 0.0110 | 5.54E-01 | 62.339 |
|  | 0 | 0.0271 | 8.55E-02 | 541.825 |  | 0.0272 | 2.29E-01 | 543.820 |
|  | -1 | 0.0164 | 1.83E-01 | -32.110 |  | 0.0165 | 4.10E-01 | -30.131 |
|  | -2 | 0.0113 | 2.68E-01 | -1.722 |  | 0.0116 | 5.37E-01 | 0.255 |
| Herbs | 2 | **0.1504** | **2.84E-05** | **-231.657** |  | 0.1575 | 1.05E-04 | -230.576 |
|  | 1 | **0.2659** | **8.19E-09** | **57.364** |  | 0.2773 | 7.36E-09 | 56.381 |
|  | 0 | 0.3800 | 7.54E-13 | 644.755 |  | **0.5771** | **2.20E-16** | **604.674** |
|  | -1 | 0.3350 | 3.51E-11 | -126.795 |  | **0.4645** | **3.07E-15** | **-148.621** |
|  | -2 | 0.3080 | 3.13E-10 | -94.437 |  | **0.4042** | **9.30E-13** | **-108.892** |
| Herb rhizosphere fauna | 2 | 0.0038 | 5.24E-01 | -281.694 |  | 0.0111 | 5.50E-01 | -280.508 |
|  | 1 | 0.0059 | 4.26E-01 | 9.203 |  | 0.0225 | 2.95E-01 | 9.344 |
|  | 0 | 0.0190 | 1.51E-01 | 541.074 |  | 0.0250 | 2.58E-01 | 542.405 |
|  | -1 | 0.0100 | 2.99E-01 | -66.889 |  | **0.0543** | **4.85E-02** | **-69.924** |
|  | -2 | 0.0067 | 3.95E-01 | -28.038 |  | **0.0689** | **2.19E-02** | **-33.153** |
| Litter fauna | 2 | **0.0639** | **7.71E-03** | **-339.609** |  | 0.0866 | 5.91E-03 | -340.351 |
|  | 1 | **0.0944** | **1.09E-03** | **-32.081** |  | 0.1062 | 9.14E-04 | -33.848 |
|  | 0 | 0.0004 | 8.37E-01 | 715.928 |  | **0.4406** | **3.59E-13** | **659.053** |
|  | -1 | 0.0148 | 2.05E-01 | -118.668 |  | **0.3541** | **6.98E-11** | **-163.105** |
|  | -2 | 0.01574 | 1.92E-01 | -87.538 |  | **0.3093** | **2.52E-09** | **-124.499** |

Note: If both the linear model and quadratic model passed the significance test (p < 0.05), we chose the model based on the following principles: (1) if the delta AIC is higher than 2, we chose the lower one; (2) if the delta AIC is lower than 2, we chose the simple (linear) model.

**Table S3** Regression results of alpha diversity (Jost's effective species numbers) of plants and soil fauna against elevation.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Response variables | q value | Linear model | | |  | Quadratic model | | |
| R2 | p value | AIC |  | R2 | p value | AIC |
| Trees | 2 | **0.3176** | **1.46E-10** | **217.418** |  | 0.3202 | 1.07E-09 | 218.989 |
|  | 1 | **0.3820** | **6.32E-13** | **236.460** |  | 0.3835 | 5.77E-12 | 238.188 |
|  | -1 | **0.4236** | **1.40E-14** | **488.888** |  | 0.4369 | 9.58E-15 | 487.351 |
|  | -2 | **0.3722** | **1.50E-12** | **612.419** |  | 0.3984 | 8.56E-13 | 611.006 |
| Tree rhizosphere fauna | 2 | 0.0022 | 6.29E-01 | 394.458 |  | 0.0024 | 8.78E-01 | 396.428 |
|  | 1 | 0.0001 | 9.39E-01 | 440.505 |  | 0.0001 | 9.93E-01 | 442.497 |
|  | -1 | 0.0265 | 8.95E-02 | 663.534 |  | 0.0279 | 2.20E-01 | 665.372 |
|  | -2 | 0.0351 | 5.01E-02 | 738.918 |  | 0.0382 | 1.25E-01 | 740.568 |
| Shrubs | 2 | **0.1812** | **1.95E-06** | **388.712** |  | 0.2179 | 3.55E-06 | 391.751 |
|  | 1 | **0.2312** | **1.06E-07** | **434.491** |  | 0.2439 | 9.62E-08 | 433.710 |
|  | -1 | **0.1428** | **4.69E-05** | **830.549** |  | 0.1582 | 9.99E-05 | 830.563 |
|  | -2 | **0.1029** | **6.35E-04** | **1032.262** |  | 0.1227 | 9.10E-04 | 1031.807 |
| Shrub rhizosphere fauna | 2 | 0.0001 | 9.41E-01 | 363.291 |  | 0.0392 | 1.18E-01 | 360.900 |
|  | 1 | 0.0045 | 4.85E-01 | 410.484 |  | 0.0220 | 3.05E-01 | 410.542 |
|  | -1 | 0.0254 | 9.62E-02 | 695.643 |  | 0.0266 | 2.36E-01 | 697.509 |
|  | -2 | 0.0180 | 1.63E-01 | 786.934 |  | 0.0196 | 3.48E-01 | 788.758 |
| Herbs | 2 | **0.2116** | **4.28E-07** | **460.842** |  | 0.2319 | 7.44E-07 | 459.982 |
|  | 1 | **0.3080** | **3.13E-10** | **507.927** |  | 0.3159 | 9.69E-11 | 506.799 |
|  | -1 | 0.3392 | 2.49E-11 | 831.471 |  | **0.5082** | **2.20E-16** | **800.980** |
|  | -2 | 0.3145 | 1.87E-10 | 947.455 |  | **0.4484** | **1.50E-14** | **925.548** |
| Herb rhizosphere fauna | 2 | 0.0059 | 4.24E-01 | 370.445 |  | 0.0222 | 3.01E-01 | 370.631 |
|  | 1 | 0.0067 | 3.94E-01 | 409.093 |  | 0.0249 | 2.60E-01 | 409.065 |
|  | -1 | 0.0163 | 1.85E-01 | 745.571 |  | **0.0746** | **1.58E-02** | **740.846** |
|  | -2 | 0.0113 | 2.69E-01 | 862.807 |  | **0.0873** | **7.55E-03** | **856.011** |
| Litter fauna | 2 | **0.0953** | **1.03E-03** | **433.653** |  | 0.1176 | 1.24E-03 | 432.910 |
|  | 1 | **0.0965** | **9.59E-04** | **474.489** |  | 0.1195 | 8.15E-04 | 472.994 |
|  | -1 | 0.0062 | 4.13E-01 | 1044.910 |  | **0.3372** | **2.78E-10** | **1002.353** |
|  | -2 | 0.0066 | 4.00E-01 | 1193.735 |  | **0.2905** | **1.06E-08** | **1158.712** |

Note: If both the linear model and quadratic model passed the significance test (p < 0.05), we chose the model based on the following principles: (1) if the delta AIC is higher than 2, we chose the lower one; (2) if the delta AIC is lower than 2, we chose the simple (linear) model.

**Table S4** Regression results of beta diversity of plants and soil fauna against elevation

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Beta diversity index | Response variables | Linear model | | |  | Quadratic model | | |
| R2 | p value | AIC |  | R2 | p value | AIC |
| Beta-sim index | Tree | 0.05 | 0.0234 | -34.178 |  | **0.09** | **0.0088** | **-36.650** |
|  | Tree rhizosphere fauna | 0.02 | 0.1274 | -75.185 |  | 0.04 | 0.1501 | -74.707 |
|  | Shrub | 0.00 | 0.5354 | -44.033 |  | 0.04 | 0.1470 | -45.583 |
|  | Shrub rhizosphere fauna | 0.00 | 0.7364 | -90.283 |  | 0.00 | 0.8001 | -88.626 |
|  | Herb | 0.00 | 0.7626 | -112.999 |  | 0.01 | 0.7503 | -111.496 |
|  | Herb rhizosphere fauna | 0.02 | 0.1671 | -134.337 |  | **0.09** | **0.0081** | **-140.296** |
|  | Litter | 0.01 | 0.2422 | -243.298 |  | 0.04 | 0.1264 | -244.151 |
| Beta-morisita index | Tree | 0.01 | 0.3652 | -20.049 |  | **0.10** | **0.0037** | **-28.724** |
|  | Tree rhizosphere fauna | 0.01 | 0.3733 | -43.872 |  | 0.05 | 0.0564 | -46.976 |
|  | Shrub | **0.04** | **0.0320** | **33.140** |  | 0.05 | 0.0824 | 34.711 |
|  | Shrub rhizosphere fauna | 0.01 | 0.3130 | -102.469 |  | 0.04 | 0.1440 | -103.413 |
|  | Herb | **0.05** | **0.0185** | **5.824** |  | 0.05 | 0.0625 | 7.796 |
|  | Herb rhizosphere fauna | 0.02 | 0.1623 | -105.870 |  | 0.04 | 0.1068 | -106.471 |
|  | Litter | 0.00 | 0.8975 | -161.592 |  | **0.07** | **0.0261** | **-167.075** |

Note: If both the linear model and quadratic model passed the significance test (p < 0.05), we chose the model based on the following principles: (1) if the delta AIC is higher than 2, we chose the lower one; (2) if the delta AIC is lower than 2, we chose the simple (linear) model.

**Table S5** Coefficients of determination between abundant taxa diversity (q = 1 or 2) or rare taxa diversity (q = -1 or -2) and richness (q = 0) in plants and soil animals (Rényi's diversity) based on GLM analysis along the elevational gradient on Dongling Mountain.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Plants** | q = 2 | q = 1 | q = -1 | q = -2 |
| Tree richness (q = 0) | 0.628 | 0.772 | 0.812 | 0.745 |
| Shrub richness (q = 0) | 0.450 | 0.631 | 0.580 | 0.460 |
| Herb richness (q= 0 ) | 0.218 | 0.527 | 0.767 | 0.623 |
| **Soil animals** |  |  |  |  |
| Litter fauna richness (q = 0) | 0.027 | 0.097 | 0.754 | 0.635 |
| Tree rhizosphere fauna richness (q = 0) | 0.350 | 0.709 | 0.846 | 0.760 |
| Shrub rhizosphere fauna richness (q = 0) | 0.299 | 0.613 | 0.849 | 0.773 |
| Herb rhizosphere fauna richness (q = 0) | 0.116 | 0.381 | 0.734 | 0.608 |

Note: The coefficients of determination from left to right in each row were calculated by the following expressions, respectively: Richness (q = 0) ~ Abundant taxa diversity (q = 2), Richness (q = 0) ~ Abundant taxa diversity (q = 1), Richness (q = 0) ~ Rare taxa diversity (q = -1), and Richness (q = 0) ~ Rare taxa diversity (q = -2). For example, the value 0.628 was the coefficient of determination between abundant tree diversity (q = 2) and tree richness (q = 0); the value 0.772 was the coefficient of determination between abundant tree diversity (q = 1) and tree richness (q = 0), the value 0.812 was the coefficient of determination between rare tree diversity (q = -1) and tree richness (q = 0), and the value 0.745 was coefficient of determination between rare tree diversity (q = -2) on tree richness (q = 0). The red number represents the only coefficient of determination (Litter fauna richness ~ rare litter fauna diversity when q = 2) which did not pass the significant test (p > 0.05).

**Table S6** Coefficients of determination between abundant taxa diversity (q = 1 or 2) or rare taxa diversity (q = -1 or -2) and richness (q = 0) in plants and soil animals (Jost's effective species numbers) based on GLM analysis along the elevational gradient on Dongling Mountain.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Plants** | q = 2 | q = 1 | q = -1 | q = -2 |
| Tree richness (q = 0) | 0.585 | 0.754 | 0.776 | 0.634 |
| Shrub richness (q = 0) | 0.456 | 0.616 | 0.565 | 0.354 |
| Herb richness (q= 0) | 0.329 | 0.622 | 0.823 | 0.693 |
| **Soil animals** |  |  |  |  |
| Litter fauna richness (q = 0) | 0.026 | 0.107 | 0.754 | 0.625 |
| Tree rhizosphere fauna richness (q = 0) | 0.446 | 0.740 | 0.896 | 0.793 |
| Shrub rhizosphere fauna richness (q = 0) | 0.302 | 0.618 | 0.872 | 0.770 |
| Herb rhizosphere fauna richness (q = 0) | 0.095 | 0.355 | 0.700 | 0.525 |

For explanation, see note to Table S6.

**Table S7** Partial correlation of alpha diversity (Jost's effective species numbers) between plant and soil invertebrates

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Litter fauna (q=2) | Litter fauna (q=1) | Litter fauna (q=0) | Litter fauna (q=-1) | Litter fauna (q=-2) |
| Tree (q=2) | 0.172 | 0.155 | 0.091 | 0.026 | -0.004 |
| Tree (q=1) | 0.185 | **0.194** | 0.079 | 0.010 | -0.021 |
| Tree (q=0) | 0.175 | 0.150 | -0.034 | -0.101 | -0.125 |
| Tree (q=-1) | 0.099 | 0.067 | -0.175 | **-0.217** | **-0.224** |
| Tree (q=-2) | 0.075 | 0.037 | **-0.216** | **-0.248** | **-0.249** |
| Shrub (q=2) | -0.099 | -0.115 | **-0.265** | **-0.292** | **-0.296** |
| Shrub (q=1) | -0.129 | -0.140 | **-0.249** | **-0.265** | **-0.266** |
| Shrub (q=0) | -0.036 | -0.053 | -0.101 | -0.117 | -0.124 |
| Shrub(q=-1) | 0.167 | 0.126 | 0.086 | 0.063 | 0.047 |
| Shrub (q=-2) | 0.166 | 0.144 | 0.111 | 0.096 | 0.081 |
| Herb (q=2) | -0.049 | -0.015 | 0.001 | -0.040 | -0.056 |
| Herb (q=1) | -0.126 | -0.132 | -0.166 | -0.149 | -0.145 |
| Herb (q=0) | **-0.255** | **-0.343** | **-0.449** | **-0.318** | **-0.275** |
| Herb (q=-1) | **-0.213** | **-0.307** | **-0.434** | **-0.311** | **-0.269** |
| Herb (q=-2) | -0.175 | **-0.260** | **-0.390** | **-0.286** | **-0.249** |
|  | Tree-rhi (q=2) | Tree-rhi (q=1) | Tree-rhi (q=0) | Tree-rhi (q=-1) | Tree-rhi (q=-2) |
| Tree (q=2) | 0.104 | 0.113 | 0.111 | 0.088 | 0.070 |
| Tree (q=1) | 0.123 | 0.112 | 0.093 | 0.073 | 0.059 |
| Tree (q=0) | 0.152 | 0.109 | 0.058 | 0.040 | 0.037 |
| Tree (q=-1) | 0.104 | 0.073 | 0.032 | 0.020 | 0.021 |
| Tree (q=-2) | 0.077 | 0.056 | 0.026 | 0.016 | 0.018 |
|  | Shrub-rhi (q=2) | Shrub-rhi (q=1) | Shrub-rhi (q=0) | Shrub-rhi (q=-1) | Shrub-rhi (q=-2) |
| Shrub (q=2) | 0.094 | 0.066 | 0.091 | 0.124 | 0.143 |
| Shrub (q=1) | 0.135 | 0.099 | 0.108 | 0.134 | 0.153 |
| Shrub (q=0) | 0.123 | 0.100 | 0.145 | **0.189** | **0.205** |
| Shrub (q=-1) | 0.003 | 0.006 | 0.079 | 0.129 | 0.139 |
| Shrub (q=-2) | 0.003 | 0.010 | 0.061 | 0.097 | 0.105 |
|  | Herb-rhi (q=2) | Herb-rhi (q=1) | Herb-rhi (q=0) | Herb-rhi (q=-1) | Herb-rhi (q=-2) |
| Herb (q=2) | -0.166 | -0.129 | -0.045 | -0.040 | -0.049 |
| Herb (q=1) | -0.091 | -0.062 | -0.047 | -0.084 | -0.102 |
| Herb (q=0) | 0.043 | 0.043 | -0.111 | **-0.207** | **-0.227** |
| Herb (q=-1) | 0.059 | 0.024 | **-0.194** | **-0.276** | **-0.279** |
| Herb (q=-2) | 0.046 | -0.001 | **-0.220** | **-0.284** | **-0.279** |

Note: Tree rhizosphere fauna is abbreviated to 'Tree-rhi', Shrub rhizosphere fauna is abbreviated to 'Shrub-rhi', Herb rhizosphere fauna is abbreviated to 'Herb-rhi'. Significant coefficient r values are shown in bold font.