**Supplementary Information: Extinction risk of saproxylic beetles reflects the ecological degradation of forests in Europe**

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**Appendix S1: Red List, trait data and phylogeny of saproxylic beetles in Central and Western Europe**

Centuries of entomological work have accumulated a large body of literature on taxonomy (Freude et al. 1964-83), distribution, ecology, and traits (Koch 1989-92; Köhler & Klausnitzer 1998; Böhme 2005) of saproxylic beetles in Central and Western Europe.

**Red List data**

The German Red List of Beetles [Schmidl, J. & Büche, B. unpublished data: Die Rote Liste und Gesamtartenliste der Käfer (Coleoptera, exkl. Lauf- und Wasserkäfer) Deutschlands im Überblick (September 2011). *Naturschutz und Biologische Vielfalt*, **70**] follows the methodology of Binot-Haffke et al. (2009) and considers the time period between 1986 and 2011. As it does not include Carabidae and Rhysodidae, we used the Red List status of the three saproxylic species of these families from Schmidt, J., Trautner, J. & Müller-Motzfeld, G. unpublished data: *Rote Liste und Gesamtartenliste der Laufkäfer (Coleoptera: Carabidae) Deutschlands. - April 2013.* The German Red List of Beetles uses the German translations of the recent IUCN classification (IUCN 2012) but also contains the categories “rare” and “indeterminate” that were used by the IUCN only until 2001.

**Table S1:**  Percentage of saproxylic beetles included in the German Red List of Beetles (exclusive categories DD, I, and R) and percentage of threatened or regionally extinct species in each family compared to the numbers of all saproxylic beetle species and only saproxylic beetle species approved for Germany (Schmidl & Bußler 2004; Köhler 2011)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Family/Order | Beetle species in Germany | Saproxylic beetle species in Germany | Saproxylic beetle species included in German Red List [exclusive DD, R, I; %] | Threatened saproxylic beetle species [%] |
| Coleoptera | 6,929 | 1,405 | 76 | 28 |
| Carabidae | 585 | 1 | 100 | 0 |
| Rhysodidae | 2 | 2 | 100 | 100 |
| Histeridae | 85 | 23 | 65 | 13 |
| Sphaeritidae | 1 | 1 | 100 | 0 |
| Cholevidae | 51 | 3 | 67 | 50 |
| Leiodidae | 85 | 7 | 86 | 0 |
| Scydmaenidae | 53 | 13 | 54 | 29 |
| Ptiliidae | 86 | 13 | 54 | 14 |
| Staphylinidae | 707 | 152 | 63 | 8 |
| Pselaphidae | 93 | 36 | 67 | 0 |
| Lycidae | 7 | 7 | 86 | 33 |
| Cantharidae | 87 | 38 | 79 | 27 |
| Malachiidae | 36 | 5 | 60 | 33 |
| Melyridae | 26 | 19 | 79 | 7 |
| Phloiophilidae | 1 | 1 | 100 | 0 |
| Cleridae | 24 | 16 | 75 | 33 |
| Derodontidae | 2 | 1 | 100 | 100 |
| Trogossitidae | 5 | 3 | 100 | 67 |
| Peltidae | 4 | 4 | 100 | 100 |
| Lophocateridae | 2 | 1 | 100 | 100 |
| Lymexylonidae | 3 | 2 | 100 | 50 |
| Elateridae | 152 | 56 | 79 | 59 |
| Cerophytidae | 1 | 1 | 100 | 100 |
| Eucnemidae | 21 | 19 | 79 | 60 |
| Lissomidae | 1 | 1 | 100 | 100 |
| Buprestidae | 106 | 85 | 78 | 48 |
| Dermestidae | 53 | 8 | 100 | 50 |
| Nosodendridae | 1 | 1 | 100 | 100 |
| Bothrideridae | 7 | 4 | 25 | 100 |
| Cerylonidae | 7 | 6 | 83 | 0 |
| Nitidulidae | 132 | 37 | 81 | 0 |
| Monotomidae | 23 | 13 | 92 | 0 |
| Cucujidae | 4 | 4 | 50 | 0 |
| Phloeostichidae | 1 | 1 | 100 | 0 |
| Erotylidae | 16 | 13 | 85 | 55 |
| Biphyllidae | 2 | 2 | 50 | 0 |
| Cryptophagidae | 134 | 37 | 57 | 19 |
| Laemophloeidae | 21 | 14 | 79 | 18 |
| Latridiidae | 86 | 29 | 41 | 0 |
| Mycetophagidae | 17 | 13 | 77 | 40 |
| Colydiidae | 20 | 14 | 93 | 54 |
| Corylophidae | 20 | 10 | 30 | 0 |
| Endomychidae | 14 | 7 | 71 | 20 |
| Aspidiphoridae | 3 | 3 | 67 | 0 |
| Ciidae | 49 | 45 | 67 | 10 |
| Lyctidae | 9 | 6 | 33 | 0 |
| Bostrichidae | 18 | 5 | 80 | 50 |
| Anobiidae | 78 | 63 | 78 | 22 |
| Ptinidae | 31 | 5 | 40 | 0 |
| Oedemeridae | 25 | 14 | 71 | 20 |
| Pythidae | 2 | 2 | 100 | 50 |
| Salpingidae | 14 | 14 | 57 | 0 |
| Prostomidae | 1 | 1 | 100 | 100 |
| Pyrochroidae | 3 | 3 | 100 | 0 |
| Scraptiidae | 31 | 24 | 42 | 10 |
| Aderidae | 10 | 8 | 50 | 50 |
| Mordellidae | 86 | 24 | 46 | 0 |
| Melandryidae | 34 | 33 | 88 | 55 |
| Tetratomidae | 3 | 3 | 100 | 33 |
| Lagriidae | 3 | 1 | 100 | 100 |
| Alleculidae | 20 | 10 | 90 | 78 |
| Tenebrionidae | 69 | 31 | 74 | 57 |
| Trogidae | 8 | 1 | 100 | 100 |
| Scarabaeidae | 167 | 13 | 100 | 54 |
| Lucanidae | 7 | 7 | 100 | 43 |
| Cerambycidae | 204 | 168 | 82 | 33 |
| Anthribidae | 20 | 16 | 63 | 20 |
| Scolytidae | 114 | 108 | 81 | 10 |
| Platypodidae | 2 | 2 | 50 | 0 |
| Curculionidae | 330 | 72 | 74 | 28 |
|  |  |  |  |  |

**Trait data**

Trait data were compiled consistently throughout the whole data set. Gossner et al. (2013) calculated mean niche positions based on the data of Möller (2009). For species not included in Gossner et al. (2013), we calculated values based on the original data of Möller (2009) following the same procedure as Gossner et al. (2013). Similarly, the mean body size of species not available from Gossner et al. (2013) was extracted from the same original data set of Freude et al. (1964-83). These data provide a range of body sizes of adult individuals of both sexes from which the mean was calculated. Host tree preference and habitat guild was taken from Schmidl & Bußler (2004) and for missing species from Köhler (2000). Consistency and comparability between both references was checked with the help of the authors.

Mean niche positions were calculated following Gossner et al. (2013): The classes of each trait were assigned to an ordinal scale. For each species, each class was multiplied with a weighting score representing the frequency of occurrence in this particular class (0.5, very rarely used; 1, rarely used; 2, commonly used; 3, preferred) and divided by the sum of the weighting scores. For the elevational distribution, no information on the frequency of occurrence was available. Therefore, the elevational distribution (planar, colline, montane, and subalpine) was transformed into an ordinal scale from which the mean was calculated.

As an example, we provide the calculation of the mean canopy niche position of the longhorn beetle *Rosalia alpina* as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Canopy cover: | open | semi-open | closed |
| Canopy class: | 1 | 2 | 3 |
| Weighting score: | 3 | 2 | 0 |
| Calculation of mean: | (3×1 + 2×2 + 0×3)/5 | | |
| Mean canopy niche: | 1.4 | | |

**Table S2:** List of explanatory variables used to model the extinction risk of saproxylic beetles and the sources of the data.

|  |  |
| --- | --- |
| Variable | Source |
| Range size | Köhler (2011) |
| Elevation | Böhme (2005) |
| Body size | Gossner et al. (2013) completed after Freude et al. (1964-83) |
| Wood diameter niche | Gossner et al. (2013) completed after Möller (2009) |
| Canopy niche | Gossner et al. (2013) completed after Möller (2009) |
| Decay niche | Gossner et al. (2013) completed after Möller (2009) |
| Flower visitor | Köhler (2000) |
| Host tree | Schmidl & Bußler (2004), completed after Köhler (2000) |
| Guild | Schmidl & Bußler (2004) simplified, completed after Köhler (2000) |
| Feeding type | Köhler (2000) simplified |

**Table S3:** Dataset of 1,213 saproxylic beetle species including Red List information, modeled extinction risk, and species traits. See file Seibold\_ESM\_T3.xlsx.

**Fig. S1:** Scatterplot showing the correlation of raw values of wood diameter niche and mean body size of 1,025 saproxylic beetle species. R- and p-values of a Pearson’s test on correlation are given.

I:\Promotion\Daten\RL_Phylogenie\Analyse\results\Grafiken\Fig_S1_Korr.TIF**Phylogeny**

In the same way as Gossner et al. (2013), we constructed a phylogenetic tree of the saproxylic beetles. The current phylogeny of beetles is still under debate (Hunt et al. 2007; Lawrence et al. 2011). Therefore, we decided to use the most comprehensive genetic phylogeny provided by Hunt et al. (2007) as a basic topology. This phylogeny is based on three genes and nearly 1,900 species, representing more than 80% of the world’s recognized beetle families. We expanded this topology using higher-resolution topologies of several subgroups [for Ciidae Buder et al. (2008); for Scolytinae Bussler et al. (2011); for Curculionidae Jordal et al. (2011); for Elateridae Kundrata & Bocak (2011), for Staphylinidae Chatzimanolis et al. (2010)], and we used additional information from a phylogeny based on morphology (Lawrence et al. 2011) and from taxonomic classification following the Catalogue of the Palaearctic Coleoptera (Löbl & Smetana 2003-11) and Freude et al. (1964-83). Additional species were assigned to the tip next to the closest known relative. The final tree topology was calibrated using 25 calibration points (Table S4) for certain nodes using the function *bladj* in the add-on package *phylocom* (Webb et al. 2008).

**Table S4:** Calibration points used for the phylogenetic tree predicted from fossil records.

|  |  |  |
| --- | --- | --- |
| Age (million years) | Taxon | Reference |
| 285 | Oldest beetle | Hunt et al. (2007) |
| 23.6 | Rhysodidae | Grimaldi & Engels (2003) |
| 150.8 ± 4.0 | Scarabaeoidea | Hunt et al. (2007) |
| 216.5 ± 2.0 | Staphylinidae | Hunt et al. (2007) |
| 196.5 ± 1.0 | Elateridae | Hunt et al. (2007) |
| 95 | Bostrichiformia | Grimaldi & Engels (2003) |
| 80 | Oldest Rhipihoridae | Grimaldi & Engels (2003) |
| 181 | Tenebrionoidea | Wang & Zhang (2011) |
| 150.8 | Chrysomelidae | Hunt et al. (2007) |
| 150 | Mordellidae | Hunt et al. (2007) |
| 130 | Scolytinae | Kirejtshuk et al. (2009) |
| 80 | Cryptophagidae | Zherikhin (1977) |
| 37 | *Cryphalus* | Kirejtshuk (2009) |
| 31 | *Dryoecoetus* | Kirejtshuk (2009) |
| 37 | *Taphrorychus* | Kirejtshuk (2009) |
| 20 | *Gnathotrichus* | Kirejtshuk (2009) |
| 37 | *Ips* | Kirejtshuk (2009) |
| 37 | *Tomicus* | Kirejtshuk (2009) |
| 20 | *Pityophthorus* | Kirejtshuk (2009) |
| 37 | *Hylastes* | Kirejtshuk (2009) |
| 31 | *Hylesinus* | Kirejtshuk (2009) |
| 37 | *Hylurgops* | Kirejtshuk (2009) |
| 20 | *Scolytus* | Kirejtshuk (2009) |
| 37 | *Xyleborus* | Kirejtshuk (2009) |
| 37 | *Xylechinus* | Kirejtshuk (2009) |

**Table S5:** Phylogeny of the 1,213 saproxylic beetle species based on the topology of Hunt et al. (2007) and calibrated using 25 calibration points from fossil records.

((Tachyta\_nana:150.018753,(Rhysodes\_sulcatus:23.6,Omoglymmius\_germari:23.6)match3:126.418755)match2:126.418747,(((((((Plegaderus\_saucius:48.217503,Plegaderus\_vulneratus:48.217503,Plegaderus\_caesus:48.217503,Plegaderus\_dissectus:48.217503,Plegaderus\_discisus:48.217503)match11:48.217503,((Abraeus\_granulum:32.145,Abraeus\_parvulus:32.145,Abraeus\_perpusillus:32.145)match13:32.145,(Acritus\_minutus:32.145,Aeletes\_atomarius:32.145)match14:32.145)match12:32.145004)match10:64.290001,((Paromalus\_flavicornis:44.645832,Paromalus\_parallelepipedus:44.645832)match17:89.291668,(Hololepta\_plana:107.150002,((Platysoma\_compressum:53.575,Platysoma\_angustatum:53.575)match20:26.787502,Eblisia\_minor:80.362503)match19:26.787498)match18:26.787498)match15:26.787506)match8:26.787491,Dendrophilus\_punctatus:187.512497)match7:26.787506,Sphaerites\_glabratus:214.300003)match6:26.787491,((((Euthiconus\_conicicollis:120.543747,(((Stenichnus\_godarti:30.135937,Stenichnus\_foveola:30.135937)match29:30.135937,Stenichnus\_bicolor:60.271873)match28:30.135933,Euconnus\_pragensis:90.407806)match27:30.135941)match26:30.135941,((Neuraphes\_carinatus:50.226563,Neuraphes\_plicicollis:50.226563)match31:50.226563,Scydmoraphes\_minutus:100.453126)match30:50.226563)match25:30.135925,Microscydmus\_minimus:180.815613)match24:30.135941,(Scydmaenus\_perrisii:105.475777,Scydmaenus\_hellwigii:105.475777)match33:105.475777)match23:30.135941)match5:26.787506,(((((Nemadus\_colonoides:66.866669,Anemadus\_strigosus:66.866669)match38:66.866669,Dreposcia\_umbrina:133.733337)match37:66.866669,(((Anisotoma\_humeralis:50.150002,Anisotoma\_axillaris:50.150002,Anisotoma\_castanea:50.150002,Anisotoma\_glabra:50.150002,Anisotoma\_orbicularis:50.150002)match41:50.150002,Liodopria\_serricornis:100.300003)match40:50.149994,Agathidium\_nigripenne:150.449996)match39:50.150009)match36:50.149994,(((((((((((Siagonium\_quadricorne:32.474998,Siagonium\_humerale:32.474998)match53:32.474998,Olisthaerus\_substriatus:64.949997)match52:32.474998,(Oxyporus\_maxillosus:48.712498,Hesperus\_rufipennis:48.712498)match54:48.712498,Gabrius\_splendidulus:97.424996)match51:32.474998,(Thoracophorus\_corticinus:108.25,Velleius\_dilatatus:108.25,(Quedius\_truncicola:81.1875,((Quedius\_infuscatus:27.0625,Quedius\_microps:27.0625)match59:27.0625,(Quedius\_brevicornis:27.0625,Quedius\_maurus:27.0625,Quedius\_xanthopus:27.0625,Quedius\_scitus:27.0625)match60:27.0625)match58:27.0625,Quedius\_plagiatus:81.1875)match57:27.0625,((((Lordithon\_bicolor:21.65,Lordithon\_trimaculatus:21.65)match64:21.65,(Lordithon\_pulchellus:21.65,Lordithon\_speciosus:21.65)match65:21.65)match63:21.649998,Carphacis\_striatus:64.949997)match62:21.650002,Tachinus\_bipustulatus:86.599998)match61:21.650002)match56:21.649994)match50:21.650009,((Phyllodrepa\_melanocephala:45.465,Phyllodrepa\_nigra:45.465)match68:45.465,(Phyllodrepa\_ioptera:60.620002,(Phyllodrepa\_vilis:30.310001,Phyllodrepa\_gracilicornis:30.310001)match71:30.310001)match69:30.309998)match67:60.620003,(Metoponcus\_brevicornis:75.775002,Nudobius\_lentus:75.775002)match72:75.775002,(Atrecus\_affinis:101.033333,Atrecus\_pilicornis:101.033332)match73:50.51667)match49:21.649994,((((Oligota\_granaria:49.485714,Holobus\_apicatus:49.485714)match78:49.485714,(((Gyrophaena\_nana:24.742857,Gyrophaena\_pseudonana:24.742857,Gyrophaena\_rugipennis:24.742857,Gyrophaena\_poweri:24.742857,Gyrophaena\_minima:24.742857,Gyrophaena\_congrua:24.742857,Gyrophaena\_williamsi:24.742857,Gyrophaena\_fasciata:24.742857,Gyrophaena\_bihamata:24.742857,Gyrophaena\_lucidula:24.742857,Gyrophaena\_transversalis:24.742857,Gyrophaena\_joyi:24.742857,Gyrophaena\_angustata:24.742857,Gyrophaena\_strictula:24.742857,Gyrophaena\_polita:24.742857,Gyrophaena\_boleti:24.742857)match81:24.742857,(Leptusa\_pulchella:24.742857,Leptusa\_norvegica:24.742857,Leptusa\_fumida:24.742857)match82:24.742857)match80:24.742855,(Agaricochara\_latissima:37.114285,Anomognathus\_cuspidatus:37.114285)match83:37.114285,Cyphea\_curtula:74.22857,(Silusa\_rubiginosa:37.114285,Silusa\_rubra:37.114285)match85:37.114285,((Euryusa\_castanoptera:24.742857,Euryusa\_optabilis:24.742857,Euryusa\_sinuata:24.742857,Euryusa\_coarctata:24.742857)match87:24.742857,Tachyusida\_gracilis:49.485714,(Bolitochara\_obliqua:24.742857,Bolitochara\_bella:24.742857,Bolitochara\_mulsanti:24.742857,Bolitochara\_pulchra:24.742857,Bolitochara\_lucida:24.742857)match88:24.742857)match86:24.742855)match79:24.742859)match77:24.742859,((Placusa\_complanata:41.238094,Placusa\_depressa:41.238094,Placusa\_tachyporoides:41.238094,Placusa\_incompleta:41.238094,Placusa\_atrata:41.238094,Placusa\_pumilio:41.238094)match91:41.238094,Paranopleta\_inhabilis:82.476188)match90:41.238098,((Homalota\_plana:61.857143,(Atheta\_fungivora:30.928572,Atheta\_euryptera:30.928572,Atheta\_speluncicollis:30.928572,Atheta\_picipes:30.928572,Atheta\_basicornis:30.928572,Atheta\_oblita:30.928572,Atheta\_boletophila:30.928572,Atheta\_pilicornis:30.928572)match95:30.928572,(Thamiaraea\_cinnamomea:30.928572,Thamiaraea\_hospita:30.928572)match96:30.928572)match94:30.92857,(Dinaraea\_aequata:46.392857,Dinaraea\_arcana:46.392857)match97:46.392857,Dadobia\_immersa:92.785713)match93:30.928574,(((Phloeopora\_teres:30.928572,Phloeopora\_concolor:30.928572,Phloeopora\_testacea:30.928572,Phloeopora\_nitidiventris:30.928572,Phloeopora\_corticalis:30.928572,Phloeopora\_scribae:30.928572)match100:30.928572,(Ischnoglossa\_prolixa:30.928572,Ischnoglossa\_obscura:30.928572)match101:30.928572,(Dexiogya\_corticina:30.928572,Dexiogya\_forticornis:30.928572)match102:30.928572,Thiasophila\_inquilina:61.857143)match99:30.92857,(Oxypoda\_recondita:46.392857,Oxypoda\_bicolor:46.392857)match103:46.392857)match98:30.928574)match76:24.742851,(Sepedophilus\_testaceus:74.228569,Sepedophilus\_bipunctatus:74.228569,Sepedophilus\_binotatus:74.228569)match104:74.228569)match75:24.742859,(Acrulia\_inflata:138.559998,(Hapalaraea\_pygmaea:103.919998,((Phloeonomus\_pusillus:34.639999,Phloeonomus\_punctipennis:34.639999,Phloeonomus\_minimus:34.639999)match109:34.639999,(Phyllodrepoidea\_crenata:34.639999,Coryphium\_angusticolle:34.639999)match110:34.639999)match108:34.639999,Xylostiba\_monilicornis:103.919998)match106:34.639999,(Phloeostiba\_planus:69.279999,Phloeostiba\_lapponicus:69.279999)match112:69.279999)match105:34.639999)match48:21.650009,Phloeocharis\_subtilissima:194.850006,(((Bibloporus\_ultimus:69.589287,Bibloporus\_bicolor:69.589287,Bibloporus\_minutus:69.589287,Bibloporus\_mayeti:69.589287)match115:69.589287,((((Euplectus\_nanus:27.835714,Euplectus\_kirbyi:27.835714,Euplectus\_piceus:27.835714,Euplectus\_sparsus:27.835714,Euplectus\_infirmus:27.835714,Euplectus\_punctatus:27.835714,Euplectus\_tholini:27.835714,Euplectus\_karsteni:27.835714,Euplectus\_fauveli:27.835714,Euplectus\_brunneus:27.835714,Euplectus\_duponti:27.835714)match119:27.835714,Leptoplectus\_spinolae:55.671429)match118:27.83572,(Plectophloeus\_fleischeri:41.753574,Plectophloeus\_erichsoni:41.753574,Plectophloeus\_nubigena:41.753574,Plectophloeus\_nitidus:41.753574,Plectophloeus\_fischeri:41.753574)match120:41.753574)match117:27.835709,(Batrisus\_formicarius:74.228569,(Batrisodes\_delaporti:37.114285,Batrisodes\_venustus:37.114285,Batrisodes\_buqueti:37.114285,Batrisodes\_unisexualis:37.114285)match122:37.114285)match121:37.114288)match116:27.835716)match114:27.835724,Tyrus\_mucronatus:167.014297)match113:27.835709)match47:21.65,(Scaphidium\_quadrimaculatum:185.571426,(((Scaphisoma\_agaricinum:46.392857,Scaphisoma\_inopinatum:46.392857)match127:46.392857,((Scaphisoma\_boleti:30.928572,Scaphisoma\_assimile:30.928572)match129:30.928572,Scaphisoma\_boreale:61.857143)match128:30.92857)match126:30.928574,(Scaphisoma\_obenbergeri:82.476188,Scaphisoma\_balcanicum:82.476189)match130:41.238098)match125:61.85714)match123:30.928572)match46:8.5625,((((((Dictyopterus\_aurora:153.495544,Pyropterus\_nigroruber:153.495544,(Lopherus\_rubens:102.33036,(Platycis\_minutus:51.16518,Platycis\_cosnardi:51.16518)match140:51.16518)match139:51.165184,Lygistopterus\_sanguineus:153.495544)match137:51.165176,(((((((Ampedus\_sinuatus:49.125,Ampedus\_erythrogonus:49.125,Ampedus\_rufipennis:49.125,Ampedus\_balteatus:49.125,Ampedus\_praeustus:49.125,Ampedus\_cardinalis:49.125,Ampedus\_aethiops:49.125,Ampedus\_brunnicornis:49.125,Ampedus\_nigerrimus:49.125,Ampedus\_sanguineus:49.125,Ampedus\_cinnabarinus:49.125,Ampedus\_pomonae:49.125,Ampedus\_sanguinolentus:49.125,Ampedus\_pomorum:49.125,Ampedus\_hjorti:49.125,Ampedus\_quercicola:49.125,Ampedus\_triangulum:49.125,Ampedus\_nigroflavus:49.125,Ampedus\_elongatulus:49.125,Ampedus\_melanurus:49.125,Ampedus\_elegantulus:49.125,Ampedus\_nigrinus:49.125,Ampedus\_auripes:49.125)match147:49.125,((Ischnodes\_sanguinicollis:24.5625,Megapenthes\_lugens:24.5625,Procraerus\_tibialis:24.5625)match151:24.5625,Elater\_ferrugineus:49.125)match150:49.125,Cardiophorus\_gramineus:98.25)match146:24.5625,((Melanotus\_rufipes:40.9375,Melanotus\_castanipes:40.9375)match153:40.9375,(Denticollis\_borealis:40.9375,Denticollis\_rubens:40.9375,Denticollis\_linearis:40.9375)match154:40.9375,Diacanthous\_undulatus:81.875)match152:40.9375,(Limoniscus\_violaceus:92.109375,((Stenagostus\_rufus:30.703125,Stenagostus\_rhombeus:30.703125)match157:30.703125,Crepidophorus\_mutilatus:61.40625)match156:30.703125)match155:30.703125)match145:24.5625,((Calambus\_bipustulatus:49.125,Hypoganus\_inunctus:49.125)match159:49.125,Drapetes\_cinctus:98.25)match158:49.125)match144:24.5625,(Anostirus\_purpureus:85.96875,Anostirus\_castaneus:85.96875,Anostirus\_sulphuripennis:85.96875)match160:85.96875)match143:24.5625,((Lacon\_lepidopterus:65.5,Lacon\_querceus:65.5)match162:65.5,Danosoma\_fasciatus:131)match161:65.5)match142:4.080353,Cerophytum\_elateroides:200.580353)match141:4.080368)match136:4.080353,((Malthinus\_punctatus:69.58036,Malthinus\_seriepunctatus:69.58036,Malthinus\_fasciatus:69.58036,Malthinus\_balteatus:69.58036,Malthinus\_facialis:69.58036,Malthinus\_gl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