**Appendix Table S1.** Frequency (number of transects) and abundance (number of individuals) of 118 palm taxa in 96 transects in western Amazonia. Palms with a frequency lower than 10 were omitted from eHOF models analyses. For unabbreviated taxon names, see Table S9 in Supporting Information.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Taxa** | **Frequency** | **Total abundance** | **Maximum abundance** | **Taxa** | **Frequency** | **Total abundance** | **Maximum abundance** |
| *aiphacul* | 1 | 1 | 1 | *euteprec* | 89 | 2799 | 134 |
| *aiphdelt* | 2 | 3 | 2 | *geonarun* | 1 | 1 | 1 |
| *aiphulei* | 20 | 129 | 16 | *geonatro* | 7 | 52 | 20 |
| *aiphwebe* | 2 | 6 | 5 | *geonbrev* | 9 | 1147 | 399 |
| *ammadasy* | 2 | 87 | 59 | *geonbron* | 31 | 1637 | 581 |
| *aphanata* | 15 | 700 | 145 | *geoncama* | 14 | 61 | 10 |
| *astracul* | 8 | 50 | 27 | *geondeve* | 52 | 2911 | 523 |
| *astrcham* | 43 | 518 | 51 | *geoninteinte* | 1 | 1 | 1 |
| *astrchon* | 2 | 197 | 125 | *geonlept* | 6 | 48 | 15 |
| *astrcili* | 12 | 697 | 211 | *geonlong* | 2 | 161 | 93 |
| *astrfara* | 11 | 1702 | 265 | *geonmacracau* | 43 | 2287 | 301 |
| *astrgrat* | 11 | 1403 | 284 | *geonmacrmacr* | 34 | 4430 | 1448 |
| *astrgyna* | 16 | 1547 | 331 | *geonmaxichel* | 27 | 1370 | 260 |
| *astrulei* | 6 | 209 | 69 | *geonmaximaxi* | 19 | 335 | 47 |
| *astruros* | 23 | 361 | 68 | *geonmaximini* | 1 | 3 | 3 |
| *attabuty* | 12 | 575 | 182 | *geonmaximult* | 1 | 88 | 88 |
| *attainsi* | 7 | 88 | 32 | *geonmaxispix* | 12 | 225 | 91 |
| *attamari* | 47 | 1212 | 201 | *geonocci* | 2 | 29 | 20 |
| *attamicr* | 16 | 1324 | 302 | *geonolig* | 10 | 230 | 64 |
| *attaphal* | 23 | 2340 | 608 | *geonpoep* | 14 | 751 | 212 |
| *attaplow* | 3 | 18 | 11 | *geonpoly* | 3 | 49 | 38 |
| *attarace* | 6 | 475 | 179 | *geonstriarun* | 1 | 8 | 8 |
| *attatess* | 9 | 2106 | 595 | *geonstripisc* | 13 | 293 | 109 |
| *bactacanexsc* | 33 | 924 | 116 | *geonstristri* | 40 | 1450 | 248 |
| *bactacantrai* | 4 | 21 | 16 | *geonstritrai* | 33 | 1024 | 143 |
| *bactbala* | 2 | 11 | 8 | *geonsupr* | 13 | 541 | 179 |
| *bactbifi* | 3 | 50 | 46 | *geontrig* | 4 | 16 | 9 |
| *bactbron* | 1 | 10 | 10 | *hyoseleg* | 51 | 1177 | 207 |
| *bactchav* | 2 | 7 | 5 | *iriadelt* | 61 | 5610 | 449 |
| *bactconc* | 20 | 579 | 126 | *iriaseti* | 26 | 1975 | 460 |
| *bactcoro* | 32 | 620 | 74 | *iriasten* | 19 | 2794 | 719 |
| *bacteleg* | 5 | 76 | 43 | *lepitenu* | 21 | 14887 | 2312 |
| *bactfiss* | 4 | 173 | 151 | *manimart* | 1 | 5 | 5 |
| *bactgasi* | 1 | 4 | 4 | *maurflex* | 13 | 86 | 23 |
| *bactgasichic* | 1 | 1 | 1 | *oenobaca* | 20 | 1426 | 588 |
| *bacthalm* | 19 | 135 | 26 | *oenobali* | 13 | 163 | 32 |
| *bacthirthirt* | 38 | 476 | 41 | *oenobata* | 76 | 15686 | 1369 |
| *bacthirtlako* | 15 | 297 | 72 | *oenomapo* | 42 | 869 | 132 |
| *bacthirtpect* | 2 | 5 | 4 | *oenomino* | 4 | 31 | 12 |
| *bacthirtspru* | 2 | 203 | 193 | *pholsyna* | 9 | 620 | 219 |
| *bactkill* | 17 | 396 | 76 | *phytmacr* | 21 | 1961 | 284 |
| *bactmacr* | 19 | 325 | 66 | *phyttenu* | 16 | 1283 | 169 |
| *bactmarachae* | 1 | 2 | 2 | *presschu* | 16 | 1804 | 609 |
| *bactmarajuru* | 12 | 59 | 10 | *socrexor* | 78 | 2489 | 310 |
| *bactmaramara* | 48 | 555 | 61 | *socrsala* | 9 | 295 | 60 |
| *bactmaratric* | 8 | 190 | 42 | *syagsanc* | 2 | 5 | 4 |
| *bactmart* | 1 | 2 | 2 | *syagsmit* | 1 | 2 | 2 |
| *bactolig* | 1 | 1 | 1 | *wendgracgrac* | 9 | 444 | 120 |
| *bactripa* | 1 | 1 | 1 | *wendgracsimp* | 1 | 157 | 157 |
| *bactschu* | 21 | 207 | 47 | *wettaugu* | 9 | 466 | 118 |
| *bactsimp* | 49 | 526 | 68 | *wettdrud* | 11 | 672 | 142 |
| *bactsp\_O1* | 5 | 76 | 28 | *wettmayn* | 16 | 171 | 42 |
| *bactsp5* | 3 | 75 | 44 |  |  |  |  |
| *bactspha* | 9 | 488 | 161 |  |  |  |  |
| *bactsyag* | 3 | 8 | 5 |  |  |  |  |
| *bacttefe* | 2 | 5 | 3 |  |  |  |  |
| *chamangu* | 2 | 6 | 5 |  |  |  |  |
| *champauc* | 24 | 85 | 18 |  |  |  |  |
| *champinn* | 36 | 459 | 60 |  |  |  |  |
| *chelulei* | 5 | 42 | 28 |  |  |  |  |
| *desmgiga* | 24 | 50 | 6 |  |  |  |  |
| *desmmitilept* | 19 | 116 | 27 |  |  |  |  |
| *desmmitimiti* | 14 | 54 | 14 |  |  |  |  |
| *desmorth* | 6 | 15 | 5 |  |  |  |  |
| *desmpoly* | 27 | 147 | 53 |  |  |  |  |
| *elaeolei* | 2 | 72 | 69 |  |  |  |  |

**Appendix Table S2.** Means and ranges of the total abundance (number of individuals) and richness (number of taxa) of palms in nine regions sampled in western Amazonia. Taxa are counted at the lowest taxonomic level possible, i.e. with each accepted subspecies or variety counted separately. For geographical locations, see Fig. 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Region | Country | No. Transects | No. Individuals (min. – max.) | Richness |
| 1. Guaviare | Colombia | 8 | 1055 (504–1385) | 15.50 (13–18) |
| 2. Caquetá | Colombia | 12 | 445 (195–782) | 20.92 (13–27) |
| 3. Yasuní | Ecuador | 12 | 1332 (944–2014) | 22.50 (9–29) |
| 4. Kapawi | Ecuador | 11 | 681 (342–1446) | 18.72 (9–29) |
| 5. Iquitos | Peru | 10 | 1497 (1115–1922) | 25.10 (18–29) |
| 6. Orellana | Peru | 11 | 1026 (430–2149) | 13.45 (8–19) |
| 7. Ucayali | Peru | 9 | 1900 (747–2904) | 19.56 (16–22) |
| 8. Juruá | Brazil | 12 | 898 (407–2437) | 27.25 (18–36) |
| 9. La Paz | Bolivia | 11 | 810 (571–1263) | 10.45 (8–15) |

**Appendix Table S3.** Abundance (number of individuals per region) and overall frequency (number of regions) of 61 palm taxa in nine regions in western Amazonia.For geographical locations, see Fig. 1. For the number of transects sampled in each region, see Table S2 in Supporting Information. For unabbreviated taxon names, see Table S9 in Supporting Information.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Species** | **I. Guaviare** | **II. Caqueta** | **III. Yasuni** | **IV. Kapawi** | **V. Iquitos** | **VI. Orellana** | **VII. Ucayali** | **VIII. Jurua** | **IX. La Paz** | **Frequency** |
| oenobata | 1385 | 28 | 6194 | 1529 | 3913 | 259 | 990 | 1301 | 87 | 9 |
| euteprec | 322 | 635 | 255 | 190 | 117 | 143 | 193 | 225 | 719 | 9 |
| socrexor | 213 | 652 | 59 | 260 | 53 | 105 | 35 | 726 | 386 | 9 |
| bactmaramara | 102 | 132 | 12 | 34 | 33 | 13 | 141 | 86 | 2 | 9 |
| maurflex |  | 3 | 1 | 11 | 8 | 8 | 23 | 13 | 19 | 8 |
| iriadelt |  | 29 | 1971 | 536 | 1 | 47 | 112 | 192 | 2722 | 8 |
| oenomapo |  | 65 | 28 | 43 | 1 | 197 | 178 | 50 | 307 | 8 |
| hyoseleg |  | 116 | 106 | 256 | 205 | 1 | 59 | 434 |  | 7 |
| attamari | 219 | 68 | 651 | 33 | 107 |  | 101 | 33 |  | 7 |
| geondeve | 427 | 128 | 147 |  | 87 |  | 45 | 517 | 1560 | 7 |
| bactsimp | 71 | 222 | 2 | 54 | 76 |  | 46 | 55 |  | 7 |
| geonmacrmacr | 5 | 31 | 2356 | 31 | 8 | 1448 |  | 551 |  | 7 |
| geonbron |  |  | 81 | 6 | 5 | 44 | 1123 | 359 | 19 | 7 |
| champinn |  |  | 126 | 121 | 1 | 131 | 7 | 42 | 31 | 7 |
| geonmacracau |  | 108 |  | 441 | 1051 | 60 | 612 | 15 |  | 6 |
| geonstritrai |  | 70 | 31 | 47 | 203 |  | 486 | 187 |  | 6 |
| geonstristri |  | 251 | 146 | 630 | 147 |  | 25 | 251 |  | 6 |
| bactcoro | 144 | 143 | 42 | 134 | 107 |  |  | 50 |  | 6 |
| bacthirthirt | 146 | 130 |  | 13 | 102 |  | 39 | 46 |  | 6 |
| bactacanexsc | 587 | 26 |  | 110 | 27 |  | 31 | 143 |  | 6 |
| astrcham |  | 47 | 328 | 32 | 26 |  | 32 | 53 |  | 6 |
| desmgiga | 3 |  | 3 | 2 | 19 |  | 7 | 16 |  | 6 |
| champauc |  | 4 | 16 | 43 | 3 |  | 2 | 17 |  | 6 |
| desmpoly | 8 | 97 |  | 21 |  | 2 | 9 | 10 |  | 6 |
| desmmitimiti |  | 15 | 4 | 3 | 29 |  |  | 3 |  | 5 |
| geoncama |  | 5 |  | 2 | 3 |  | 14 | 37 |  | 5 |
| desmmitilept | 11 |  |  |  | 2 | 7 | 31 | 65 |  | 5 |
| attaphal |  |  |  | 6 |  | 2183 | 21 | 35 | 95 | 5 |
| lepitenu |  | 35 |  |  | 2149 |  | 10818 | 1885 |  | 4 |
| geonmaxichel |  | 1 |  |  | 1022 |  | 106 | 241 |  | 4 |
| bactmacr |  | 98 |  |  | 162 | 60 | 5 |  |  | 4 |
| attamicr | 852 | 68 |  |  | 86 |  |  | 318 |  | 4 |
| bacthalm |  | 21 |  |  | 28 |  | 70 | 16 |  | 4 |
| bactconc |  |  |  |  | 1 | 118 |  | 243 | 217 | 4 |
| phytmacr |  |  |  |  |  | 1412 | 15 | 373 | 161 | 4 |
| attabuty |  |  |  | 218 |  | 178 |  | 178 | 1 | 4 |
| geonmaximaxi | 31 |  | 222 | 79 |  |  |  | 3 |  | 4 |
| iriasten |  |  |  | 366 | 1867 |  | 561 |  |  | 3 |
| bactschu |  |  | 13 | 46 | 148 |  |  |  |  | 3 |
| bactkill |  | 39 |  |  | 135 |  |  | 222 |  | 3 |
| geonstripisc |  |  | 31 | 180 | 82 |  |  |  |  | 3 |
| oenobali |  | 128 |  |  | 31 |  |  | 4 |  | 3 |
| astruros |  |  | 123 | 237 | 1 |  |  |  |  | 3 |
| iriaseti | 1543 | 266 |  |  |  |  |  | 166 |  | 3 |
| oenobaca | 1103 | 254 |  |  |  |  |  | 69 |  | 3 |
| presschu |  |  | 1740 | 37 |  |  |  | 27 |  | 3 |
| bactmarajuru |  |  | 37 | 2 |  |  |  | 20 |  | 3 |
| aphanata |  |  | 108 | 4 |  | 588 |  |  |  | 3 |
| geonpoep |  |  |  | 59 | 692 |  |  |  |  | 2 |
| wettdrud |  |  |  | 143 | 529 |  |  |  |  | 2 |
| bacthirtlako |  | 101 |  |  | 196 |  |  |  |  | 2 |
| astrgyna | 1263 |  |  |  |  |  |  | 284 |  | 2 |
| geonmaxispix |  | 178 |  |  |  |  |  | 47 |  | 2 |
| geonolig |  | 229 |  |  |  |  |  | 1 |  | 2 |
| aiphulei |  |  | 109 | 20 |  |  |  |  |  | 2 |
| geonsupr |  |  | 73 | 468 |  |  |  |  |  | 2 |
| phyttenu |  |  | 725 | 558 |  |  |  |  |  | 2 |
| wettmayn |  |  | 128 | 43 |  |  |  |  |  | 2 |
| astrcili |  | 697 |  |  |  |  |  |  |  | 1 |
| astrfara |  |  |  |  |  | 1702 |  |  |  | 1 |
| astrgrat |  |  |  |  |  |  |  |  | 1403 | 1 |

**Appendix Table S4.** Direction cosines and squared coefficients of soil variables fitted onto the Non-Metric Multidimensional Scaling (NMDS) ordination space of 96 palm communities in western Amazonia.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | NMDS dimension 1 | NMDS dimension 2 | R2 | *P* |  |
| Exchangeable bases | -0.949 | -0.315 | 0.644 | 0.001 | \*\*\* |
| Ca | -0.956 | -0.295 | 0.605 | 0.001 | \*\*\* |
| K | -0.932 | -0.363 | 0.449 | 0.001 | \*\*\* |
| Mg | -0.912 | -0.411 | 0.710 | 0.001 | \*\*\* |
| P | -0.890 | 0.456 | 0.452 | 0.001 | \*\*\* |
| S | -0.947 | -0.322 | 0.631 | 0.001 | \*\*\* |
| B | 0.145 | 0.989 | 0.076 | 0.022 | \* |
| Cu | -0.858 | -0.513 | 0.602 | 0.001 | \*\*\* |
| Fe | 0.844 | 0.537 | 0.469 | 0.001 | \*\*\* |
| Mn | -0.979 | -0.205 | 0.535 | 0.001 | \*\*\* |
| Zn | -0.995 | 0.095 | 0.596 | 0.001 | \*\*\* |

**Appendix Table S5**. Linear Pearson correlation coefficients between soil properties as measured in 96 transects in western Amazonia.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Variable | | | | | | | | | |
| Variable | Mg | K | Ca+Mg+K | Zn | Cu | Fe | Mn | P | B | S |
| Ca | 0.87 | 0.68 | 1 | 0.59 | 0.68 | -0.59 | 0.58 | 0.47 | 0.16 | 0.94 |
| Mg |  | 0.73 | 0.9 | 0.64 | 0.75 | -0.65 | 0.66 | 0.44 | -0.02 | 0.82 |
| K |  |  | 0.71 | 0.61 | 0.76 | -0.63 | 0.43 | 0.44 | -0.08 | 0.65 |
| Ca+Mg+K |  |  |  | 0.61 | 0.71 | -0.62 | 0.6 | 0.47 | 0.14 | 0.94 |
| Zn |  |  |  |  | 0.59 | -0.46 | 0.68 | 0.77 | 0.03 | 0.68 |
| Cu |  |  |  |  |  | -0.68 | 0.48 | 0.39 | -0.13 | 0.65 |
| Fe |  |  |  |  |  |  | -0.52 | -0.35 | 0.61 | -0.59 |
| Mn |  |  |  |  |  |  |  | 0.4 | -0.19 | 0.57 |
| P |  |  |  |  |  |  |  |  | 0.11 | 0.63 |
| B |  |  |  |  |  |  |  |  |  | 0.15 |

**Appendix Table S6.** (A) Mantel test results between floristic and edaphic dissimilarities (rM is the Pearson correlation between the two) in 96 transects in western Amazonia, and corresponding partial Mantel test results where the effect of logarithmically transformed geographic distances has been partialled out. Floristic dissimilarity was based on the Steinhaus index. *P* < 0.001 in all cases. (B) Mantel test results between differences in individual soil variables and logarithmically transformed geographic distance used in (A). All statistical significances were established with a Monte Carlo permutation test using 999 random permutations.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **(A)** | Mantel rM | | Partial Mantel rM | |
|  | Presence/Absence | Abundance | Presence/Absence | Abundance |
| All soil | 0.64 | 0.49 | 0.62 | 0.43 |
| Exchangeable bases | 0.58 | 0.45 | 0.59 | 0.43 |
| Ca | 0.57 | 0.45 | 0.58 | 0.43 |
| K | 0.34 | 0.30 | 0.29 | 0.24 |
| Mg | 0.59 | 0.42 | 0.60 | 0.39 |
| P | 0.39 | 0.27 | 0.33 | 0.19 |
| S | 0.47 | 0.36 | 0.47 | 0.33 |
| B | 0.20 | 0.12 | 0.18 | 0.08 |
| Cu | 0.48 | 0.32 | 0.47 | 0.27 |
| Fe | 0.36 | 0.27 | 0.39 | 0.28 |
| Mn | 0.52 | 0.38 | 0.49 | 0.31 |
| Zn | 0.47 | 0.37 | 0.41 | 0.28 |
| Geographic | 0.62 | 0.62 | – | – |
|  |  |  |  |  |
| **(B)** | **rM** | *P*-value |  |  |
| Ca+Mg+K | 0.20 | 0.001 |  |  |
| Ca | 0.19 | 0.001 |  |  |
| K | 0.18 | 0.001 |  |  |
| Mg | 0.21 | 0.001 |  |  |
| P | 0.21 | 0.001 |  |  |
| S | 0.17 | 0.001 |  |  |
| B | 0.09 | 0.001 |  |  |
| Cu | 0.19 | 0.001 |  |  |
| Fe | 0.09 | 0.003 |  |  |
| Mn | 0.23 | 0.001 |  |  |
| Zn | 0.25 | 0.001 |  |  |

**Appendix Table S7.** Response shapes of 61 western Amazonian palm taxa along soil nutrient gradients as fitted using extended Huismann-Olff-Fresco models and abundance data: (II) monotonic, (III) plateau, (IV) unimodal symmetric, (V) unimodal skewed, (VI) bimodal with two equal optima, (VII) bimodal with unequal optima. Model I (no response) was not obtained for any taxon. For unabbreviated taxon names see Table S9 in Supporting Information.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Macronutrients** | | | | | |  | **Micronutrients** | | | | | | |
| **Species** | **Exchangeable bases** | **Ca** | **K** | **Mg** | **P** | **S** |  | **B** | **Cu** | **Fe** | **Mn** | **Zn** | **Habit** |
| **(Ca + K + Mg)** |
| aiphulei | V | V | V | V | VII | V |  | VII | VII | III | VI | V | Understory |
| aphanata | V | V | V | III | V | V |  | VII | V | V | V | V | Canopy |
| astrcham | VII | VII | VII | VII | VII | VII |  | VII | VII | VII | VII | VII | Canopy |
| astrcili | VII | VII | VII | VII | V | V |  | V | V | V | VII | VII | Understory |
| astrfara | VII | VII | V | III | V | III |  | VII | VII | V | VI | VI | Understory |
| astrgrat | V | V | V | V | VII | VII |  | V | V | VII | V | V | Understory |
| astrgyna | V | V | V | V | V | VII |  | VII | V | VI | VII | V | Understory |
| astruros | V | V | VII | V | VII | V |  | V | V | VII | V | V | Understory |
| attabuty | VII | VII | VII | VII | VII | V |  | VII | VII | VII | VII | V | Canopy |
| attamari | VII | VII | VII | VII | VII | VII |  | V | VII | VII | VII | VII | Canopy |
| attamicr | V | II | V | V | VII | VII |  | VII | VII | VII | VII | V | Understory |
| attaphal | VI | VI | VI | VI | V | VII |  | VII | VI | V | VI | VI | Canopy |
| bactacanexsc | VII | VII | V | VII | VII | VII |  | VII | VII | VII | VII | VII | Understory |
| bactconc | VI | VI | VII | VI | V | III |  | VII | VII | VII | VII | V | Understory |
| bactcoro | V | VII | V | V | VII | VII |  | VII | VII | VII | VII | VII | Understory |
| bacthalm | VII | VII | VII | VII | V | VII |  | VII | V | VI | VII | VII | Understory |
| bacthirthirt | VII | VII | VII | VII | V | V |  | V | V | VII | VII | VII | Understory |
| bacthirtlako | V | V | III | V | V | III |  | VII | V | IV | VII | V | Understory |
| bactkill | V | VII | V | V | V | VII |  | VII | II | VI | VII | V | Understory |
| bactmacr | VII | VII | VII | VII | VII | VII |  | VII | VII | V | VII | VII | Understory |
| bactmarajuru | VII | VII | VII | VII | VII | VII |  | VII | VII | VII | VII | V | Understory |
| bactmaramara | VII | VII | VII | V | VII | VII |  | VII | VII | VII | VII | VII | Understory |
| bactschu | V | V | V | VII | VII | V |  | VII | V | V | VII | V | Understory |
| bactsimp | VII | VII | VII | VII | VII | VII |  | V | V | V | IV | VI | Understory |
| champauc | V | V | VII | V | VII | V |  | VI | VII | VII | VII | VII | Understory |
| champinn | V | V | V | V | V | V |  | VII | VI | VII | II | III | Understory |
| desmgiga | V | VII | V | V | II | IV |  | II | II | II | V | V | Understory |
| desmmitilept | VII | VII | VII | VII | VII | VI |  | VII | VII | VII | VII | VII | Understory |
| desmmitimiti | V | VII | VII | V | VII | V |  | VII | V | VII | VII | V | Understory |
| desmpoly | VII | VII | VII | VII | VII | VII |  | VI | VII | VII | V | VII | Understory |
| euteprec | VII | VII | VII | VII | VII | VII |  | VII | VII | VII | VII | VII | Canopy |
| geonbron | VII | VII | V | VII | VII | VII |  | V | III | V | VII | VII | Understory |
| geoncama | V | V | V | V | VII | V |  | VII | II | II | VII | V | Understory |
| geondeve | VII | VII | VII | VII | VII | V |  | VII | VII | V | VII | VII | Understory |
| geonmacracau | V | VII | VII | VII | VII | V |  | VII | VII | VII | VII | VII | Understory |
| geonmacrmacr | VII | VII | VII | VII | VII | VII |  | VII | VII | VII | VII | VII | Understory |
| geonmaxichel | V | VII | VII | VII | VII | V |  | VII | V | VI | VII | V | Understory |
| geonmaximaxi | VII | VII | VII | VII | VII | V |  | VII | VII | V | VII | VII | Understory |
| geonmaxispix | VII | VII | VII | VII | VII | VII |  | VII | VII | VI | V | VII | Understory |
| geonolig | V | V | VII | V | V | VII |  | VII | VII | V | VII | V | Understory |
| geonpoep | V | VII | V | V | V | V |  | V | V | V | VII | V | Understory |
| geonstripisc | VII | VII | VII | VII | VII | VII |  | VII | VII | V | VII | VII | Understory |
| geonstristri | VII | VII | VII | VII | VII | VII |  | VII | VII | VII | V | VII | Understory |
| geonstritrai | V | V | VII | V | VII | VII |  | VII | VII | VI | V | VII | Understory |
| geonsupr | V | V | VII | V | VII | V |  | VII | VII | VII | V | V | Understory |
| hyoseleg | V | V | V | V | V | V |  | VII | VII | VII | VII | VII | Understory |
| iriadelt | V | V | V | V | VII | V |  | VII | VII | VII | V | VII | Canopy |
| iriaseti | VII | VII | VII | V | V | VII |  | VI | VII | VII | VII | VII | Understory |
| iriasten | V | V | V | V | V | V |  | V | V | V | V | VII | Understory |
| lepitenu | VII | VII | VII | VII | III | VII |  | V | VII | V | V | V | Understory |
| maurflex | V | V | VII | V | VII | VII |  | VII | VI | VII | VII | VII | Canopy |
| oenobaca | II | V | VII | II | VII | V |  | V | VII | VII | VII | VII | Canopy |
| oenobali | V | V | VII | V | V | VII |  | VII | V | V | V | VII | Canopy |
| oenobata | VII | VII | VII | VII | VII | VII |  | VII | VII | VII | VII | V | Canopy |
| oenomapo | VII | V | VII | VII | VII | V |  | VII | VII | VII | VII | VII | Canopy |
| phytmacr | VI | V | V | III | V | III |  | VII | VII | V | VI | VI | Understory |
| phyttenu | V | V | VII | V | V | V |  | VII | VII | VII | V | V | Understory |
| presschu | V | V | V | V | V | V |  | III | VII | V | V | V | Understory |
| socrexor | VII | VII | VII | VII | VII | VII |  | VII | VII | VII | VII | VII | Canopy |
| wettdrud | V | V | V | V | VII | V |  | V | V | V | V | V | Understory |
| wettmayn | VII | VII | VII | VII | VII | V |  | VII | VII | VII | V | V | Canopy |

**Appendix Table S8.** Percentage of western Amazonian palm taxa (n=61) with different response shapes to (A) macronutrients and (B) micronutrients, and percentage of (C) canopy (n=14) and understory palms (n=47) with different response shapes along the exchangeable bases (Ca+K+Mg) gradient. Response shapes were calculated using extended Huisman-Olff-Fresco models and abundance data: (I) flat, (II) monotonic, (III) plateau, (IV) unimodal symmetric, (V) unimodal skewed, (VI) bimodal with two equal optima, (VII) bimodal with unequal optima. The most frequent response shape on each line is shown in bold.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **eHOF model** | I | II | III | IV | V | VI | VII |  |
| **(A) Macronutrients** |  |  |  |  |  |  |  |  |
| Exchangeable bases | 0 | 2 | 0 | 0 | **47** | 5 | 46 |  |
| Ca | 0 | 2 | 0 | 0 | 39 | 3 | **56** |  |
| K | 0 | 0 | 2 | 0 | 34 | 2 | **62** |  |
| Mg | 0 | 2 | 5 | 0 | 44 | 3 | **46** |  |
| **P** | 0 | 2 | 2 | 0 | 33 | 0 | **63** |  |
| S | 0 | 0 | 7 | 2 | 42 | 2 | **47** |  |
| **(B) Micronutrients** |  |  |  |  |  |  |  |  |
| B | 0 | 2 | 2 | 0 | 19 | 5 | **72** |  |
| Cu | 0 | 3 | 2 | 2 | 26 | 5 | **62** |  |
| Fe | 0 | 3 | 2 | 2 | 31 | 9 | **53** |  |
| Mn | 0 | 2 | 0 | 2 | 27 | 7 | **62** |  |
| Zn | 0 | 0 | 2 | 0 | 41 | 7 | **50** |  |
| **(C) Habit: exchangeable bases** |  |  |  |  |  |  |  |  |
| Canopy palms (n=14) | 0 | 7 | 0 | 0 | 29 | 7 | **57** |  |
| Understory palms (n=47) | 0 | 0 | 0 | 0 | **53** | 4 | 43 |  |

**Appendix Table S9.** Ranges, means and optimum values of selected log-transformed soil nutrients as modelled with abundance data for 61 western Amazonian palm taxa: (a) exchangeable bases (Ca +Mg + K), (b) phosphorus, and (c) boron.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | (a) log10 exchangeable bases | | | (b) log10 P | | | (c) log10 B | | |  |
| Species | Acronym | Range | Mean | Optimum | Range | Mean | Optimum | Range | Mean | Optimum | Habit |
| *Aiphanes* *ulei* (Dammer) Burret | aiphulei | 1.56 | 0.50 | 0.59 | 0.76 | 1.00 | 1.03 | 0.35 | -0.43 | -0.43 | Understory |
| *Aphandra natalia* (Balslev & A.J.Hend.) Barfod | aphanata | 1.83 | 1.20 | 1.40 | 0.59 | 1.31 | 1.38 | 0.60 | -0.32 | -0.31 | Canopy |
| *Astrocaryum chambira* Burret | astrcham | 2.22 | 0.11 | 0.31 | 0.76 | 0.92 | 0.99 | 0.58 | -0.33 | -0.37 | Canopy |
| *Astrocaryum ciliatum* F.Kahn & B.Millán | astrcili | 1.07 | -0.24 | -0.12 | 0.65 | 0.93 | 0.86 | 0.17 | -0.33 | -0.34 | Understory |
| *Astrocaryum faranae* F.Kahn & E.Ferreira | astrfara | 1.53 | 1.39 | 1.46 | 0.45 | 1.42 | 1.41 | 0.34 | -0.22 | -0.25 | Understory |
| *Astrocaryum gratum* F.Kahn & B.Millán | astrgrat | 1.24 | 0.69 | 0.91 | 0.93 | 1.45 | 1.54 | 0.25 | -0.27 | -0.25 | Understory |
| *Astrocaryum gynacanthum* Mart. | astrgyna | 1.28 | -0.63 | -0.70 | 0.59 | 0.82 | 0.84 | 0.33 | -0.21 | -0.28 | Understory |
| *Astrocaryum urostachys* Burret | astruros | 1.65 | 0.55 | 0.93 | 0.76 | 1.00 | 1.04 | 0.38 | -0.43 | -0.48 | Understory |
| *Attalea butyracea* (Mutis ex L.f.) Wess.Boer | attabuty | 1.96 | 0.67 | 0.62 | 1.00 | 1.04 | 1.11 | 0.58 | -0.35 | -0.29 | Canopy |
| *Attalea maripa* (Aubl.) Mart. | attamari | 2.22 | -0.19 | -0.05 | 0.76 | 0.91 | 0.98 | 0.54 | -0.31 | -0.34 | Canopy |
| *Attalea microcarpa* Mart. | attamicr | 0.68 | -0.61 | -0.70 | 0.59 | 0.78 | 0.83 | 0.31 | -0.25 | -0.28 | Understory |
| *Attalea phalerata* Mart. ex Spreng. | attaphal | 1.83 | 1.15 | 1.52 | 0.95 | 1.40 | 1.42 | 0.50 | -0.27 | -0.19 | Canopy |
| *Bactris acanthocarpa* var. *exscapa* Barb.Rodr. | bactacanexsc | 1.30 | -0.46 | -0.63 | 0.74 | 0.81 | 0.81 | 0.34 | -0.26 | -0.30 | Understory |
| *Bactris concinna* Mart. | bactconc | 2.46 | 1.02 | 0.99 | 1.06 | 1.29 | 1.32 | 0.36 | -0.24 | -0.23 | Understory |
| *Bactris corossilla* H.Karst. | bactcoro | 2.19 | -0.19 | -0.24 | 0.74 | 0.86 | 0.82 | 0.56 | -0.31 | -0.31 | Understory |
| *Bactris halmoorei* A.J.Hend. | bacthalm | 0.86 | -0.50 | -0.46 | 0.67 | 0.84 | 0.91 | 0.31 | -0.24 | -0.26 | Understory |
| *Bactris hirta* Martius var. *hirta* | bacthirthirt | 1.30 | -0.41 | -0.40 | 0.74 | 0.84 | 0.87 | 0.34 | -0.27 | -0.31 | Understory |
| *Bactris* *hirta* var. *lakoi* (Burret) A.J.Hend. | bacthirtlako | 1.05 | -0.21 | -0.27 | 0.52 | 0.84 | 0.81 | 0.26 | -0.30 | -0.30 | Understory |
| *Bactris killipii* Burret | bactkill | 1.20 | -0.44 | -0.57 | 0.54 | 0.76 | 0.71 | 0.29 | -0.22 | -0.17 | Understory |
| *Bactris macroacantha* Mart. | bactmacr | 1.12 | -0.32 | -0.28 | 0.75 | 0.88 | 0.95 | 0.26 | -0.29 | -0.26 | Understory |
| *Bactris maraja* var. *juruensis* (Trail) A.J.Hend. | bactmarajuru | 1.71 | 0.01 | -0.01 | 0.54 | 0.90 | 0.89 | 0.58 | -0.29 | -0.29 | Understory |
| *Bactris maraja* Mart. var. *maraja* | bactmaramara | 2.43 | 0.11 | -0.05 | 1.09 | 0.99 | 0.98 | 0.48 | -0.31 | -0.31 | Understory |
| *Bactris schultesii* (L.H.Bailey) Glassman | bactschu | 1.52 | -0.03 | -0.38 | 0.74 | 0.88 | 0.81 | 0.31 | -0.31 | -0.25 | Understory |
| *Bactris simplicifrons* Mart. | bactsimp | 1.73 | -0.33 | -0.32 | 0.85 | 0.87 | 0.88 | 0.38 | -0.29 | -0.30 | Understory |
| *Chamaedorea pauciflora* Mart. | champauc | 1.95 | 0.33 | 0.62 | 0.63 | 0.98 | 1.00 | 0.58 | -0.36 | -0.39 | Understory |
| *Chamaedorea pinnatifrons* (Jacq.) Oerst. | champinn | 1.84 | 0.91 | 1.04 | 1.09 | 1.18 | 1.19 | 0.53 | -0.37 | -0.43 | Understory |
| *Desmoncus giganteus* A.J.Hend. | desmgiga | 2.07 | -0.20 | -0.27 | 0.67 | 0.87 | 0.83 | 0.56 | -0.27 | -0.25 | Understory |
| *Desmoncus mitis* subsp. *leptospadix* (Mart.) A.J.Hend. | desmmitilept | 2.56 | 0.58 | 0.42 | 0.90 | 1.08 | 1.02 | 0.46 | -0.31 | -0.29 | Understory |
| *Desmoncus mitis* Mart. subsp. *mitis* | desmmitimiti | 1.53 | -0.06 | -0.32 | 0.70 | 0.86 | 0.84 | 0.45 | -0.33 | -0.26 | Understory |
| *Desmoncus polyacanthos* Mart. | desmpoly | 2.23 | 0.00 | 0.06 | 0.92 | 0.90 | 1.01 | 0.57 | -0.32 | -0.36 | Understory |
| *Euterpe precatoria* Mart. | euteprec | 2.60 | 0.17 | 0.19 | 1.47 | 1.04 | 1.10 | 0.58 | -0.30 | -0.31 | Canopy |
| *Geonoma brongniartii* Mart. | geonbron | 2.17 | 0.32 | 0.54 | 1.20 | 1.10 | 1.07 | 0.54 | -0.32 | -0.42 | Understory |
| *Geonoma camana* Trail | geoncama | 1.65 | -0.22 | -0.44 | 0.67 | 0.90 | 0.81 | 0.34 | -0.24 | -0.18 | Understory |
| *Geonoma deversa* (Poit.) Kunth | geondeve | 2.03 | -0.13 | 0.02 | 1.09 | 0.97 | 1.19 | 0.39 | -0.28 | -0.29 | Understory |
| *Geonoma macrostachys* Mart. var. *macrostachys* | geonmacracau | 2.38 | 0.30 | 0.01 | 1.08 | 1.01 | 0.90 | 0.51 | -0.30 | -0.33 | Understory |
| *Geonoma macrostachys* var. *acaulis* (Mart.) Skov ex A.J.Hend. | geonmacrmacr | 2.09 | 0.09 | 0.30 | 0.84 | 0.95 | 1.16 | 0.56 | -0.30 | -0.29 | Understory |
| *Geonoma maxima* var. *chelidonura* (Spruce) A.J.Hend. | geonmaxichel | 1.60 | -0.38 | -0.34 | 0.67 | 0.83 | 0.82 | 0.34 | -0.23 | -0.24 | Understory |
| *Geonoma maxima* (Poit.) Kunth var. *maxima* | geonmaximaxi | 2.16 | 0.06 | 0.08 | 0.76 | 0.94 | 0.94 | 0.52 | -0.36 | -0.35 | Understory |
| *Geonoma maxima* subsp. *spixiana* (Mart.) A.J.Hend. | geonmaxispix | 1.07 | -0.43 | -0.55 | 0.61 | 0.79 | 0.85 | 0.33 | -0.22 | -0.24 | Understory |
| *Geonoma oligoclona* Trail | geonolig | 0.94 | -0.23 | -0.11 | 0.59 | 0.87 | 0.82 | 0.33 | -0.32 | -0.34 | Understory |
| *Geonoma poeppigiana* Mart. | geonpoep | 1.05 | -0.29 | -0.38 | 0.74 | 0.78 | 0.81 | 0.24 | -0.28 | -0.25 | Understory |
| *Geonoma stricta* var. *piscicauda* (Dammer) A.J.Hend. | geonstripisc | 1.13 | -0.02 | -0.17 | 0.74 | 0.89 | 0.73 | 0.37 | -0.33 | -0.34 | Understory |
| *Geonoma stricta* (Poit.) Kunth var. *stricta* | geonstristri | 2.22 | 0.07 | 0.19 | 0.76 | 0.91 | 0.88 | 0.56 | -0.34 | -0.34 | Understory |
| *Geonoma stricta* var. *trailii* (Burret) A.J.Hend. | geonstritrai | 2.09 | -0.16 | -0.38 | 0.76 | 0.88 | 0.85 | 0.56 | -0.29 | -0.27 | Understory |
| *Geonoma supracostata* Svenning | geonsupr | 1.27 | 0.50 | 0.78 | 0.62 | 1.03 | 1.03 | 0.38 | -0.43 | -0.53 | Understory |
| *Hyospathe elegans* Mart. | hyoseleg | 2.45 | -0.06 | -0.35 | 1.08 | 0.91 | 0.80 | 0.58 | -0.29 | -0.24 | Understory |
| *Iriartea deltoidea* Ruiz & Pav. | iriadelt | 2.25 | 0.47 | 0.65 | 1.47 | 1.10 | 1.26 | 0.60 | -0.34 | -0.34 | Canopy |
| *Iriartella setigera* (Mart.) H.Wendl. | iriaseti | 1.07 | -0.52 | -0.68 | 0.61 | 0.84 | 0.87 | 0.34 | -0.27 | -0.32 | Understory |
| *Iriartella stenocarpa* Burret | iriasten | 1.05 | -0.37 | -0.36 | 0.76 | 0.83 | 0.76 | 0.20 | -0.28 | -0.30 | Understory |
| *Lepidocaryum tenue* Mart. | lepitenu | 1.12 | -0.41 | -0.43 | 0.66 | 0.84 | 0.90 | 0.27 | -0.26 | -0.26 | Understory |
| *Mauritia flexuosa* L.f. | maurflex | 1.89 | 0.24 | -0.05 | 0.76 | 1.09 | 1.08 | 0.42 | -0.32 | -0.26 | Canopy |
| *Oenocarpus bacaba* Mart. | oenobaca | 1.01 | -0.60 | -0.80 | 0.76 | 0.84 | 0.89 | 0.33 | -0.27 | -0.32 | Canopy |
| *Oenocarpus balickii* F.Kahn | oenobali | 1.05 | -0.19 | -0.21 | 0.50 | 0.87 | 0.89 | 0.33 | -0.29 | -0.31 | Canopy |
| *Oenocarpus bataua* Mart. | oenobata | 2.43 | 0.09 | -0.09 | 1.47 | 1.02 | 0.91 | 0.58 | -0.31 | -0.31 | Canopy |
| *Oenocarpus mapora* H.Karst. | oenomapo | 2.20 | 0.45 | 0.23 | 1.47 | 1.16 | 1.22 | 0.60 | -0.29 | -0.30 | Canopy |
| *Phytelephas macrocarpa* Ruiz & Pav. | phytmacr | 1.53 | 1.15 | 1.34 | 0.69 | 1.35 | 1.36 | 0.50 | -0.26 | -0.25 | Understory |
| *Phytelephas tenuicaulis* (Barfod) A.J.Hend. | phyttenu | 1.46 | 0.72 | 0.97 | 0.27 | 1.05 | 1.08 | 0.38 | -0.45 | -0.51 | Understory |
| *Prestoea schultzeana* (Burret) H.E.Moore | presschu | 1.46 | 0.66 | 1.03 | 0.27 | 1.07 | 1.08 | 0.45 | -0.37 | -0.52 | Understory |
| *Socratea exorrhiza* (Mart.) H.Wendl. | socrexor | 2.46 | 0.24 | 0.18 | 1.38 | 1.05 | 1.04 | 0.60 | -0.32 | -0.29 | Canopy |
| *Wettinia drudei* (O.F.Cook & Doyle) A.J.Hend. | wettdrud | 1.05 | -0.35 | -0.41 | 0.44 | 0.75 | 0.74 | 0.20 | -0.27 | -0.27 | Understory |
| *Wettinia maynensis* Spruce | wettmayn | 1.56 | 0.50 | 0.53 | 0.76 | 1.04 | 1.03 | 0.36 | -0.43 | -0.46 | Canopy |

**Appendix Table S10.** The best and next-best eHOF models for the abundance responses of conspecific palm varieties or subspecies along the gradient of soil exchangeable base concentration (Ca + K + Mg). Model selection was based on the Akaike Information Criterion corrected for small sample sizes and a bootstrap approach (999 permutations).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Bactris hirta var. hirta** | | | | | | |
| Model | Deviance | logLik | AICc | AICc.Diff | AICc.W | BIC.Diff |
| I | 1259.678 | -629.839 | 1261.721 | 498.912 | 0 | 489.279 |
| II | 878.193 | -439.097 | 882.322 | 119.513 | 0 | 112.358 |
| III | 835.69 | -417.845 | 841.951 | 79.141 | 0 | 74.418 |
| IV | 877.746 | -438.873 | 884.007 | 121.198 | 0 | 116.475 |
| V |  |  |  |  |  |  |
| VI | 786.046 | -393.023 | 794.485 | 31.676 | 0 | 29.339 |
| VII | 752.143 | -376.071 | 762.809 | 0 | 1 | 0 |
|  |  |  |  |  |  |  |
| Percentage of model types after bootstrapping: | | | | |  |  |
| II | III | IV | VI | VII |  |  |
| 7 | 8 | 1 | 3 | 81 |  |  |
| Sum of bootstrapping model weights: | | | | | |  |
| I | II | III | IV | V | VI | VII |
| 0 | 38.69 | 69.38 | 15.7 | 39.69 | 52.82 | 782.72 |
| Suggested best model (AICc, bootselect.lower): | | | | VII |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **Bactris hirta var. lakoi** | | | | | | |
| Model | Deviance | logLik | AICc | AICc.Diff | AICc.W | BIC.Diff |
| I | 1251.098 | -625.549 | 1253.14 | 388.504 | 0 | 381.208 |
| II | 1111.963 | -555.981 | 1116.092 | 251.455 | 0 | 246.637 |
| III | 988.03 | -494.015 | 994.291 | 129.655 | 0 | 127.269 |
| IV | 908.896 | -454.448 | 915.157 | 50.521 | 0 | 48.136 |
| V | 856.197 | -428.098 | 864.636 | 0 | 1 | 0 |
| VI | 908.897 | -454.449 | 917.337 | 52.7 | 0 | 52.7 |
| VII | 908.896 | -454.448 | 919.563 | 54.927 | 0 | 57.264 |
|  |  |  |  |  |  |  |
| Percentage of model types after bootstrapping: | | | | |  |  |
| III | IV | V | VI | VII |  |  |
| 6 | 17 | 45 | 7 | 26 |  |  |
| Sum of bootstrapping model weights: | | | | | |  |
| I | II | III | IV | V | VI | VII |
| 0 | 0 | 54.37 | 96.8 | 478.55 | 102.71 | 265.57 |
| Suggested best model (AICc, bootselect.lower): | | | | V |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **Bactris maraja var. juruensis** | | | | | | |
| Model | Deviance | logLik | AICc | AICc.Diff | AICc.W | BIC.Diff |
| I | 261.69 | -130.845 | 263.732 | 74.711 | 0 | 65.078 |
| II | 256.284 | -128.142 | 260.413 | 71.393 | 0 | 64.237 |
| III | 227.944 | -113.972 | 234.205 | 45.184 | 0 | 40.461 |
| IV | 238.085 | -119.043 | 244.346 | 55.325 | 0 | 50.602 |
| V | 215.248 | -107.624 | 223.688 | 34.667 | 0 | 32.329 |
| VI | 238.085 | -119.043 | 246.525 | 57.504 | 0 | 55.167 |
| VII | 178.354 | -89.177 | 189.021 | 0 | 1 | 0 |
|  |  |  |  |  |  |  |
| Percentage of model types after bootstrapping: | | | | |  |  |
| II | III | IV | V | VI | VII |  |
| 2 | 0 | 1 | 1 | 20 | 76 |  |
| Sum of bootstrapping model weights: | | | | | |  |
| I | II | III | IV | V | VI | VII |
| 0.02 | 8.49 | 4.47 | 8.71 | 15.49 | 205.85 | 755.96 |
| Suggested best model (AICc, bootselect.lower): | | | | VII |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **Bactris maraja var. maraja** | | | | | | |
| Model | Deviance | logLik | AICc | AICc.Diff | AICc.W | BIC.Diff |
| I | 1573.158 | -786.579 | 1575.2 | 124.359 | 0 | 117.063 |
| II | 1497.515 | -748.758 | 1501.644 | 50.803 | 0 | 45.985 |
| III | 1490.339 | -745.169 | 1496.6 | 45.759 | 0 | 43.373 |
| IV | 1488.363 | -744.181 | 1494.623 | 43.782 | 0 | 41.397 |
| V | 1442.401 | -721.201 | 1450.841 | 0 | 1 | 0 |
| VI | 1488.563 | -744.282 | 1497.003 | 46.162 | 0 | 46.162 |
| VII | 1488.363 | -744.181 | 1499.029 | 48.188 | 0 | 50.526 |
|  |  |  |  |  |  |  |
| Percentage of model types after bootstrapping: | | | | |  |  |
| II | III | IV | V | VI | VII |  |
| 4 | 9 | 5 | 32 | 13 | 36 |  |
| Sum of bootstrapping model weights: | | | | | |  |
| I | II | III | IV | V | VI | VII |
| 0 | 19.11 | 45.77 | 32.89 | 243.92 | 128.65 | 259.66 |
| Suggested best model (AICc, bootselect.lower): | | | | V |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **Desmoncus mitis subsp. leptospadix** | | | | | | |
| Model | Deviance | logLik | AICc | AICc.Diff | AICc.W | BIC.Diff |
| I | 515.043 | -257.522 | 517.086 | 60.474 | 0 | 50.841 |
| II | 507.243 | -253.622 | 511.372 | 54.761 | 0 | 47.605 |
| III | 496.589 | -248.294 | 502.85 | 46.238 | 0 | 41.515 |
| IV | 476.274 | -238.137 | 482.535 | 25.923 | 0 | 21.2 |
| V | 470.462 | -235.231 | 478.901 | 22.29 | 0 | 19.953 |
| VI | 475.81 | -237.905 | 484.249 | 27.638 | 0 | 25.3 |
| VII | 445.945 | -222.972 | 456.612 | 0 | 1 | 0 |
|  |  |  |  |  |  |  |
| Percentage of model types after bootstrapping: | | | | |  |  |
| I | II | III | IV | V | VI | VII |
| 1 | 1 | 2 | 3 | 3 | 11 | 80 |
| Sum of bootstrapping model weights: | | | | | |  |
| I | II | III | IV | V | VI | VII |
| 5.78 | 5.5 | 20.7 | 29.54 | 39.39 | 98.24 | 799.86 |
| Suggested best model (AICc, bootselect.lower): | | | | VII |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **Desmoncus mitis subsp. mitis** | | | | | | |
| Model | Deviance | logLik | AICc | AICc.Diff | AICc.W | BIC.Diff |
| I | 265.7452 | -132.8726 | 267.7878 | 44.0678 | 0 | 39.1574 |
| II | 233.7376 | -116.8688 | 237.8667 | 14.1467 | 0.0004 | 11.7142 |
| III | 220.7931 | -110.3965 | 227.0539 | 3.3339 | 0.0933 | 3.3339 |
| IV | 217.4591 | -108.7296 | 223.72 | 0 | 0.4939 | 0 |
| V | 217.4591 | -108.7296 | 225.8987 | 2.1787 | 0.1662 | 4.5643 |
| VI | 217.1729 | -108.5865 | 225.6125 | 1.8925 | 0.1917 | 4.2781 |
| VII | 217.4591 | -108.7296 | 228.1258 | 4.4058 | 0.0546 | 9.1287 |
|  |  |  |  |  |  |  |
| Percentage of model types after bootstrapping: | | | | |  |  |
| II | III | IV | V | VI | VII |  |
| 0 | 9 | 26 | 37 | 7 | 21 |  |
| Sum of bootstrapping model weights: | | | | | |  |
| I | II | III | IV | V | VI | VII |
| 0.11 | 6.89 | 82.32 | 148.45 | 418.27 | 121.63 | 221.33 |
| Suggested best model (AICc, bootselect.lower): | | | | IV |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **Geonoma macrostachys var. macrostachys** | | | | | | |
| Model | Deviance | logLik | AICc | AICc.Diff | AICc.W | BIC.Diff |
| I | 17722.98 | -8861.49 | 17725.02 | 7585.53 |  | 7575.89 |
| II | 17673.05 | -8836.53 | 17677.18 | 7537.69 |  | 7530.53 |
| III | 15388.62 | -7694.31 | 15394.88 | 5255.38 |  | 5250.66 |
| IV | 11286.39 | -5643.2 | 11292.65 | 1153.16 |  | 1148.44 |
| V | 10910.98 | -5455.49 | 10919.42 | 779.93 |  | 777.59 |
| VI | 11286.39 | -5643.2 | 11294.83 | 1155.34 |  | 1153 |
| VII | 10128.83 | -5064.41 | 10139.49 | 0 |  | 0 |
|  |  |  |  |  |  |  |
| Percentage of model types after bootstrapping: | | | | |  |  |
| IV | V | VI | VII |  |  |  |
| 0 | 10 | 0 | 89 |  |  |  |
| Sum of bootstrapping model weights: | | | | | |  |
| I | II | III | IV | V | VI | VII |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Suggested best model (AICc, bootselect.lower): | | | | VII |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **Geonoma macrostachys var. acaulis** | | | | | | |
| Model | Deviance | logLik | AICc | AICc.Diff | AICc.W | BIC.Diff |
| I | 6946.34 | -3473.17 | 6948.39 | 1238.97 | 1231.67 |  |
| II | 6763 | -3381.5 | 6767.13 | 1057.71 | 1052.89 |  |
| III | 6689.24 | -3344.62 | 6695.51 | 986.09 | 983.7 |  |
| IV | 6606.07 | -3303.03 | 6612.33 | 902.91 | 900.53 |  |
| V | 5700.98 | -2850.49 | 5709.42 | 0 | 0 |  |
| VI | 6598.94 | -3299.47 | 6607.38 | 897.96 | 897.96 |  |
| VII | 6606.07 | -3303.03 | 6616.74 | 907.32 | 909.66 |  |
|  |  |  |  |  |  |  |
| Percentage of model types after bootstrapping: | | | | |  |  |
| II | III | IV | V | VI | VII |  |
| 0 | 4 | 2 | 67 | 9 | 17 |  |
| Sum of bootstrapping model weights: | | | | | |  |
| I | II | III | IV | V | VI | VII |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Suggested best model (AICc, bootselect.lower): | | | | V |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **Geonoma maxima var. maxima** | | | | | | |
| Model | Deviance | logLik | AICc | AICc.Diff | AICc.W | BIC.Diff |
| I | 1295.3392 | -647.6696 | 1297.3818 | 342.9344 | 0 | 333.3011 |
| II | 1283.0344 | -641.5172 | 1287.1635 | 332.716 | 0 | 325.5606 |
| III | 1137.7168 | -568.8584 | 1143.9777 | 189.5302 | 0 | 184.8073 |
| IV | 960.0768 | -480.0384 | 966.3376 | 11.8902 | 0.0025 | 7.1673 |
| V | 952.0027 | -476.0014 | 960.4423 | 5.9949 | 0.0474 | 3.6576 |
| VI | 960.0768 | -480.0384 | 968.5163 | 14.0689 | 0.0008 | 11.7317 |
| VII | 943.7807 | -471.8904 | 954.4474 | 0 | 0.9493 | 0 |
|  |  |  |  |  |  |  |
| Percentage of model types after bootstrapping: | | | | |  |  |
| IV | V | VI | VII |  |  |  |
| 5 | 28 | 1 | 66 |  |  |  |
| Sum of bootstrapping model weights: | | | | | |  |
| I | II | III | IV | V | VI | VII |
| 0 | 0 | 0.01 | 42.89 | 294.97 | 21.3 | 639.83 |
| Suggested best model (AICc, bootselect.lower): | | | | VII |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **Geonoma maxima var. spixiana** | | | | | | |
| Model | Deviance | logLik | AICc | AICc.Diff | AICc.W | BIC.Diff |
| I | 1233 | -616.5 | 1235.04 | 674.28 | 0 | 664.65 |
| II | 925.17 | -462.59 | 929.3 | 368.54 | 0 | 361.39 |
| III | 925.17 | -462.59 | 931.43 | 370.67 | 0 | 365.95 |
| IV | 925.17 | -462.59 | 931.43 | 370.67 | 0 | 365.95 |
| V | 925.17 | -462.59 | 933.61 | 372.85 | 0 | 370.52 |
| VI | 925.17 | -462.59 | 933.61 | 372.85 | 0 | 370.52 |
| VII | 550.09 | -275.05 | 560.76 | 0 | 1 | 0 |
|  |  |  |  |  |  |  |
| Percentage of model types after bootstrapping: | | | | |  |  |
| II | III | IV | V | VI | VII |  |
| 22 | 3 | 0 | 5 | 7 | 62 |  |
| Sum of bootstrapping model weights: | | | | | |  |
| I | II | III | IV | V | VI | VII |
| 0.13 | 109.56 | 68.96 | 43.41 | 66.76 | 81.74 | 620.43 |
| Suggested best model (AICc, bootselect.lower): | | | | VII |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **Geonoma maxima var. chelidonura** | | | | | | |
| Model | Deviance | logLik | AICc | AICc.Diff | AICc.W | BIC.Diff |
| I | 5364.95 | -2682.48 | 5366.99 | 1677.09 |  | 1669.79 |
| II | 4479.58 | -2239.79 | 4483.71 | 793.81 |  | 788.99 |
| III | 4329.24 | -2164.62 | 4335.5 | 645.6 |  | 643.21 |
| IV | 4244.03 | -2122.02 | 4250.29 | 560.39 |  | 558 |
| V | 3681.47 | -1840.73 | 3689.91 | 0 |  | 0 |
| VI | 4254.52 | -2127.26 | 4262.96 | 573.06 |  | 573.06 |
| VII | 4244.03 | -2122.02 | 4254.7 | 564.79 |  | 567.13 |
|  |  |  |  |  |  |  |
| Percentage of model types after bootstrapping: | | | | |  |  |
| III | IV | V | VI | VII |  |  |
| 12 | 1 | 47 | 17 | 24 |  |  |
| Sum of bootstrapping model weights: | | | | | |  |
| I | II | III | IV | V | VI | VII |
| 0 | 0 | 0 | 6.24 | 100.5 | 14.29 | 124.97 |
| Suggested best model (AICc, bootselect.lower): | | | | V |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **Geonoma stricta var. stricta** | | | | | | |
| Model | Deviance | logLik | AICc | AICc.Diff | AICc.W | BIC.Diff |
| I | 4263.89 | -2131.94 | 4265.93 | 334.67 |  | 325.04 |
| II | 4262.08 | -2131.04 | 4266.21 | 334.95 |  | 327.79 |
| III | 4262.07 | -2131.04 | 4268.34 | 337.08 |  | 332.35 |
| IV | 4260.7 | -2130.35 | 4266.96 | 335.7 |  | 330.98 |
| V | 4260.65 | -2130.32 | 4269.09 | 337.83 |  | 335.49 |
| VI | 4134.65 | -2067.32 | 4143.09 | 211.83 |  | 209.49 |
| VII | 3920.59 | -1960.3 | 3931.26 | 0 |  | 0 |
|  |  |  |  |  |  |  |
| Percentage of model types after bootstrapping: | | | | |  |  |
| I | II | III | IV | V | VI | VII |
| 0 | 1 | 16 | 3 | 12 | 7 | 61 |
| Sum of bootstrapping model weights: | | | | | |  |
| I | II | III | IV | V | VI | VII |
| 0 | 0 | 0 | 0.5 | 1.25 | 0.18 | 3.07 |
| Suggested best model (AICc, bootselect.lower): | | | | VII |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **Geonoma stricta var. piscicauda** | | | | | | |
| Model | Deviance | logLik | AICc | AICc.Diff | AICc.W | BIC.Diff |
| I | 1533.85 | -766.92 | 1535.89 | 586.3 | 0 | 576.67 |
| II | 1449.65 | -724.82 | 1453.78 | 504.19 | 0 | 497.04 |
| III | 1300.94 | -650.47 | 1307.2 | 357.62 | 0 | 352.9 |
| IV | 1146.61 | -573.31 | 1152.87 | 203.29 | 0 | 198.56 |
| V | 1053.76 | -526.88 | 1062.2 | 112.61 | 0 | 110.28 |
| VI | 1146.61 | -573.31 | 1155.05 | 205.46 | 0 | 203.13 |
| VII | 938.92 | -469.46 | 949.59 | 0 | 1 | 0 |
|  |  |  |  |  |  |  |
| Percentage of model types after bootstrapping: | | | | |  |  |
| III | IV | V | VI | VII |  |  |
| 8 | 14 | 22 | 3 | 53 |  |  |
| Sum of bootstrapping model weights: | | | | | |  |
| I | II | III | IV | V | VI | VII |
| 0 | 0 | 73.79 | 81.15 | 242.28 | 61.29 | 534.49 |
| Suggested best model (AICc, bootselect.lower): | | | | VII |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **Geonoma stricta var. trailii** | | | | | | |
| Model | Deviance | logLik | AICc | AICc.Diff | AICc.W | BIC.Diff |
| I | 3155.38 | -1577.69 | 3157.43 | 1431.37 |  | 1424.07 |
| II | 2380.18 | -1190.09 | 2384.31 | 658.26 |  | 653.44 |
| III | 2201.71 | -1100.85 | 2207.97 | 481.92 |  | 479.53 |
| IV | 1897.76 | -948.88 | 1904.02 | 177.97 |  | 175.58 |
| V | 1717.62 | -858.81 | 1726.06 | 0 |  | 0 |
| VI | 1914.57 | -957.28 | 1923.01 | 196.95 |  | 196.95 |
| VII | 1897.76 | -948.88 | 1908.43 | 182.37 |  | 184.71 |
|  |  |  |  |  |  |  |
| Percentage of model types after bootstrapping: | | | | |  |  |
| IV | V | VI | VII |  |  |  |
| 0 | 79 | 5 | 15 |  |  |  |
| Sum of bootstrapping model weights: | | | | | |  |
| I | II | III | IV | V | VI | VII |
| 0 | 0 | 0 | 1.18 | 288.23 | 16.43 | 104.15 |
| Suggested best model (AICc, bootselect.lower): | | | | V |  |  |

**Appendix Table S11.** Number of transects where conspecific subspecies and varieties of palms co-occur and their mean abundances over the transects where they co-occur. Taxon 1 corresponds to the most abundant taxon in each pairwise comparison.For unabbreviated taxon names see Table S9 in Supporting Information.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Taxon 1** | **Taxon 2** | **No. Transects** | **Mean abundance Taxon 1** | **Mean abundance Taxon 2** |
| bacthirtlako | bacthirthirt | 14 | 19.1 | 12.8 |
| bactmarajuru | bactmaramara | 5 | 6 | 3.2 |
| desmmitimiti | desmmitilept | 0 | - | - |
| geonmacracau | geonmacrmacr | 5 | 40.4 | 10.4 |
| geonmaxichel | geonmaximaxi | 1 | 10 | 3 |
| geonmaxichel | geonmaxispix | 5 | 36.4 | 9.4 |
| geonmaxispix | geonmaximaxi | 1 | 7 | 3 |
| geonstristri | geonstritrai | 19 | 28.4 | 17.4 |
| geonstripisc | geonstristri | 8 | 26.4 | 21.8 |
| geonstripisc | geonstritrai | 5 | 43.0 | 35.8 |