**Supporting information**

**Divergent herb communities in drier and chronically disturbed areas of the Brazilian Caatinga**

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Appendix S1. Sample completeness estimation.

 To estimate sample completeness of herb communities at the plot level (*N* = 19) we used the abundance-based sample coverage procedure available in the iNEXT software (Chao et al., 2016). Sample coverage is a measure of sample completeness, which considers the proportion of the total number of individuals in a community that belong to the species represented in the sample (see Chao et al., 2016), as follows:

$$\hat{C}\_{n}^{}=1-\frac{f\_{1}}{n}\left[\frac{(n-1)f\_{1}}{(n-1)f\_{1}+2f\_{2}}\right]$$

Where *f*1 and *f*2 are the species represented by one (singletons) and two (doubletons) individuals, respectively, and *n* is the total number of individuals in the community. The values of completeness varied between 0.92 and 1.0 among plots, indicating high sample completeness and reliable comparisons among them.

Appendix S2. Construction of the phylogenetic tree.

We constructed a molecular phylogeny based on four DNA regions from sequence data available in GenBank and in *Amborella* Genome Database: ribulose-bisphosphate carboxylase gene (*rbc*L), maturase K (*mat*K), 5.8S ribosomal RNA gene and *trn*L-*trn*F intergenic spacer (*trn*L-F). When sequence data for a species were not available, we used a randomly chosen alternative species within the genus to estimate the relatedness to that genus (Table S1). The effect on branch length of using these substitute species is expected to be minimal given the breadth of phylogenetic sampling (Cadotte et al., 2008, 2009). We used *Amborella* *trichocarpa* and *Magnolia virginiana* to root the tree and increase the depth of taxon sampling (Burns and Strauss, 2011). Sequences were aligned for each region independently and later combined into a single supermatrix using Geneious version 7.1.4 (Kearse et al., 2012). The Bayesian inference search was performed using the default setting of MrBayes v3.1.2 (Ronquist and Huelsenbeck, 2003), allowing the general time reversible (GTR) + γ model to be estimated. The analysis was conducted for two independent runs and for 10 × 106 generations, sampling every 1000 trees. To verify the effective sampling of all parameters and assess convergence of independent chains, we examined their posterior distributions in Tracer 1.6. (Rambaut et al., 2014). The first 25% of the sampled trees were discarded as the burn-in period. The subsequent trees were retained and posterior probabilities (PP) were estimated by constructing a 50% majority-rule consensus tree. The trees were edited in FigTree 1.3.1 (Rambaut, 2009). We then created a time-calibrated phylogeny adopting secondary calibration points derived from a broad dated Angiosperms phylogeny (Bell et al. 2010). For this we fixed MrBayes topology for estimating divergence times using BEAST v1.8.2 (Drummond et al., 2012). Secondary calibration points were Gentianales (54-78 MY), Malphighiales (88-97 MY) and Fabaceae (49-77 MY) diversifications (Fig. S1). These ages were based on minimum age constraints treated as lognormal distributions on BEAST (Bell et al. 2010). Divergence-time was conducted using MCMC methods (10 × 106 generations) implemented in BEAST v1.8.2, which employs a lognormal relaxed-clock model to estimate divergence times.

Appendix S3. Calculation of phylogenetic metrics based on Hill numbers

Following Chao et al. (2010), we calculated three metrics of phylogenetic richness and divergence based on Hill's numbers, 0*D*(*T*), 1*D*(*T*) and 2*D*(*T*) as follows:

$$\left\{\sum\_{i\in Β\_{T}}^{}\frac{L\_{i}}{T}a\_{i}^{q}\right\}^{1/(1-q)}$$

Where *T* is any fixed time of interest, *Li* is the length of branch *i* in the group of all branches present in the *BT* interval, *a* is the total abundance of descendants of the branch *i* and *q* is a parameter that determines the sensitivity of the measure to the species frequency (Chao et al., 2010). When *q* = 0 [0*D*(*T*)], species abundances are ignored and the measure indicates the phylogenetic richness of the community (Tucker et al., 2017). When *q*> 0 [1*D*(*T*) and 2*D*(*T*)] species abundances are considered; the greater the *q* the greater is the weight given to dominant lineages. We used *q* = 1 and *q* = 2, both cases estimate the phylogenetic divergence of the communities (Tucker et al., 2017). Analyses were performed using the *PhD* (Phylogenetic Diversity) program (Chao and Chiu, 2018), using *gWidgets*, *tcltk*, *gWidgetstcltk* and *ade4* packages in *R* 3.2.1.



Figure S1. Time-calibrated molecular phylogenetic tree of the herb species recorded in the Catimbau National Park, northeast Brazil. Black stars indicate the calibration points: Gentianales (66 Mya), Malphighiales (91 Mya) and Fabaceae (65 Mya).

Table S1. Sequences used to estimate the phylogenetic tree. We used four DNA regions: maturase K (*mat*K), 5.8S ribosomal RNA gene (5.8S), ribulose-1,5-carboxylase/bisphosphate gene (*rbc*L) and *trn*L-*trn*F intergenic spacer. Data from sequences available in GenBank and in *Amborella* Genome Database (http://amborella.huck.psu.edu/shortstack). NA – Cases where information was absent for the species and its genera.

| Species | rcbL | Species used for rbcL | matK | Species used for matK | 5.8s | Species used for 5.8s | trnL-trnF | Species used for trnL-trnF |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Aeschynomene viscidula* | KJ773248 | *Aeschynomene viscidula* | KJ772525 | *Aeschynomene viscidula* | KT821162 | *Aeschynomene schimperi* | NA | NA |  |
| *Anthephora hermaphrodita* | KC123352 | *Anthephora hermaphrodita* | KC123394 | *Anthephora hermaphrodita* | HM347005 | *Anthephora pubescens* | DQ005007 | *Tripsacum dactyloides* |
| *Astraea lobata* | EF405829 | *Astraea lobata* | KJ708871 | *Croton laevifolius* | AY971172 | *Astraea lobata* | EU586999 | *Astraea lobata* |
| *Ayenia erecta* | JQ594194 | *Ayenia micrantha* | HM488419 | *Ayenia microphylla* | NA | NA | HM488377 | *Ayenia microphylla* |
| *Blainvillea* sp. | JQ933237 | *Blainvillea acmella* | AY297646 | *Blainvillea rhomboidea* | AY303404 | *Blainvillea rhomboidea* | AY297679 | *Blainvillea rhomboidea* |
| *Borreria* sp. | X81679 | *Spermacoce assurgens* | NA | NA | KF736997 | *Borreria schumannii* | KT252883 | *Spermacoce marginata* |
| *Bulbostylis* sp. | KJ773324 | *Bulbostylis warei* | KJ513580 | *Bulbostylis atrosanguinea* | AY506765 | *Bulbostylis striatella* | AY506711 | *Bulbostylis striatella* |
| *Ceratosanthes* sp. | DQ535788 | *Ceratosanthes palmata* | DQ536646 | *Ceratosanthes palmata* | NA | NA | DQ536795 | *Ceratosanthes palmata* |
| *Chamaecrista rotundifolia* | U74187 | *Chamaecrista fasciculata* | AY386955 | *Chamaecrsita fasciculata* | FJ009857 | *Chamaecrista rotundifolia* | FJ009911 | *Chamaecrista rotundifolia* |
| *Cnidoscolus* sp. | AB267937 | *Cnidoscolus aconitifolius* | JQ587479 | *Cnidoscolus urens* | NA | NA | EU518895 | *Cnidoscolus tubulosus* |
| *Commelina erecta* | JQ591126 | *Commelina erecta* | KJ772671 | *Commelina erecta* | KR733806 | *Commelina africana* | KR737593 | *Commelina erecta* |
| *Dalechampia* sp. | AB233863 | *Dalechampia spathulata* | AB233759 | *Dalechampia spathulata* | GQ463796 | *Dalechampia scandens* | AY794754 | *Dalechampia spathulata* |
| *Diodella teres* | KJ773460 | *Diodella teres* | KJ772733 | *Diodella teres* | KF737006 | *Diodella teres* | NA | NA |  |
| *Dioscorea* sp. | AB557671 | *Dioscorea polystachya* | AB557663 | *Dioscorea polystachya* | EU808018 | *Dioscorea polystachya* | KF357955 | *Dioscorea humilis* |
| *Eragrostis pilosa* | JN681667 | *Eragrostis reptans* | JN681647 | *Eragrostis reptans* | EF153046 | *Eragrostis tenella* | EF196902 | *Eragrostis obtusiflora* |
| *Euphorbia comosa* | JN249284 | *Euphorbia comosa* | X661940 | *Euphorbia maculata* | AF537503 | *Euphorbia comosa* | N249619 | *Euphorbia comosa* |
| *Evolvulus glomeratus* | AY101012 | *Evolvulus glomeratus* | HQ384566 | *Evolvulus pilosus* | EF567109 | *Evolvulus glomeratus* | AY101121 | *Evolvulus glomeratus* |
| *Forelichia humboldtiana* | FR775276 | *Froelichia drummondii* | FR775294 | *Froelichia drummondii* | AY174401 | *Froelichia drummondii* | EF688751 | *Froelichia floridana* |
| *Gomphrena vaga* | AY270090 | *Gomphrena serrata* | AM887524 | *Gomphrena ferruginea* | KP875880 | *Gomphrena kanisii* | EF688766 | *Gomphrena vaga* |
| *Habranthus sylvaticus* | KC704788 | *Zephyranthes candida* | JX464591 | *Zephyranthes candida* | AF223503 | *Zephyranthes candida* | JX464398 | *Zephyranthes candida* |
| *Herissantia crispa* | HM849734 | *Abutilon theophrasti* | KR734848 | *Abutilon mauritianum* | JQ753295 | *Abutilon costicalyx* | KR738579 | *Abutilon mauritianum* |
| *Herissantia tiubae* | KP094518 | *Abutilon indicum* | HQ696683 | *Abutilon theophrasti* | KT779103 | *Abutilon indicum* | HQ696727 | *Abutilon theophrasti* |
| *Hybanthus* sp. | KC699586 | *Hybanthus galeottii* | DQ842613 | *Hybanthus floribundus* | HM483598 | *Hybanthus enneaspermus* | GQ262538 | *Hybanthus concolor* |
| *Indigofera suffruticosa* | JQ591788 | *Indigofera suffruticosa* | AF142697 | *Indigofera suffruticosa* | AF467051 | *Indigofera suffruticosa* | KR737795 | *Indigofera hochstetteri* |
| *Jacquemontia* sp. | HQ384918 | *Jacquemontia reclinata* | HQ384567 | *Jacquemontia reclinata* | DQ219864 | *Jacquemontia pentanthos* | AY101147 | *Jacquemontia sandwicensis* |
| *Marsypianthes chamaedrys* | JQ592298 | *Marsypianthes chamaedrys* | JQ588075 | *Marsypianthes chamaedrys* | JF301435 | *Marsypianthes chamaedrys* | JF357815 | *Marsypianthes chamaedrys* |
| *Melocactus* sp. | AM502566 | *Melocactus oreas* | JX683849 | *Melocactus zehntneri* | AY181585 | *Cephalocereus senilis* | HM041301 | *Melocactus intortus* |
| *Merremia cissoides* | AY100981 | *Merremia vitifolia* | KR024951 | *Merremia cissoides* | KP261977 | *Merremia cissoides* | KP236652 | *Merremia cissoides* |
| *Microtea paniculata* | NA | NA | FN597633 | *Microtea scabrida* | JX232577 | *Microtea debilis* | NA | NA |  |
| *Mimosa quadrivalvis* | JQ591943 | *Mimosa watsonii* | JQ587781 | *Mimosa watsonii* | KF420983 | *Mimosa scabrella* | Q344588 | *Mimosa quadrivalvis* |
| *Mollugo verticillata* | M62566 | *Mollugo verticillata* | JQ844142 | *Mollugo verticillata* | EU434729 | *Mollugo verticillata* | FJ405003 | *Mollugo verticillata* |
| *Neoglaziovia variegata* | KC123377 | *Neoglaziovia variegata* | AY950051 | *Neoglaziovia variegata* | NA | NA | KJ580376 | *Neoglaziovia variegata* |
| *Oxalis* sp. | JN587327 | *Oxalis holosericea* | AF542605 | *Oxalis stricta* | KT737728 | *Oxalis stricta* | EU437137 | *Oxalis nubigena* |
| *Panicum* sp. | KJ773713 | *Panicum dichotomiflorum* | KF163754 | *Panicum dichotomiflorum* | AY129706 | *Panicum dichotomiflorum* | JQ041847 | *Panicum capillare* |
| *Pavonia* sp. | KU054393 | *Pavonia multiflora* | KJ012705 | *Pavonia paludicola* | KT966954 | *Pavonia spinifex* | KR738611 | *Pavonia sp* |
| *Phyllanthus* sp. | KC514097 | *Phyllanthus talbotii* | KC514101 | *Phyllanthus talbotii* | KC414630 | *Phyllanthus talbotii* | HG971916 | *Phyllanthus orbicularis* |
| *Physostemon guianense* | KU739630 | *Cleome gynandra* | KF923159 | *Cleome tucumanensis* | DQ455811 | *Cleome tucumanensis* | KR738198 | *Cleome gynandra* |
| *Physostemon rotundifolium* | KU739615 | *Cleome amblyocarpa* | KF923151 | *Cleome rotundifolia* | KF923182 | *Cleome rotundifolia* | Y122440 | *Cleome monophylla* |
| *Piriqueta* sp. | KJ773752 | *Piriqueta cistoides* | KJ773008 | *Piriqueta cistoides* | AY973391 | *Piriqueta cistoides* | JQ723391 | *Piriqueta viscosa* |
| *Portulaca elatior* | KJ773784 | *Portulaca pilosa* | KJ773040 | *Portulaca pilosa* | JF508542 | *Portulaca elatior* | KR738472 | *Portulaca quadrifida* |
| *Portulaca oleraceae* | HM850279 | *Portulaca oleraceae* | HQ620836 | *Portulaca oleraceae* | KM051437 | *Portulaca oleraceae* | LN559099 | *Portulaca oleraceae* |
| *Rhaphiodon echinus* | NA | NA | JF357840 | *Rhaphiodon echinus* | JF301543 | *Rhaphiodon echinus* | JF357809 | *Rhaphiodon echinus* |
| *Richardia grandiflora* | KJ773840 | *Richardia grandiflora* | KJ773090 | *Richardia grandiflora* | KM215370 | *Richardia grandiflora* | EU543156 | *Richardia scabra* |
| *Schwenckia americana* | JQ594138 | *Schwenckia americana* | EF439053 | *Schwenckia americana* | NA | NA | EU581057 | *Schwenckia glabrata* |
| *Setaria* sp. | KC123385 | *Setaria viridis* | JQ588817 | *Setaria palmifolia* | HQ600484 | *Setaria viridis* | JQ041853 | *Setaria viridis* |
| *Sida galheirensis* | KJ773889 | *Sida rhombifolia* | KR735155 | *Sida tenuicarpa* | JN542430 | *Sida spinosa* | KR738229 | *Sida tenuicarpa* |
| *Solanum* sp. | KC535808 | *Solanum aethiopicum* | KC535801 | *Solanum aethiopicum* | LC020015 | *Solanum tuberosum* | GU323356 | *Solanum villosum* |
| *Staelia* sp. | NA | NA | NA | NA | KF737026 | *Staelia virgata* | GU357187 | *Staelia thymoides* |
| *Tacinga inamoema* | JF787305 | *Tacinga inamoena* | JF786870 | *Tacinga inamoena* | JF787027 | *Tacinga inamoena* | JF712844 | *Tacinga inamoena* |
| *Tacinga palmadora* | JF787307 | *Tacinga palmadora* | JF786872 | *Tacinga palmadora* | JF787028 | *Tacinga palmadora* | JF712845 | *Tacinga palmadora* |
| *Talinum* sp. | HM850388 | *Talinum paniculatum* | AY015274 | *Talinum paniculatum* | JF508608 | *Talinum paniculatum* | KM261958 | *Talinum portulacifolium* |
| *Tarenaya* sp. | KU739634 | *Tarenaya spinosa* | KU739547 | *Tarenaya spinosa* | AY254535 | *Cleome spinosa* | KF849815 | *Cleome spinosa* |
| *Tradescantia* sp. | JQ734524 | *Tradescantia spathacea* | GU135029 | *Tradescantia spathacea* | NA | NA | KC512107 | *Tradescantia spathacea* |
| *Turnera humilis* | JX664074 | *Turnera ulmifolia* | JX661965 | *Turnera ulmifolia* | JQ723375 | *Turnera oculata* | JQ723405 | *Turnera ulmifolia* |
| *Turnera pumilea* | JQ593111 | *Turnera acuta* | AB536654 | *Turnera odorata* | AY973375 | *Turnera pumilea* | JQ723403 | *Turnera subulata* |
| *Urochloa mollis* | LN907901 | *Urochloa semiundulata* | LN906665 | *Urochloa semiundulata* | AY346350 | *Urochloa decumbens* | GU594534 | *Urochloa mollis* |
| *Zornia grandiflora* | KJ773997 | *Zornia bracteata* | KJ773243 | *Zornia bracteata* | KF477932 | *Zornia areolata* | KF477982 | *Zornia reptans* |

Table S2. Abundance, classification, life form, pollination syndrome, dispersion syndrome, palatability to goat/sheep, presence of prickles, spines, or stinging hairs of herbaceous species of the Catimbau National Park, northeast Brazil. Dicot- dicotyledonous, mono-monocotyledonous; ane-anemophily, mel-melittophily, pha-phalaenophily, orn-ornithophily, chir-chiropterophily, psy- psychophily, self-self-pollinated; auto- autochory, zoo-zoochory, ane-anemochory.

| Family/Species | Abundance | Classification | Life form | Pollination syndrome | Dispersion syndrome | Palatability to goat/sheep | Prickles/Spines | Stinging hairs |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| AMARANTHACEAE |  |  |  |  |  |  |  |  |
| *Forelichia humboldtiana* | 50 | dicot | terophyte | mel | ane | high | absent | absent |
| *Gomphrena vaga* | 44 | dicot | terophyte | mel | zoo | high | absent | absent |
| AMARYLLIDACEAE |  |  |  |  |  |  |  |  |
| *Habranthus sylvaticus* | 22 | mono | geophyte | mel | auto | low | absent | absent |
| ASTERACEAE |  |  |  |  |  |  |  |  |
| *Blainvillea* sp. | 7 | dicot | terophyte | mel | auto | low | absent | absent |
| BROMELIACEAE |  |  |  |  |  |  |  |  |
| *Neoglaziovia variegata* | 99 | mono | chamaephyte | orn/psy | zoo | low | present | absent |
| CACTACEAE |  |  |  |  |  |  |  |  |
| *Melocactus* sp. | 7 | dicot | chamaephyte | orn/psy | zoo | low | present | absent |
| *Tacinga inamoema* | 116 | dicot | chamaephyte | orn/psy | zoo | low | present | absent |
| *Tacinga palmadora* | 30 | dicot | chamaephyte | orn/psy | zoo | low | present | absent |
| CLEOMACEAE |  |  |  |  |  |  |  |  |
| *Physostemon guianense* | 14 | dicot | terophyte | psy | auto | low | absent | absent |
| *Physostemon rotundifolium* | 10 | dicot | terophyte | psy | auto | low | absent | absent |
| *Tarenaya* sp. | 13 | dicot | terophyte | mel/ pha/ chir | auto | low | absent | absent |
| COMMELINACEAE |  |  |  |  |  |  |  |  |
| *Commelina erecta* | 247 | mono | terophyte | mel | auto | high | absent | absent |
| *Tradescantia* sp. | 6 | mono | geophyte | mel | auto | high | absent | absent |
| CONVOLVULACEAE |  |  |  |  |  |  |  |  |
| *Evolvulus glomeratus* | 115 | dicot | terophyte | mel | auto | high | absent | absent |
| *Jacquemontia* sp. | 2 | dicot | terophyte | mel | auto | high | absent | absent |
| *Merremia cissoides* | 6 | dicot | terophyte | mel | auto | high | absent | absent |
| CURCUBITACEAE |  |  |  |  |  |  |  |  |
| *Ceratosanthes* sp. | 2 | dicot | terophyte | mel | zoo | low | absent | absent |
| CYPERACEAE |  |  |  |  |  |  |  |  |
| *Bulbostylis* sp. | 410 | mono | terophyte | ane | auto | low | absent | absent |
| DIOSCOREACEAE |  |  |  |  |  |  |  |  |
| *Dioscorea* sp. | 13 | mono | geophyte | ane | ane | high | absent | absent |
| EUPHORBIACEAE |  |  |  |  |  |  |  |  |
| *Astraea lobata* | 34 | dicot | terophyte | mel | auto | low | absent | absent |
| *Cnidoscolus* sp. | 12 | dicot | chamaephyte | mel | auto | low | absent | present |
| *Dalechampia* sp. | 11 | dicot | chamaephyte | mel | auto | low | absent | present |
| *Euphorbia comosa* | 26 | dicot | terophyte | auto | auto | low | absent | absent |
| *Phyllanthus* sp. | 3 | dicot | terophyte | mel | auto | low | absent | absent |
| FABACEAE |  |  |  |  |  |  |  |  |
| *Aeschynomene viscidula* | 10 | dicot | terophyte | self | zoo | low | absent | absent |
| *Chamaecrista rotundifolia* | 12 | dicot | terophyte | mel | auto | high | absent | absent |
| *Indigofera suffruticosa* | 13 | dicot | chamaephyte | mel | auto | low | absent | absent |
| *Mimosa quadrivalvis* | 2 | dicot | terophyte | mel | auto | low | absent | absent |
| *Zornia grandiflora* | 6 | dicot | terophyte | mel | zoo | low | absent | absent |
| LAMIACEAE |  |  |  |  |  |  |  |  |
| *Marsypianthes chamaedrys* | 5 | dicot | terophyte | mel | zoo | low | absent | absent |
| *Rhaphiodon echinus* | 6 | dicot | terophyte | mel | zoo | low | absent | absent |
| MALVACEAE |  |  |  |  |  |  |  |  |
| *Ayenia erecta* | 77 | dicot | terophyte | mel | auto | low | absent | absent |
| *Herissantia crispa* | 318 | dicot | chamaephyte | mel | ane | low | absent | absent |
| *Herissantia tiubae* | 47 | dicot | terophyte | mel | ane | low | absent | absent |
| *Pavonia* sp. | 4 | dicot | terophyte | mel | auto | low | absent | absent |
| *Sida galheirensis* | 56 | dicot | terophyte | mel | auto | low | absent | absent |
| MOLLUGINACEAE |  |  |  |  |  |  |  |  |
| *Mollugo verticillata* | 1247 | dicot | terophyte | mel | auto | low | absent | absent |
| OXALIDACEAE |  |  |  |  |  |  |  |  |
| *Oxalis* sp. | 34 | dicot | terophyte | mel | zoo | high | absent | absent |
| PHYTOLACCACEAE |  |  |  |  |  |  |  |  |
| *Microtea paniculata* | 2 | dicot | terophyte | mel | auto | high | absent | absent |
| POACEAE |  |  |  |  |  |  |  |  |
| *Anthephora hermaphrodita* | 98 | dicot | terophyte | ane | zoo | high | absent | absent |
| *Eragrostis pilosa* | 1635 | mono | terophyte | ane | zoo | high | absent | absent |
| *Panicum* sp. | 441 | mono | terophyte | ane | zoo | high | absent | absent |
| *Setaria* sp. | 127 | mono | terophyte | ane | ane | high | absent | absent |
| *Urochloa mollis* | 433 | mono | terophyte | ane | ane | high | absent | absent |
| PORTULACACEA |  |  |  |  |  |  |  |  |
| *Portulaca elatior* | 240 | dicot | terophyte | mel | auto | high | absent | absent |
| *Portulaca oleraceae* | 196 | dicot | terophyte | mel | auto | high | absent | absent |
| *Talinum* sp. | 14 | dicot | terophyte | mel | zoo | high | absent | absent |
| RUBIACEAE |  |  |  |  |  |  |  |  |
| *Borreria* sp. | 11 | dicot | terophyte | mel | auto | high | absent | absent |
| *Diodella teres* | 332 | dicot | terophyte | mel | auto | high | absent | absent |
| *Richardia grandiflora* | 34 | dicot | terophyte | mel | auto | high | absent | absent |
| *Staelia* sp. | 24 | dicot | terophyte | mel | auto | high | absent | absent |
| SOLANACEAE |  |  |  |  |  |  |  |  |
| *Schwenckia americana* | 34 | dicot | terophyte | mel | auto | low | absent | absent |
| *Solanum* sp. | 5 | dicot | terophyte | mel | zoo | low | present | absent |
| TURNERACEAE |  |  |  |  |  |  |  |  |
| *Piriqueta* sp. | 4 | dicot | terophyte | mel | auto | low | absent | absent |
| *Turnera humilis* | 5 | dicot | terophyte | mel | auto | low | absent | absent |
| *Turnera pumilea* | 2 | dicot | terophyte | mel | auto | low | absent | absent |
| VIOLACEAE |  |  |  |  |  |  |  |  |
| *Hybanthus* sp. | 14 | dicot | terophyte | pha | auto | low | absent | absent |

Table S3. Results of linear models applied to species richness, herb density, and phylogenetic metrics of 19 herb communities in the Catimbau National Park, northeast Brazil. For each model are shown the estimate, standard error (SE), the statistics *t* and the *P*-value. The most relevant relationships are exhibited in Figure 3 of the main text. *ab* refers to abundance-based metrics and *pa* refers to presence/absence metrics.

| Explanatory variables | Estimate | SE | *t* | *P*-value |
| --- | --- | --- | --- | --- |
| *Herb density (log)* |  |  |  |  |
| Chronic disturbance | 0.1098 | 0.7507 | 0.15 | 0.8856 |
| Annual rainfall | 0.0038 | 0.0014 | 2.66 | < 0.05 |
| Density of woody plants | -0.0031 | 0.0021 | -1.49 | 0.1556 |
| *Species richness* |  |  |  |  |
| Chronic disturbance | 3.2479 | 4.7655 | 0.68 | 0.5059 |
| Annual rainfall | 0.0035 | 0.0090 | 0.39 | 0.7046 |
| Density of woody plants | -0.0284 | 0.0133 | -2.14 | < 0.05 |
| *MPDab* |  |  |  |  |
| Chronic disturbance | 25.1687 | 40.4868 | 0.62 | 0.5435 |
| Annual rainfall | -0.0389 | 0.0762 | -0.51 | 0.6167 |
| Density of woody plants | 0.0840 | 0.1128 | 0.74 | 0.4679 |
| *NRIab* |  |  |  |  |
| Chronic disturbance | -1.2347 | 0.7864 | -1.57 | 0.1372 |
| Annual rainfall | -0.0010 | 0.0015 | -0.69 | 0.4984 |
| Density of woody plants | -0.0021 | 0.0022 | -0.96 | 0.3527 |
| *MNTDab* |  |  |  |  |
| Chronic disturbance | 56.9518 | 34.0972 | 1.67 | 0.1156 |
| Annual rainfall | 0.0061 | 0.0642 | 0.09 | 0.9256 |
| Density of woody plants | 0.0567 | 0.0950 | 0.60 | 0.5596 |
| *NTIab* |  |  |  |  |
| Chronic disturbance | -1.5075 | 0.6837 | -2.20 | < 0.05 |
| Annual rainfall | -0.0019 | 0.0013 | -1.45 | 0.1679 |
| Density of woody plants | 0.0005 | 0.0019 | 0.25 | 0.8031 |
| *0D(T)* |  |  |  |  |
| Chronic disturbance | 1.3386 | 1.8631 | 0.72 | 0.4835 |
| Annual rainfall | 0.0013 | 0.0035 | 0.38 | 0.7102 |
| Density of woody plants | -0.0114 | 0.0052 | -2.21 | < 0.05 |
| *1D(T)* |  |  |  |  |
| Chronic disturbance | 0.1462 | 0.9541 | 0.15 | 0.8803 |
| Annual rainfall | -0.0016 | 0.0018 | -0.92 | 0.3731 |
| Density of woody plants | -0.0007 | 0.0027 | -0.27 | 0.7885 |
| *2D(T)* |  |  |  |  |
| Chronic disturbance | -0.1391 | 0.6532 | -0.21 | 0.8342 |
| Annual rainfall | -0.0009 | 0.0012 | -0.75 | 0.4665 |
| Density of woody plants | 0.0005 | 0.0018 | 0.29 | 0.7737 |
| *MPDpa* |  |  |  |  |
| Chronic disturbance | 9.8091 | 8.1360 | 1.21 | 0.2466 |
| Annual rainfall | 0.0206 | 0.0153 | 1.34 | 0.1990 |
| Density of woody plants | 0.0416 | 0.0227 | 1.84 | 0.0862 |
| *NRIpa* |  |  |  |  |
| Chronic disturbance | -0.7133 | 0.7762 | -0.92 | 0.3726 |
| Annual rainfall | -0.0017 | 0.0015 | -1.19 | 0.2536 |
| Density of woody plants | -0.0055 | 0.0022 | -2.56 | < 0.05 |
| *MNTDpa* |  |  |  |  |
| Chronic disturbance | 25.8281 | 17.0225 | 1.52 | 0.1500 |
| Annual rainfall | 0.0213 | 0.0320 | 0.66 | 0.5166 |
| Density of woody plants | 0.1552 | 0.0474 | 3.27 | < 0.01 |
| *NTIpa* |  |  |  |  |
| Chronic disturbance | -1.3436 | 0.5214 | -2.58 | < 0.05 |
| Annual rainfall | -0.0022 | 0.0010 | -2.20 | < 0.05 |
| Density of woody plants | -0.0046 | 0.0015 | -3.20 | < 0.01 |

Table S4. Percentage of herb species, individuals and mean number of individuals per functional category in 19 herb communities in the Catimbau National Park, northeast Brazil.

|  | Species (%) | Individuals (%) |
| --- | --- | --- |
| *Classification* |  |  |
| Dicots | 82.4 | 49.4 |
| Monocots | 17.5 | 52.5 |
| Grasses | 8.8 | 46.9 |
| *Life form* |  |  |
| Chamaephyte | 14.0 | 8.9 |
| [Geophyte](https://www.google.com/search?rlz=1C1CHZL_pt-BRBR765BR765&q=geophyte&spell=1&sa=X&ved=0ahUKEwi68fiV-tzjAhXXHbkGHU8kBZsQkeECCC0oAA) | 5.3 | 0.6 |
| Therophyte | 80.7 | 90.5 |
| *Pollination syndrome* |  |  |
| Self-pollination | 1.7 | 0.5 |
| Melittophily | 71.9 | 48.6 |
| Psychophily | 10.5 | 3.9 |
| Anemophily | 12.2 | 46.6 |
| Phalenophily | 1.8 | 0.4 |
| Chiropterophily | 1.8 | 0.2 |
| Ornithophily | 7.0 | 3.7 |
| *Dispersal syndrome* |  |  |
| Autochory | 61.4 | 47.9 |
| Zoochory | 26.3 | 37.6 |
| Anemochory | 10.5 | 14.5 |
| *Palatability to goats* |  |  |
| High palatability to goats | 59.6 | 60.7 |
| Presence of prickles/spines | 8.8 | 4.0 |
| Presence of stinging hairs | 3.5 | 0.3 |

Table S5. Result of linear models applied to functional categories of 19 herb communities in the Catimbau National Park, northeast Brazil. For each model are shown the estimate, standard error (SE), the statistics *t* and the *P*-value. The most relevant relationships are exhibited in Figure 6 of the main text.

| Explanatory variables | Estimate | SE | *t* | *P*-value |
| --- | --- | --- | --- | --- |
| *Chamaephyte* |  |  |  |  |
| Annual rainfall | -2.56E-04 | 2.50E-04 | -1.02 | 0.3201 |
| Chronic disturbance | -2.29E-01 | 1.27E-01 | -1.89 | 0.0890 |
| Density of woody plants | 1.82E-04 | 3.82E-04 | 0.48 | 0.6399 |
| *Geophyte* |  |  |  |  |
| Annual rainfall | 1.49E-04 | 1.05E-04 | 1.42 | 0.1736 |
| Chronic disturbance | -4.58E-03 | 5.95E-01 | -0.08 | 0.9395 |
| Density of woody plants | 5.32E-05 | 1.65E-04 | 0.32 | 0.7513 |
| *Therophyte* |  |  |  |  |
| Annual rainfall  | 1.08E-04 | 2.82E-04 | 1.42 | 0.7078 |
| Chronic disturbance | 2.33E-01 | 1.41E-01 | 1.66 | 0.1162 |
| Density of woody plants | -2.35E-04 | 4.19E-04 | -0.56 | 0.5814 |
| *Melittophily* |  |  |  |  |
| Annual rainfall  | 2.54E-04 | 4.89E-04 | 0.52 | 0.6101 |
| Chronic disturbance | 5.46E-01 | 2.29E-01 | 2.38 | < 0.05 |
| Density of woody plants | -1.32E-03 | 6.63E-04 | -1.99 | 0.0627 |
| *Psychophily* |  |  |  |  |
| Annual rainfall  | -4.62E-04 | 1.77E-04 | -2.61 | < 0.05 |
| Chronic disturbance | -1.62E-01 | 1.05E-01 | -1.54 | 0.1409 |
| Density of woody plants | 1.57E-04 | 3.10E-04 | 0.51 | 0.6184 |
| *Anemophily* |  |  |  |  |
| Annual rainfall  | 6.46E-04 | 4.47E-04 | 1.44 | 0.1667 |
| Chronic disturbance | -2.09E-01 | 2.49E-01 | -0.84 | 0.1432 |
| Density of woody plants | 9.24E-04 | 6.71E-04 | 1.38 | 0.1862 |
| *Phalenophily* |  |  |  |  |
| Annual rainfall  | 9.09E-06 | 2.57E-05 | 0.35 | 0.7277 |
| Chronic disturbance | -3.19E-03 | 1.38E-02 | -0.23 | 0.8197 |
| Density of woody plants | 4.37E-05 | 3.70E-05 | 1.18 | 0.2535 |
| *Chiropterophily* |  |  |  |  |
| Annual rainfall  | 1.36E-05 | 1.10E-05 | 1.24 | 0.2323 |
| Chronic disturbance | 6.35E-03 | 5.96E-03 | 1.07 | 0.3010 |
| Density of woody plants | 2.60E-05 | 1.60E-05 | 1.63 | 0.1208 |
| *Ornithophily* |  |  |  |  |
| Annual rainfall  | -4.56E-04 | 1.90E-04 | -2.39 | < 0.05 |
| Chronic disturbance | -1.91E-01 | 1.09E-01 | -1.75 | 0.0974 |
| Density of woody plants | 1.68E-04 | 3.26E-04 | 0.51 | 0.6133 |
| *Self-pollinated* |  |  |  |  |
| Annual rainfall  | -5.13E-06 | 2.65E-05 | -0.19 | 0.8488 |
| Chronic disturbance | 1.29E-02 | 1.39E-02 | 0.93 | 0.3669 |
| Density of woody plants | 1.54E-06 | 3.96E-05 | 0.4 | 0.9694 |
| *Autochory* |  |  |  |  |
| Annual rainfall  | 3.89E-05 | 2.82E-04 | 0.14 | 0.8918 |
| Chronic disturbance | 2.42E-01 | 1.39E-01 | 1.74 | 0.1007 |
| Density of woody plants | -3.52E-04 | 4.12E-04 | -0.85 | 0.4046 |
| *Zoochory* |  |  |  |  |
| Annual rainfall  | -2.92E-04 | 2.74E-04 | -1.06 | 0.3019 |
| Chronic disturbance | -4.48E-01 | 1.43E-01 | -1.45 | 0.1648 |
| Density of woody plants | 5.29E-04 | 4.02E-04 | 1.32 | 0.2059 |
| *Anemochory* |  |  |  |  |
| Annual rainfall  | 2.53E-04 | 1.16E-04 | 2.17 | < 0.05 |
| Chronic disturbance | -3.41E-02 | 7.01E-02 | -0.49 | 0.6332 |
| Density of woody plants | 1.77E-04 | 1.92E-04 | 0.83 | 0.3683 |
| *High palatability to goats* |  |  |  |  |
| Annual rainfall  | 1.95E-04 | 1.48E-04 | 1.32 | 0.2044 |
| Chronic disturbance | -6.31E-02 | 8.18E-02 | -0.77 | 0.4507 |
| Density of woody plants | -4.94E-05 | 2.31E-04 | -0.21 | 0.8333 |
| *Presence of Prickles/Spines* |  |  |  |
| Annual rainfall  | -4.51E-04 | 2.35E-04 | -1.92 | 0.0718 |
| Chronic disturbance | -1.71E-01 | 1.33E-01 | -1.29 | 0.2157 |
| Density of woody plants | 3.22E-04 | 3.79E-04 | 0.85 | 0.4076 |
| *Presence of stinging hairs* |  |  |  |  |
| Annual rainfall  | 1.26E-04 | 6.30E-04 | 2.00 | 0.0622 |
| Chronic disturbance | -3.10E-02 | 3.68E-02 | -0.84 | 0.4116 |
| Density of woody plants | 9.20E-05 | 1.02E-04 | 0.90 | 0.3799 |
| *Dicotyledonous (proportion of individuals)* |  |  |
| Annual rainfall | 0.00E+00 | 0.00E+00 | -0.56 | 0.583 |
| Chronic disturbance | 5.28E-01 | 2.17E-01 | 2.43 | < 0.05 |
| Density of woody plants | -1.00E-03 | 1.00E-03 | -1.92 | 0.073 |
| *Grass (proportion of individuals)* |  |  |  |
| Annual rainfall | 1.00E-03 | 0.00E+00 | 1.26 | 0.225 |
| Chronic disturbance | -2.95E-01 | 2.46E-01 | -1.19 | 0.249 |
| Density of woody plants | 1.00E-03 | 1.00E-03 | 1.34 | 0.197 |
| *Monocotyledonous (proportion of individuals)* |  |  |
| Annual rainfall | 0.00E+00 | 0.00E+00 | -1.02 | 0.321 |
| Chronic disturbance | -2.32E-01 | 1.85E-01 | -1.25 | 0.229 |
| Density of woody plants | 0.00E+00 | 1.00E-03 | 0.46 | 0.650 |
| *Dicotyledonous (proportion of species)* |  |  |
| Annual rainfall | 0.00E+00 | 0.00E+00 | -0.87 | 0.397 |
| Chronic disturbance | 2.07E-01 | 1.23E-01 | 1.67 | 0.114 |
| Density of woody plants | -1.00E-03 | 0.00E+00 | -2.22 | < 0.05 |
| *Grass (proportion of species)* |  |  |  |
| Annual rainfall | 0.00E+00 | 0.00E+00 | 0.98 | 0.339 |
| Chronic disturbance | -1.17E-01 | 1.20E-01 | -0.97 | 0.347 |
| Density of woody plants | 0.00E+00 | 0.00E+00 | 0.81 | 0.430 |
| *Monocotyledonous (proportion of species)* |  |  |
| Annual rainfall | -2.09E-01 | 0.00E+00 | -0.09 | 0.923 |
| Chronic disturbance | -9.00E-02 | 1.13E-01 | -0.79 | 0.437 |
| Density of woody plants | 0.00E+00 | 0.00E+00 | 1.56 | 0.138 |

References

Bell, C. D., Soltis, D. E., Soltis, P. S. (2010). The age and diversification of the angiosperms re‐revisited. American Journal of Botany, 97(8), 1296-1303. doi.org/10.3732/ajb.0900346

Cadotte, M. W., Cardinale, B. J., Oakley, T. H. (2008). Evolutionary history and the effect of biodiversity on plant productivity. Proceedings of the National Academy of Sciences, 105(44), 17012-17017. doi.org/10.1073/pnas.0805962105

Cadotte, M. W., Cavender-Bares, J., Tilman, D., Oakley, T. H. (2009). Using phylogenetic, functional and trait diversity to understand patterns of plant community productivity. Plos One, 4(5), e5695. doi:10.1371/journal.pone.0005695

Chao, A., Chiu, C. (2018). User’s Guide for PhD (Phylogenetic Diversity) Online: Software for Rarefaction/Extrapolation and Asymptotic Estimation of Phylogenetic Diversity. http://chao.stat.nthu.edu.tw/wordpress/wp-content/uploads/software/PhDOnline\_UserGuide.pdf

Chao, A., Chiu, C. H., Jost, L. (2010). Phylogenetic diversity measures based on Hill numbers. Philosophical Transactions of the Royal Society B: Biological Sciences, 365(1558), 3599-3609. doi.org/10.1098/rstb.2010.0272

Chao, A., Ma, K. H., Hsieh, T. C. (2016). iNEXT (iNterpolation and EXTrapolation) online: software for interpolation and extrapolation of species diversity. Program and user’s guide. chao.stat.nthu.edu.tw/wordpress/software\_download

Drummond, A. J., Suchard, M. A., Xie, D., Rambaut, A. (2012). Bayesian phylogenetics with BEAUti and the BEAST 1.7. Molecular Biology and Evolution, 29(8), 1969-1973. doi.org/10.1093/molbev/mss075

Kearse, M., Moir, R., Wilson, A., Stones-Havas, S., Cheung, M., Sturrock, S., Buxton, S., Cooper, A., Markowitz, S., Duran, C., Thierer, T., Ashton, B., Meintjes, P., Drummond, A. (2012). Geneious Basic: an integrated and extendable desktop software platform for the organization and analysis of sequence data. Bioinformatics, 28(12), 1647-1649. doi.org/10.1093/bioinformatics/bts199

Rambaut, A., 2009. FigTree v1. 3.1: Tree Figure Drawing Tool. http://tree.bio.ed.ac.uk/ software/figtree.

Rambaut, A., Drummond, A.J., Suchard, M., 2014. Tracer v1. pp. 6. http://beast.bio.ed. ac.uk.Tracer.

Ronquist, F., Huelsenbeck, J. P. (2003). MrBayes 3: Bayesian phylogenetic inference under mixed models. Bioinformatics, 19(12), 1572-1574. doi.org/10.1093/bioinformatics/btg180

Tucker, C. M., Cadotte, M. W., Carvalho, S. B., Davies, T. J., Ferrier, S., Fritz, S. A., Grenyer, R., Helmus, M. R., Jin, L. S., Mooers, A. O., Pavoine, S., Purschke, O., Redding, D. W., Rosauer, D. F., Winter, M., Mazel, F. (2017). A guide to phylogenetic metrics for conservation, community ecology and macroecology. Biological Reviews, 92(2), 698-715. doi.org/10.1111/brv.12252