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Supplementary material for

"Phylogenetic linkages between composition and structure of tree communities shed light on historical processes influencing tropical rainforest diversity"

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Appendix 1. Lists of TEAM Network's sites (7), Gentry's sites (74), published studies (34 sites from 32 studies) used to compile rainforest tree species pools for Neotropics, Afrotropics and Madagascar. TEAM data sets are available at http://www.teamnetwork.org. Gentry's transect data is available at http://www.mobot.org/mobot/research/gentry/welcome.shtml.

(a) TEAM's sites used: NEOTROPICS - Volcán Barva (La Selva Biological Station and Braulio Carrillo National Park, Costa Rica), Manaus (three different field stations near the city of Manaus, Brazil) and Caxiuanã (Caxiuanã National Forest, Brazil); AFROTROPICS - Korup (Korup National Park, Cameroon), Bwindi (Bwindi Impenetrable National Park, Uganda), Udzungwa (Udzungwa Mountains National Park, Tanzania); MADAGASCAR - Ranomafana (Ranomafana National Park, Madagascar).

We selected seven sites containing information of tree composition and abundance in tropical rainforests. For each site, we used the inventory data that ranged between Aug 2010 and May 2011. The TEAM Network sampling design for trees consists of tropical rainforest sites with five to seven 1-ha plots (100 x 100 m), each subdivided in 25 subplots of 400 m^2 (20 x 20 m), where trees with diameter at breast height ≥10 cm were recorded. Plots were placed in closed-canopy moist forest habitats. Each of the selected sites was composed by six plots of 1 ha, except for Korup and Volcán Barva, which were composed by five and nine plots, respectively. The data from all these plots were gathered using a defined, shared and therefore comparable method, which follows quality controls, such as including late successional forests with little anthropogenic impact. Further information can be found in TEAM Network (2010) and at http://www.teamnetwork.org.

(b) Alwyn Gentry's sites (codes in parentheses): AFROTROPICS – Banyong (Afr1), Belinga (Afr6), Makokou 1 (Afr7), Makokou 2 (Afr8), Mount Cameroun (Afr3), Ndakan (Afr4), Pande Forest Reserve (Afr17), Pugu Forest Reserve (Afr18); MADAGASCAR – Nosy Mangabe (Afr13), Perinet Forestry Station (Afr14); NEOTROPICS - Allpahuayo (SAm89), Alter de Chao (SAm20), Alto de Cuevas (SAm33), Alto de Mirador (SAm35), Alto Madidi (SAm10), Alto Madidi – Ridge Top (SAm11), Anchicayá (SAm36), Antado (SAm37), Araracuara (SAm39), Araracuara - High Campina (SAm38), Bajo Calima (SAm40), Belém-Mocambo (SAm29), Berbice River (SAm87), Bosque de la Cueva (SAm41), Bosque Nacional von Humboldt (SAm90), Cabeza de Mono (SAm91), Candamo (SAm108), Carajas (SAm23), Carara National Park (CAm6), Centinela (SAm70), Cerro de la Neblina 1 (SAm124), Cerro de la Neblina 2 (SAm125), Cerro El Picacho (CAm24), Cerro Olumo (CAm23), Cochacashu (SAm96), Constancia (SAm97),Cuangos (SAm71),Curundu (CAm25), Cuzco Amazónico (SAm99), Dureno (SAm72), Fila de Bilsa (SAm68), Huamaní (SAm75), Indiana (SAm101), Jatun Sacha (SAm76), Jenaro Herrera (SAm102), La Planada (SAm54), Madden Forest (CAm26), Maquipucuna (SAm78), Miazi (SAm79), Mishana - Tahuampa (SAm104), Mishana Old Floodplain (SAm105), Mishana White Sand (SAm106), Murrí (SAm59), Osa-Sirena (CAm8), Pampas del Heath (SAm109), Pipeline Road (CAm27), Quebrada Sucusari (SAm112), Rancho Quemado (CAm7), Río Manso (SAm61), Río Nangaritza (SAm82), Río

Palenque 1 (SAm83), Río Palenque 2 (SAm84), Río Távara (SAm110), San Sebastían (SAm85), Saul (SAm86), Shiringamazú (SAm111), Tambopata Alluvial (SAm114), Tambopata Lateritic (SAm116), Tambopata Swamp Trail (SAm115), Tambopata Upland Sandy (SAm113), Tutunendo (SAm65), Yanamono 1 (SAm120), Yanamono 2 (SAm121), Yanamono Tahuampo (SAm119).

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Appendix 2. Analyses of the influence of data source on phylogenetic structure patterns.

Considering that our data came from different sources with different sampling sizes, we tested for the influence of data source on net relatedness index (NRI), our measure of phylogenetic structure. Among the data sources used, the transects sampled by Alwyn Gentry had the smallest sampling effort, where each site had one transect with 0.1 ha, while TEAM Network's sites had 5 to 9 ha sampled and surveys from the literature had variable sampling effort (mostly 1 ha). Thus, one could wonder about the effect of small sampling effort in Gentry's sites over NRI.

In order to test for this possible sampling effect, we compared NRI values between data sources. For this, we used a two-way ANOVA, in which the factors were Source (Gentry vs. TEAM vs. Literature) and Andes (sites in the Andes vs. sites in other regions). Since the design was unbalanced, we used an ANOVA with randomization tests (Pillar and Orlóci 1996) to test for significance of the contrasts between groups of each factor. Analyses were performed using the software MULTIV v. 3.1 by V. Pillar (available at http://ecoqua.ecologia.ufrgs.br/software.html).

Gentry's sites had lower NRI values than TEAM's sites and surveys from the literature (Fig. A3; Table A1). Moreover, Andes sites had lower NRI values than other sites (Fig. A4; Table A1).

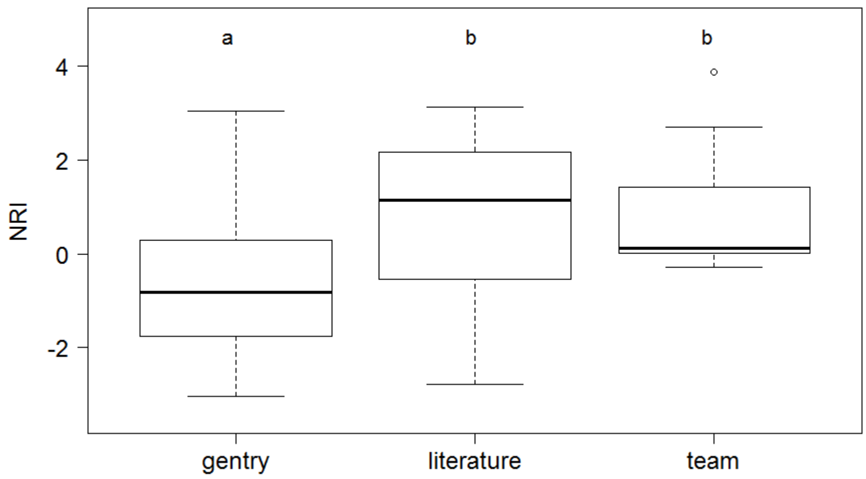

Figure A1. Comparison of NRI values between different sources of data: Gentry's transects, surveys from the literature, and TEAM Network's plots. Different letter above boxes mean significant differences between data sources ($P < 0.05$).

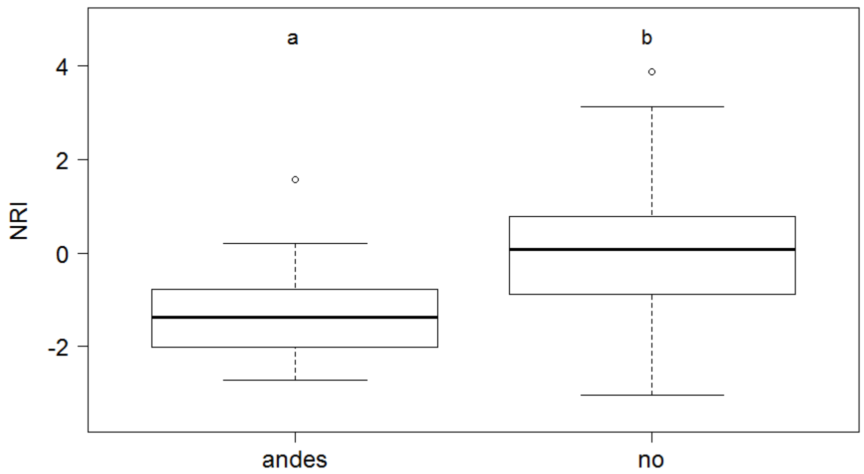

Figure A2. Comparison of NRI values between groups of sites in Andes and in other regions. Different letter above boxes mean significant differences between data sources ($P < 0.05$).

Table A1. Results of the two-way ANOVA with randomization tests, comparing NRI values between Andean and non-Andean sites and between sites from different data sources.

Source of variation	Sum of squares (Q)	$P(Qb_{null} \geq Qb)$
Factor Andes		
Andean sites vs. other sites	40.721	0.002
Factor Source		
Between groups	30.391	0.034
Contrasts:		
Gentry vs. Literature	17.188	0.048
Gentry vs. TEAM	16.656	0.036
Literature vs. TEAM	0.61308	0.672
Andes vs. Source *	-18.8	0.973
Between groups	52.312	0.001
Within groups	158.17	
Total	210.48	

*Note that the interaction between Andes and Source does not contain all the combinations of levels, because all Andean sites came from Gentry's database.

Given that all data on Andean sites came from Gentry's database, we were not able to decouple the effect of data source from biogeographic causation using only the data from Andean sites. Thus, we compared NRI values between Gentry's non-Andean sites and non-Andean sites from other data sources. If Gentry's sites are not biased toward low NRI values, then there should be no difference in NRI between Gentry's non-Andean sites and all other non-Andean sites.

Indeed, there were no significant differences in NRI between non-Andean sites from different data sources (Fig. A5; Table A2). Hence, Gentry's sites in general presented lower NRI values than other data sources because of Andes, which typically had low NRI values (see Results in the main text). Therefore, we conclude that Gentry's sites are unbiased and can be used together with TEAM Network's sites and the surveys from the literature in the analyses.

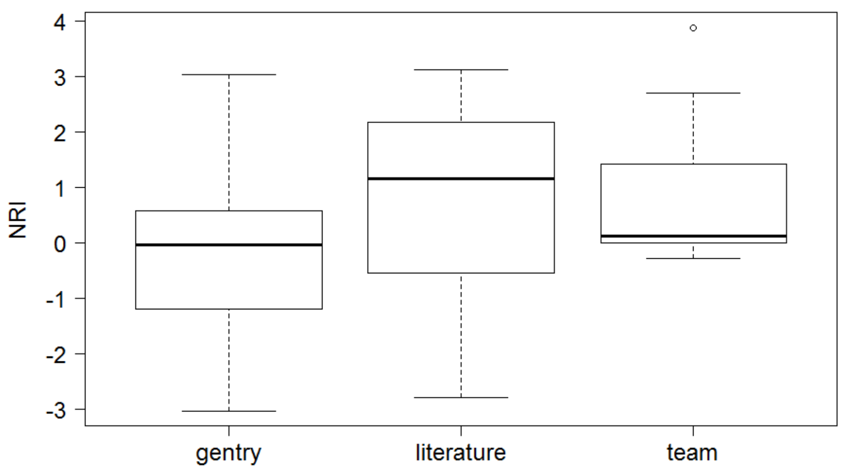

Figure A3. Comparison of NRI values between non-Andean sites from different data sources. NRI did not differ between groups.

Table A2. Results of the one-way ANOVA with randomization tests, comparing NRI values between non-Andean sites from different data sources.

Source of variation	Sum of squares (Q)	$P(Qb_{null} \geq Qb)$
Factor Source		
Between groups	11.591	0.084
Contrasts		
Gentry vs. Literature	5.9116	0.096
Gentry vs. TEAM	7.7806	0.061
Literature vs. TEAM	0.61308	0.669
Within groups	129.01	
Total	140.6	

References

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Appendix 3. Figure of the phylogenetic tree.

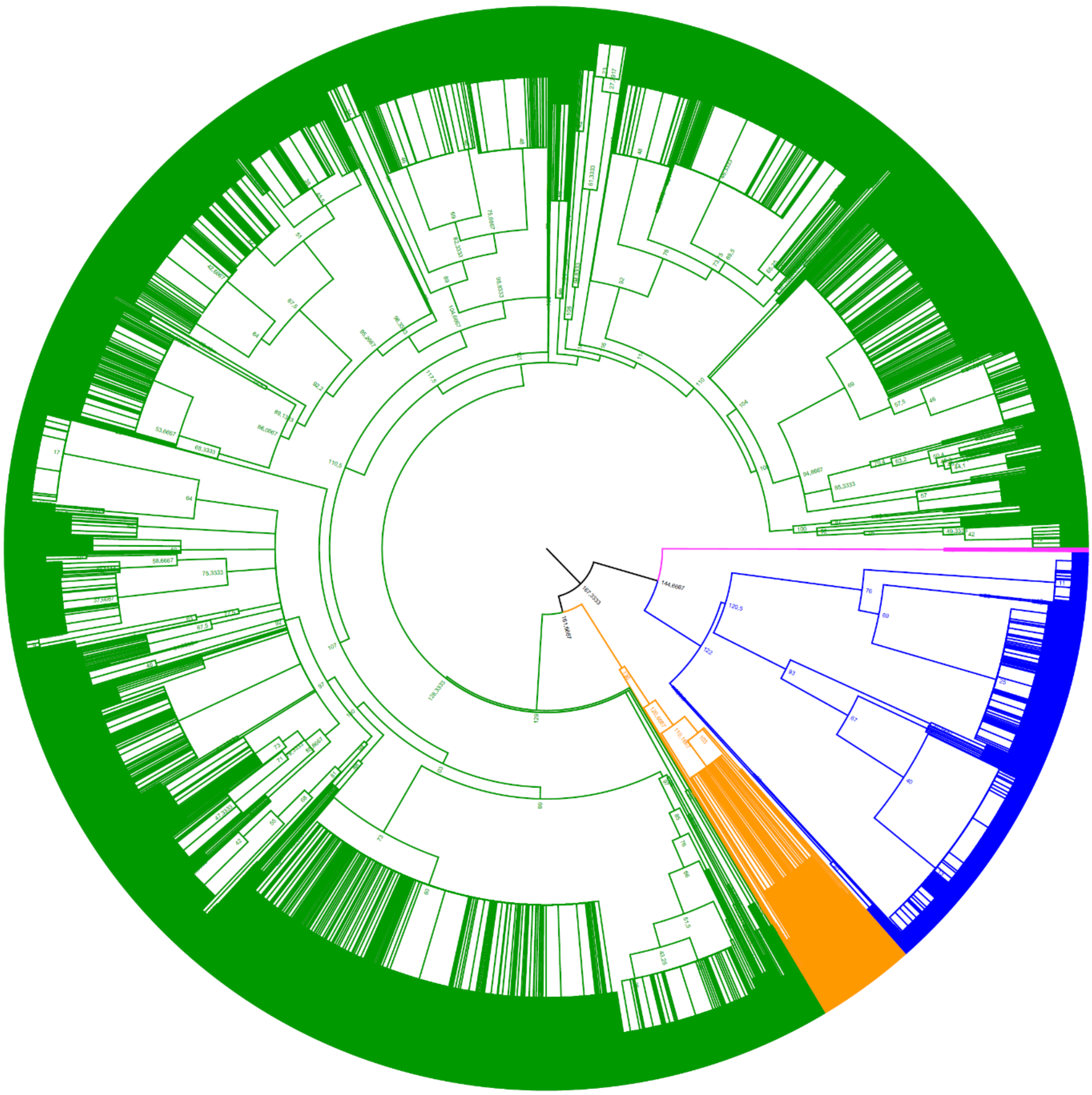

Figure A4. Phylogenetic tree for 6,307 rainforest tree species occurring in 115 Neotropical, Afrotropical and Malagasy communities (including the 94 with species abundance data and 21 with only species occurrence data). Pink, Chloranthales; Blue, magnoliids; orange, monocots; Green, eudicots.

Appendix 4. Correlation between PCPS (principal coordinates of phylogenetic structure) and NRI (net relatedness index).

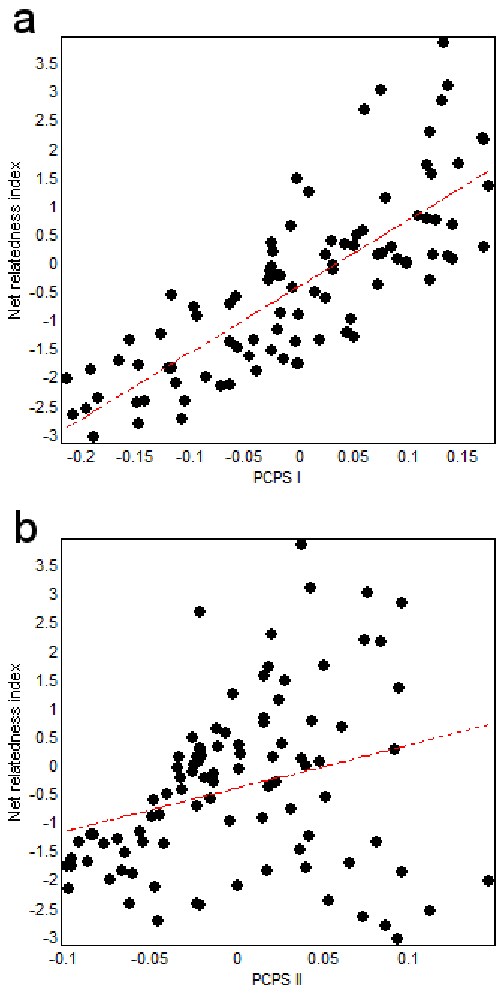

Figure A5. Scatter plot between phylogenetic composition and structure of tropical rainforest tree communities (n= 94), measured using PCPS and NRI, respectively. Pearson's correlation was significant for the comparisons of NRI with both main phylogenetic composition vectors: (a) PCPS I vs. NRI, r = 0.791, $F_{30.2}$ = 50.35, P <.001; (b) PCPS II vs. NRI, r = 0.28, $F_{52.1}$ = 4.42, P = 0.04. Correlation statistics and significance were obtained after accounting for the influence of spatial autocorrelation on the number of degrees of freedom by using Dutilleul's correction (Dutilleul 1993).

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