

Supplemental Information for:

The Andes as a semi-permeable geographical barrier: genetic connectivity between structured populations in a colorful and widespread spider

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Supplementary table 1. Collected samples and localities.

voucher code	individual code	locality	latitude	longitude	sex	color morph
1	Acre_1	Acre	-9.98	-67.81	female	Black and white
2	Acre_2	Acre	-9.98	-67.81	female	Black and white
3	Acre_3	Acre	-9.98	-67.81	female	Black and white
4	Acre_4	Acre	-9.98	-67.81	female	Black and white
5	Acre_5	Acre	-9.98	-67.81	female	Black and white
6	Acre_6	Acre	-9.98	-67.81	female	Black and white
7	Acre_7	Acre	-9.98	-67.81	female	Black and white
8	PFBA_8	Praia do Forte	-12.53	-38.02	female	Black and white
10	PFBA_9	Praia do Forte	-12.53	-38.02	female	Black and white
11	PFBA_10	Praia do Forte	-12.53	-38.02	female	Black and white
12	PFBA_11	Praia do Forte	-12.53	-38.02	female	Black and white
13	PFBA_12	Praia do Forte	-12.53	-38.02	female	Black and white
15	PFBA_13	Praia do Forte	-12.53	-38.02	female	Black and white
16	Lencois_14	Lencois	-12.56	-41.39	female	Black and white
17	Lencois_15	Lencois	-12.56	-41.39	female	Black and white
19	Lencois_16	Lencois	-12.56	-41.39	female	Black and white
20	Lencois_17	Lencois	-12.56	-41.39	female	Black and white
21	Lencois_18	Lencois	-12.56	-41.39	female	Black and white
22	Lencois_19	Lencois	-12.56	-41.39	female	Black and white
23	Lencois_20	Lencois	-12.56	-41.39	female	Black and white
24	Campinas_21	Campinas	-22.82	-47.07	female	Black and white
41	Cali_22	Cali	3.57	-76.57	female	White
43	Cali_23	Cali	3.57	-76.57	female	White
44	Cali_24	Cali	3.57	-76.57	female	White

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45	Cali_25	Cali	3.57	-76.57	female	White
47	Cali_26	Cali	3.57	-76.57	female	White
48	Cali_27	Cali	3.57	-76.57	female	White
52	Villavicencio_28	Villavicencio	4.07	-73.59	female	Black and white
53	Villavicencio_29	Villavicencio	4.07	-73.59	female	Yellow
55	Villavicencio_30	Villavicencio	4.07	-73.59	female	Yellow
58	Villavicencio_31	Villavicencio	4.07	-73.59	male	NA
58	Villavicencio_32	Villavicencio	4.07	-73.59	male	NA
59	Villavicencio_33	Villavicencio	4.07	-73.59	female	White
60	Villavicencio_34	Villavicencio	4.07	-73.59	female	White
62	Villavicencio_35	Villavicencio	4.07	-73.59	female	White
62.1	Villavicencio_36	Villavicencio	4.07	-73.59	female	Yellow
65	Villavicencio_37	Villavicencio	4.07	-73.59	female	White
68	Villavicencio_38	Villavicencio	4.07	-73.59	female	Black and white
70	Villavicencio_39	Villavicencio	4.07	-73.59	female	Black and white
77	Boquia_40	Boquía	4.64	-75.59	female	Orange
78	Boquia_41	Boquía	4.64	-75.59	female	Yellow
80	Boquia_43	Boquía	4.64	-75.59	female	Orange
81	Boquia_44	Boquía	4.64	-75.59	female	Black
82	Boquia_45	Boquía	4.64	-75.59	female	White
83	Boquia_46	Boquía	4.64	-75.59	female	Yellow
84	Boquia_47	Boquía	4.64	-75.59	female	Yellow
86	Boquia_49	Boquía	4.64	-75.59	female	White
87	Ibague_50	Ibagué	4.43	-75.21	female	White
88	Ibague_51	Ibagué	4.43	-75.21	female	White
89	Ibague_52	Ibagué	4.43	-75.21	female	Yellow
90	Ibague_53	Ibagué	4.43	-75.21	female	White
91	Ibague_54	Ibagué	4.43	-75.21	female	White

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92	Ibague_55	Ibagué	4.43	-75.21	female	Yellow
96	Bahia_Malaga_56	Bahia Málaga	4.10	-77.49	female	Yellow
97	Bahia_Malaga_57	Bahia Málaga	4.10	-77.49	female	White
98	Bahia_Malaga_58	Bahia Málaga	4.10	-77.49	female	Yellow
99	Bahia_Malaga_59	Bahia Málaga	4.10	-77.49	female	Orange
110	Palomino_60	Palmira	4.18	-76.21	female	White
111	Palomino_61	Palmira	4.18	-76.21	female	Yellow
119	Villavicencio_62	Villavicencio	4.07	-73.59	female	Black and white
120	Villavicencio_63	Villavicencio	4.07	-73.59	female	Black and white
121	Villavicencio_64	Villavicencio	4.07	-73.59	female	Orange
122	Villavicencio_65	Villavicencio	4.07	-73.59	female	Orange
123	Villavicencio_66	Villavicencio	4.07	-73.59	female	Black and white
124	Sanjuan_tolu_67	Tolú	9.59	-75.57	female	White
125	Sanjuan_tolu_68	Tolú	9.59	-75.57	female	Orange
126	Sanjuan_tolu_69	Tolú	9.59	-75.57	female	White
127	Sanjuan_tolu_70	Tolú	9.59	-75.57	female	Orange
128	Sanjuan_tolu_71	Tolú	9.59	-75.57	female	White
129	Cartagena_72	Cartagena	10.3538	-75.428	female	Black and white
130	Guaviare_73	Guaviare	2.57623	-72.714	Orange black band	NA
131	Guaviare_74	Guaviare	2.57623	-72.714	Blanck and white	NA
132	Guaviare_75	Guaviare	2.57623	-72.714	Blanck and white	NA
133	Guaviare_76	Guaviare	2.57623	-72.714	Blanck and white	NA
135	Medellin_Antioquia_77	Medellín	6.21	-75.57	female	Orange
136	Medellin_Antioquia_78	Medellín	6.21	-75.57	female	White
137	Medellin_Antioquia_79	Medellín	6.21	-75.57	female	Yellow
138	Cucuta_80	Cúcuta	7.80	-72.52	female	White
145	San_Andres_81	San Andrés	12.54	-81.81	female	Orange

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147	San_Andres_82	San Andrés	12.54	-81.81	female	Orange
156	San_Andres_83	San Andrés	12.54	-81.81	male	NA
165	San_Andres_84	San Andrés	12.54	-81.81	male	NA
173	San_Andres_85	San Andrés	12.54	-81.81	male	NA
174	Leticia_86	Leticia	-4.18	-69.95	female	Black and white
175	Leticia_87	Leticia	-4.18	-69.95	female	Black and white
176	Lima_88	Lima	-12.21	-76.99	female	Black red tips
177	Lima_89	Lima	-12.21	-76.99	female	Black red tips
178	Lima_90	Lima	-12.21	-76.99	female	Black red tips
185	Lima_91	Lima	-12.21	-76.99	female	White red tips
194	Lima_93	Lima	-12.21	-76.99	female	Black red tips
195	Lima_94	Lima	-12.21	-76.99	female	Black red tips
196	Lima_95	Lima	-12.21	-76.99	female	Black red tips
198	Lima_96	Lima	-12.21	-76.99	female	Black red tips
202	Lima_97	Lima	-12.21	-76.99	female	Black red tips
203	Lima_98	Lima	-12.21	-76.99	female	Black red tips
205	Lima_99	Lima	-12.21	-76.99	female	Black red tips
212	Lima_100	Lima	-12.21	-76.99	female	White red tips
213	Lima_101	Lima	-12.21	-76.99	female	White red tips
216	Chiclayo_102	Chiclayo	-6.64	-79.40	female	White red tips
217	Chiclayo_103	Chiclayo	-6.64	-79.40	female	White red tips
224	Moyobamba_104	Moyobamba	-6.02	-76.97	female	Black and white
226	Moyobamba_105	Moyobamba	-6.02	-76.97	female	Black and white
227	Moyobamba_106	Moyobamba	-6.02	-76.97	female	Black and white
229	Moyobamba_107	Moyobamba	-6.02	-76.97	female	Orange black band
231	Moyobamba_108	Moyobamba	-6.02	-76.97	female	Orange black band
232	Moyobamba_109	Moyobamba	-6.02	-76.97	female	Orange black band
239	Moyobamba_110	Moyobamba	-6.02	-76.97	female	Orange black band

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241	Tarapoto_111	Tarapoto	-6.48	-76.35	female	Black and white
242	Tarapoto_112	Tarapoto	-6.48	-76.35	female	Black and white
244	Tarapoto_113	Tarapoto	-6.48	-76.35	female	Black and white
249	Jaen_114	Jaen	-5.64	-78.78	female	Black and white
250	Jaen_115	Jaen	-5.64	-78.78	female	White
252	Jaen_116	Jaen	-5.64	-78.78	female	Black and white
253	Jaen_117	Jaen	-5.64	-78.78	male	NA
254	Jaen_118	Jaen	-5.64	-78.78	female	Orange
258	Piura_119	Piura	-5.51	-80.89	female	Black red tips
259	Piura_120	Piura	-5.51	-80.89	female	Black red tips
262	Piura_121	Piura	-5.51	-80.89	female	White red tips
263	Piura_122	Piura	-5.51	-80.89	female	White red tips
265	Piura_123	Piura	-5.51	-80.89	female	White red tips
266	Piura_124	Piura	-5.51	-80.89	female	White red tips
267	Piura_125	Piura	-5.51	-80.89	female	White red tips
268	Piura_126	Piura	-5.51	-80.89	female	White red tips
269	Piura_127	Piura	-5.51	-80.89	female	White red tips
270	Piura_128	Piura	-5.51	-80.89	female	White red tips
271	Piura_129	Piura	-5.51	-80.89	female	White red tips
272	Piura_130	Piura	-5.51	-80.89	female	White red tips
273	Alamor_131	Alamor	-4.02	-80.02	female	Yellow
274	Alamor_132	Alamor	-4.02	-80.02	female	White red tips
282	Alamor_133	Alamor	-4.02	-80.02	female	White red tips
284	Alamor_134	Alamor	-4.02	-80.02	female	White
286	Alamor_135	Alamor	-4.02	-80.02	female	White
287	Alamor_136	Alamor	-4.02	-80.02	female	White
288	Alamor_137	Alamor	-4.02	-80.02	female	Yellow
292	Vilcabamba_138	Vilcabamba	-4.26	-79.22	female	White red tips

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293	Vilcabamba_139	Vilcabamba	-4.26	-79.22	female	White red tips
295	Vilcabamba_140	Vilcabamba	-4.26	-79.22	female	White red tips
296	Vilcabamba_141	Vilcabamba	-4.26	-79.22	female	Yellow
297	Vilcabamba_142	Vilcabamba	-4.26	-79.22	female	White red tips
298	EIPangui_143	Sucua	-2.40	-78.16	female	Black and white
299	EIPangui_144	Sucua	-2.40	-78.16	female	Black and white
302	Gualaquiza_145	Sucua	-2.40	-78.16	female	Orange black band
303	Gualaquiza_146	Sucua	-2.40	-78.16	female	Orange
304	Sucua_147	Sucua	-2.40	-78.16	female	Orange black band
305	Sucua_148	Sucua	-2.40	-78.16	female	Black and white
306	Sucua_149	Sucua	-2.40	-78.16	female	Orange black band
310	Sucua_150	Sucua	-2.40	-78.16	female	Orange
315	Sucua_151	Sucua	-2.40	-78.16	female	Black and white
328	Banos_152	Baños	-1.40	-78.42	female	Yellow
329	Banos_153	Baños	-1.40	-78.42	female	Black
331	Banos_154	Baños	-1.40	-78.42	female	White
332	Banos_155	Baños	-1.40	-78.42	female	White
338	Banos_156	Baños	-1.40	-78.42	female	White
339	Banos_157	Baños	-1.40	-78.42	female	Yellow
340	Banos_158	Baños	-1.40	-78.42	female	Black
341	Banos_159	Baños	-1.40	-78.42	female	Yellow
342	Banos_160	Baños	-1.40	-78.42	female	Black
350	Misahualli_161	Misahuallí	1.04	-77.67	female	Black and white
351	Misahualli_162	Misahuallí	1.04	-77.67	female	Black and white
352	Misahualli_163	Misahuallí	1.04	-77.67	male	NA
353	Misahualli_164	Misahuallí	1.04	-77.67	female	Black and white
354	Misahualli_165	Misahuallí	1.04	-77.67	female	Black and white
356	Misahualli_166	Misahuallí	1.04	-77.67	female	Orange black band

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357	Misahualli_167	Misahuallí	1.04	-77.67	female	Orange
358	Misahualli_168	Misahuallí	1.04	-77.67	female	Orange
371	Santo_Domingo_169	Santo Domingo	-0.25	-79.16	female	White red tips
372	Santo_Domingo_170	Santo Domingo	-0.25	-79.16	female	White
374	Santo_Domingo_171	Santo Domingo	-0.25	-79.16	female	Yellow
375	Santo_Domingo_172	Santo Domingo	-0.25	-79.16	female	Black
376	Quito_173	Quito	-0.19	-78.14	female	Yellow
377	Quito_174	Quito	-0.19	-78.14	female	White
379	Quito_175	Quito	-0.19	-78.14	female	Yellow
380	Quito_176	Quito	-0.19	-78.14	female	Yellow
381	Quito_177	Quito	-0.19	-78.14	female	White
383	Quito_178	Quito	-0.19	-78.14	female	Orange
384	Quito_179	Quito	-0.19	-78.14	female	Yellow
385	Quito_180	Quito	-0.19	-78.14	female	Yellow
390	Santo_Domingo_181	Santo Domingo	-0.25	-79.16	female	White
391	Santo_Domingo_182	Santo Domingo	-0.25	-79.16	female	White

Supplementary table 2. Analysis of molecular variance results for each locus. Columns are coded as follow: df: degrees of freedom, ss: sum of squares; vp: variation percentages; fi: fixation index.

Source of variation	df	ss	vp	fi	p-value
Among geographical regions	2	1389.248	21.44	$F_{ct}=0.21$	0.001
Among localities within regions	24	1627.064	9.96	$F_{st}=0.13$	0.001
Within localities	149	5265.666	68.58	$F_{sc}=0.31$	0.001

Supplementary table 3. Parameter estimation for the two best models obtained in delimitR. Population size in number of alleles. Divergence time in number of generations, usually assumed as one generation per year. Time secondary contact ended moving backwards in time.

Model 90

Variable name	mean	min	max
Population size East Andes (EA)	40814.12	36851.8539	45023.04845
Population size Dry Pacific (DP)	18523.19	16709.97482	20535.148
Population size West Andes 1 (WA1)	5772.94	5368.52828	6167.855242
Population size West Andes 2 (WA2)	5470.61	5105.062003	5836.768683
Population size Baños	5713.28	5347.70227	6089.526745
Divergence time between EA and DP	3809219.03	3555729.725	4070151.512
Migration rate between EA and DP	3.04E-05	2.83E-05	3.24E-05
Time secondary contact ended EA and DP	1904609.25	1777499.148	2034005.231

Model 93

Variable name	mean	min	max
Population size East Andes (EA)	29916.55	27600.77	32248.95
Population size Dry Pacific (DP)	25100.6	23173.77	27079.41
Population size West Andes 1 (WA1)	2612.82	2458.7	2768.06
Population size West Andes 2 (WA2)	5524.554	5148.496	5907.807
Population size Baños	5257.25	4863.219	5653.91
Divergence time between EA and WA	2802633	2393274	3234989
Divergence time between EA-WA and DP	6882791	6535216	7243349
Migration rate between EA and WA	3.23E-05	2.96E-05	3.51E-05
Migration rate between DP and WA	3.42E-05	3.18E-05	3.67E-05
Time secondary contact ended EA and WA	1401316	1193287	1618676
Time secondary contact ended DP and WA	3441395	3268817	3617093

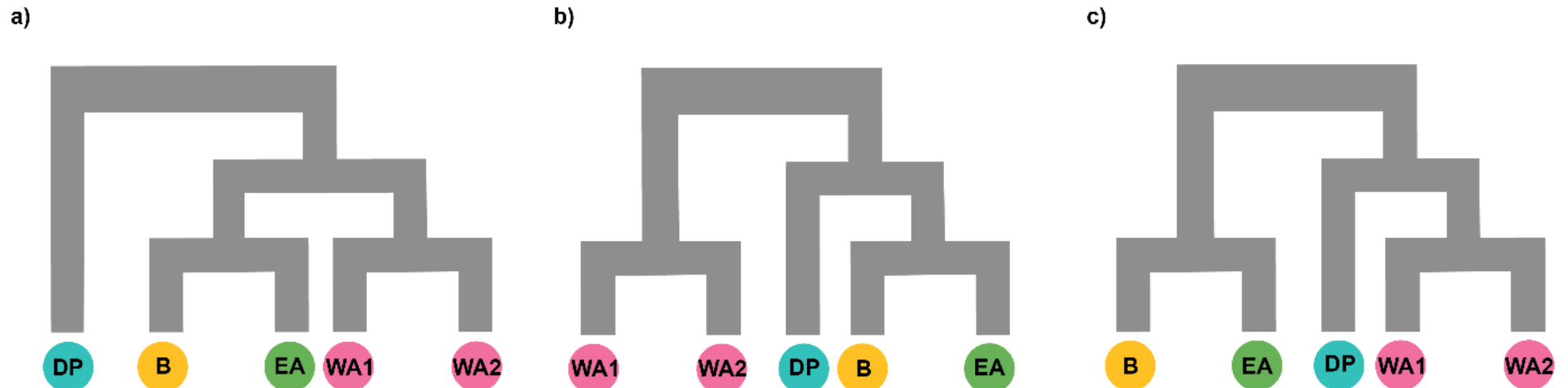
Supplementary table 4. Niche model algorithms accuracy . **AUC** (Area Under the Receiver Operating Characteristic Curve (AUC-ROC)): evaluates the model's ability to discriminate between presence and absence locations. **Sensitivity**: proportion of actual positive occurrences that are correctly predicted by the model. **Specificity**: proportion of true absences that are correctly predicted by the model.

Algorithm	AUC	Sensitivity	Specificity
GLM	0.886	0.923	0.902
GBM	0.886	0.914	0.898
Maxent	0.843	0.906	0.908
GAM	0.843	0.940	0.917
Ensemble model	0.911	0.955	0.949

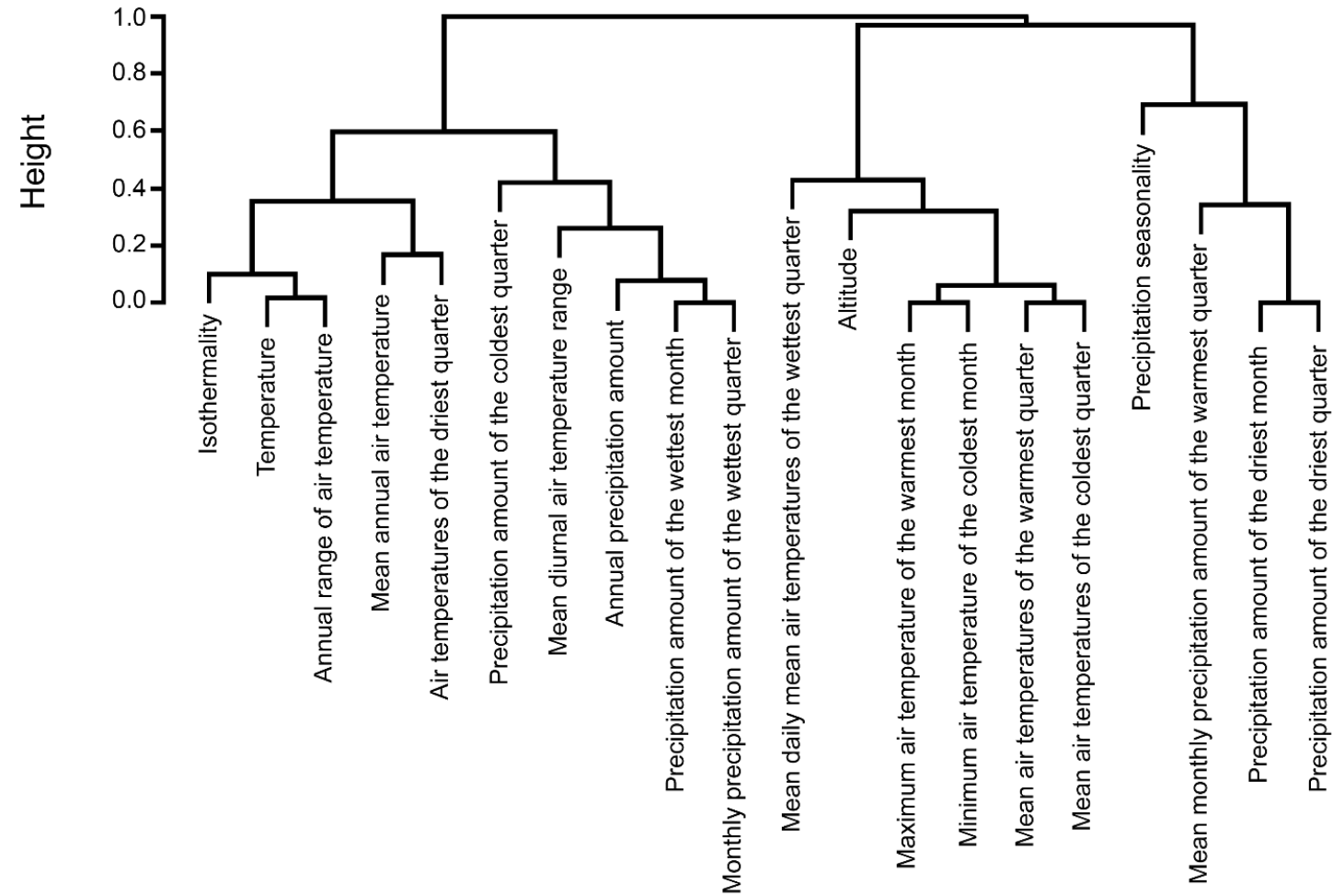
Supplementary table 5. Niche model variable relevance Relative importance of environmental variables receiver operating characteristic (ROC).

Variable	ROC
Isothermality	48.9
Mean diurnal air temperature range	23.3
Precipitation seasonality	10.9
Mean monthly precipitation amount of the warmest quarter	6.2
Altitude	10.6

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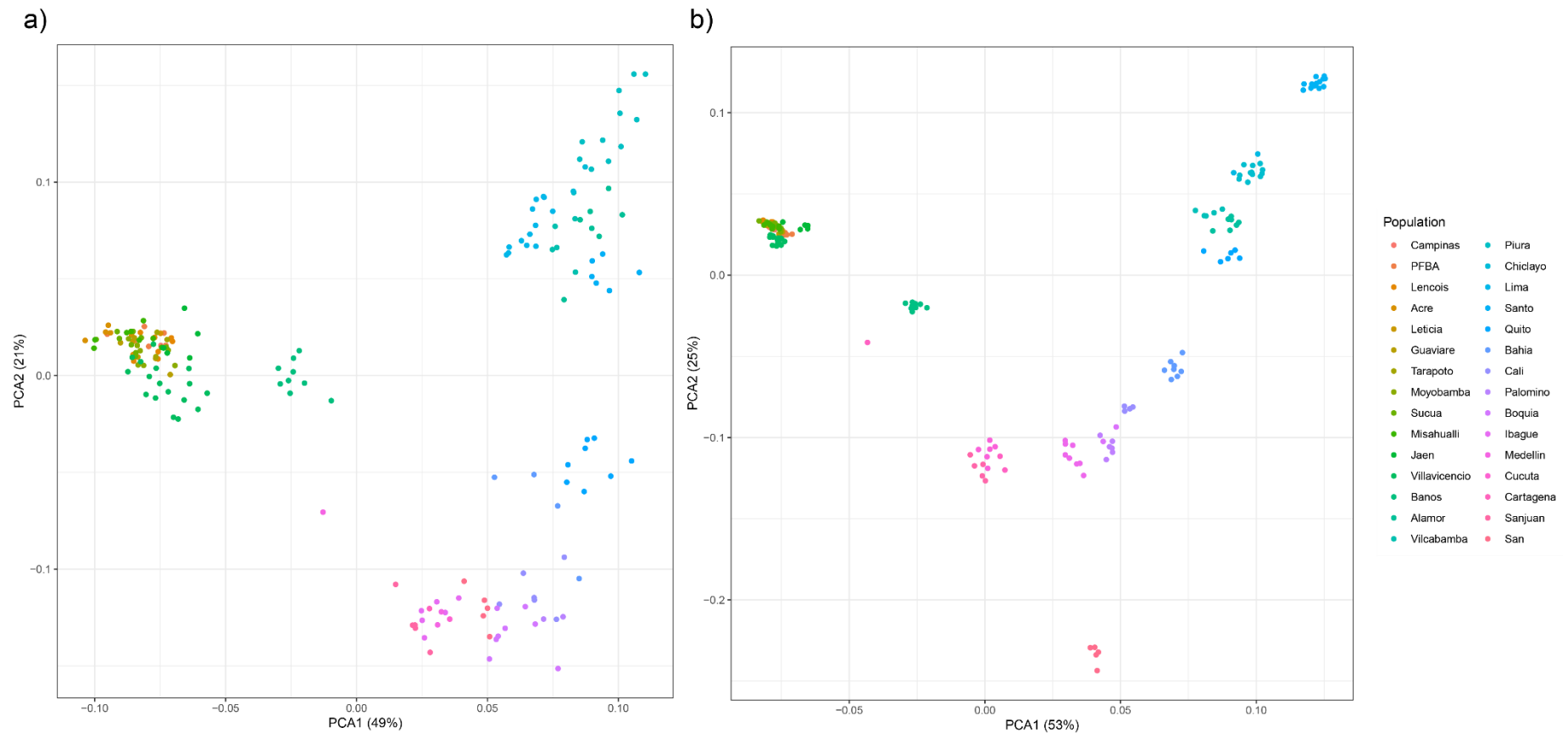


Supplementary figure 1. Topologies tested in delimitR. Colours represent geographical regions, green: East Andes (EA), pink: West Andes (WE), blue: Dry Pacific coast of Perú and Ecuador (DP), yellow: Baños-Ecuador. West Andes was divided in two groups: WA1, composed by Quito, Bahia Málaga, Cali and Boquía. WA2 includes San Andrés, Ibagué, Tolú, Medellín, Cartagena, Cúcuta.

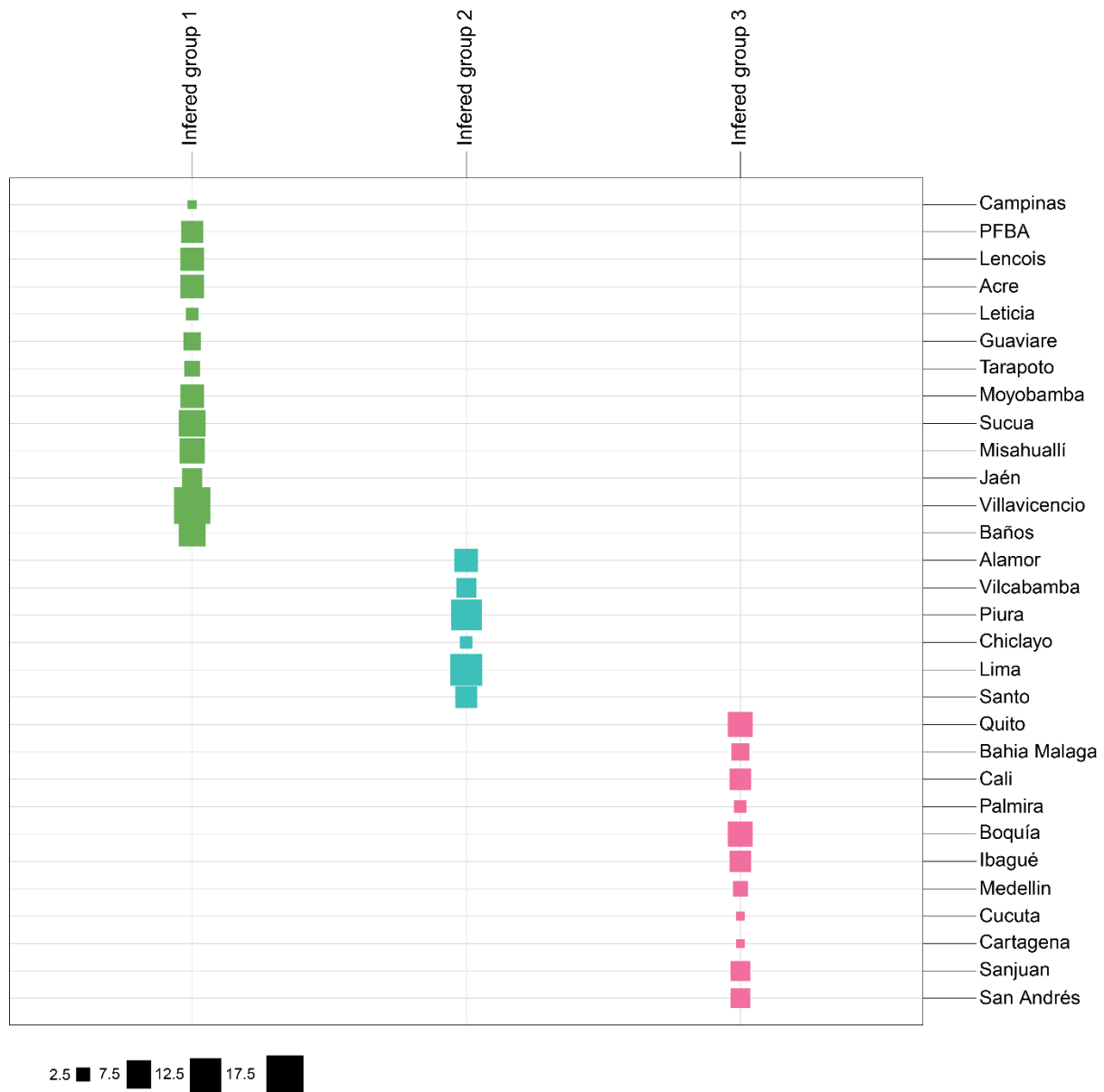


Supplementary figure 2. Dendrogram showing correlation of the climatic variables. We selected one variable with a pairwise distance <0.5 from each cluster to run our analyses. These variables were: (i) diurnal mean air temperature range, (ii) altitude, (iii) isothermality, (iv) precipitation seasonality, and (v) mean monthly precipitation amount of the warmest quarter

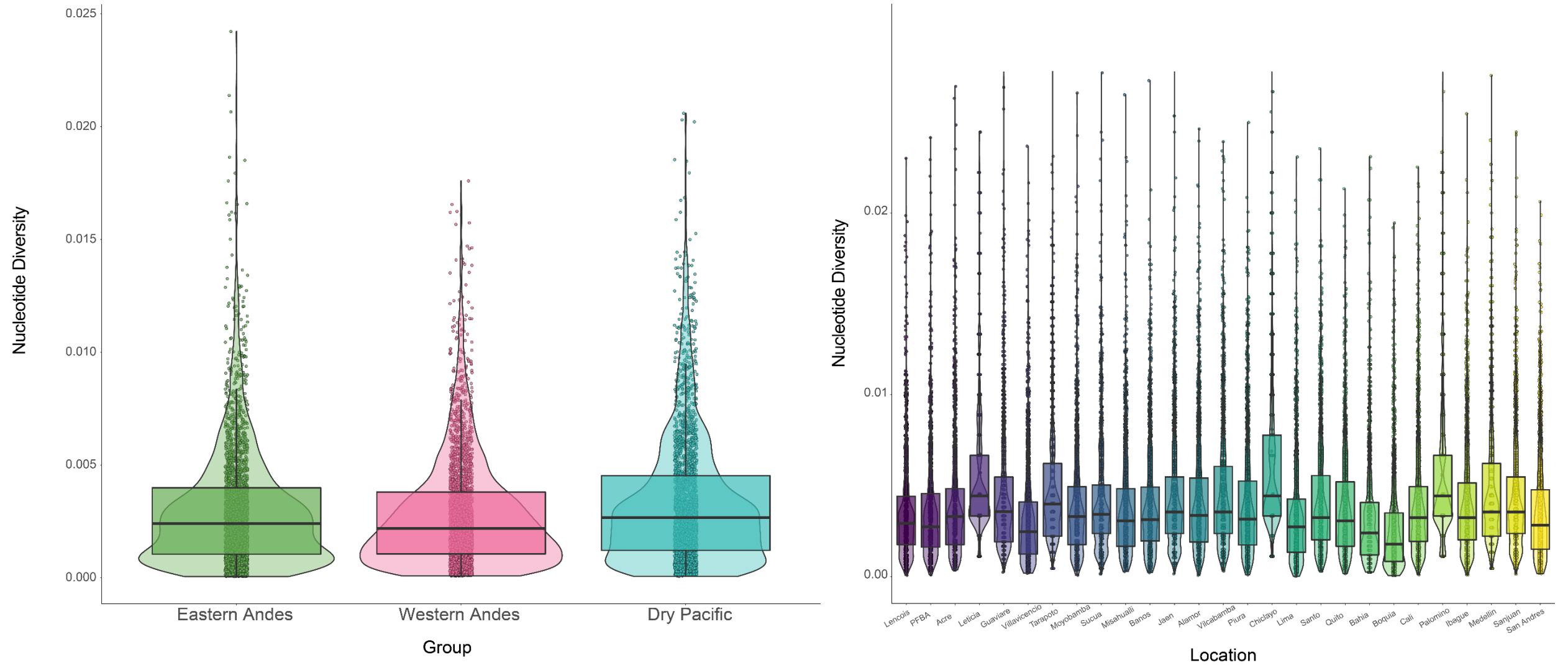
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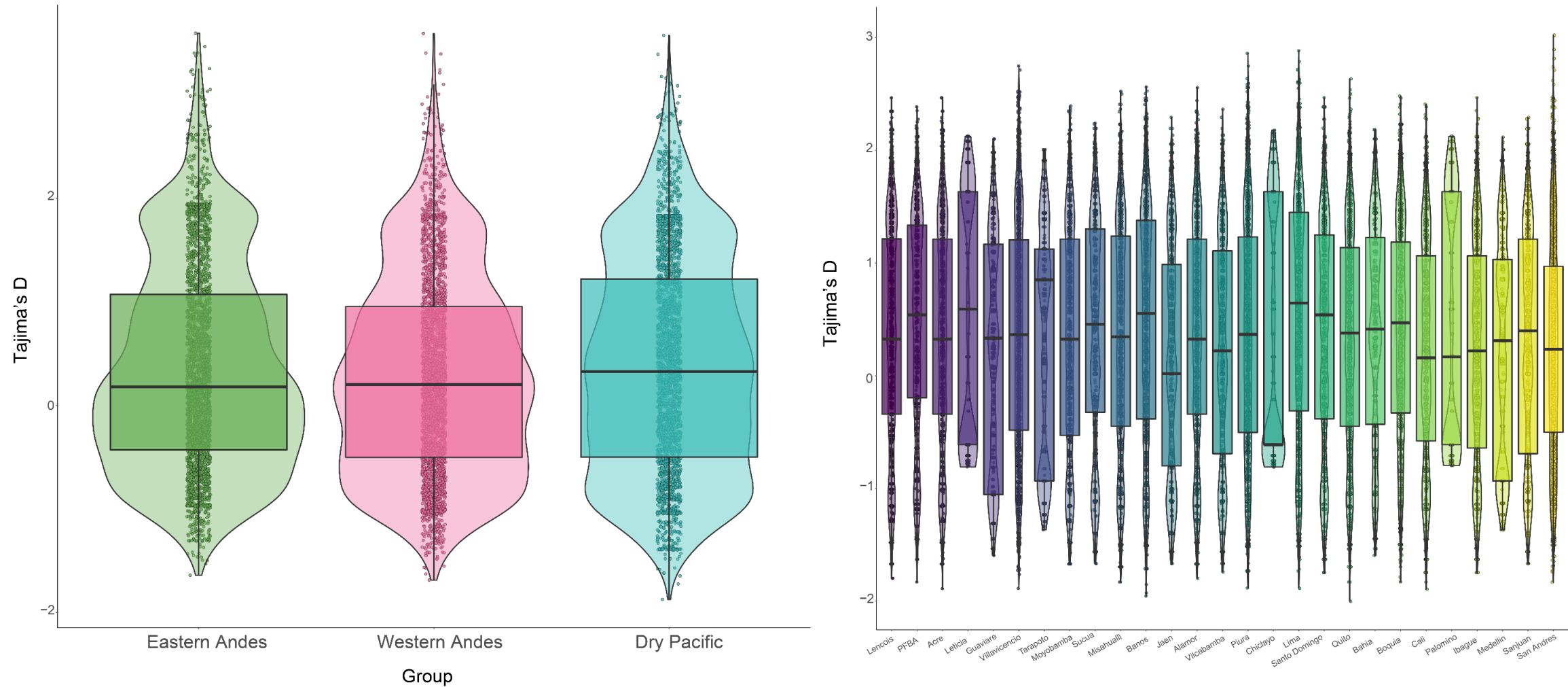
Supplementary Figure 3. Principal components analyses of the SNP variation (PCA). a) PCA built with one SNP per tag. b) PCA built with all the SNPs.



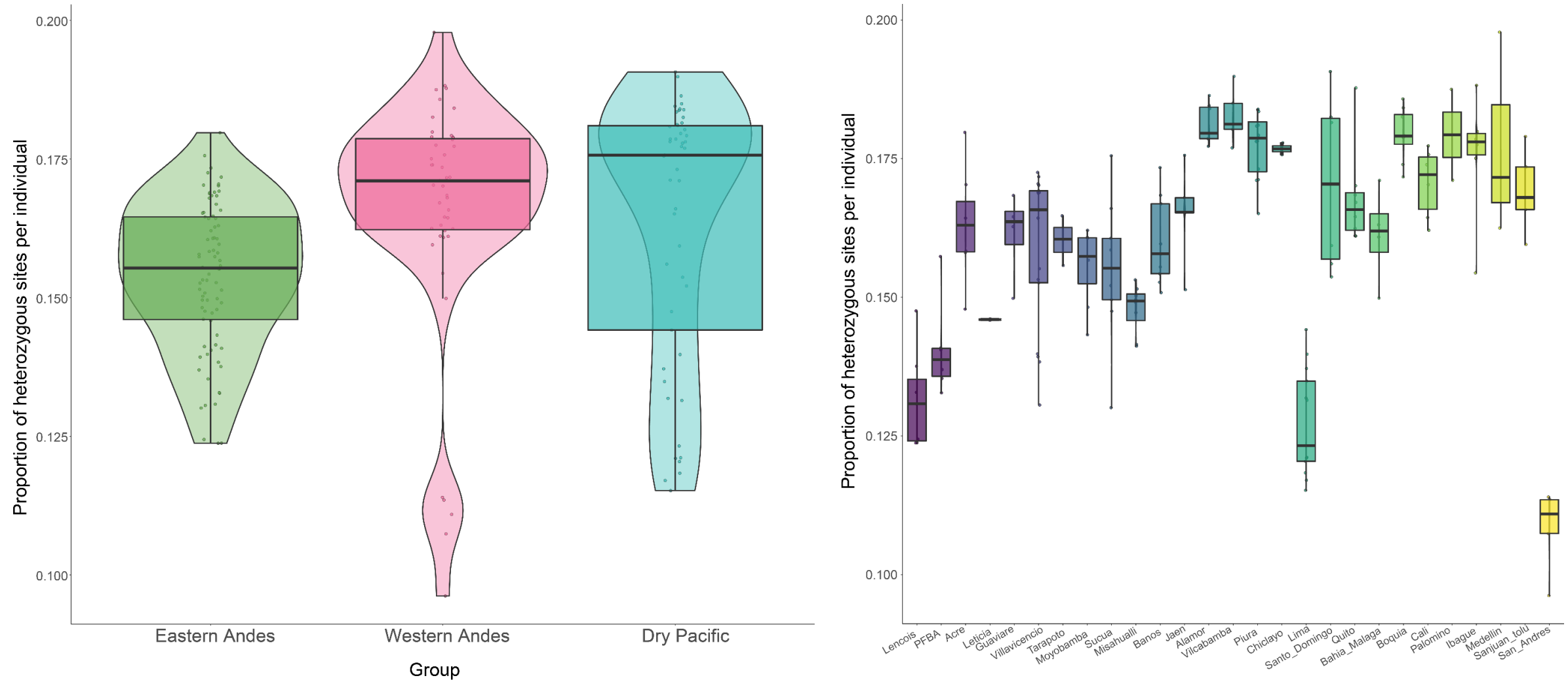
Supplementary Figure 4. DAPC categorization and plot. Colours represent geographical regions, green: East Andes (EA), pink: West Andes (WE), blue: Dry Pacific coast of Perú and Ecuador (DP). For details about the geographic location of the localities refer to Figure 1 in the main text.



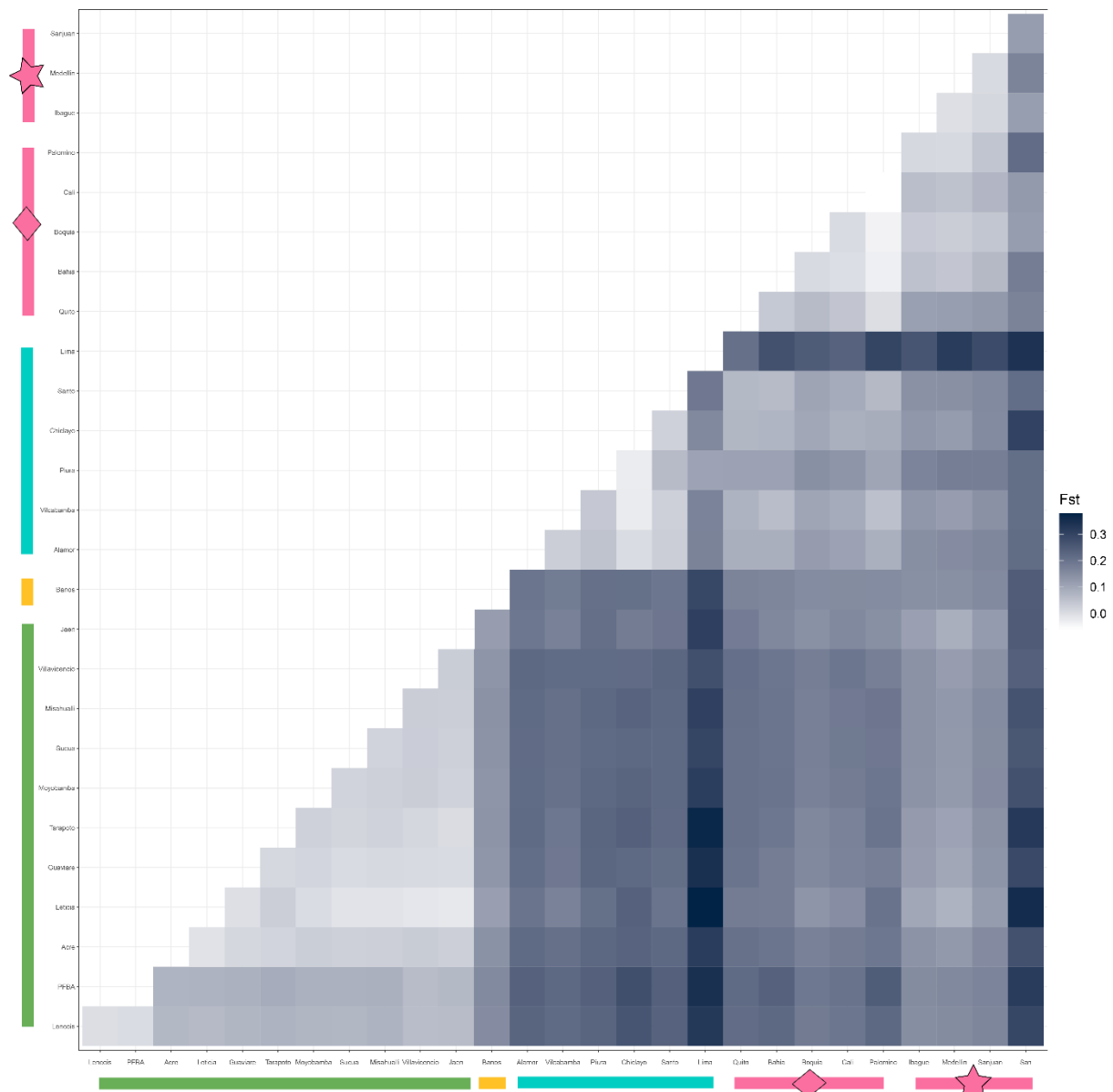
Supplementary Figure 5. Boxplots comparing the nucleotide diversity values between different geographical groups. The left panel shows the differences between the geographical groups delimited in the structure K=3 and DAPC. The right panel shows the difference between localities



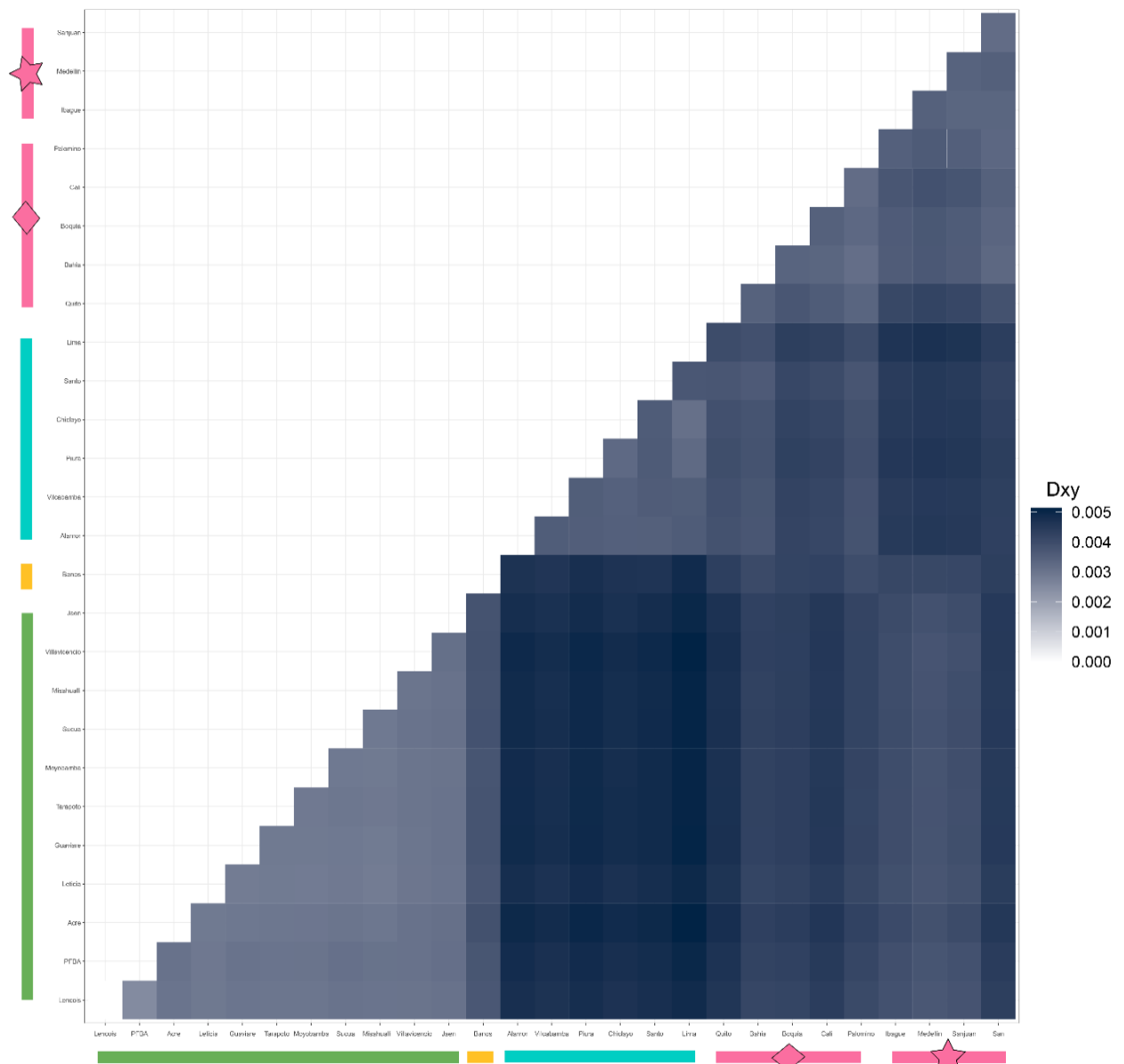
Supplementary Figure 6. Boxplots comparing Tajima's D values between different geographical groups. The left panel shows the differences between the geographical groups delimited in the structure K=3 and DAPC. The right panel shows the difference between localities.



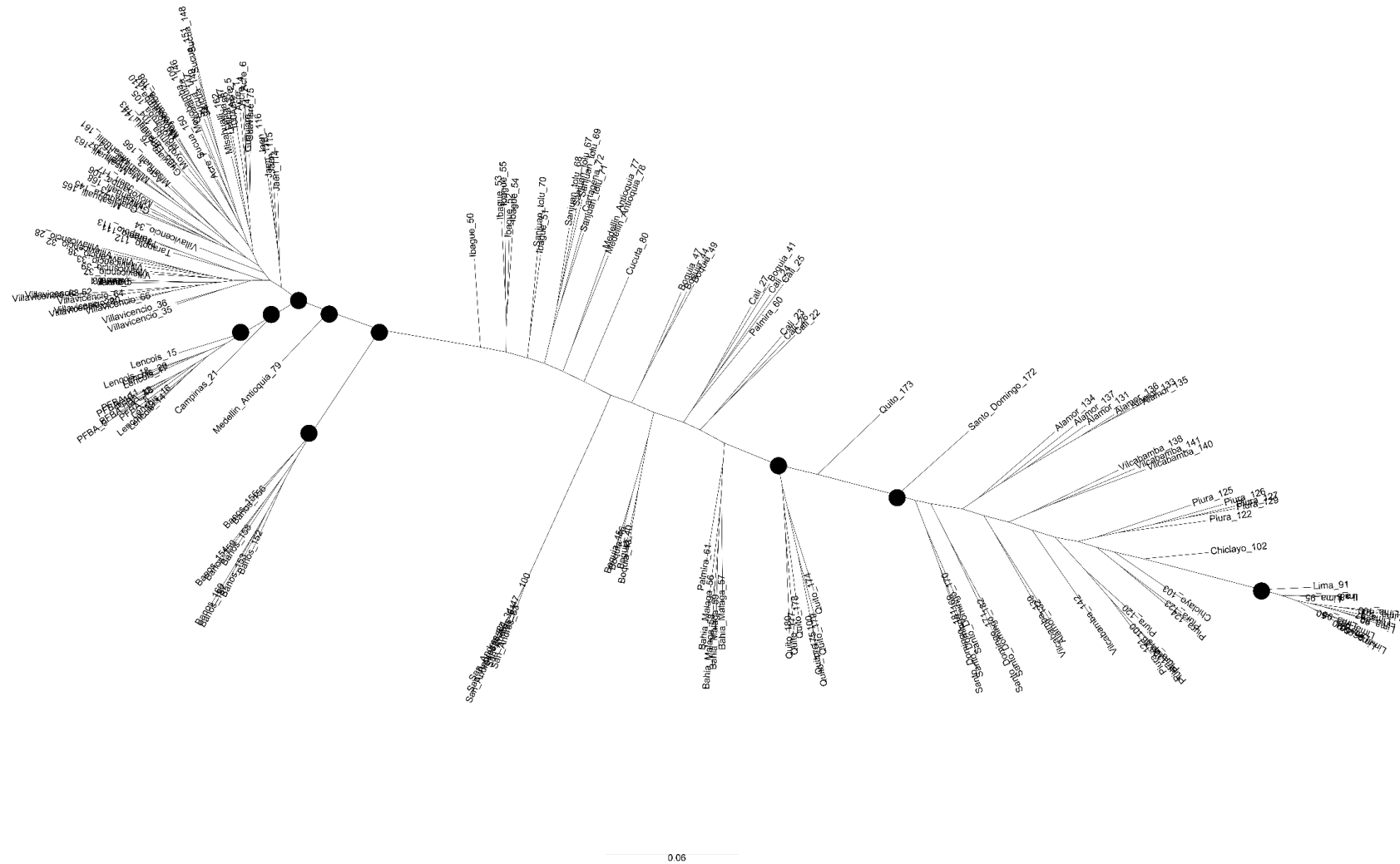
Supplementary Figure 7. Boxplots comparing the proportion of heterozygous sites between different geographical groups. The left panel shows the differences between the geographical groups delimited in the structure K=3 and DAPC. The right panel shows the difference between localities.



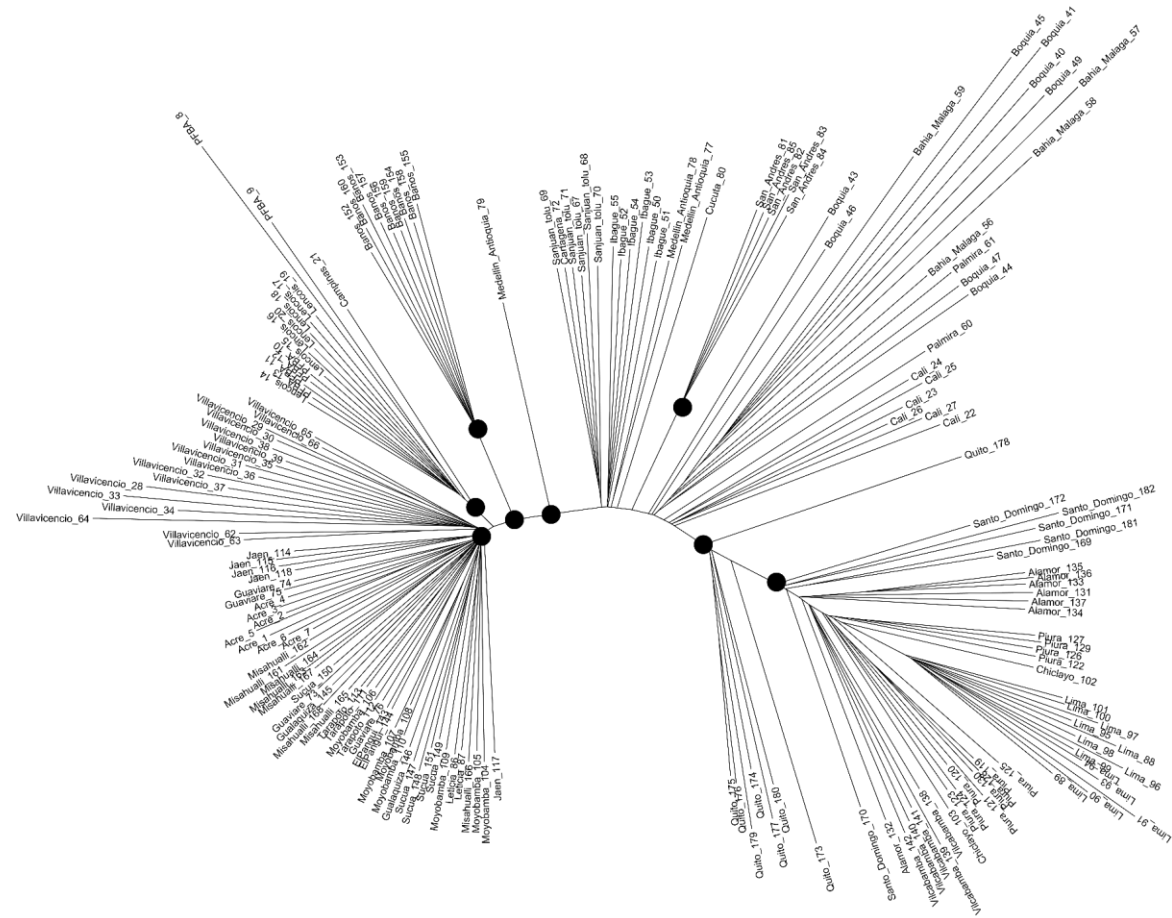
Supplementary Figure 8. F_{st} heatmap. Color bars and symbols represent the geographic groups. West Andes (WE), pink diamond corresponds samples from Quito, Cauca Valley and Pacific Coast of Colombia; pink star symbolize individuals from Magdalena River Valley and Caribbean, blue: Dry Pacific coast of Perú and Ecuador (DP), yellow: Baños-Ecuador.



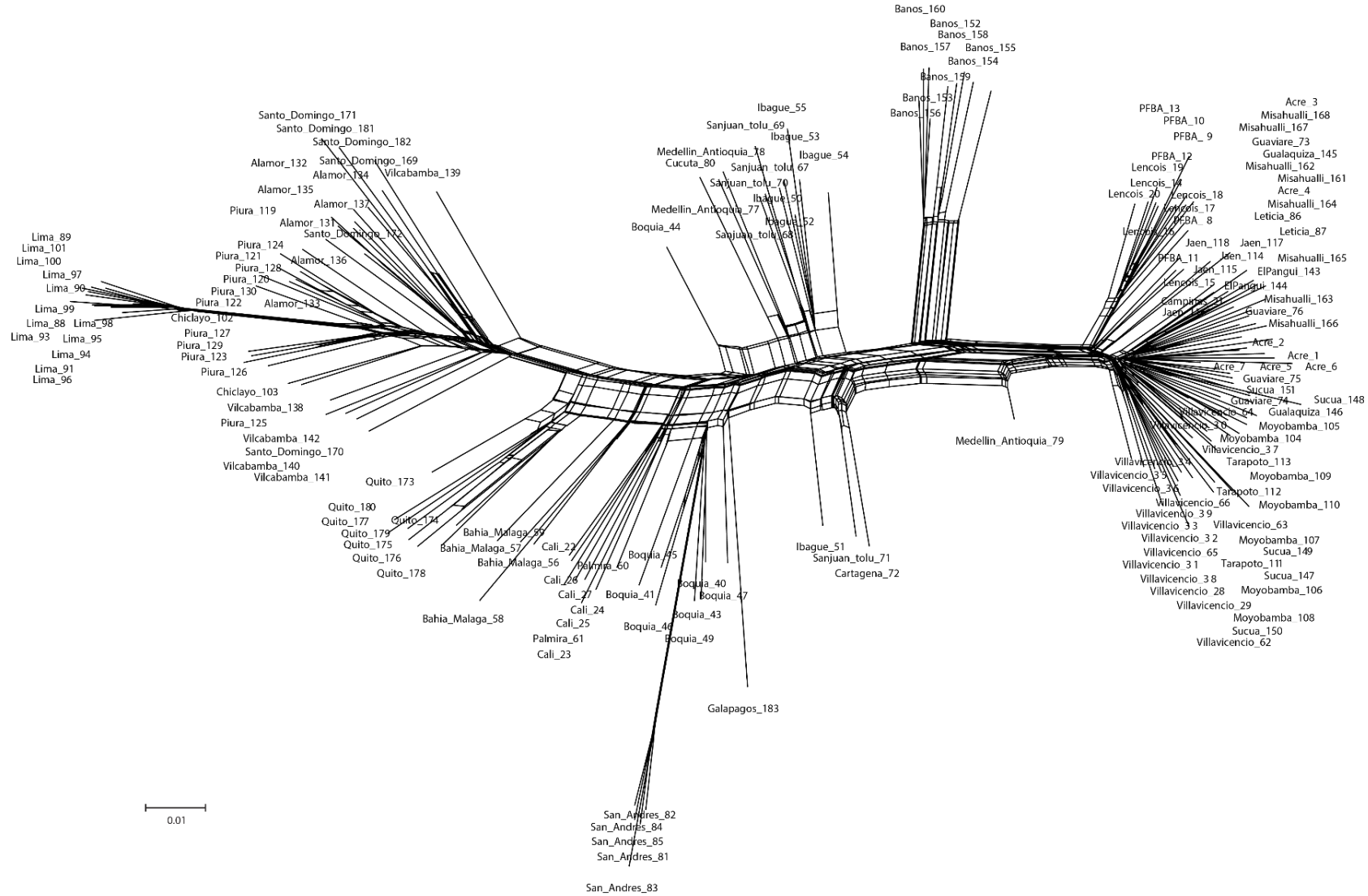
Supplementary Figure 9. D_{xy} heatmap. Color bars and symbols represent the geographic groups. West Andes (WE), pink diamond corresponds samples from Quito, Cauca Valley and Pacific Coast of Colombia; pink star symbolize individuals from Magdalena River Valley and Caribbean, blue: Dry Pacific coast of Perú and Ecuador (DP), yellow: Baños-Ecuador



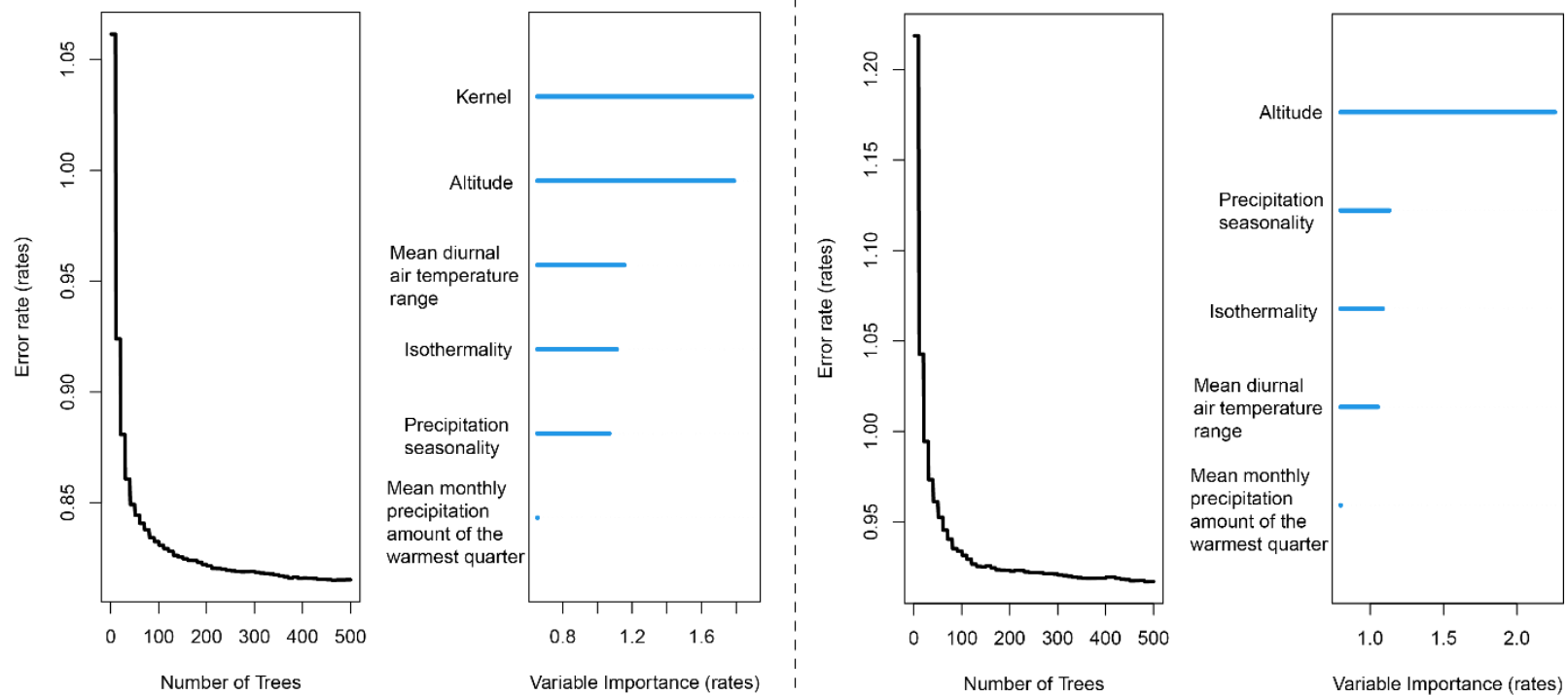
Supplementary Figure 10. RAXML phylogeny. Black circles represent nodes with a bootstrap support above 0.9. Individuals are coded as in supplementary table 1.



Supplementary Figure 11. PhyloDIST phylogeny. Black circles represent nodes with a bootstrap support above 0.9. Individuals are coded as in supplementary table 1.

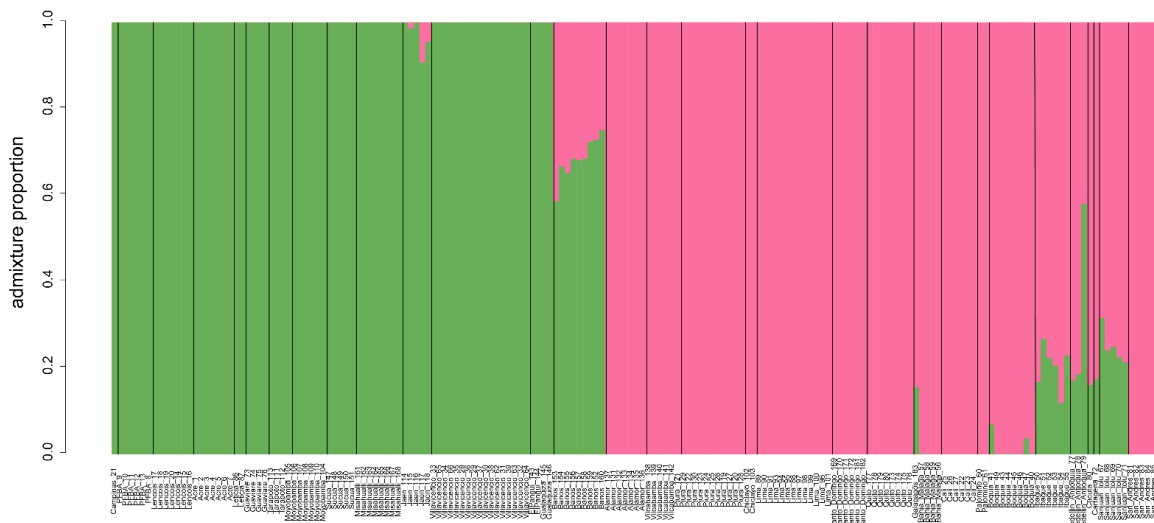


Supplementary Figure 12. Neighbornet netowrk. Individuals are coded as in supplementary table 1.

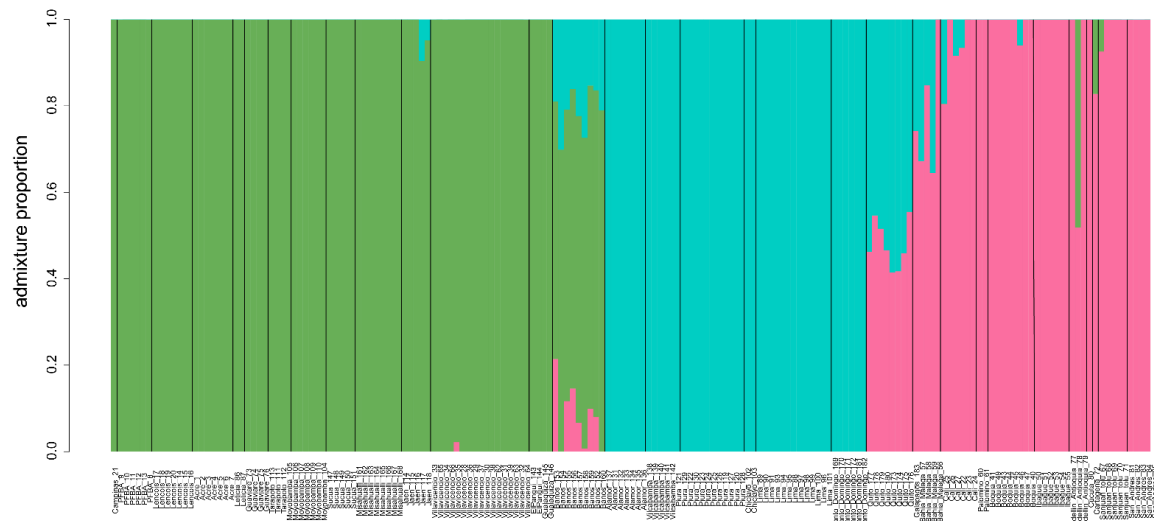


Supplementary figure 13. Variable relevance from SPRUCE. Most important variables in the SPRUCE random forest are identified based on the reduction in model accuracy when each variable is removed. Left panel correspond to the model with the Kernel. Right panel corresponds to the model without the Kernel

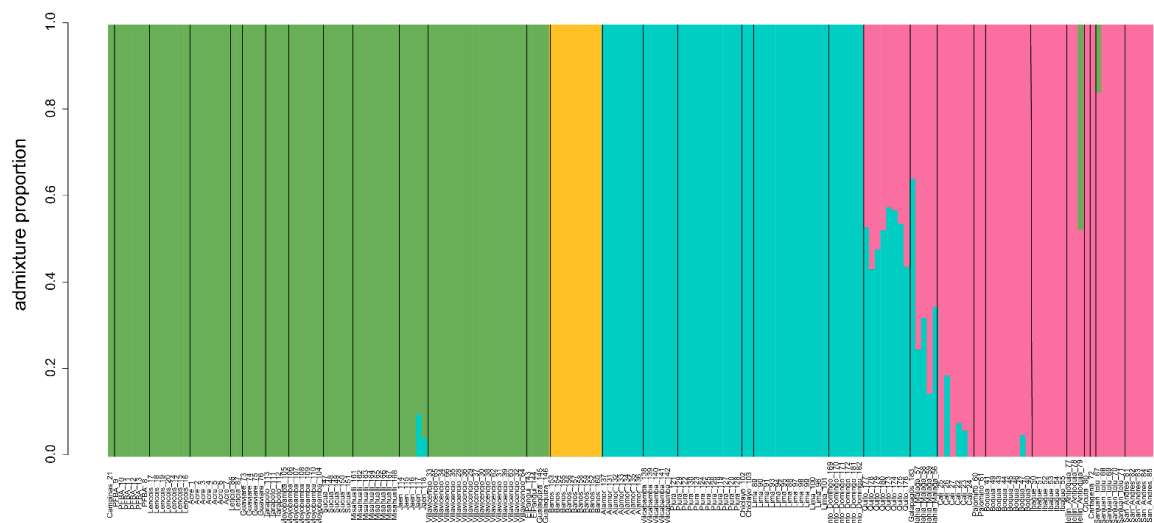
K=2



K=3



K=4



Supplementary figure 14. Detailed FastStructure. Individuals are coded as in Supplementary table 1.