The pollination trade-off

Supplementary information

Fernando Cagua, Hugo Marrero, Jason Tylianakis, Daniel Stouffer

Table S1: Summary of the model used to analyse the relationship between heterospecific and conspecific pollen

predictor	estimate	S.E.	z-value
fixed component			
(Intercept)	4.976	0.279	17.862
heterospecific	0.008	0.017	0.474
random component (species:community)			
S.D. random intercept	1.964	-	-
S.D. random slope	0.120	-	-

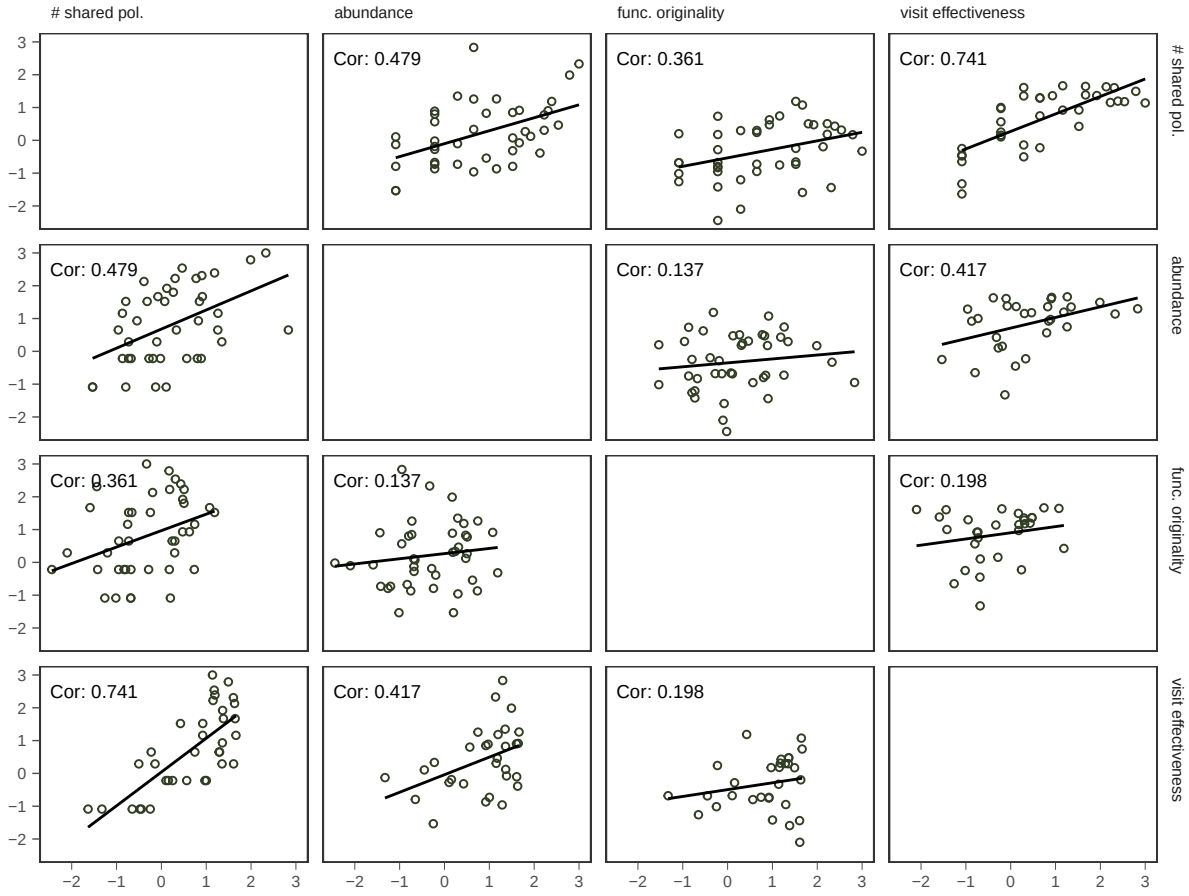

Figure S1: Correlation between the explanatory variables included in the statistical models.

Table S2: The slope of the relationship between heterospecific and conspecific pollen for each species in their community (fixed effect + conditional effect). Community names are constructed by location - agricultural/restored - fragment number.

species name	community	slope	S.E.
Aloysia gratissima	Anquilóo - reserve - 2	0.0746	0.0144
Baccharis pingraea	San Claudio - reserve - 1	-0.0012	0.0359
Carduus acanthoides	Anquilóo - agricultural - 2	0.0116	0.0147
Carduus acanthoides	San Claudio - agricultural - 1	-0.0106	0.0040
Carduus acanthoides	San Claudio - agricultural - 2	0.0518	0.0044
Carduus acanthoides	San Claudio - reserve - 1	0.0781	0.0710
Carduus acanthoides	San Claudio - reserve - 2	-0.0008	0.0359
Cirsium vulgare	Anquilóo - agricultural - 2	-0.0401	0.0025
Cirsium vulgare	Las Chilcas - reserve - 1	0.0007	0.0012
Cirsium vulgare	San Claudio - agricultural - 2	0.0197	0.0158
Cirsium vulgare	San Claudio - reserve - 1	-0.0149	0.0076
Condalia microphylla	Anquilóo - reserve - 1	0.0487	0.0200
Cypella herbertii	Las Chilcas - agricultural - 2	0.0037	0.0002
Cypella herbertii	Las Chilcas - reserve - 1	-0.0052	0.0001
Descurania argentina	Anquilóo - agricultural - 2	0.0429	0.0048
Diplotaxis tenuifolia	Anquilóo - reserve - 1	0.0008	0.0004
Diplotaxis tenuifolia	Anquilóo - reserve - 2	0.5173	0.0270
Diplotaxis tenuifolia	San Claudio - reserve - 2	-0.0045	0.0001
Dipsacus sp.	San Claudio - reserve - 2	-0.0368	0.0648
Gaillardia megapotamica	Anquilóo - reserve - 2	0.0016	0.0004
Glandularia hookeriana	Anquilóo - reserve - 2	-0.0942	0.0244
Hirschfeldia incana	Anquilóo - agricultural - 1	-0.0045	0.0013
Hirschfeldia incana	Anquilóo - agricultural - 2	-0.0148	0.0057
Hirschfeldia incana	San Claudio - agricultural - 1	0.0110	0.0020
Hirschfeldia incana	San Claudio - agricultural - 2	0.0031	0.0023
Hirschfeldia incana	San Claudio - reserve - 1	0.0022	0.0002
Hirschfeldia incana	San Claudio - reserve - 2	0.0432	0.0020
Lycium chilense	Anquilóo - reserve - 2	-0.3355	0.0087
Mentha pulegium	Las Chilcas - agricultural - 2	0.0136	0.0866
Mentha pulegium	Las Chilcas - reserve - 1	0.3973	0.0388
Nierembergia aristata	Anquilóo - agricultural - 1	0.0197	0.0217
Nierembergia aristata	Anquilóo - reserve - 1	-0.0065	0.0016
Nierembergia aristata	Anquilóo - reserve - 2	-0.0048	0.0011
Nothoscordum euosimum	Las Chilcas - agricultural - 1	0.0405	0.0034
Nothoscordum euosimum	Las Chilcas - agricultural - 2	-0.0045	0.1162
Physalis viscosa	Anquilóo - agricultural - 1	0.0041	0.0005
Prosopidastrum globosum	Anquilóo - reserve - 2	-0.0012	0.0194
Senecio pulcher	Las Chilcas - agricultural - 1	-0.0104	0.0007
Sisyrinchium platense	Las Chilcas - agricultural - 1	-0.2850	0.0203
Sisyrinchium platense	Las Chilcas - agricultural - 2	-0.0487	0.0324
Sisyrinchium platense	Las Chilcas - reserve - 1	0.0206	0.1143
Solanum sisymbriifolium	San Claudio - agricultural - 1	0.0002	0.0004
Sphaeralcea crispa	Anquilóo - reserve - 1	-0.0601	0.0133
Stemodia lanceolata	Las Chilcas - agricultural - 1	-0.0044	0.0001
Thelesperma megapotamicum	Anquilóo - agricultural - 1	-0.0022	0.0025
Turnera sidioides	Anquilóo - agricultural - 1	-0.0002	0.0001
Turnera sidioides	Anquilóo - agricultural - 2	-0.0140	0.0170
Turnera sidioides	Anquilóo - reserve - 2	-0.0014	0.0002
Verbena intermedia	Anquilóo - reserve - 2	-0.0643	0.0327
Verbena intermedia	San Claudio - agricultural - 2	0.0932	0.0071
Verbena intermedia	San Claudio - reserve - 2	-0.0073	0.0101

Table S3: Summary of the model used to analyse the relationship between conspecific pollen deposited in bagged and unbagged flowers (open to animal pollination).

predictor	estimate	S.E.	z-value
fixed component			
(Intercept)	4.215	0.318	13.235
treatment (unbagged flower)	0.845	0.205	4.128
random component (species:community)			
S.D. random intercept	2.240	-	-
S.D. random slope	1.377	-	-

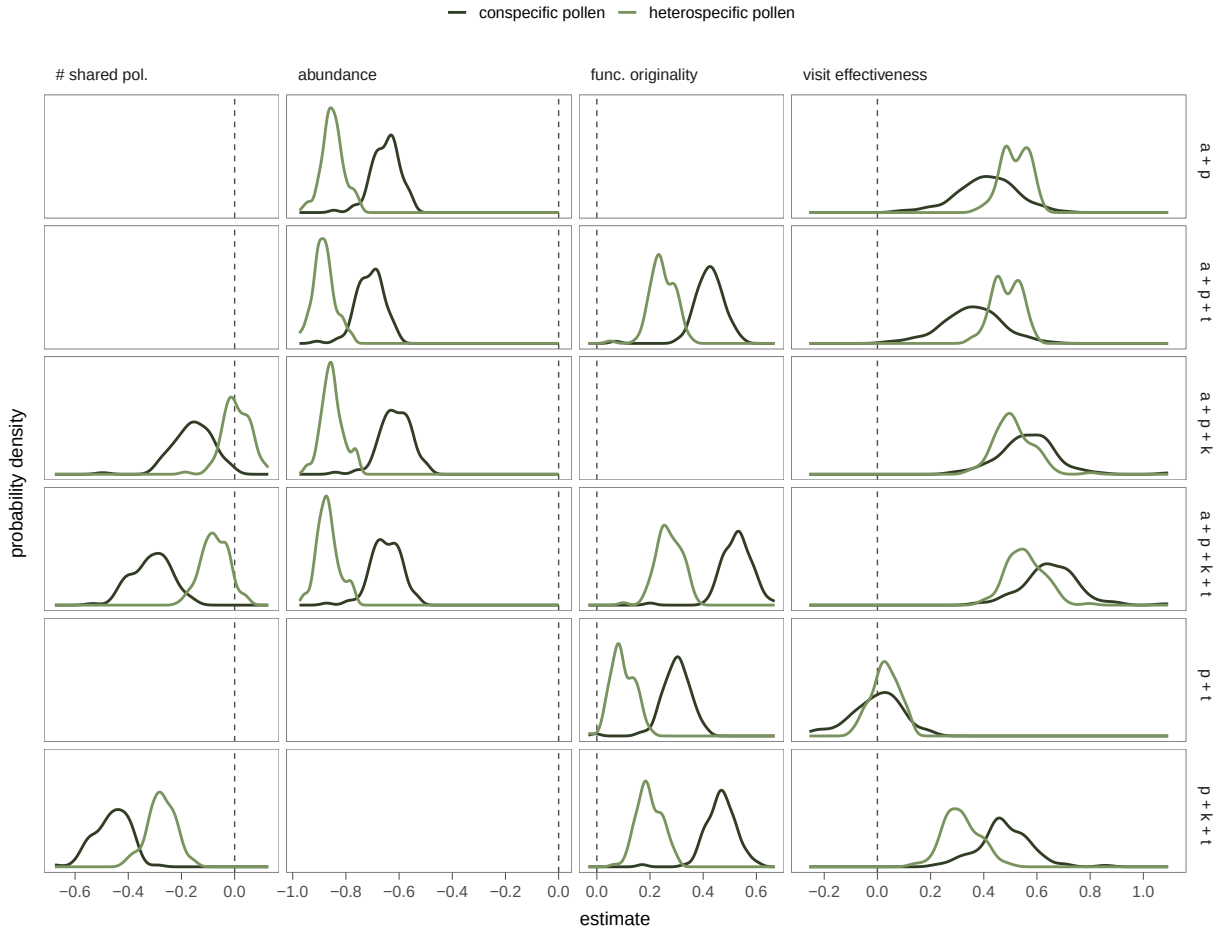

Figure S2: Distribution of effect estimates for models of conspecific and heterospecific pollen density gain. Model formulas have been abbreviated: a for abundance, k for the number of shared pollinators, p for the visit effectiveness, and t for trait originality. Only candidate formulas with a $\Delta AICc < 4$ for either conspecific or heterospecific pollen are shown. Models candidates are arranged in decreasing order of support.

Table S4: Amount of conspecific pollen deposited in bagged and unbagged flowers (open to animal pollination) for each species in their community. Community names are constructed by location - agricultural/restored - fragment number.

		bagged		unbagged	
species name	community	mean	C.I.	mean	C.I.
Aloysia gratissima	Anquilóo - reserve - 2	1	[0, 1]	39	[26, 59]
Baccharis pingraea	San Claudio - reserve - 1	0	[0, 0]	4	[2, 8]
Carduus acanthoides	Anquilóo - agricultural - 2	25	[23, 27]	56	[52, 61]
Carduus acanthoides	San Claudio - agricultural - 1	34	[32, 35]	42	[40, 44]
Carduus acanthoides	San Claudio - agricultural - 2	41	[39, 43]	16	[16, 17]
Carduus acanthoides	San Claudio - reserve - 1	12	[11, 14]	10	[9, 11]
Carduus acanthoides	San Claudio - reserve - 2	10	[9, 11]	15	[14, 17]
Cirsium vulgare	Anquilóo - agricultural - 2	211	[205, 217]	222	[215, 228]
Cirsium vulgare	Las Chilcas - reserve - 1	284	[277, 291]	320	[313, 328]
Cirsium vulgare	San Claudio - agricultural - 2	33	[8, 132]	76	[19, 302]
Cirsium vulgare	San Claudio - reserve - 1	218	[210, 226]	81	[78, 84]
Condalia microphylla	Anquilóo - reserve - 1	38	[36, 41]	35	[33, 37]
Cypella herbertii	Las Chilcas - agricultural - 2	1095	[276, 4336]	2738	[691, 10844]
Cypella herbertii	Las Chilcas - reserve - 1	478	[462, 494]	2743	[2652, 2836]
Descurania argentina	Anquilóo - agricultural - 2	90	[86, 93]	117	[113, 121]
Diplotaxis tenuifolia	Anquilóo - reserve - 1	362	[92, 1435]	881	[222, 3489]
Diplotaxis tenuifolia	Anquilóo - reserve - 2	177	[45, 700]	422	[107, 1671]
Diplotaxis tenuifolia	San Claudio - reserve - 2	769	[762, 776]	1153	[1143, 1163]
Dipsacus sp.	San Claudio - reserve - 2	4	[3, 5]	14	[12, 17]
Gaillardia megapotamica	Anquilóo - reserve - 2	590	[580, 601]	179	[175, 182]
Glandularia hookeriana	Anquilóo - reserve - 2	185	[178, 192]	131	[127, 136]
Hirschfeldia incana	Anquilóo - agricultural - 1	432	[427, 437]	412	[408, 417]
Hirschfeldia incana	Anquilóo - agricultural - 2	246	[240, 252]	758	[740, 778]
Hirschfeldia incana	San Claudio - agricultural - 1	407	[403, 412]	271	[268, 274]
Hirschfeldia incana	San Claudio - agricultural - 2	291	[288, 294]	305	[302, 308]
Hirschfeldia incana	San Claudio - reserve - 1	384	[380, 389]	355	[351, 359]
Hirschfeldia incana	San Claudio - reserve - 2	340	[337, 344]	465	[460, 470]
Lycium chilense	Anquilóo - reserve - 2	998	[987, 1009]	1339	[1325, 1354]
Mentha pulegium	Las Chilcas - agricultural - 2	1	[1, 2]	3	[2, 4]
Mentha pulegium	Las Chilcas - reserve - 1	7	[6, 8]	15	[12, 18]
Nierembergia aristata	Anquilóo - agricultural - 1	116	[105, 128]	835	[756, 922]
Nierembergia aristata	Anquilóo - reserve - 1	179	[171, 187]	1072	[1024, 1121]
Nierembergia aristata	Anquilóo - reserve - 2	71	[67, 76]	1054	[984, 1129]
Nothoscordum euosimum	Las Chilcas - agricultural - 1	92	[88, 97]	408	[388, 428]
Nothoscordum euosimum	Las Chilcas - agricultural - 2	324	[315, 334]	352	[343, 362]
Oxalis violeta	San Claudio - reserve - 2	371	[122, 1131]	467	[153, 1423]
Physalis viscosa	Anquilóo - agricultural - 1	1227	[1211, 1244]	2732	[2696, 2769]
Prosopidastrum globosum	Anquilóo - reserve - 2	10	[8, 11]	13	[12, 15]
Senecio pulcher	Las Chilcas - agricultural - 1	358	[348, 367]	406	[395, 417]
Sisyrinchium platense	Las Chilcas - agricultural - 1	91	[88, 95]	159	[152, 165]
Sisyrinchium platense	Las Chilcas - agricultural - 2	35	[9, 139]	81	[20, 319]
Sisyrinchium platense	Las Chilcas - reserve - 1	193	[179, 208]	73	[67, 79]
Solanum sisymbriifolium	San Claudio - agricultural - 1	57	[50, 66]	2194	[1923, 2502]
Sphaeralcea crispa	Anquilóo - reserve - 1	2	[2, 2]	9	[8, 10]
Stemodia lanceolata	Las Chilcas - agricultural - 1	387	[380, 394]	1919	[1884, 1955]
Thelesperma megapotamicum	Anquilóo - agricultural - 1	314	[306, 322]	327	[319, 336]
Turnera sidioides	Anquilóo - agricultural - 1	53	[51, 55]	198	[189, 206]
Turnera sidioides	Anquilóo - agricultural - 2	1	[0, 1]	4	[2, 8]
Turnera sidioides	Anquilóo - reserve - 2	1	[1, 2]	189	[113, 315]
Verbena intermedia	Anquilóo - reserve - 2	67	[64, 70]	125	[119, 131]
Verbena intermedia	San Claudio - agricultural - 2	34	[32, 36]	66	[63, 70]
Verbena intermedia	San Claudio - reserve - 2	136	[133, 139]	356	[348, 365]

Table S5: The coefficient of determination R^2 of the most parsimonious pollen deposition models (those with the lowest AICc). The marginal coefficient of determination describes the proportion of variance explained by just the fixed effects.

conditional $R^2_{(c)}$			marginal $R^2_{(m)}$		
mean	min	max	mean	min	max
conspecific pollen					
0.91	0.87	0.93	0.09	0.06	0.14
heterospecific pollen					
0.80	0.76	0.87	0.27	0.21	0.35

Table S6: Comparison of the two random structures we considered for the models of conspecific and heterospecific pollen deposition. The table shows median ΔAIC values of 99 bootstrap resamples of the data. The 5th and 95th percentile are shown inside square brackets. Communities are defined by individual fragments but ignore the hierarchical arrangement of sampling sites.

	ΔAIC	
random structure	median	C.I.
conspecific pollen		
1 | plant sp. * community	0.0	[0, 0]
1 | plant sp.	30.7	[8.2, 58.1]
heterospecific pollen		
1 | plant sp. * community	0.0	[0, 0]
1 | plant sp.	44.6	[19.3, 88.4]

Table S7: Comparison of the different fixed structures we considered for the models of conspecific and heterospecific pollen deposition. The table shows median ΔAIC values of 99 bootstrap resamples of the data. The 5th and 95th percentile are shown inside square brackets.

	ΔAIC	
fixed structure	median	C.I.
conspecific pollen		
~ abundance + share pollen	0.0	[0 ,0]
~ abundance + share pollen + func. originality	0.9	[0.4 ,1.3]
~ abundance + share pollen + degree	1.9	[1.6 ,2.1]
~ abundance + share pollen + degree + func. originality	2.2	[1.6 ,2.8]
~ share pollen + func. originality	2.8	[2.1 ,3.8]
~ share pollen + degree + func. originality	3.6	[2.3 ,4.6]
~ share pollen	118.3	[75.3 ,178.7]
~ share pollen + degree	119.0	[76 ,179.9]
~ abundance	189.7	[150.1 ,239.7]
~ abundance + func. originality	191.6	[151.7 ,241.6]
~ abundance + degree	191.7	[151.9 ,241.7]
~ func. originality	192.5	[152.9 ,242.2]
~ abundance + degree + func. originality	193.7	[153.6 ,243.6]
~ degree + func. originality	193.7	[154.6 ,243.7]
~ degree	351.8	[293.5 ,419.9]
heterospecific pollen		
~ abundance + share pollen	0.0	[0 ,0]
~ abundance + share pollen + func. originality	1.1	[0.5 ,1.5]
~ abundance + share pollen + degree	2.1	[1.9 ,2.1]
~ abundance + share pollen + degree + func. originality	3.1	[2.6 ,3.5]
~ share pollen + func. originality	11.9	[10 ,13.9]
~ share pollen + degree + func. originality	13.2	[11.2 ,15.2]
~ share pollen	67.5	[53.4 ,87.5]
~ share pollen + degree	68.4	[54.2 ,88.7]
~ abundance + degree	206.9	[160.6 ,251.5]
~ abundance	207.6	[162.8 ,251.7]
~ abundance + func. originality	208.6	[163.2 ,252.6]
~ abundance + degree + func. originality	208.6	[162.2 ,253.2]
~ func. originality	214.3	[168.3 ,258.7]
~ degree + func. originality	216.3	[170.3 ,260.6]
~ degree	336.0	[282.6 ,391.5]