

Supplemental Information for:

Sky islands as foci for divergence of fig trees and their pollinators in South-West China

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Table S1 The contributions of each climatic factors shaping the geographic distributions of *Ficus tikoua* simulated by Species Distribution Modeling (SDM) in the last interglacial (LIG), last glacial maximum (LGM) and current time. (Top five contribution climate factors were marked as bold).

Time	LIG	LGM	Current
Bio1 (annual mean temperature)	0.5%	15.7%	0.2%
Bio2 (mean diurnal range)	8.4%	9.9%	1.3%
Bio3 (isothermality)	1.2%	3.0%	1.7%
Bio4 (temperature seasonality)	4.4%	10.6%	7.4%
Bio5 (max temperature of warmest month)	0.5%	0.1%	0.7%
Bio6 (min temperature of coldest month)	27.9%	8.5%	23.5%
Bio7 (temperature annual range)	2.8%	0.7%	6.3%
Bio8 (mean temperature of wettest quarter)	3.0%	2.1%	2.2%
Bio9 (mean temperature of driest quarter)	1.3%	18.4%	18.5%
Bio10 (mean temperature of warmest quarter)	0.2%	0.2%	0.3%
Bio11 (mean temperature of coldest quarter)	27.4%	3.2%	16.4%
Bio12 (annual precipitation)	2.0%	5.1%	2.5%
Bio13 (precipitation of wettest month)	1.9%	0.4%	0.1%
Bio14 (precipitation of driest month)	1.6%	16.0%	8.5%
Bio15 (precipitation seasonality)	3.1%	1.2%	1.1%
Bio16 (precipitation of wettest quarter)	0.5%	0.4%	0.2%
Bio17 (precipitation of driest quarter)	9.8%	0.2%	7.4%
Bio18 (precipitation of warmest quarter)	1.7%	0.5%	0.7%
Bio19 (precipitation of coldest quarter)	1.9%	4.1%	1.0%

Table S2 Pairwise population differentiation (pairwise F_{ST}) of *Ceratosolen* pollinating fig wasp of *F. tikoua*. Only the population-pairs without significant differentiations were marked by NS ($p>0.05$). All other population pairs had significant differentiations ($p<0.05$, or $p<0.001$).

	YMJ	YMZ	YJS	YYS	GTY	YPZ	GYZ	GLZ	GDL	GHC	GLL	YLP	GND	CSJ	YSH	YLX	YQU	QGL	QTL	QSD	YJY	YKM	YXW	SMH	SXC	YWD	SPZ	YHZ	YQJ	YLD	SYJ	SFY	SSP	SSN	SNC	SGJ	SMY	SBZ						
YMJ	0.000																																											
YMZ	0.161	0.000																																										
YJS	0.198	0.189	0.000																																									
YYS	0.154	0.308	0.265	0.000																																								
GTY	0.222	0.260	0.277	0.279	0.000																																							
YPZ	0.113	0.095	0.179	0.207	0.157	0.000																																						
GYZ	0.284	0.376	0.348	0.278	0.145	0.262	0.000																																					
GLZ	0.230	0.297	0.303	0.261	0.084	0.183	0.066	0.000																																				
GDL	0.314	0.390	0.379	0.317	0.241	0.292	0.196	0.218	0.000																																			
GHC	0.221	0.276	0.276	0.246	0.062	0.153	0.086	0.004 ^{NS}	0.216	0.000																																		
GLL	0.172	0.221	0.229	0.225	0.086	0.123	0.158	0.126	0.190	0.106	0.000																																	
YLP	0.179	0.244	0.221	0.205	0.122	0.143	0.116	0.129	0.124	0.120	0.027 ^{NS}	0.000																																
GND	0.288	0.382	0.340	0.292	0.207	0.262	0.155	0.179	0.083	0.178	0.154	0.082	0.000																															
CSJ	0.228	0.307	0.294	0.245	0.116	0.195	0.013 ^{NS}	0.042	0.145	0.057	0.111	0.074	0.124	0.000																														
YSH	0.040 ^{NS}	0.158	0.205	0.184	0.243	0.098	0.316	0.254	0.341	0.231	0.188	0.203	0.322	0.265	0.000																													
YLX	0.091	0.202	0.257	0.239	0.241	0.139	0.354	0.284	0.383	0.250	0.188	0.224	0.355	0.292	0.104	0.000																												
YQU	0.145	0.327	0.327	0.272	0.295	0.206	0.357	0.320	0.385	0.289	0.231	0.239	0.365	0.302	0.169	0.131	0.000																											
GGL	0.157	0.197	0.193	0.206	0.072	0.098	0.146	0.102	0.156	0.088	0.015	0.026	0.125	0.094	0.163	0.181	0.219	0.000																										
GTL	0.223	0.323	0.275	0.224	0.194	0.214	0.137	0.180	0.152	0.181	0.120	0.074	0.150	0.114	0.249	0.299	0.289	0.098	0.000																									
GSD	0.158	0.230	0.237	0.171	0.183	0.117	0.280	0.206	0.278	0.176	0.147	0.161	0.233	0.229	0.157	0.171	0.219	0.122	0.213	0.000																								
YJY	0.244	0.513	0.508	0.380	0.483	0.445	0.525	0.499	0.565	0.477	0.428	0.415	0.545	0.487	0.251	0.351	0.328	0.401	0.465	0.377	0.000																							
YKM	0.250	0.532	0.518	0.413	0.514	0.485	0.549	0.522	0.580	0.505	0.456	0.441	0.564	0.513	0.271	0.365	0.358	0.430	0.490	0.408	0.100	0.000																						
YXW	0.222	0.475	0.446 ^{NS}	0.307	0.448	0.396	0.494	0.460	0.527	0.439	0.376	0.368	0.499	0.450	0.257	0.272	0.278	0.356	0.422	0.330	0.378	0.297	0.000																					
SMH	0.199	0.418	0.376	0.282	0.396	0.337	0.441	0.407	0.462	0.390	0.343	0.339	0.435	0.404	0.215	0.294	0.297	0.318	0.366	0.294	0.267	0.273	0.236	0.000																				
SXC	0.233	0.434	0.403	0.305	0.411	0.369	0.450	0.413	0.487	0.398	0.362	0.358	0.459	0.417	0.252	0.332	0.351	0.339	0.382	0.300	0.336	0.347	0.319	0.096	0.000																			
YWD	0.267	0.497	0.486	0.360	0.474	0.436	0.508	0.479	0.543	0.462	0.426	0.416	0.526	0.474	0.283	0.390	0.384	0.397	0.457	0.363	0.353	0.334	0.372	0.178	0.198	0.000																		
SPZ	0.225	0.469	0.446	0.325	0.432	0.408	0.477	0.440	0.510	0.421	0.388	0.380	0.488	0.442	0.231	0.330	0.329	0.360	0.414	0.332	0.268	0.233	0.295	0.186	0.180	0.172	0.000																	
YHZ	0.198	0.408	0.362	0.230	0.376	0.328	0.429	0.387	0.447	0.368	0.318	0.314	0.414	0.388	0.215	0.285	0.295	0.291	0.346	0.228	0.315	0.322	0.277	0.200	0.193	0.302	0.229	0.000																
YQJ	0.211	0.450	0.421	0.334	0.412	0.382	0.453	0.420	0.482	0.401	0.366	0.354	0.459	0.417	0.207	0.303	0.307	0.335	0.388	0.321	0.216	0.220	0.272	0.187	0.212	0.302	0.155	0.142	0.000															
YLD	0.162	0.404	0.362	0.247	0.394	0.320	0.431	0.396	0.463	0.382	0.325	0.315	0.430	0.390	0.170	0.279	0.267	0.300	0.331	0.283	0.223	0.200	0.206	0.107	0.164	0.233	0.171	0.143	0.119	0.000														
SYJ	0.230	0.418	0.393	0.298	0.391	0.356	0.441	0.402	0.476	0.385	0.348	0.350	0.452	0.407	0.250	0.314	0.328	0.330	0.364	0.283	0.330	0.328	0.341	0.125	0.062	0.208	0.156	0.236	0.245	0.184	0.000													
SHS	0.226	0.409	0.368	0.259	0.398	0.340	0.360	0.361	0.402	0.361	0.326	0.290	0.377	0.331	0.266	0.327	0.336	0.308	0.255	0.297	0.402	0.398	0.388	0.296	0.336	0.380	0.353	0.306	0.309	0.269	0.317	0.000												
SLS	0.250	0.423	0.427	0.354	0.392	0.343	0.457	0.406	0.506	0.376	0.341	0.359	0.480	0.411	0.267	0.258	0.313	0.322	0.382	0.263	0.431	0.426	0.410	0.323	0.362	0.400	0.359	0.331	0.331	0.334	0.318	0.203	0.000											
GKY	0.238	0.384	0.350	0.270	0.367	0.303	0.349	0.347	0.383	0.349	0.294	0.257	0.340	0.315	0.277	0.346	0.353	0.279	0.224	0.286	0.500	0.501	0.476	0.341	0.377	0.455	0.402	0.349	0.388	0.321	0.340	0.118	0.325	0.000										
SGL	0.268	0.407	0.389	0.320	0.431	0.347	0.434	0.417	0.459	0.416	0.359	0.331	0.431	0.398	0.293	0.385	0.400	0.337	0.301	0.335	0.524	0.513	0.499	0.355	0.400	0.475	0.428	0.381	0.407	0.329	0.364	0.128	0.326	0.028 ^{NS}	0.000									
SJA	0.242	0.379	0.390	0.327	0.389	0.316	0.423	0.380	0.476	0.361	0.333	0.336	0.451	0.382	0.259	0.293	0.340	0.319	0.337	0.287	0.476	0.456	0.404	0.337	0.373	0.431	0.389	0.346	0.358	0.318	0.338	0.138	0.119	0.214	0.198	0.000								
SNX	0.289	0.460	0.470	0.338	0.444	0.408	0.405	0.413	0.475	0.406	0.387	0.347	0.460	0.377	0.330	0.400	0.429	0.371	0.352	0.374	0.549	0.530	0.550	0.398	0.440	0.500	0.476	0.438	0.443	0.409	0.419	0.109	0.339	0.217	0.232	0.212	0.000							
SYJ	0.244	0.370	0.338	0.278	0.377	0.308	0.380	0.365	0.423	0.355	0.309	0.301	0.393	0.346	0.256	0.316	0.344	0.294	0.276	0.287	0.438	0.440	0.413	0.310	0.340	0.408	0.350	0.316	0.328	0.274	0.311	0.170	0.230	0.155	0.179	0.155	0.269	0.000						
SFY	0.192	0.339	0.281	0.161	0.324	0.264	0.331	0.315	0.360	0.309	0.275	0.249	0.321	0.301	0.214	0.255	0.278	0.247	0.226	0.209	0.376	0.393	0.289	0.275	0.296	0.368	0.314	0.253	0.296	0.263	0.280													

Table S3 Means, standard errors and results of all populations on 19 Bioclimate variables for *Ceratosolen* sp.. Turkey's D was used to conduct multiple comparison of the bioclimatic variables between different region pairs at different time. (Bold characters represent $p < 0.05$)

		Bio1 (°C)	Bio2 (°C)	Bio3 (°C)	Bio4 (SD*100)	Bio5 (°C)	Bio6 (°C)	Bio7 (°C)	Bio8 (°C)	Bio9 (°C)	Bio10 (°C)	Bio11 (°C)	Bio12 (mm)	Bio13 (mm)	Bio14 (mm)	Bio15 (CV)	Bio16 (mm)	Bio17 (mm)	Bio18 (mm)	Bio19 (mm)	
LIG	Mean	15.2	7.8	2.4	738.2	31.4	-0.7	32.1	24.0	5.0	25.9	2.8	667.7	185.0	0.0	112.5	394.0	3.2	326.6	3.4	
	SE	0.3	0.2	0.1	74.9	0.4	0.4	0.5	0.5	0.6	0.5	0.3	43.1	6.7	0.0	3.2	27.5	0.8	40.2	0.8	
LGM	Mean	13.3	8.3	3.0	624.5	26.8	-0.1	26.9	20.0	4.5	21.0	4.5	994.6	232.2	11.6	89.9	581.8	40.5	554.5	40.5	
	SE	0.2	0.3	0.1	8.5	0.3	0.4	0.4	0.3	0.2	0.3	0.2	34.3	17.1	1.5	4.9	31.8	4.8	29.2	4.8	
SCB	Current	Mean	16.9	7.5	2.7	693.3	30.8	3.3	27.5	24.7	7.5	25.5	7.5	1058.6	213.2	13.5	78.9	561.3	46.2	540.4	46.2
	SE	0.2	0.2	0.1	10.7	0.4	0.3	0.3	0.3	0.2	0.3	0.2	27.6	9.9	1.6	3.6	19.9	4.9	20.3	4.9	
	p (LIG vs LGM)	0.000	0.269	0.000	0.171	0.000	0.446	0.000	0.000	0.631	0.000	0.000	0.000	0.021	0.000	0.001	0.000	0.000	0.000	0.000	
	p (LIG vs Current)	0.000	0.650	0.015	0.751	0.440	0.000	0.000	0.388	0.000	0.750	0.000	0.000	0.233	0.000	0.000	0.000	0.000	0.000	0.000	
	p (LGM vs Current)	0.000	0.046	0.002	0.514	0.000	0.000	0.586	0.000	0.000	0.000	0.000	0.418	0.507	0.556	0.135	0.853	0.570	0.944	0.570	
HDM	LIG	Mean	14.1	11.1	3.6	634.5	28.8	(1.7)	30.5	20.2	9.6	21.1	5.6	874.3	243.9	0.0	121.8	635.0	2.0	518.4	11.4
	SE	0.5	0.3	0.1	14.8	0.5	0.4	0.3	0.5	1.0	0.5	0.6	30.5	10.2	0.0	1.6	22.8	0.9	27.6	4.3	
LGM	Mean	12.0	10.9	4.5	466.9	22.3	(1.6)	23.9	17.2	5.4	17.3	5.4	885.2	187.5	9.5	85.3	499.8	32.7	492.2	32.7	
	SE	0.5	0.2	0.1	12.3	0.6	0.4	0.5	0.5	0.5	0.5	0.5	19.1	5.2	0.8	1.5	11.6	2.9	13.9	2.9	
Current	Mean	15.9	10.9	4.4	482.3	26.4	1.8	24.6	21.3	9.0	21.3	9.0	933.5	198.4	9.2	88.4	544.2	31.3	544.2	31.3	
	SE	0.5	0.3	0.1	15.8	0.6	0.5	0.4	0.5	0.6	0.5	0.6	21.0	4.8	0.9	1.6	12.7	2.8	12.7	2.8	
	p (LIG vs LGM)	0.013	0.787	0.000	0.000	0.000	1.000	0.000	0.000	0.001	0.000	0.979	0.945	0.000	0.000	0.000	0.000	0.000	0.000	0.605	0.000
	p (LIG vs Current)	0.040	0.868	0.000	0.000	0.011	0.000	0.000	0.283	0.826	0.982	0.000	0.204	0.000	0.000	0.000	0.001	0.000	0.614	0.001	
	p (LGM vs Current)	0.000	0.987	0.738	0.731	0.000	0.000	0.409	0.000	0.003	0.000	0.000	0.342	0.540	0.971	0.365	0.151	0.913	0.151	0.956	
YGP	LIG	Mean	16.6	9.0	2.9	694.7	32.6	2.2	30.3	23.6	8.1	24.8	7.2	1173.4	287.3	1.9	99.2	736.9	22.2	540.6	34.5
	SE	0.5	0.3	0.1	21.9	0.6	0.6	0.4	0.7	0.8	0.6	0.6	31.4	10.2	0.9	3.7	20.6	5.7	39.6	5.7	
LGM	Mean	14.6	9.8	4.1	522.4	25.9	2.0	24.0	20.2	8.0	20.8	7.3	1117.6	216.2	17.6	73.4	577.1	71.9	556.7	82.5	
	SE	0.4	0.1	0.1	22.5	0.7	0.4	0.6	0.5	0.6	0.6	0.4	39.7	7.2	1.2	1.4	18.0	5.4	15.3	8.4	
Current	Mean	18.1	8.9	3.8	541.4	28.9	5.0	23.9	23.8	10.8	24.2	10.4	1268.2	238.3	21.4	74.3	659.4	78.1	644.3	80.8	
	SE	0.4	0.2	0.2	24.0	0.6	0.5	0.5	0.5	0.5	0.6	0.5	43.3	6.2	2.4	1.8	16.5	7.7	16.5	8.9	
	p (LIG vs LGM)	0.010	0.022	0.000	0.000	0.000	0.910	0.000	0.000	0.991	0.000	0.986	0.564	0.000	0.000	0.000	0.000	0.000	0.902	0.000	
	p (LIG vs Current)	0.058	0.955	0.000	0.000	0.000	0.001	0.000	0.965	0.010	0.807	0.000	0.199	0.000	0.000	0.000	0.012	0.000	0.020	0.000	
	p (LGM vs Current)	0.000	0.010	0.166	0.827	0.005	0.000	0.987	0.000	0.007	0.001	0.000	0.021	0.136	0.221	0.966	0.007	0.774	0.057	0.987	

Table S4 Population genetic variation of *Ceratosolen* pollinating fig wasp of *F. tikoua*. Number of individuals (N_{SSR}), number of alleles (N_A), allelic richness after rarefaction (A_R), observed (H_O) and expected (H_E) heterozygosity with significance for deviation from HWE ($*p < 0.05$, $**p < 0.01$, $***p < 0.001$) after correction for multiple testing, inbreeding coefficient (F_{IS}) ($*p < 0.05$), and private allelic richness (P_A).

Population	N_{SSR}	N_A	A_R	H_O/H_E	F_{IS}	P_A
YMJ	27	6.89	5.45	0.230/0.735***	0.70*	0.14
YMZ	28	5.33	4.51	0.249/0.559***	0.57*	0.05
YJS	17	4.22	3.64	0.499/0.532	0.10	0.00
YYS	23	6.11	4.8	0.616/0.631	0.05	0.00
YSH	30	6.56	4.92	0.230/0.698***	0.69*	0.06
GTY	29	6.33	4.95	0.196/0.614***	0.69*	0.12
YPZ	15	5.89	5.43	0.274/0.707**	0.63*	0.03
YJY	12	2.22	2.15	0.111/0.276*	0.62*	0.08
GYZ	28	5.33	4.14	0.182/0.551	0.68*	0.02
GLZ	26	5.00	4.20	0.245/0.608**	0.61*	0.01
GDL	23	5.00	4.10	0.250/0.506**	0.51*	0.04
GHC	29	5.56	4.60	0.168/0.627**	0.74*	0.13
YLX	30	5.44	4.32	0.163/0.618**	0.74*	0.00
GLL	26	7.33	5.73	0.356/0.720***	0.52*	0.00
YLP	28	8.67	6.55	0.361/0.734**	0.52*	0.08
YKM	26	2.67	2.28	0.088/0.308	0.72*	0.06
GND	18	5.22	4.33	0.275/0.554*	0.53*	0.02
YQU	17	4.56	3.96	0.210/0.605**	0.67*	0.32
YWD	28	4.22	3.23	0.222/0.381	0.43*	0.04
CSJ	28	6.00	4.57	0.259/0.617***	0.59*	0.00
GGL	28	9.22	6.84	0.408/0.753**	0.47*	0.11
GSD	29	7.78	5.91	0.400/0.727	0.46*	0.19
YXW	11	3.56	3.35	0.242/0.359*	0.37*	0.01
SPZ	27	3.67	3.13	0.137/0.417**	0.68*	0.00
GTL	14	5.33	4.83	0.296/0.630*	0.56*	0.13
YHZ	20	4.11	3.37	0.285/0.508	0.46*	0.00
YQJ	26	3.89	3.16	0.262/0.436	0.42*	0.11
YLD	13	3.89	3.75	0.308/0.486	0.40*	0.05
GKY	13	4.22	3.98	0.181/0.476*	0.65*	0.01
SY Y	31	4.56	3.65	0.345/0.492	0.31*	0.01
SXC	25	5.78	4.39	0.271/0.475*	0.45*	0.03
SGL	17	4.44	3.72	0.183/0.409	0.57*	0.01
SMH	24	5.78	4.36	0.239/0.510	0.55*	0.11
SJA	27	5.33	3.58	0.162/0.442	0.65*	0.11
SNX	16	2.67	2.56	0.028/0.312*	0.92*	0.09
SHS	26	5.56	4.36	0.125/0.494**	0.75*	0.07

SLS	24	4.22	3.29	0.153/0.423***	0.65*	0.00
SYJ	30	5.44	4.03	0.160/0.500*	0.69*	0.07
SFY	28	5.67	4.41	0.570/0.587	0.05	0.00
SSP	26	4.22	3.52	0.095/0.475**	0.81*	0.00
SSN	27	4.33	3.34	0.076/0.445**	0.84*	0.03
SNC	25	4.33	3.75	0.064/0.474**	0.87*	0.06
SGJ	29	5.11	3.94	0.161/0.501	0.69*	0.10
SMY	28	4.00	3.42	0.136/0.426	0.69*	0.01
SBZ	29	5.11	3.96	0.047/0.512***	0.91*	0.22

Fig. S1 The box plot of maximum pairwise relatedness (R) of fig wasps reared from different and same figs in each population.

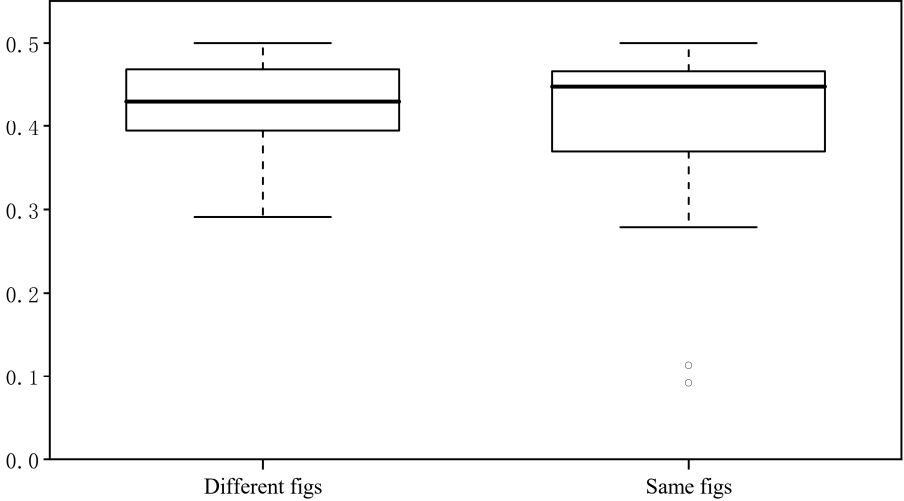


Fig. S2 Five demographic scenarios of the first run performed in DIYABC. All individuals in YGP, HDM and SCB were pooled together respectively, and were regarded as one population for each region. Each population was highlighted by different colors. t1 and t2 represented the divergent time of each population. The values in square brackets were posterior probability and the 95% credibility interval of each scenario calculated in DIYABC.

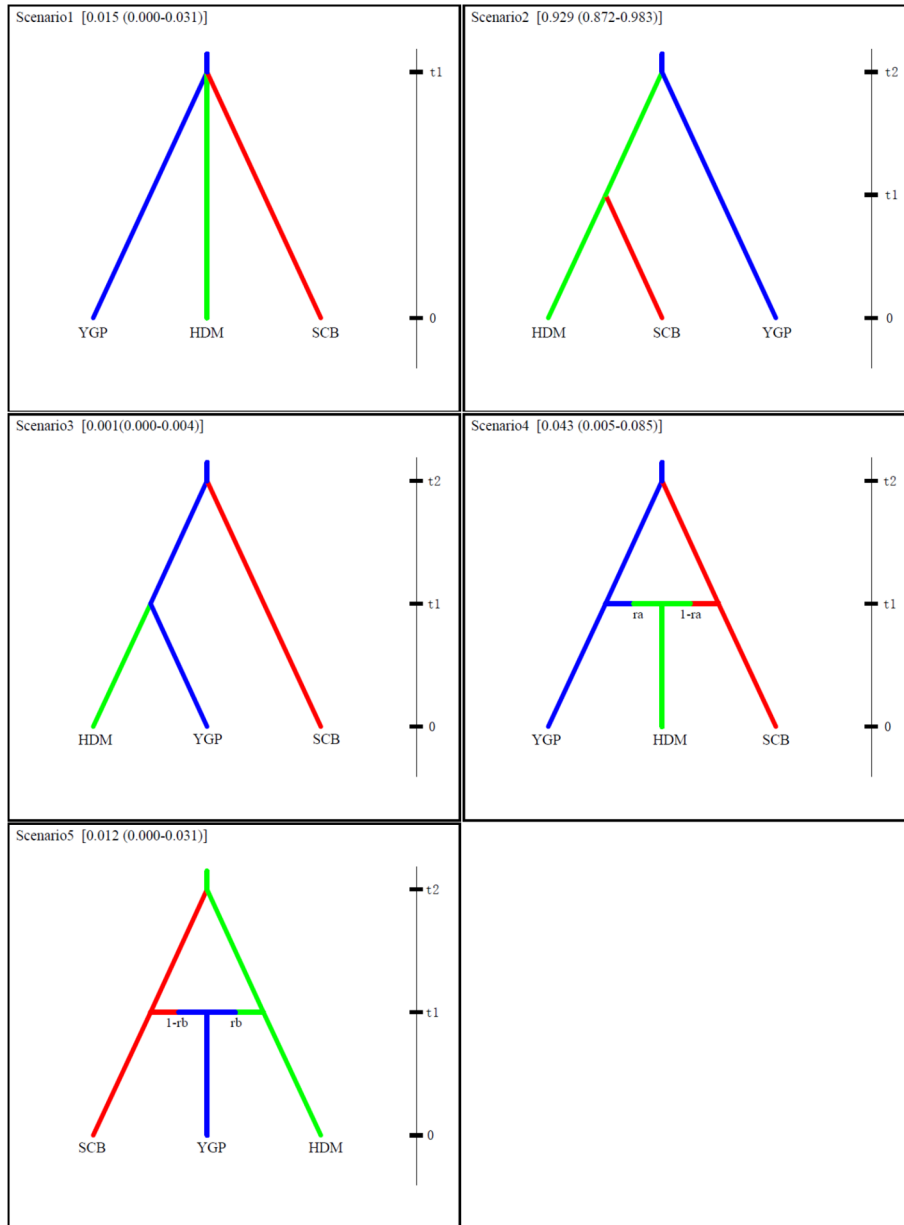


Fig. S3 Two scenarios of the second run performed in DIYABC. All the parameters were the same as Fig S1.

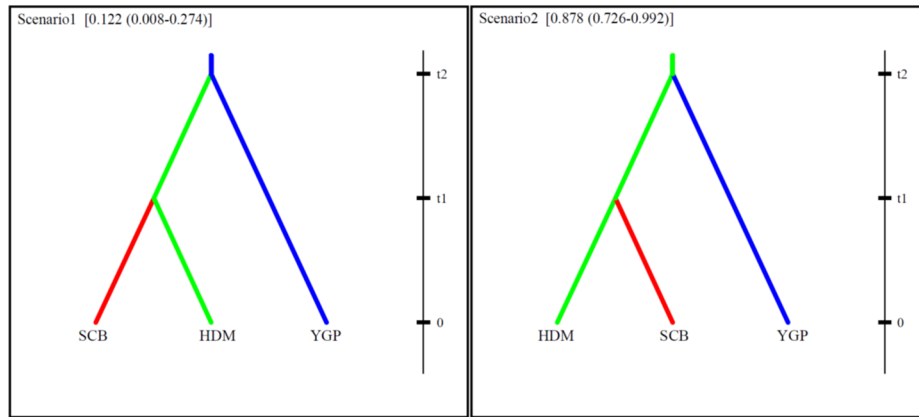


Fig. S4 The phylogenetic trees and network of ITS2 genes of the *Ceratosolen* pollinating fig wasps reared from *Ficus tikoua* populations in Southwest China. In the network, each haplotype was indicated by an ellipse with the frequencies showed by the ellipse sizes. The haplotypes whose frequencies were no less than five were indicated in the network. The color indicated corresponded lineage compositions between phylogenetic trees and network.

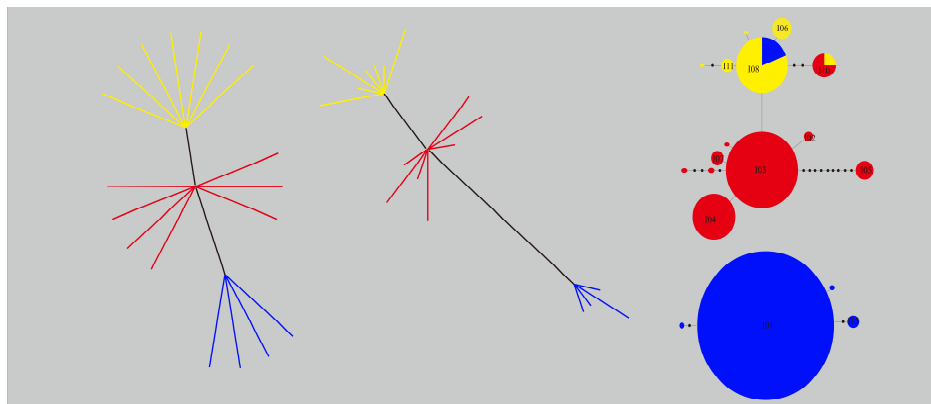


Fig. S5 The mean posterior probability of the data for K; (b) the magnitude of delta K (ΔK) simulated by STRUCTURE.

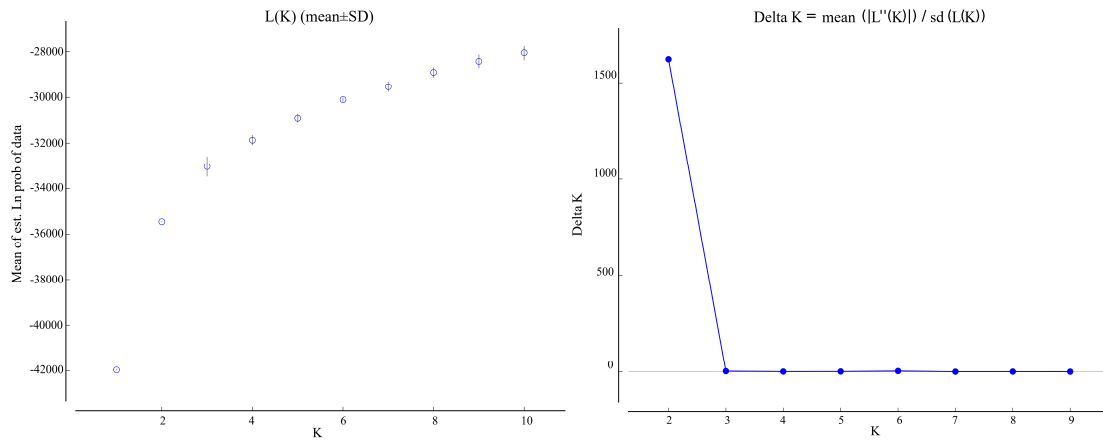


Fig. S6 The geographic distribution and frequencies of two SSR groups of the *Ceratosolen* pollinating fig wasp of *Ficus tikoua* in Southwest China. Red and blue indicated the frequencies of individuals assigned into each of the two SSR groups in the populations, while the yellow showed the frequencies of individuals could not be assigned into either group absolutely. The geneflow barriers of pollinator were highlighted by red lines.

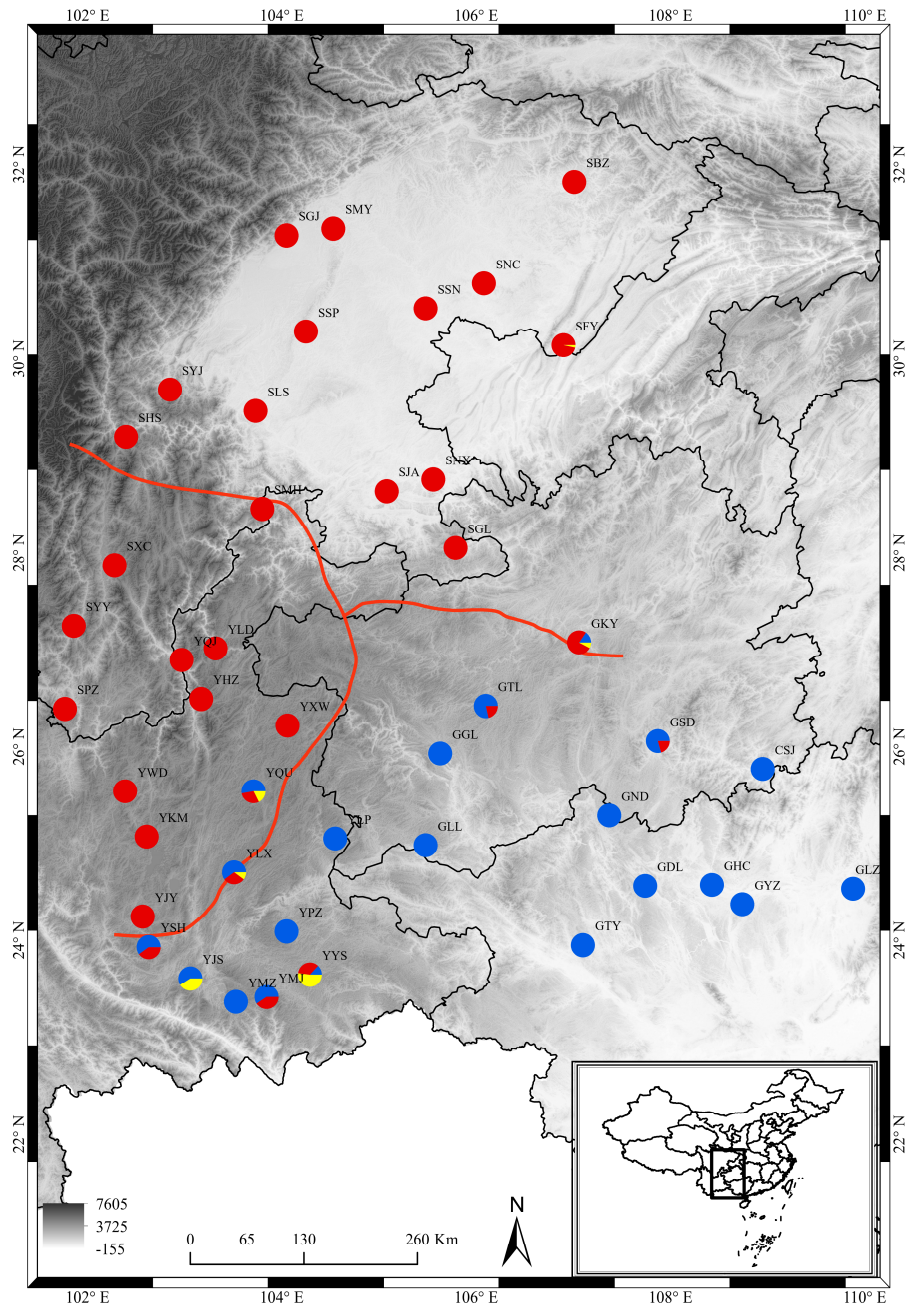


Fig. S7 The microsatellite memberships of *Ceratosolen* sp. individuals assigned by STRUCTURE (K from four to ten). Each vertical line represents one individual. The populations were indicated by numbers, which are corresponded with the population codes in Table 1.

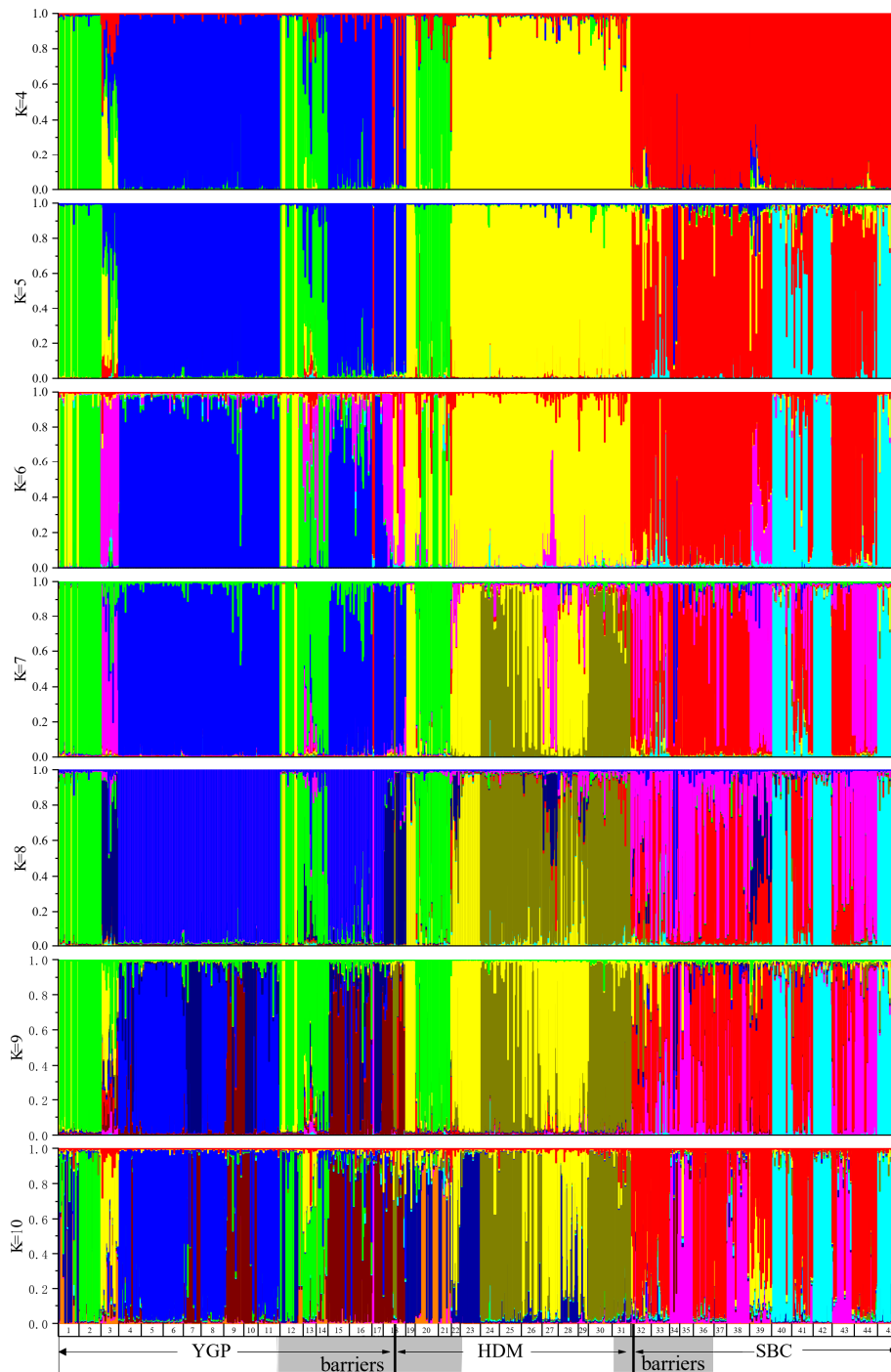


Fig. S8 The relationships of genetic distances and geographic distances between population pairs based on SSR genotypes. All populations were pooled together.

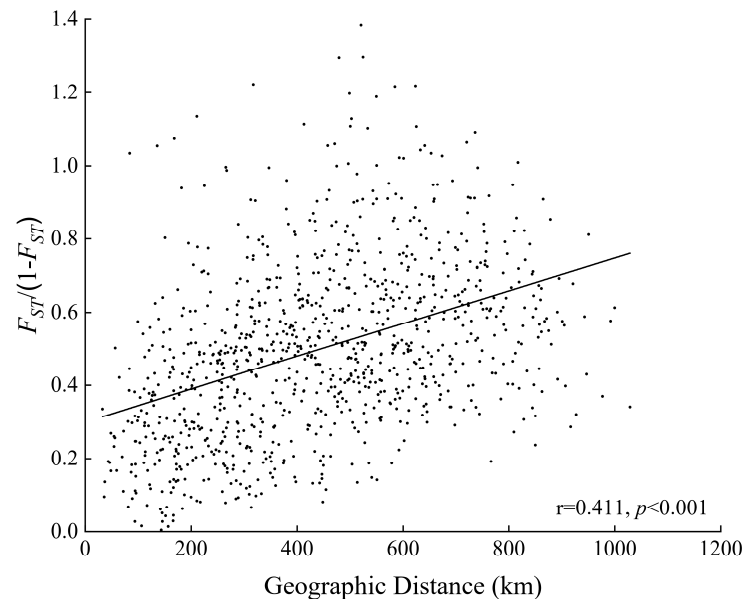


Fig. S9 The relationships of genetic distances and geographic distances between population pairs in each region based on SSR genotypes. Red, yellow and blue color indicate the populations in SBC, HDM, YGP regions were involved respectively.

