Table S2. Summary of coalescent models. Each model compares the simulated number of shared Malawi SNPs to empirical values, given varying combinations of effective population size and gene migration. As described in the text, all models are constrained to exhibit polymorphism among Malawi species. Cells highlighted in yellow are statistically similar to empirical values. For each model, we also report an average Z-score to estimate how far empirical values deviate from the simulated distribution. Red and pink highlighting indicates the best-fit models. Model set B and E limit gene flow to the first 100,000 years after group divergence. Model D and E impose a bottleneck on the Lake Victoria superflock. Model C includes alternative group assignment for the set of Astatotilapia samples that cluster with Lake Malawi and Victoria superflock species in our Bayesian and PCA analyses (also Joyce et al. 2011; Wagner et al. 2012).

A

(NoVictoriaBottleneck)	**Model**	**Empirical**	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	**A9**	**A10**	**A11**	**A12**	**A13**	**A14**	**A15**
	Ne		**1M**	**1M**	**1M**	**1M**	**1M**	**100k**	**100k**	**100k**	**100k**	**100k**	**10k**	**10k**	**10k**	**10k**	**10k**
	migration		**1**	**0.1**	**0.01**	**0.001**	**0**	**1**	**0.1**	**0.01**	**0.001**	**0**	**1**	**0.1**	**0.01**	**0.001**	**0**
Malawi	Mmean	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
	Msd		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Victoria	Vmean	22	144.6	125.9	98.8	27.1	2.5	128.9	93.7	28.2	4.4	0.0	100.8	38.2	9.9	1.7	0
	Vsd		4.9	5.9	6.7	5.1	1.5	5.9	7.6	5.3	2.0	0.0	6.4	5.7	3.4	1.2	0
River Astato	Rmean	67	136.6	138.5	115.0	33.1	2.5	142.9	126.0	46.4	5.8	0.0	134.3	71.3	14.5	1.9	0
	Rsd		5.7	5.6	6.8	5.4	1.5	5.6	6.7	6.2	2.4	0.0	5.8	7.1	4.0	1.3	0
Trop+Hap	Hmean	23	127.3	114.8	75.1	9.7	0.0	119.7	85.7	19.9	1.0	0.0	94.9	34.0	5.8	0.2	0
	Hsd		6.2	6.7	6.7	2.8	0.0	6.6	7.4	4.6	1.0	0.0	5.8	5.7	2.5	0.4	0
Deephaps	Dmean	27	133.1	117.8	77.6	10.4	0.0	122.6	88.2	20.4	1.0	0.0	96.5	35.1	5.9	0.3	0
	Dsd		5.6	6.1	6.2	3.1	0.0	6.6	6.9	4.3	1.0	0.0	6.0	5.7	2.5	0.5	0
Tanganyika	Tmean	36	138.9	121.3	79.7	11.3	0.0	126.4	91.6	20.3	1.0	0.0	98.7	35.5	5.9	0.2	0
	Tsd		5.7	6.3	6.8	3.4	0.0	6.2	6.8	4.0	1.0	0.0	6.6	5.4	2.6	0.5	0
	AvgZdev		**18.35075**	**14.49896**	**8.148154**	**4.927147**	**NA**	**15.08006**	**8.739934**	**2.130641**	**23.12337**	**NA**	**11.47736**	**1.3764**	**8.780062**	**49.64245**	**NA**

B

(NoVictoriaBottleneck)	**Model**	**Empirical**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**B8**	**B9**	**B10**	**B11**	**B12**	**B13**	**B14**	**B15**
(Limited100kYrMigr)	**Ne**		**1M**	**1M**	**1M**	**1M**	**1M**	**100k**	**100k**	**100k**	**100k**	**100k**	**10k**	**10k**	**10k**	**10k**	**10k**
	migration		**1**	**0.1**	**0.01**	**0.001**	**0**	**1**	**0.1**	**0.01**	**0.001**	**0**	**1**	**0.1**	**0.01**	**0.001**	**0**
Malawi	Mmean	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
	Msd		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Victoria	Vmean	22	2.2	2.5	2.2	2.4	2.4	0	0	0	0	0	0	0	0	0	0
	Vsd		1.6	1.5	1.4	1.6	1.5	0	0	0	0	0	0	0	0	0	0
River Astato	Rmean	67	2.3	2.4	2.1	2.4	2.4	0	0	0	0	0	0	0	0	0	0
	Rsd		1.6	1.5	1.4	1.6	1.5	0	0	0	0	0	0	0	0	0	0
Trop+Hap	Hmean	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hsd		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deephaps	Dmean	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dsd		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tanganyika	Tmean	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tsd		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	AvgZdev		**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

C

(NoVictoriaBottleneck)	Model	Empirical	C1	C2	C3	C4	C5	C6	C7	C8	C9	C20	C11	C12	C13	C14	C15
(AlternativeGroupings)	Ne		1M	1M	1M	1M	1M	100k	100k	100k	100k	100k	10k	10k	10k	10k	10k
	migration		1	0.1	0.01	0.001	0	1	0.1	0.01	0.001	0	1	0.1	0.01	0.001	0
Malawi+Malawi/Chilwa/Mozam	Mmean	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
Astatos	Msd		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Victoria + Astato	Vmean	23	144.2	126.4	99.9	27.6	2.4	128.4	93.7	28.3	4.3	0	101.6	38.1	10.0	1.5	0
	Vsd		5.5	5.5	5.4	4.8	1.6	5.4	7.1	4.5	1.9	0	7.5	6.1	3.2	1.3	0
River Astato	Rmean	28	125.5	132.8	113.7	32.2	2.3	136.5	122.8	45.3	5.4	0	131.5	69.6	14.2	1.8	0
	Rsd		6.5	5.1	5.7	5.1	1.6	4.7	6.5	5.7	2.0	0	6.1	6.5	3.7	1.4	0
Trop+Hap	Hmean	23	125.1	114.6	77.6	10.6	0	118.6	86.2	19.7	0.9	0	93.8	34.7	5.4	0.2	0
	Hsd		6.6	5.9	6.1	3.2	0	6.1	7.0	4.2	0.9	0	7.8	5.6	2.4	0.5	0
Deephaps	Dmean	27	130.0	118.0	77.8	10.7	0	121.7	87.8	20.3	1.0	0	96.4	34.3	6.0	0.3	0
	Dsd		6.5	5.8	6.6	3.3	0	5.8	6.5	4.2	0.9	0	6.9	5.3	2.5	0.6	0
Tanganyika	Tmean	36	137.9	121.9	81.0	10.9	0	125.5	91.1	20.9	0.9	0	98.6	35.9	5.4	0.3	0
	Tsd		6.4	5.2	6.3	3.4	0	5.5	6.9	4.1	1.0	0	6.9	5.7	2.3	0.6	0
	AvgZdev		**16.87065**	**17.40649**	**10.64529**	**3.604347**	**NA**	**18.19463**	**10.17222**	**2.05841**	**21.55229**	**NA**	**11.09967**	**2.47418**	**7.344742**	**36.99748**	**NA**

D

(WithVictoriaBottleneck)	Model	Empirical	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15
	Ne		1M	1M	1M	1M	1M	100k	100k	100k	100k	100k	10k	10k	10k	10k	10k
	migration		1	0.1	0.01	0.001	0	1	0.1	0.01	0.001	0	1	0.1	0.01	0.001	0
Malawi	Mmean	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
	Msd		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Victoria	Vmean	22	125.0	84.3	51.3	16.4	2.2	118.6	75.3	24.8	4.4	0	97.0	36.4	9.7	1.6	0
	Vsd		6.7	7.2	6.7	3.9	1.5	6.5	7.2	5.0	2.1	0	6.6	5.2	3.0	1.2	0
River Astato	Rmean	67	133.6	139.9	116.0	32.4	2.5	141.7	127.1	46.0	5.7	0	134.3	71.3	14.1	1.9	0
	Rsd		5.7	5.7	6.3	5.3	1.5	5.3	6.7	6.6	2.3	0	5.8	6.0	3.9	1.2	0
Trop+Hap	Hmean	23	126.0	115.8	76.2	9.6	0.0	119.8	86.5	20.2	0.9	0	93.8	34.4	5.7	0.2	0
	Hsd		6.0	6.3	6.1	3.2	0.0	5.5	7.3	4.3	1.0	0	6.7	5.5	2.3	0.5	0
Deephaps	Dmean	27	131.8	118.3	78.5	10.3	0.0	123.2	88.3	19.6	1.1	0	95.5	35.0	5.5	0.3	0
	Dsd		5.6	5.9	6.1	3.3	0.0	6.6	6.6	4.2	1.0	0	6.3	5.1	2.4	0.5	0
Tanganyika	Tmean	36	138.4	121.9	80.7	10.9	0.0	126.5	91.1	20.6	1.1	0	98.5	35.7	5.8	0.2	0
	Tsd		6.1	6.4	6.7	3.1	0.0	5.3	6.8	4.7	0.9	0	6.5	5.6	2.7	0.5	0
	AvgZdev		**15.97125**	**12.9854**	**7.232721**	**5.047278**	**NA**	**15.64181**	**8.47903**	**1.884654**	**23.57227**	**NA**	**10.82287**	**1.435019**	**9.164962**	**48.35584**	**NA**

E

(WithVictoriaBottleneck)	**Model**	**Empirical**	**E1**	**E2**	**E3**	**E4**	**E5**	**E6**	**E7**	**E8**	**E9**	**E10**	**E11**	**E12**	**E13**	**E14**	**E15**
(Limited100kYrMigr)	**Ne**		**1M**	**1M**	**1M**	**1M**	**1M**	**100k**	**100k**	**100k**	**100k**	**100k**	**10k**	**10k**	**10k**	**10k**	**10k**
	migration		**1**	**0.1**	**0.01**	**0.001**	**0**	**1**	**0.1**	**0.01**	**0.001**	**0**	**1**	**0.1**	**0.01**	**0.001**	**0**
Malawi	Mmean	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
	Msd		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Victoria	Vmean	22	2.2	2.0	2.0	2.0	1.8	0	0	0	0	0	0	0	0	0	0
	Vsd		1.4	1.4	1.4	1.4	1.4	0	0	0	0	0	0	0	0	0	0
River Astato	Rmean	67	2.5	2.2	2.3	2.3	2.1	0	0	0	0	0	0	0	0	0	0
	Rsd		1.4	1.4	1.4	1.4	1.5	0	0	0	0	0	0	0	0	0	0
Trop+Hap	Hmean	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hsd		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deephaps	Dmean	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dsd		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tanganyika	Tmean	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tsd		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	AvgZdev		**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**