

# AUTO

POPULATION SIZE, MIGRATION, DIVERGENCE, ASSIGNMENT, HISTORY

Bayesian inference using the structured coalescent

Migrate-n version 5.0.0a [May-20-2017]

Using Intel AVX (Advanced Vector Extensions)

Compiled for PARALLEL computer architectures

One master and 100 compute nodes are available.

Program started at Sun Aug 13 01:17:38 2017

Program finished at Sun Aug 13 03:47:32 2017 [Runtime:0000:02:29:54]



## Options

Datatype:

DNA sequence data

Inheritance scalers in use for Thetas:

All loci use an inheritance scaler of 1.0

[The locus with a scaler of 1.0 used as reference]

Random number seed:

(with internal timer)

3851152718

Start parameters:

Theta values were generated

Using a percent value of the prior

M values were generated

Using a percent value of the prior

Connection matrix:

m = average (average over a group of Thetas or M,

s = symmetric migration M, S = symmetric 4Nm,

0 = zero, and not estimated,

\* = migration free to vary, Thetas are on diagonal

d = row population split off column population, D = split and then migration

Population 1

1 Romanshorn\_0 \*

Order of parameters:

1  $\Theta_1$

<displayed>

Mutation rate among loci: Mutation rate is constant for all loci

Analysis strategy: Bayesian inference  
 -Population size estimation: Exponential Distribution

#### Proposal distributions for parameter

Parameter	Proposal
Theta	Metropolis sampling
M	Metropolis sampling
Divergence	Metropolis sampling
Divergence Spread	Metropolis sampling
Genealogy	Metropolis-Hastings

#### Prior distribution for parameter

Parameter	Prior	Minimum	Mean	Maximum	Delta	Bins	UpdateFreq
1	Theta -11 Uniform	0.000000	0.050	0.100	0.010	1500	0.20000

[-1 -1 means priors were set globally]

Markov chain settings: Long chain

Number of chains	1
Recorded steps [a]	50000
Increment (record every x step [b])	200
Number of concurrent chains (replicates) [c]	2
Visited (sampled) parameter values [a*b*c]	20000000
Number of discard trees per chain (burn-in)	10000

#### Multiple Markov chains:

Static heating scheme 4 chains with temperatures  
 1000000.00 3.00 1.50 1.00  
 Swapping interval is 1

#### Print options:

Data file: infile.0.7  
 Haplotyping is turned on: NO  
 Output file: outfile\_0.7\_1.0  
 Posterior distribution raw histogram file: bayesfile  
 Raw data from the MCMC run: bayesallfile\_0.7\_1.0  
 Print data: No  
 Print genealogies [only some for some data type]: None

## *Data summary*

Data file:	infile.0.7
Datatype:	Sequence data
Number of loci:	100

Mutationmodel:

Locus	Sublocus	Mutationmodel	Mutationmodel parameters
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1	1	Jukes-Cantor	[Basefreq: =0.25]
2	1	Jukes-Cantor	[Basefreq: =0.25]
3	1	Jukes-Cantor	[Basefreq: =0.25]
4	1	Jukes-Cantor	[Basefreq: =0.25]
5	1	Jukes-Cantor	[Basefreq: =0.25]
6	1	Jukes-Cantor	[Basefreq: =0.25]
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97	1	Jukes-Cantor	[Basefreq: =0.25]
98	1	Jukes-Cantor	[Basefreq: =0.25]
99	1	Jukes-Cantor	[Basefreq: =0.25]
100	1	Jukes-Cantor	[Basefreq: =0.25]

#### Sites per locus

Locus	Sites
1	10000
2	10000
3	10000
4	10000
5	10000
6	10000
7	10000
8	10000
9	10000
10	10000
11	10000
12	10000
13	10000
14	10000
15	10000
16	10000
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18	10000
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21	10000
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92	10000
93	10000
94	10000
95	10000
96	10000
97	10000
98	10000
99	10000
100	10000

Site rate variation and probabilities:

Locus	Sublocus	Region type	Rate of change	Probability	Patch size
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1	1	1	1.000	1.000	1.000
2	1	1	1.000	1.000	1.000
3	1	1	1.000	1.000	1.000
4	1	1	1.000	1.000	1.000
5	1	1	1.000	1.000	1.000
6	1	1	1.000	1.000	1.000

7	1	1	1.000	1.000	1.000
8	1	1	1.000	1.000	1.000
9	1	1	1.000	1.000	1.000
10	1	1	1.000	1.000	1.000
11	1	1	1.000	1.000	1.000
12	1	1	1.000	1.000	1.000
13	1	1	1.000	1.000	1.000
14	1	1	1.000	1.000	1.000
15	1	1	1.000	1.000	1.000
16	1	1	1.000	1.000	1.000
17	1	1	1.000	1.000	1.000
18	1	1	1.000	1.000	1.000
19	1	1	1.000	1.000	1.000
20	1	1	1.000	1.000	1.000
21	1	1	1.000	1.000	1.000
22	1	1	1.000	1.000	1.000
23	1	1	1.000	1.000	1.000
24	1	1	1.000	1.000	1.000
25	1	1	1.000	1.000	1.000
26	1	1	1.000	1.000	1.000
27	1	1	1.000	1.000	1.000
28	1	1	1.000	1.000	1.000
29	1	1	1.000	1.000	1.000
30	1	1	1.000	1.000	1.000
31	1	1	1.000	1.000	1.000
32	1	1	1.000	1.000	1.000
33	1	1	1.000	1.000	1.000
34	1	1	1.000	1.000	1.000
35	1	1	1.000	1.000	1.000
36	1	1	1.000	1.000	1.000
37	1	1	1.000	1.000	1.000
38	1	1	1.000	1.000	1.000
39	1	1	1.000	1.000	1.000
40	1	1	1.000	1.000	1.000
41	1	1	1.000	1.000	1.000
42	1	1	1.000	1.000	1.000
43	1	1	1.000	1.000	1.000
44	1	1	1.000	1.000	1.000
45	1	1	1.000	1.000	1.000
46	1	1	1.000	1.000	1.000
47	1	1	1.000	1.000	1.000
48	1	1	1.000	1.000	1.000
49	1	1	1.000	1.000	1.000
50	1	1	1.000	1.000	1.000
51	1	1	1.000	1.000	1.000



52	1	1	1.000	1.000	1.000
53	1	1	1.000	1.000	1.000
54	1	1	1.000	1.000	1.000
55	1	1	1.000	1.000	1.000
56	1	1	1.000	1.000	1.000
57	1	1	1.000	1.000	1.000
58	1	1	1.000	1.000	1.000
59	1	1	1.000	1.000	1.000
60	1	1	1.000	1.000	1.000
61	1	1	1.000	1.000	1.000
62	1	1	1.000	1.000	1.000
63	1	1	1.000	1.000	1.000
64	1	1	1.000	1.000	1.000
65	1	1	1.000	1.000	1.000
66	1	1	1.000	1.000	1.000
67	1	1	1.000	1.000	1.000
68	1	1	1.000	1.000	1.000
69	1	1	1.000	1.000	1.000
70	1	1	1.000	1.000	1.000
71	1	1	1.000	1.000	1.000
72	1	1	1.000	1.000	1.000
73	1	1	1.000	1.000	1.000
74	1	1	1.000	1.000	1.000
75	1	1	1.000	1.000	1.000
76	1	1	1.000	1.000	1.000
77	1	1	1.000	1.000	1.000
78	1	1	1.000	1.000	1.000
79	1	1	1.000	1.000	1.000
80	1	1	1.000	1.000	1.000
81	1	1	1.000	1.000	1.000
82	1	1	1.000	1.000	1.000
83	1	1	1.000	1.000	1.000
84	1	1	1.000	1.000	1.000
85	1	1	1.000	1.000	1.000
86	1	1	1.000	1.000	1.000
87	1	1	1.000	1.000	1.000
88	1	1	1.000	1.000	1.000
89	1	1	1.000	1.000	1.000
90	1	1	1.000	1.000	1.000
91	1	1	1.000	1.000	1.000
92	1	1	1.000	1.000	1.000
93	1	1	1.000	1.000	1.000
94	1	1	1.000	1.000	1.000
95	1	1	1.000	1.000	1.000
96	1	1	1.000	1.000	1.000

97	1	1	1.000	1.000	1.000	
98	1	1	1.000	1.000	1.000	
99	1	1	1.000	1.000	1.000	
100	1	1	1.000	1.000	1.000	
Population			Locus		Gene copies	
1 Romanshorn_0			1		10	
			2		10	
			3		10	
			4		10	
			5		10	
			6		10	
			7		10	
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			11		10	
			12		10	
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	91	10
	92	10
	93	10
	94	10
	95	10
	96	10
	97	10
	98	10
	99	10
	100	10
Total of all populations	1	10
	2	10
	3	10
	4	10
	5	10
	6	10
	7	10
	8	10
	9	10
	10	10
	11	10
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97	10
98	10
99	10
100	10

## *Bayesian Analysis: Posterior distribution table*

Locus	Parameter	2.5%	25.0%	Mode	75.0%	97.5%	Median	Mean
1	$\Theta_1$	0.00000	0.00107	0.00210	0.00307	0.00480	0.00230	0.00221
2	$\Theta_1$	0.00000	0.00000	0.00070	0.00133	0.00280	0.00130	0.00069
3	$\Theta_1$	0.00000	0.00020	0.00097	0.00167	0.00307	0.00143	0.00096
4	$\Theta_1$	0.00000	0.00000	0.00030	0.00107	0.00247	0.00110	0.00037
5	$\Theta_1$	0.00000	0.00033	0.00117	0.00187	0.00333	0.00157	0.00115
6	$\Theta_1$	0.00000	0.00007	0.00077	0.00147	0.00293	0.00137	0.00079
7	$\Theta_1$	0.00000	0.00000	0.00063	0.00120	0.00273	0.00123	0.00063
8	$\Theta_1$	0.00000	0.00013	0.00083	0.00153	0.00300	0.00137	0.00085
9	$\Theta_1$	0.00040	0.00233	0.00370	0.00493	0.00813	0.00397	0.00414
10	$\Theta_1$	0.00000	0.00033	0.00117	0.00193	0.00340	0.00157	0.00121
11	$\Theta_1$	0.00100	0.00313	0.00463	0.00607	0.01020	0.00510	0.00533
12	$\Theta_1$	0.00000	0.00027	0.00110	0.00180	0.00327	0.00150	0.00110
13	$\Theta_1$	0.00000	0.00000	0.00063	0.00120	0.00273	0.00123	0.00063
14	$\Theta_1$	0.00000	0.00087	0.00183	0.00273	0.00427	0.00203	0.00187
15	$\Theta_1$	0.00000	0.00000	0.00050	0.00113	0.00260	0.00117	0.00052
16	$\Theta_1$	0.00000	0.00053	0.00137	0.00220	0.00373	0.00177	0.00142
17	$\Theta_1$	0.00000	0.00080	0.00170	0.00260	0.00413	0.00197	0.00177
18	$\Theta_1$	0.00000	0.00013	0.00090	0.00153	0.00300	0.00137	0.00089

19	$\Theta_1$	0.00000	0.00000	0.00050	0.00113	0.00260	0.00117	0.00052
20	$\Theta_1$	0.01547	0.02313	0.02450	0.02540	0.03980	0.02737	0.03067
21	$\Theta_1$	0.00000	0.00000	0.00037	0.00107	0.00247	0.00110	0.00040
22	$\Theta_1$	0.00000	0.00020	0.00097	0.00167	0.00313	0.00143	0.00099
23	$\Theta_1$	0.00000	0.00000	0.00063	0.00120	0.00273	0.00123	0.00061
24	$\Theta_1$	0.00000	0.00107	0.00210	0.00307	0.00487	0.00237	0.00223
25	$\Theta_1$	0.03953	0.04620	0.04810	0.04987	0.05167	0.04730	0.08354
26	$\Theta_1$	0.03353	0.04413	0.04777	0.04927	0.05140	0.04463	0.06889
27	$\Theta_1$	0.00000	0.00000	0.00057	0.00120	0.00267	0.00123	0.00055
28	$\Theta_1$	0.00000	0.00053	0.00137	0.00220	0.00360	0.00170	0.00139
29	$\Theta_1$	0.00407	0.00553	0.00743	0.00987	0.01267	0.00857	0.00922
30	$\Theta_1$	0.00000	0.00013	0.00083	0.00153	0.00293	0.00137	0.00084
31	$\Theta_1$	0.00000	0.00000	0.00063	0.00127	0.00273	0.00123	0.00065
32	$\Theta_1$	0.03360	0.04320	0.04770	0.04947	0.05133	0.04457	0.06844
33	$\Theta_1$	0.00000	0.00027	0.00103	0.00180	0.00320	0.00150	0.00106
34	$\Theta_1$	0.00000	0.00000	0.00070	0.00133	0.00280	0.00130	0.00071
35	$\Theta_1$	0.00000	0.00000	0.00050	0.00113	0.00260	0.00117	0.00049
36	$\Theta_1$	0.00000	0.00027	0.00103	0.00173	0.00320	0.00150	0.00104
37	$\Theta_1$	0.00060	0.00060	0.00290	0.00507	0.00507	0.00310	0.00314
38	$\Theta_1$	0.00000	0.00080	0.00170	0.00260	0.00413	0.00197	0.00175
39	$\Theta_1$	0.00000	0.00187	0.00310	0.00420	0.00660	0.00330	0.00335
40	$\Theta_1$	0.00000	0.00033	0.00117	0.00187	0.00340	0.00157	0.00117
41	$\Theta_1$	0.00020	0.00147	0.00177	0.00207	0.00320	0.00203	0.00185



Locus	Parameter	2.5%	25.0%	Mode	75.0%	97.5%	Median	Mean
42	$\Theta_1$	0.00000	0.00000	0.00063	0.00120	0.00273	0.00123	0.00061
43	$\Theta_1$	0.00000	0.00067	0.00163	0.00247	0.00400	0.00190	0.00168
44	$\Theta_1$	0.00000	0.00120	0.00230	0.00327	0.00500	0.00243	0.00237
45	$\Theta_1$	0.00000	0.00100	0.00203	0.00300	0.00480	0.00230	0.00215
46	$\Theta_1$	0.03947	0.04613	0.04810	0.04993	0.05167	0.04723	0.08283
47	$\Theta_1$	0.00000	0.00000	0.00057	0.00120	0.00267	0.00123	0.00059
48	$\Theta_1$	0.00000	0.00033	0.00117	0.00193	0.00347	0.00163	0.00122
49	$\Theta_1$	0.00000	0.00067	0.00157	0.00240	0.00387	0.00183	0.00158
50	$\Theta_1$	0.00000	0.00033	0.00117	0.00193	0.00340	0.00157	0.00120
51	$\Theta_1$	0.00000	0.00000	0.00037	0.00107	0.00247	0.00110	0.00040
52	$\Theta_1$	0.00000	0.00013	0.00090	0.00153	0.00300	0.00137	0.00088
53	$\Theta_1$	0.00000	0.00000	0.00043	0.00113	0.00253	0.00117	0.00044
54	$\Theta_1$	0.00000	0.00067	0.00157	0.00240	0.00393	0.00190	0.00161
55	$\Theta_1$	0.00000	0.00000	0.00070	0.00133	0.00280	0.00130	0.00072
56	$\Theta_1$	0.00607	0.00727	0.01243	0.02200	0.02647	0.01450	0.01575
57	$\Theta_1$	0.00000	0.00040	0.00130	0.00207	0.00360	0.00170	0.00133
58	$\Theta_1$	0.00000	0.00033	0.00110	0.00187	0.00333	0.00157	0.00114
59	$\Theta_1$	0.00000	0.00007	0.00077	0.00140	0.00287	0.00130	0.00076
60	$\Theta_1$	0.00000	0.00040	0.00123	0.00200	0.00347	0.00163	0.00128
61	$\Theta_1$	0.00000	0.00027	0.00103	0.00173	0.00320	0.00150	0.00103

62	$\Theta_1$	0.00000	0.00073	0.00170	0.00253	0.00407	0.00197	0.00174
63	$\Theta_1$	0.00000	0.00000	0.00057	0.00120	0.00267	0.00123	0.00060
64	$\Theta_1$	0.01120	0.01687	0.02077	0.02533	0.04193	0.02383	0.02644
65	$\Theta_1$	0.00000	0.00027	0.00103	0.00180	0.00327	0.00150	0.00106
66	$\Theta_1$	0.00000	0.00033	0.00117	0.00193	0.00340	0.00157	0.00119
67	$\Theta_1$	0.00007	0.00013	0.00083	0.00147	0.00147	0.00137	0.00084
68	$\Theta_1$	0.00027	0.00227	0.00363	0.00487	0.00807	0.00390	0.00409
69	$\Theta_1$	0.00000	0.00047	0.00130	0.00207	0.00353	0.00163	0.00130
70	$\Theta_1$	0.00000	0.00007	0.00083	0.00147	0.00293	0.00137	0.00083
71	$\Theta_1$	0.00067	0.00153	0.00297	0.00420	0.00507	0.00317	0.00318
72	$\Theta_1$	0.00000	0.00000	0.00063	0.00120	0.00273	0.00123	0.00064
73	$\Theta_1$	0.00000	0.00000	0.00057	0.00120	0.00267	0.00123	0.00056
74	$\Theta_1$	0.00000	0.00000	0.00063	0.00127	0.00280	0.00130	0.00067
75	$\Theta_1$	0.00320	0.00620	0.00830	0.01100	0.01900	0.00957	0.01033
76	$\Theta_1$	0.00000	0.00040	0.00123	0.00200	0.00340	0.00163	0.00123
77	$\Theta_1$	0.00000	0.00020	0.00097	0.00167	0.00313	0.00143	0.00099
78	$\Theta_1$	0.00000	0.00013	0.00090	0.00160	0.00307	0.00143	0.00092
79	$\Theta_1$	0.00000	0.00053	0.00137	0.00220	0.00367	0.00170	0.00141
80	$\Theta_1$	0.00000	0.00007	0.00077	0.00147	0.00293	0.00137	0.00080
81	$\Theta_1$	0.00000	0.00000	0.00037	0.00107	0.00247	0.00110	0.00040
82	$\Theta_1$	0.00000	0.00007	0.00077	0.00140	0.00287	0.00130	0.00075
83	$\Theta_1$	0.03300	0.04400	0.04763	0.04900	0.05127	0.04417	0.06675
84	$\Theta_1$	0.00000	0.00027	0.00103	0.00180	0.00320	0.00150	0.00105

Locus	Parameter	2.5%	25.0%	Mode	75.0%	97.5%	Median	Mean
85	$\Theta_1$	0.00000	0.00000	0.00050	0.00113	0.00260	0.00117	0.00052
86	$\Theta_1$	0.00000	0.00000	0.00063	0.00127	0.00273	0.00123	0.00065
87	$\Theta_1$	0.00000	0.00033	0.00110	0.00187	0.00327	0.00157	0.00113
88	$\Theta_1$	0.00000	0.00093	0.00197	0.00287	0.00447	0.00217	0.00200
89	$\Theta_1$	0.00000	0.00040	0.00123	0.00200	0.00347	0.00163	0.00123
90	$\Theta_1$	0.00000	0.00007	0.00083	0.00147	0.00293	0.00137	0.00082
91	$\Theta_1$	0.00420	0.00760	0.01003	0.01327	0.02380	0.01170	0.01266
92	$\Theta_1$	0.00000	0.00067	0.00163	0.00247	0.00400	0.00190	0.00164
93	$\Theta_1$	0.00000	0.00027	0.00103	0.00173	0.00320	0.00150	0.00103
94	$\Theta_1$	0.00000	0.00020	0.00097	0.00167	0.00313	0.00143	0.00098
95	$\Theta_1$	0.00007	0.00187	0.00317	0.00427	0.00680	0.00337	0.00343
96	$\Theta_1$	0.00000	0.00000	0.00070	0.00133	0.00287	0.00130	0.00074
97	$\Theta_1$	0.00000	0.00040	0.00123	0.00200	0.00347	0.00163	0.00126
98	$\Theta_1$	0.00000	0.00060	0.00150	0.00233	0.00387	0.00183	0.00152
99	$\Theta_1$	0.00000	0.00000	0.00003	0.09993	0.09993	0.00003	0.09165
100	$\Theta_1$	0.00000	0.00013	0.00090	0.00153	0.00300	0.00143	0.00090
All	$\Theta_1$	0.00000	0.00000	0.00070	0.00133	0.00273	0.00130	0.00072

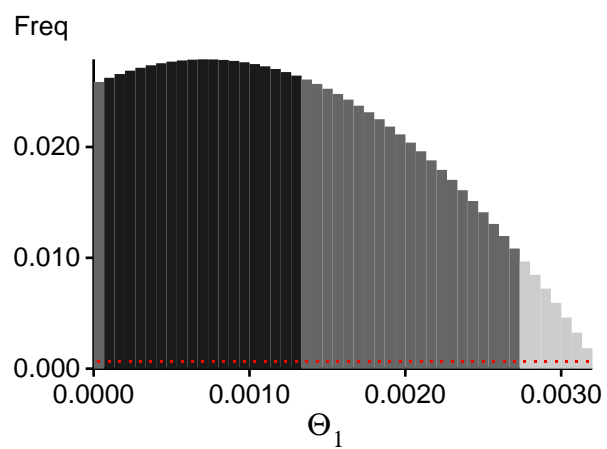
Citation suggestions:

Beerli P., 2006. Comparison of Bayesian and maximum-likelihood inference of population genetic parameters. *Bioinformatics* 22:341-345

Beerli P., 2007. Estimation of the population scaled mutation rate from microsatellite data, *Genetics*, 177:1967-1968.

Beerli P., 2009. How to use MIGRATE or why are Markov chain Monte Carlo programs difficult to use?  
 In Population Genetics for Animal Conservation, G. Bertorelle, M. W. Bruford, H. C. Hauffe, A. Rizzoli,  
 and C. Vernesi, eds., vol. 17 of Conservation Biology, Cambridge University Press, Cambridge UK, pp. 42-79.

# *Bayesian Analysis: Posterior distribution over all loci*



# *Log-Probability of the data given the model (marginal likelihood)*

Use this value for Bayes factor calculations:

$BF = \text{Exp}[\ln(\text{Prob}(D \mid \text{thisModel}) - \ln(\text{Prob}(D \mid \text{otherModel}))]$

or as  $LBF = 2 (\ln(\text{Prob}(D \mid \text{thisModel}) - \ln(\text{Prob}(D \mid \text{otherModel})))$

shows the support for thisModel]

Locus	TI(1a)	BTI(1b)	SS(2)	HS(3)
1	-14726.85	-14317.81	-14347.10	-14410.46
2	-14253.97	-13900.02	-13922.02	-13997.52
3	-14468.15	-14062.53	-14080.65	-14151.81
4	-14184.08	-13828.74	-13839.80	-13925.35
5	-14386.32	-14016.39	-14043.25	-14111.27
6	-14312.54	-13946.60	-13967.90	-14041.19
7	-14297.76	-13935.90	-13957.37	-14031.53
8	-14266.60	-13912.81	-13936.94	-14012.35
9	-15203.21	-14811.95	-14855.85	-14912.24
10	-14550.28	-14159.30	-14185.42	-14253.50
11	-16898.48	-15857.96	-15791.15	-15847.05
12	-14315.27	-13958.77	-13985.50	-14054.97
13	-14213.38	-13864.42	-13881.60	-13961.25
14	-15260.37	-14595.91	-14576.63	-14640.64
15	-14243.37	-13882.72	-13900.20	-13978.93
16	-14393.16	-14035.30	-14065.43	-14133.41
17	-14578.55	-14192.71	-14222.81	-14287.78
18	-14319.92	-13976.89	-14003.64	-14074.98
19	-14210.32	-13859.01	-13873.84	-13954.75
20	-17633.96	-17036.30	-17080.54	-17121.41
21	-14170.97	-13820.81	-13831.85	-13915.57
22	-14314.49	-13951.87	-13976.12	-14047.27
23	-14204.38	-13856.56	-13874.30	-13953.21
24	-14430.24	-14081.99	-14115.47	-14179.86
25	-38630.14	-31785.28	-30815.56	-30841.40
26	-20734.42	-20121.04	-20208.95	-20241.54
27	-14326.79	-13938.11	-13952.26	-14027.87
28	-14812.40	-14333.28	-14343.82	-14410.98
29	-15681.06	-15205.55	-15243.54	-15293.66

30	-14405.66	-14013.52	-14033.47	-14104.98
31	-14212.92	-13866.17	-13884.81	-13961.99
32	-23490.03	-22014.34	-21957.87	-21990.05
33	-14371.65	-14001.65	-14027.88	-14097.27
34	-14248.33	-13890.72	-13913.25	-13986.88
35	-14194.55	-13844.21	-13857.61	-13940.32
36	-14387.37	-14020.28	-14046.72	-14116.17
37	-14700.15	-14311.27	-14346.28	-14405.72
38	-15051.39	-14481.55	-14479.01	-14543.78
39	-15007.65	-14549.88	-14574.80	-14634.69
40	-14357.67	-13994.36	-14020.76	-14089.25
41	-15077.99	-14499.06	-14496.57	-14559.92
42	-14271.73	-13918.77	-13939.65	-14015.37
43	-14738.55	-14279.97	-14297.70	-14361.30
44	-15047.43	-14524.11	-14534.30	-14595.77
45	-14414.26	-14064.36	-14099.26	-14162.04
46	-23978.93	-23050.67	-23117.22	-23145.19
47	-14275.34	-13925.03	-13946.61	-14022.27
48	-14326.20	-13971.85	-14001.01	-14069.00
49	-14647.36	-14227.49	-14249.56	-14317.09
50	-14365.38	-13998.09	-14025.46	-14093.80
51	-14188.45	-13835.84	-13848.14	-13932.31
52	-14350.19	-14004.35	-14032.29	-14103.93
53	-14187.59	-13836.22	-13845.79	-13930.87
54	-14860.59	-14358.83	-14368.40	-14434.53
55	-14289.06	-13922.94	-13944.30	-14018.15
56	-16858.96	-16189.56	-16205.89	-16252.79
57	-14384.57	-14024.44	-14054.19	-14121.10
58	-14401.78	-14042.93	-14072.15	-14140.63
59	-14386.70	-14014.29	-14036.68	-14109.26
60	-14767.21	-14276.12	-14283.78	-14351.89
61	-14268.82	-13923.46	-13948.58	-14019.54
62	-15006.04	-14482.56	-14487.03	-14552.65
63	-14289.19	-13924.74	-13945.24	-14019.53
64	-23993.80	-20917.58	-20531.29	-20573.81
65	-14337.08	-13973.46	-13998.64	-14068.85
66	-14376.05	-14008.89	-14037.39	-14106.00
67	-14353.48	-14000.82	-14027.34	-14099.07
68	-14670.33	-14322.88	-14367.81	-14425.49
69	-14488.25	-14129.30	-14161.59	-14227.41
70	-14371.54	-14014.22	-14039.81	-14112.23
71	-14735.93	-14347.98	-14385.21	-14444.58
72	-14237.96	-13888.61	-13908.80	-13984.83
73	-14215.45	-13869.90	-13883.46	-13966.04
74	-14259.53	-13900.06	-13921.30	-13997.15

75	-15383.89	-14972.70	-15021.12	-15070.41
76	-14494.45	-14117.04	-14144.96	-14211.63
77	-14592.40	-14159.45	-14172.97	-14244.07
78	-14371.20	-14008.70	-14033.28	-14104.33
79	-14665.25	-14235.43	-14256.48	-14322.75
80	-14312.96	-13962.52	-13988.26	-14059.77
81	-14181.65	-13829.73	-13839.72	-13927.59
82	-14373.05	-13999.99	-14022.67	-14096.61
83	-19861.97	-19322.92	-19417.05	-19447.00
84	-14431.04	-14081.29	-14110.71	-14179.52
85	-14209.97	-13857.00	-13871.70	-13952.27
86	-14303.18	-13931.18	-13950.44	-14024.94
87	-14469.92	-14101.52	-14128.84	-14196.68
88	-14816.94	-14362.51	-14382.60	-14445.27
89	-14398.67	-14050.17	-14080.29	-14148.72
90	-14401.62	-14025.22	-14046.36	-14118.33
91	-15494.01	-15121.16	-15177.22	-15228.26
92	-14608.42	-14193.58	-14218.91	-14282.84
93	-14308.49	-13950.89	-13976.17	-14048.42
94	-14504.00	-14097.16	-14116.24	-14186.19
95	-15516.12	-14910.68	-14912.07	-14970.57
96	-14252.84	-13898.58	-13919.58	-13995.61
97	-14481.35	-14094.36	-14120.31	-14187.63
98	-14327.12	-13985.14	-14014.20	-14084.35
99	-41024.21	-34678.73	-33847.31	-33866.79
100	-14388.18	-14017.23	-14040.23	-14113.74
All	-1547736.42	-1490561.67	-1490567.04	-1497226.48
(1a) TI: Thermodynamic integration: log(Prob(D Model)): Good approximation with many temperatures				
(1b) BTI: Bezier-approximated Thermodynamic integration: when using few temperatures USE THIS!				
(2) SS: Steppingstone Sampling (Xie et al 2011)				
(3) HS: Harmonic mean approximation: Overestimates the marginal likelihood, poor variance				
[Scaling factor = 307.027977]				
Citation suggestions:				
Beerli P. and M. Palczewski, 2010. Unified framework to evaluate panmixia and migration direction among multiple sampling locations, Genetics, 185: 313-326.				
Palczewski M. and P. Beerli, 2014. Population model comparison using multi-locus datasets. In M.-H. Chen, L. Kuo, and P. O. Lewis, editors, Bayesian Phylogenetics: Methods, Algorithms, and Applications, pages 187-200. CRC Press, 2014.				
Xie W., P. O. Lewis, Y. Fan, L. Kuo, and M.-H. Chen. 2011. Improving marginal likelihood estimation for Bayesian phylogenetic model selection. Systematic Biology, 60(2):150â 160, 2011.				



*Acceptance ratios for all parameters and the genealogies*

Parameter	Accepted changes	Ratio
$\Theta_1$	121942521/400005235	0.30485
Genealogies	246893046/1599994765	0.15431

### *MCMC-Autocorrelation and Effective MCMC Sample Size*

Parameter	Autocorrelation	Effective Sampe Size
$\Theta_1$	0.07580	8758248.30
Genealogies	0.13988	7806896.87

## *Average temperatures during the run*

Chain	Temperatures
-------	--------------

1	0.00000
2	0.00000
3	0.00000
4	0.00000

Adaptive heating often fails, if the average temperatures are very close together try to rerun using static heating! If you want to compare models using marginal likelihoods then you **MUST** use static heating

## *Potential Problems*

This section reports potential problems with your run, but such reporting is often not very accurate. With many parameters in a multilocus analysis, it is very common that some parameters for some loci will not be very informative, triggering suggestions (for example to increase the prior range) that are not sensible. This suggestion tool will improve with time, therefore do not blindly follow its suggestions. If some parameters are flagged, inspect the tables carefully and judge whether an action is required. For example, if you run a Bayesian inference with sequence data, for macroscopic species there is rarely the need to increase the prior for Theta beyond 0.1; but if you use microsatellites it is rather common that your prior distribution for Theta should have a range from 0.0 to 100 or more. With many populations (>3) it is also very common that some migration routes are estimated poorly because the data contains little or no information for that route. Increasing the range will not help in such situations, reducing number of parameters may help in such situations.

No warning was recorded during the run