

Supplementary Table S1. Partitioning strategies from ModerFinder and PartitionFinder for mtDNA dataset.

PartitionFinder for BI analysis		
Subset	Best Model	Partition names
1	GTR+I+G	16Sdataset_mafft_gb
2	GTR+I+G	COIdataset_NT_removed_chars_gb_codon1
3	F81+I	COIdataset_NT_removed_chars_gb_codon2
4	GTR+G	COIdataset_NT_removed_chars_gb_codon3
5	SYM+I+G	ND1_NT_removed_chars_gb_codon1
6	GTR+I+G	ND1_NT_removed_chars_gb_codon2
7	GTR+G	ND1_NT_removed_chars_gb_codon3

ModelFinder for ML analysis		
Subset	Best Model	Partition names
1	TIM2+F+G4	16Sdataset_mafft_gb
2	TN+F+G4	COIdataset_NT_removed_chars_gb_codon1
3	F81+F+I+G4	COIdataset_NT_removed_chars_gb_codon2
4	TIM+F+G4	COIdataset_NT_removed_chars_gb_codon3
5	TIM2e+I+G4	ND1_NT_removed_chars_gb_codon1
6	GTR+F+I+G4	ND1_NT_removed_chars_gb_codon2
7	TPM3u+F+G4	ND1_NT_removed_chars_gb_codon3

Supplementary Table S2. Partitioning strategies from ModerFinder and PartitionFinder for nuDNA dataset.

PartitionFinder for BI analysis		
Subset	Best Model	Partition names
1	K80+I	18s_mafft_gb
2	GTR+I+G	28Sdataset_mafft_gb

ModelFinder for ML analysis		
Subset	Best Model	Partition names
1	K2P+I	18s_mafft_gb
2	TPM3u+F+G4	28Sdataset_mafft_gb

Supplementary Table S3. Partitioning strategies from ModerFinder and PartitionFinder for concatenated five-gene dataset.

PartitionFinder for BI analysis		
Subset	Best Model	Partition names
1	GTR+I+G	16Sdataset_mafft_gb
2	SYM+I	18s_mafft_gb
3	GTR+I+G	28Sdataset_mafft_gb
4	GTR+I+G	COIdataset_NT_removed_chars_gb_codon1
5	F81+I	COIdataset_NT_removed_chars_gb_codon2
6	GTR+G	COIdataset_NT_removed_chars_gb_codon3
7	SYM+I+G	ND1_NT_removed_chars_gb_codon1
8	GTR+I+G	ND1_NT_removed_chars_gb_codon2
9	GTR+G	ND1_NT_removed_chars_gb_codon3

ModelFinder for ML analysis		
Subset	Best Model	Partition names
1	TIM2+F+I+G4	16Sdataset_mafft_gb
2	K3P+I	18s_mafft_gb
3	TIM3+F+G4	28Sdataset_mafft_gb
4	TN+F+I+G4	COIdataset_NT_removed_chars_gb_codon1
5	F81+F+I	COIdataset_NT_removed_chars_gb_codon2
6	TIM+F+G4	COIdataset_NT_removed_chars_gb_codon3
7	TIM2e+I+G4	ND1_NT_removed_chars_gb_codon1
8	GTR+F+I+G4	ND1_NT_removed_chars_gb_codon2
9	HKY+F+G4	ND1_NT_removed_chars_gb_codon3

PartitionFinder for BEAST analysis			
Subset names	Best model	Sites	Partition names
1	GTR+I+G+X	469	16Sdataset_mafft_gb
2	SYM+I	642	18s_mafft_gb
3	GTR+I+G+X	743	28Sdataset_mafft_gb
4	TRN+I+G+X	219	COIdataset_NT_removed_chars_gb_codon1
5	HKY+I+X	219	COIdataset_NT_removed_chars_gb_codon2
6	GTR+G+X	219	COIdataset_NT_removed_chars_gb_codon3
7	GTR+I+G+X	294	ND1_NT_removed_chars_gb_codon1
8	GTR+I+G+X	294	ND1_NT_removed_chars_gb_codon2
9	GTR+G+X	294	ND1_NT_removed_chars_gb_codon3

Supplementary Table S4. Partitioning strategies from ModerFinder and PartitionFinder for mitogenome dataset.

PartitionFinder for mitogenome dataset		
Subset	Best Model	Partition names
1	GTR+I+G	cox2_NT_removed_chars_gb_codon1, cox3_NT_removed_chars_gb_codon1, cox1_NT_removed_chars_gb_codon1, atp6
2	GTR+I+G	nad4_NT_removed_chars_gb_codon2, nad5_NT_removed_chars_gb_codon2, nad4L_NT_removed_chars_gb_codon2, atp6 nad3_NT_removed_chars_gb_codon3, nad4L_NT_removed_chars_gb_codon3, nad4_NT_removed_chars_gb_codon3,
3	GTR+I+G	atp6_NT_removed_chars_gb_codon3, cox2_NT_removed_chars_gb_codon3, cox3_NT_removed_chars_gb_codon3, nad5_NT_removed_chars_gb_codon3, cox1_NT_removed_chars_gb_codon3
4	GTR+I+G	cox1_NT_removed_chars_gb_codon2, cox3_NT_removed_chars_gb_codon2, nad3_NT_removed_chars_gb_codon2, cox2_NT_removed_chars_gb_codon2
5	GTR+I+G	cytb_NT_removed_chars_gb_codon1, nad1_NT_removed_chars_gb_codon1, nad2_NT_removed_chars_gb_codon1, nad6_NT_removed_chars_gb_codon1
6	GTR+I+G	nad6_NT_removed_chars_gb_codon2, nad2_NT_removed_chars_gb_codon2, cytb_NT_removed_chars_gb_codon2, nad1_NT_removed_chars_gb_codon2
7	GTR+I+G	cytb_NT_removed_chars_gb_codon3, nad6_NT_removed_chars_gb_codon3, nad1_NT_removed_chars_gb_codon3, nad2_NT_removed_chars_gb_codon3
8	GTR+I+G	nad4_NT_removed_chars_gb_codon1, nad5_NT_removed_chars_gb_codon1, nad3_NT_removed_chars_gb_codon1, nad4L_NT_removed_chars_gb_codon1
9	GTR+I+G	rrnL_mafft_gb_codon3, rrnL_mafft_gb_codon1, rrnL_mafft_gb_codon2
10	GTR+G	rrnS_mafft_gb

ModelFinder for mitogenome dataset		
Subset	Best Model	Partition names
1	TIM2+F+I+G4	atp6_NT_removed_chars_gb_codon1
2	TVM+F+G4	atp6_NT_removed_chars_gb_codon2
3	TIM3+F+I+G4	atp6_NT_removed_chars_gb_codon3
4	TN+F+I+G4	cox1_NT_removed_chars_gb_codon1
5	TVM+F+I+G4	cox1_NT_removed_chars_gb_codon2
6	GTR+F+I+G4	cox1_NT_removed_chars_gb_codon3
7	HKY+F+I+G4	cox2_NT_removed_chars_gb_codon1
8	TVM+F+I+G4	cox2_NT_removed_chars_gb_codon2
9	TIM3+F+I+G4	cox2_NT_removed_chars_gb_codon3
10	K3Pu+F+I+G4	cox3_NT_removed_chars_gb_codon1
11	GTR+F+I+G4	cox3_NT_removed_chars_gb_codon2
12	TN+F+I+G4	cox3_NT_removed_chars_gb_codon3
13	TIM2e+I+G4	cytb_NT_removed_chars_gb_codon1
14	TVM+F+I+G4	cytb_NT_removed_chars_gb_codon2
15	TIM2+F+ASC+G4	cytb_NT_removed_chars_gb_codon3
16	TIM2e+I+G4	nad1_NT_removed_chars_gb_codon1
17	GTR+F+I+G4	nad1_NT_removed_chars_gb_codon2
18	TIM3+F+ASC+G4	nad1_NT_removed_chars_gb_codon3
19	TIM2+F+I+G4	nad2_NT_removed_chars_gb_codon1
20	GTR+F+I+G4	nad2_NT_removed_chars_gb_codon2
21	TIM2+F+I+G4	nad2_NT_removed_chars_gb_codon3
22	TIM2+F+I+G4	nad3_NT_removed_chars_gb_codon1
23	TVM+F+I+G4	nad3_NT_removed_chars_gb_codon2
24	GTR+F+I+G4	nad3_NT_removed_chars_gb_codon3
25	TIM2+F+I+G4	nad4L_NT_removed_chars_gb_codon1
26	TIM3+F+I+G4	nad4L_NT_removed_chars_gb_codon2
27	TIM3+F+I+G4	nad4L_NT_removed_chars_gb_codon3
28	TPM2u+F+I+G4	nad4_NT_removed_chars_gb_codon1
29	GTR+F+I+G4	nad4_NT_removed_chars_gb_codon2
30	TIM3+F+I+G4	nad4_NT_removed_chars_gb_codon3
31	TIM2+F+I+G4	nad5_NT_removed_chars_gb_codon1
32	GTR+F+I+G4	nad5_NT_removed_chars_gb_codon2
33	TIM3+F+ASC+G4	nad5_NT_removed_chars_gb_codon3
34	TPM2u+F+I+G4	nad6_NT_removed_chars_gb_codon1
35	GTR+F+I+G4	nad6_NT_removed_chars_gb_codon2
36	TIM2+F+ASC+G4	nad6_NT_removed_chars_gb_codon3
37	TIM2+F+I+G4	rrnL_mafft_gb
38	TIM2+F+G4	rrnS_mafft_gb