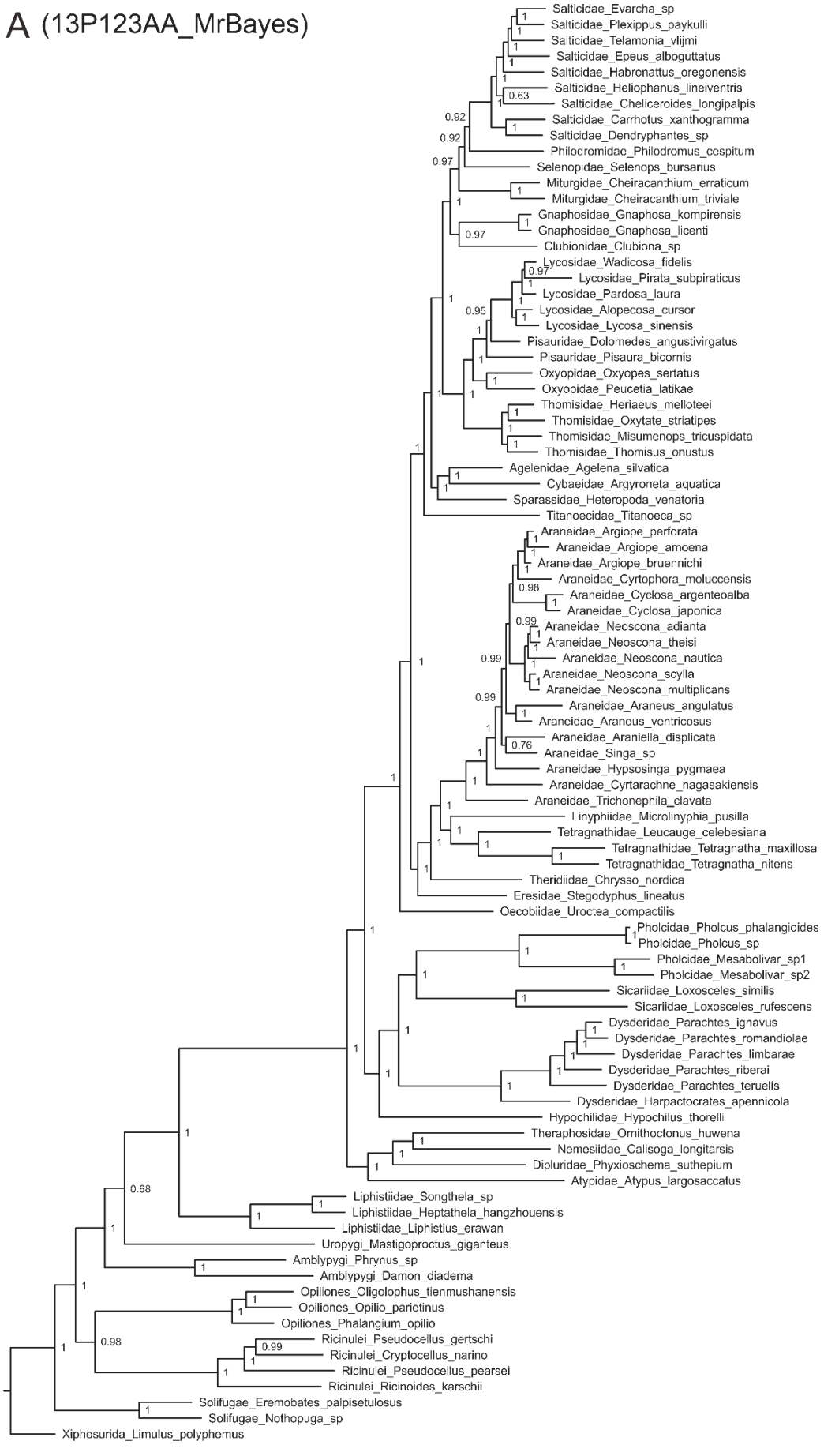
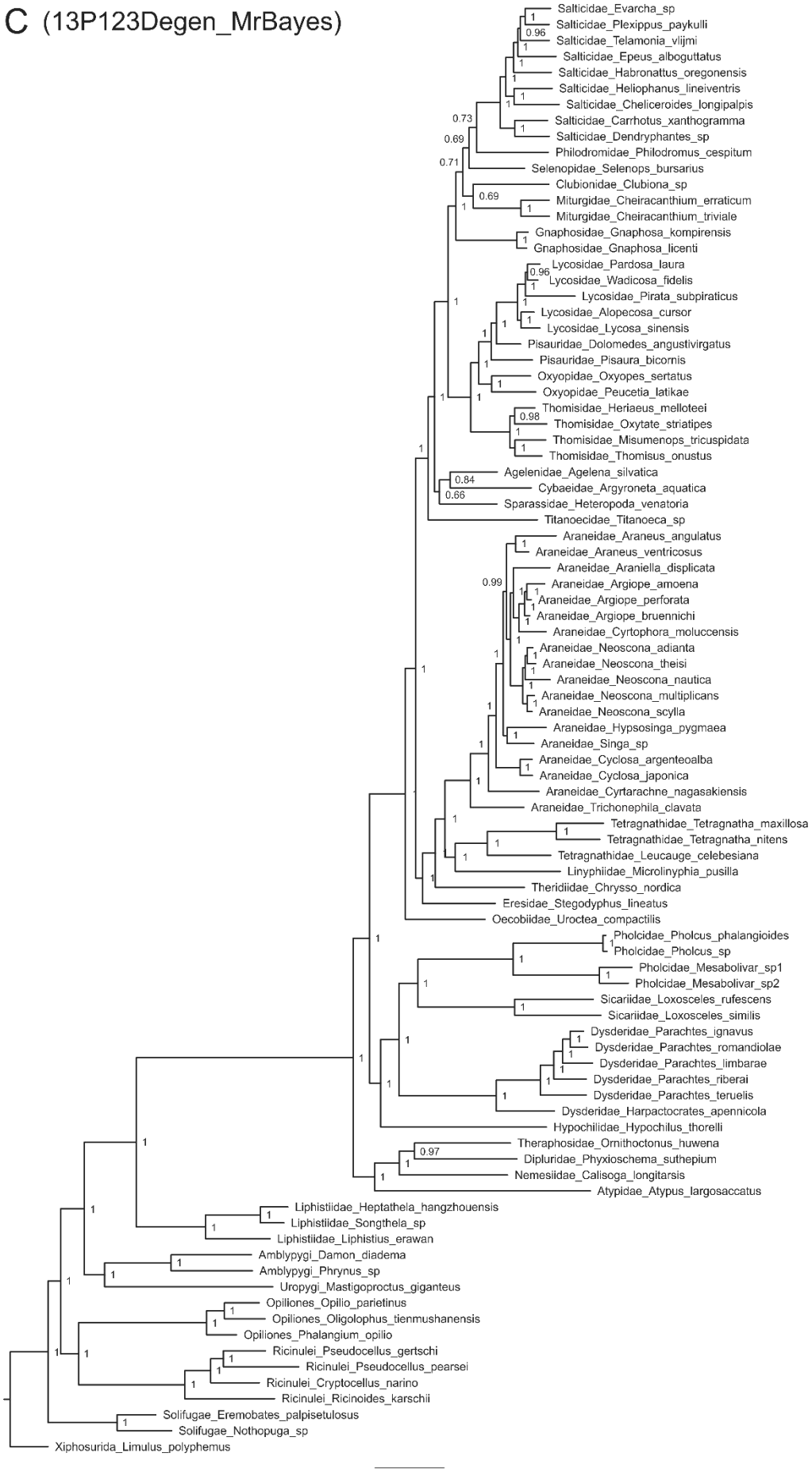
Supplementary Materials

A (13P123AA_MrBayes)



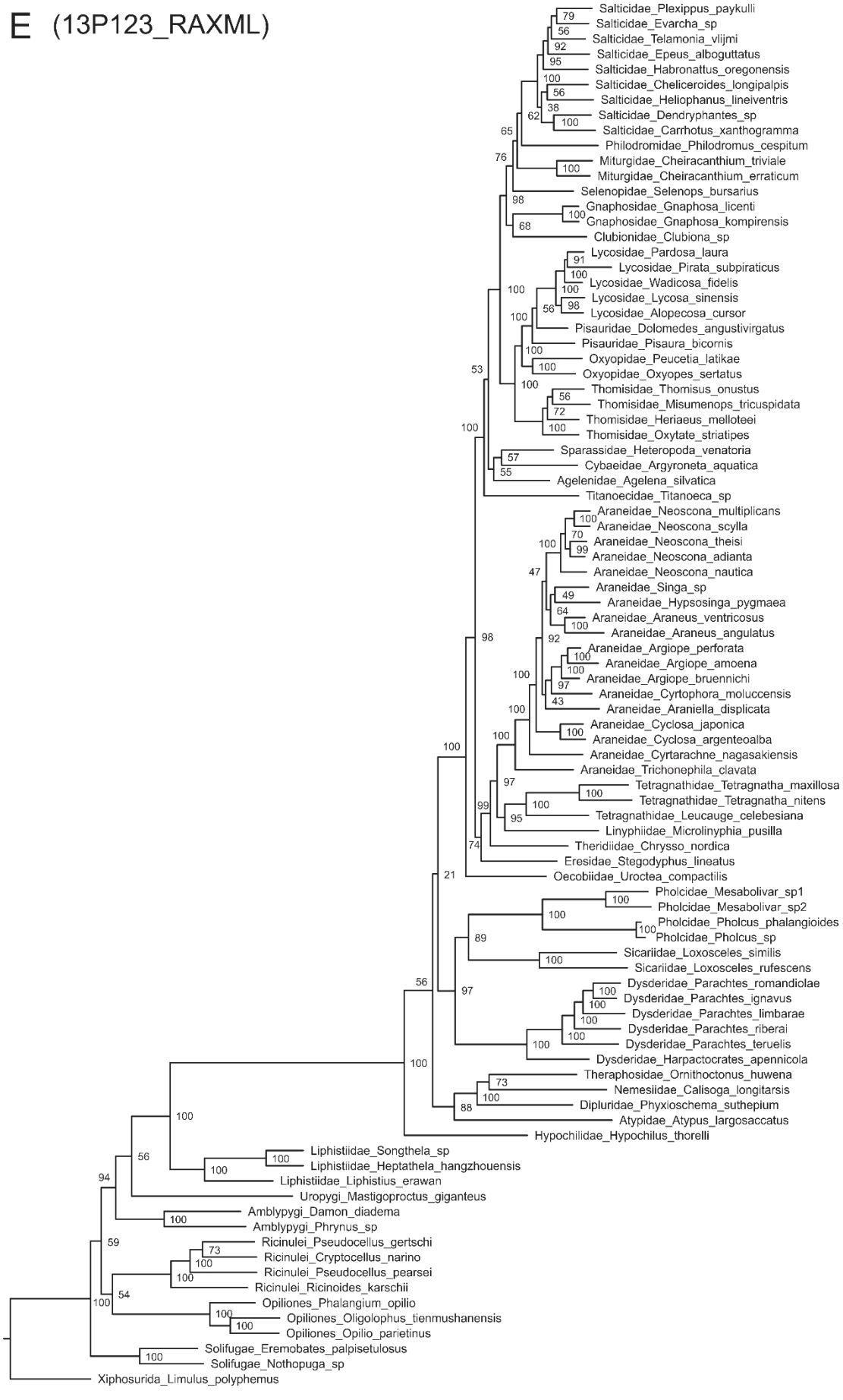
B (13P123_MrBayes)

C (13P123Degen_MrBayes)

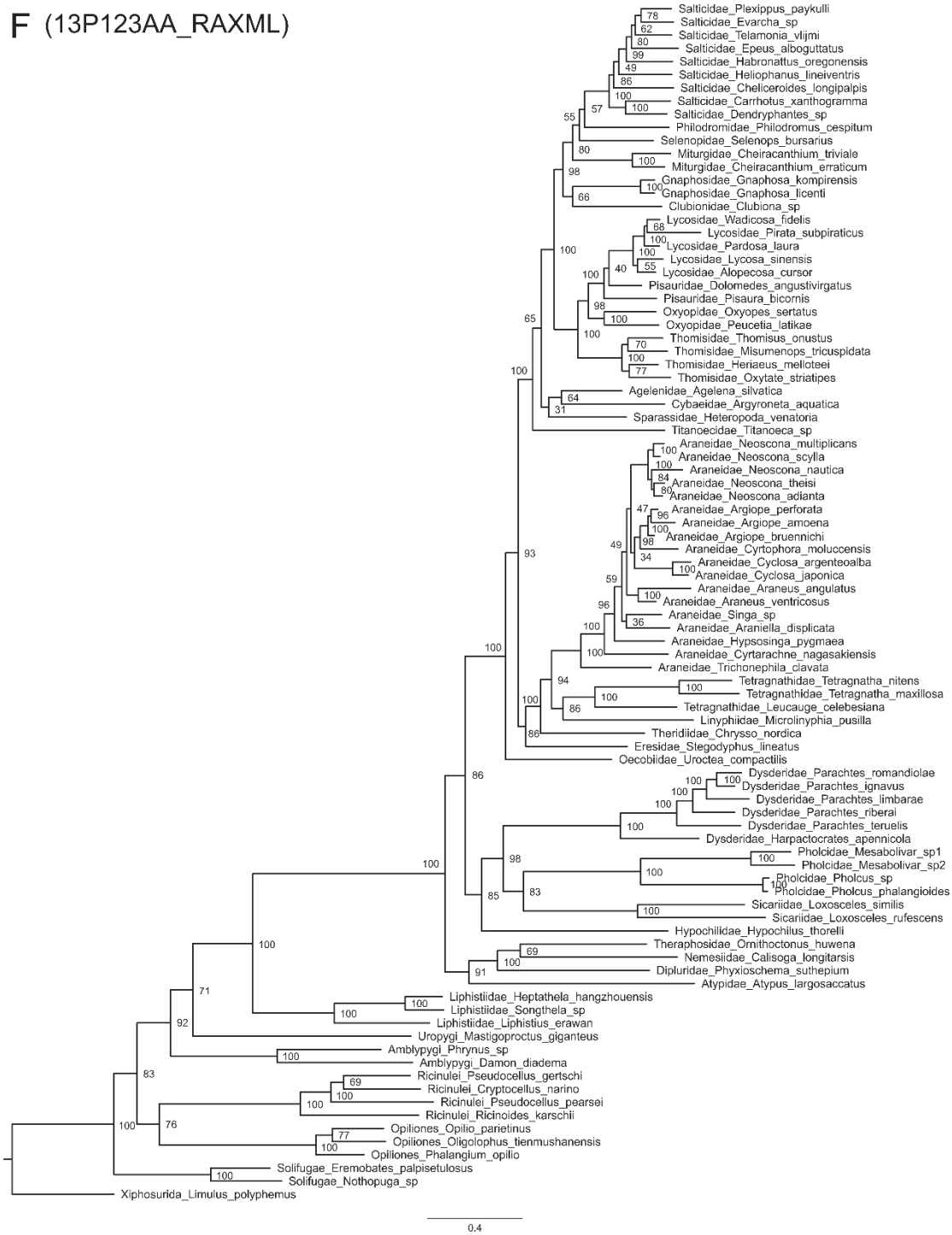


D (13P123RNA_MrBayes)

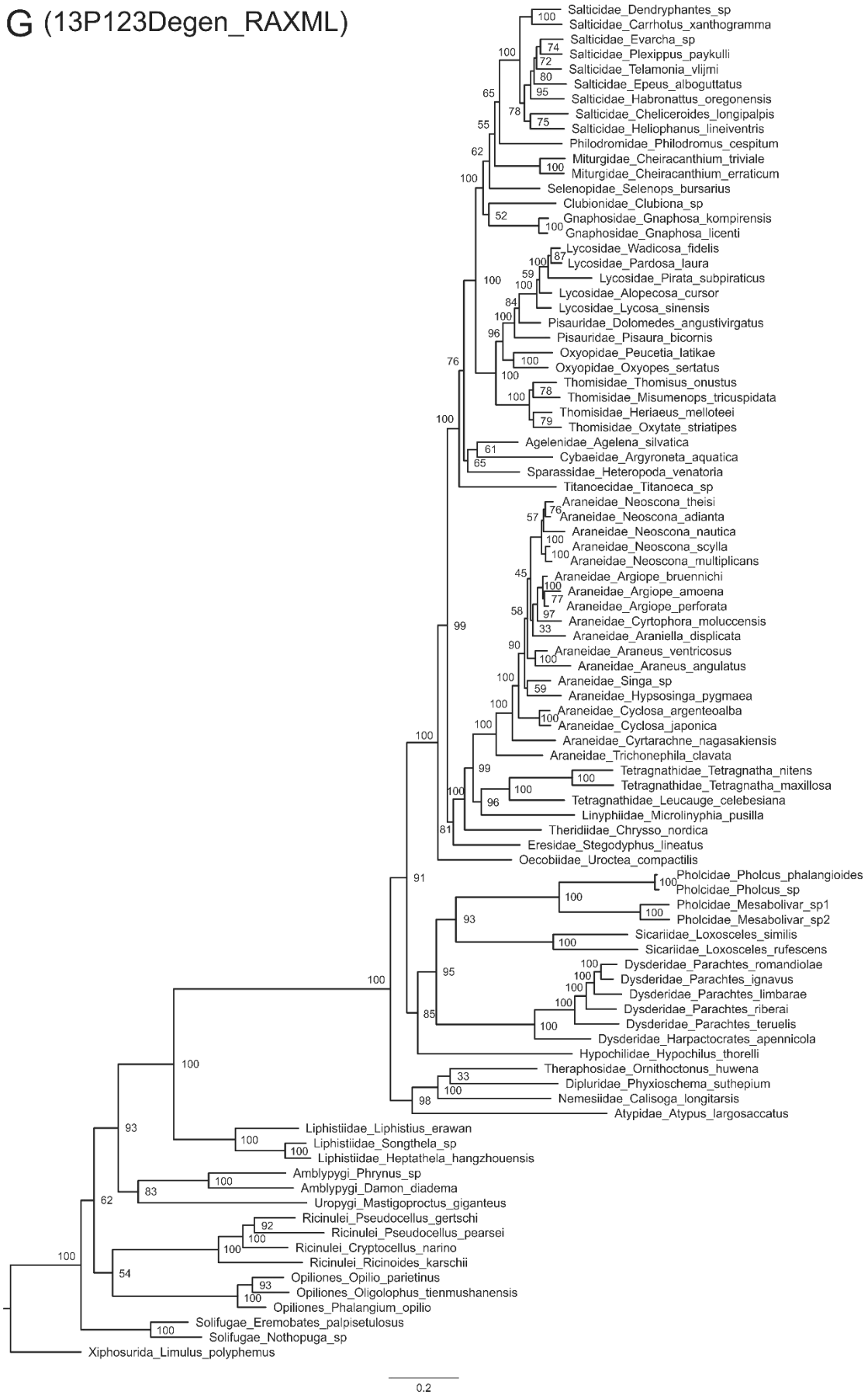
E (13P123_RAXML)



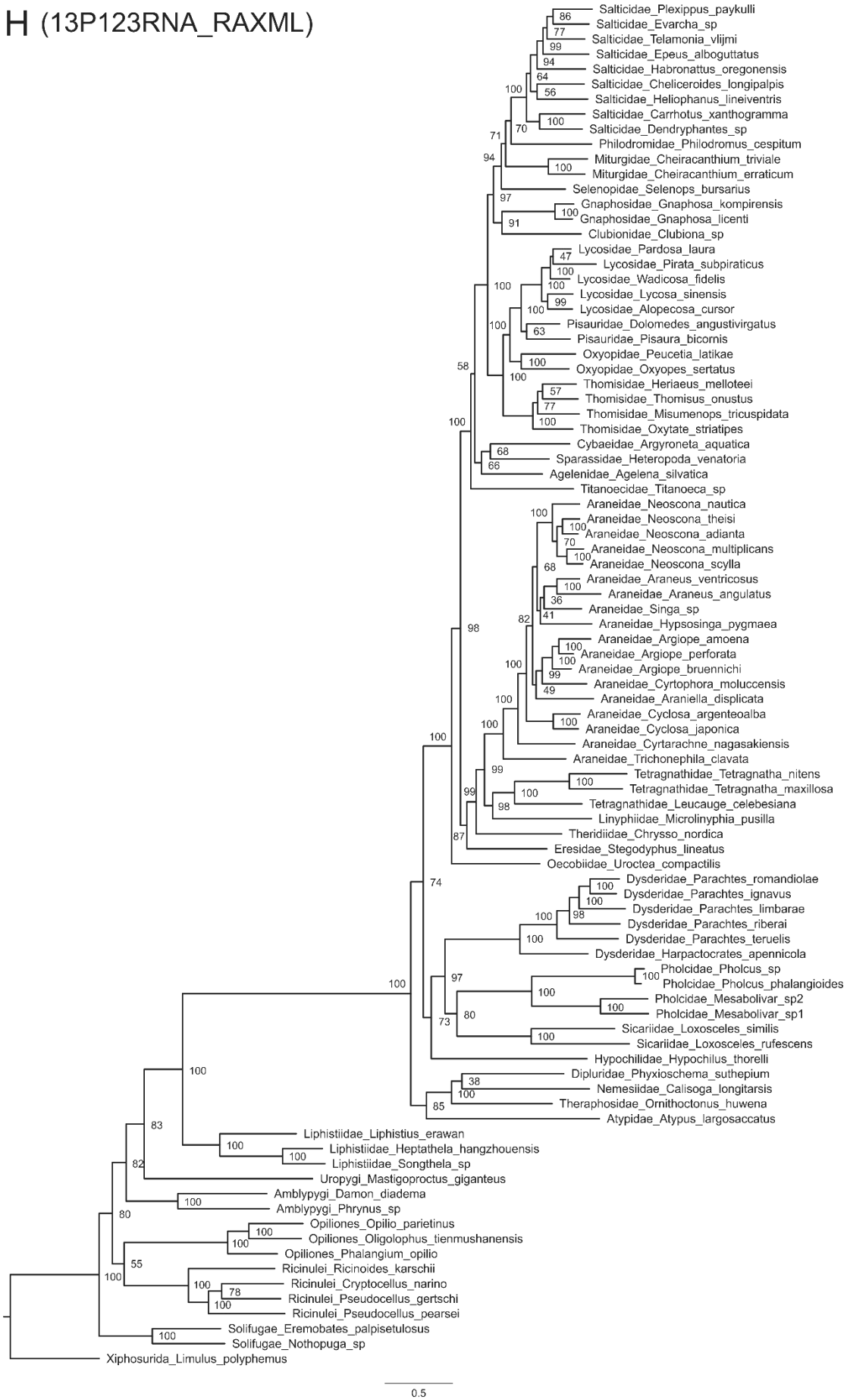
F (13P123AA_RAXML)



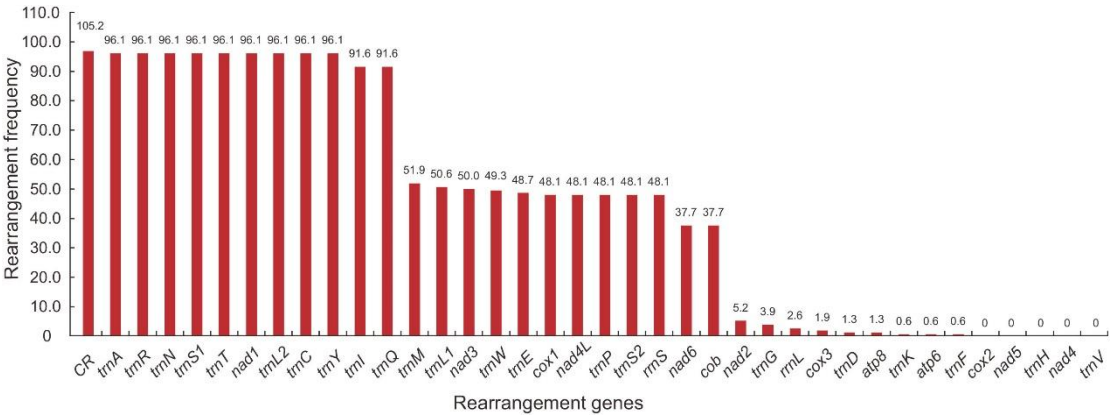
G (13P123Degen_RAXML)



H (13P123RNA_RAXML)



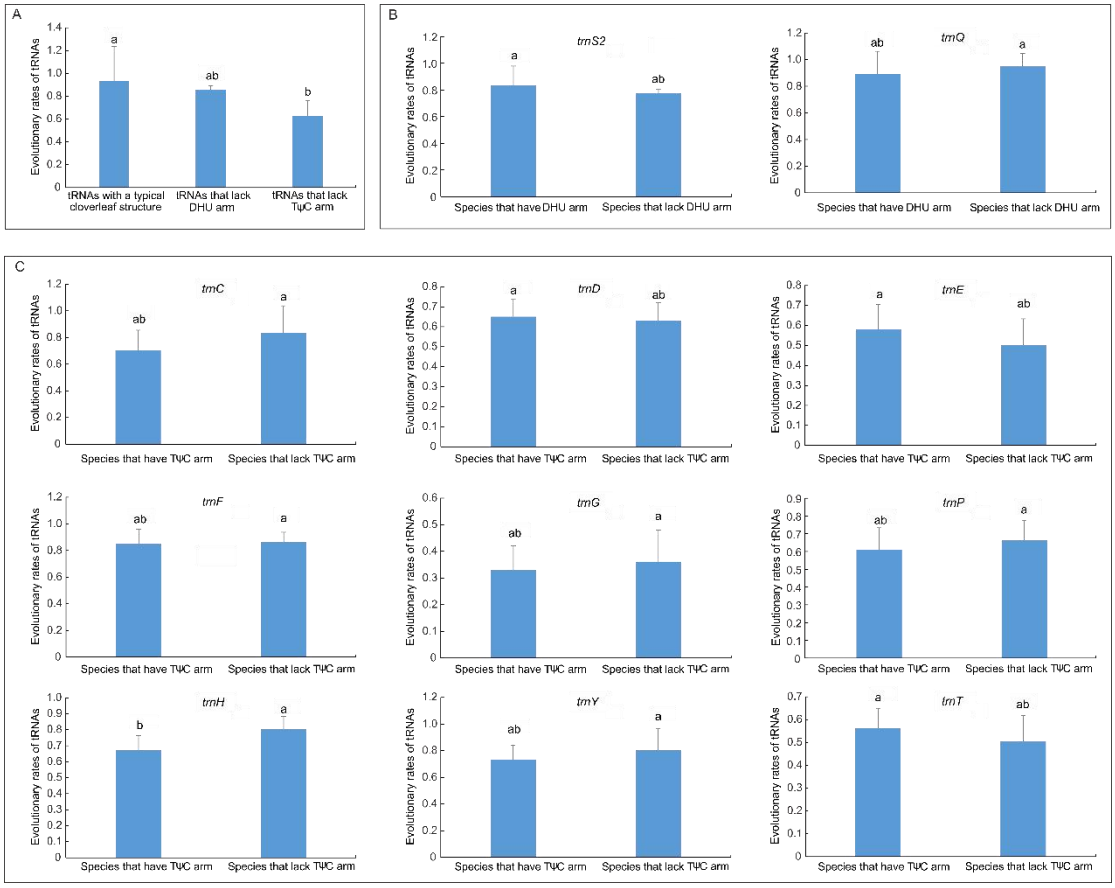
Supplementary Figure S1. Phylogenetic relationships among 29 families within Araneae obtained from two analytical methods (maximum-likelihood and Bayesian inference using RAxML and MrBayes, respectively) and four datasets (13P123, 13P123AA, 13P123Degen, and 13P123RNA).



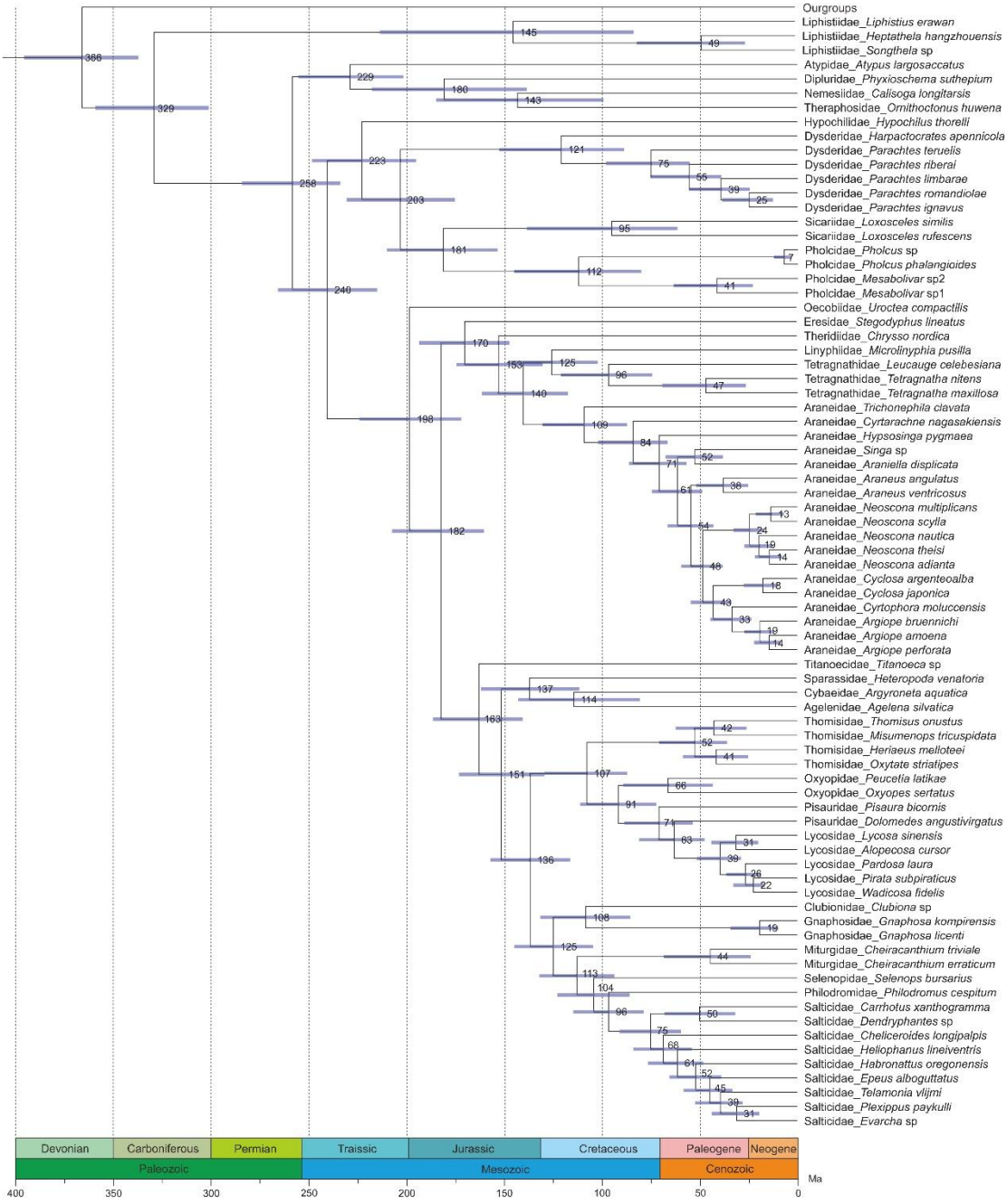
Supplementary Figure S2. Rearrangement scores of all 37 mitochondrial genes and control region in spider mitogenomes, using arrangement of *Limulus polyphemus* (Xiphosura: Limulidae) as a benchmark.

Supplementary Figure S3. Sequence alignments of 22 mitochondrial tRNA genes present in 77 species of 29 families within Araneae. Sequences of aminoacyl acceptor (AA) arm, anticodon arm, dihydrouridine DHU arm, and TΨC arm are marked with different colored backgrounds.

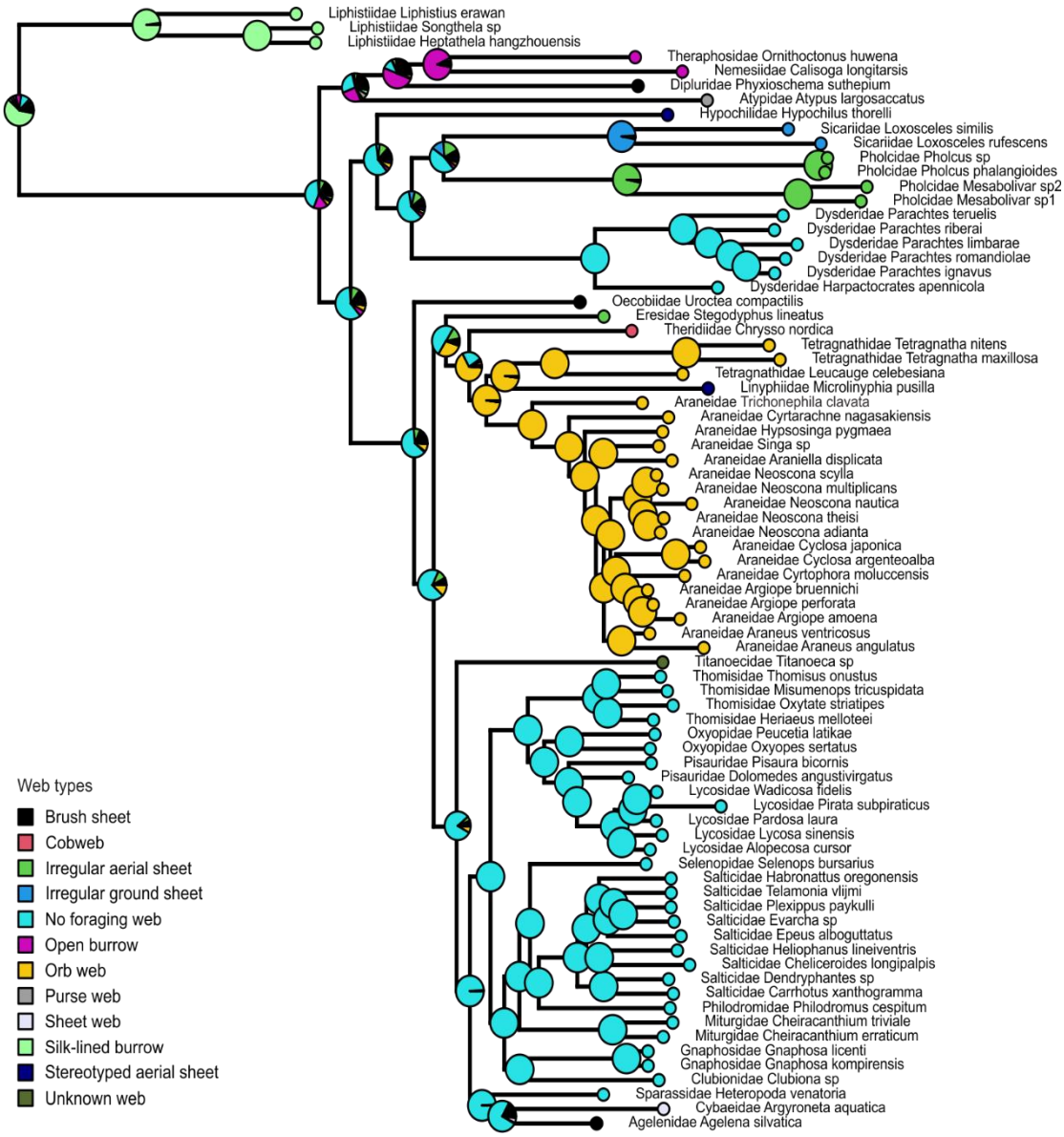
Supplementary Figure S3 is listed as a separate PDF file due to its large size.



Supplementary Figure S4. Analysis of differences in evolutionary rates of three types of tRNAs. Different lowercase letters within same column indicate significant differences between different types of tRNAs.



Supplementary Figure S5. Estimates of divergence times obtained by BEAST. Best tree topology was obtained from MrBayes analysis of the 13P123AA dataset using six fossil calibration points. Blue bars indicate 95% highest posterior densities (HPD) of divergence time estimates. Geological timescale is shown at the bottom.



Supplementary Figure S6. Original tree visualization of ancestral state reconstruction of web types of spiders using Phytools.

Supplementary Table S1. Sampling information of 23 spider species newly sequenced in this study.

Family	Species	Sampling site	Voucher specimen code	Coordinate	Identification
Araneidae	*Araniella displicata*	Lanzhou City, Gansu Province, China	YZAd	103°40′E, 36°03′N	By Min Li according to (Zhu & Zhang, 2011; Yin et al., 2012)
Araneidae	*Singa* sp	Lanzhou City, Gansu Province, China	YZS	103°40′E, 36°03′N	By Fang-Zhen Luo according to (Zhu & Zhang, 2011; Yin et al., 2012)
Atypidae	*Atypus largosaccatus*	Wuhan City, Hubei Province, China	AL	114°41′E, 30°52′N	By Min Li according to (Zhu & Zhang, 2011)
Clubionidae	*Clubiona* sp	Lanzhou City, Gansu Province, China	YZC	103°40′E, 36°03′N	By Fang-Zhen Luo according to (Zhu & Zhang, 2011; Yin et al., 2012)
Eresidae	*Stegodyphus lineatus*	Ganzhou City, Jiangxi Province, China	SL	114°94′E, 25°85′N	By Fang-Zhen Luo according to (Zhu & Zhang, 2011; Yin et al., 2012)
Gnaphosidae	*Gnaphosa kompirensis*	Qingyang City, Gansu Province, China	QYGk	107°88′E, 36°03′N	By Fang-Zhen Luo according to (Zhang et al., 2009)
Gnaphosidae	*Gnaphosa licenti*	Lanzhou City, Gansu Province, China	YZGl	103°40′E, 36°03′N	By Fang-Zhen Luo according to (Yin et al., 2012; Polchaninova, 2019)
Linyphiidae	*Microlinyphia pusilla*	Qingyang City, Gansu Province, China	QYMp	107°88′E, 36°03′N	By Fang-Zhen Luo according to (Zhu & Zhang, 2011; Yin et al., 2012)
Liphistiidae	*Songthela* sp	Hengyang City, Hunan Province, China	SS	112°61′E, 26°90′N	By Fang-Zhen Luo according to (Zhu & Zhang, 2011; Yin et al., 2012)
Lycosidae	*Lycosa sinensis*	Handan City, Hebei Province, China	LIsh	114°49′E, 36°61′N	By Min Li according to (Hu, 1983)
Lycosidae	*Alopecosa cursor*	Qingyang City, Gansu Province, China	QYAc-58	107°88′E, 36°03′N	By Min Li according to (Zhu & Zhang, 2011; Yin et al., 2012)

Family	Species	Sampling site	Voucher specimen code	Coordinate	Identification
Miturgidae	*Cheiracanthium erraticum*	Lanzhou City, Gansu Province, China	YZMC-10	103°40′E, 36°03′N	By Fang-Zhen Luo according to (Zhu & Zhang, 2011; Lissner et al., 2016)
Oxyopidae	*Peucetia latikae*	Hengyang City, Hunan Province, China	PL	112°61′E, 26°90′N	By Fang-Zhen Luo according to (Zhu & Zhang, 2011; Yin et al., 2012)
Philodromidae	*Philodromus cespitum*	Lanzhou City, Gansu Province, China	Pces	103°40′E, 36°03′N	By Min Li according to (Yin et al., 2012; Zhang & Wang, 2017)
Salticidae	*Dendryphantes* sp	Lanzhou City, Gansu Province, China	YZD	103°40′E, 36°03′N	By Fang-Zhen Luo according to (Zhu & Zhang, 2011; Yin et al., 2012)
Salticidae	*Evarcha* sp	Lanzhou City, Gansu Province, China	YZE	103°40′E, 36°03′N	By Fang-Zhen Luo according to (Zhu & Zhang, 2011; Yin et al., 2012)
Salticidae	*Heliophanus lineiventris*	Lanzhou City, Gansu Province, China	YZHL	103°40′E, 36°03′N	By Fang-Zhen Luo according to (Sacher & Metzner, 2013)
Sparassidae	*Heteropoda venatoria*	Wuhan City, Hubei Province, China	HV	114°41′E, 30°52′N	By Min Li according to (Zhu & Zhang, 2011; Yin et al., 2012)
Theridiidae	*Chrysso nordica*	Lanzhou City, Gansu Province, China	YZCn	103°40′E, 36°03′N	By Fang-Zhen Luo according to (Zhu & Zhang, 2011; Yin et al., 2012)
Thomisidae	*Heriaeus melloteei*	Lanzhou City, Gansu Province, China	YZHm	103°40′E, 36°03′N	By Min Li according to (Zhu & Zhang, 2011; Yin et al., 2012)
Thomisidae	*Misumenops tricuspidata*	Lanzhou City, Gansu Province, China	YZMt	103°40′E, 36°03′N	By Fang-Zhen Luo according to (Song DX et al., 2001; Zhu & Zhang, 2011)
Thomisidae	*Thomisus onustus*	Lanzhou City, Gansu Province, China	YZTo	103°40′E, 36°03′N	By Min Li according to (Song DX et al., 2001; Zhu & Zhang, 2011)
Titanoecidae	*Titanoeca* sp	Yushu City, Qinhai Province, China	LQHT	96°60′E, 33°20′N	By Fang-Zhen Luo according to (Yin et al., 2012; Zhang & Wang, 2017)

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Supplementary Table S2. Characteristics of mitogenomes of 78 spider species used in this study. Newly sequenced species are highlighted with an asterisk.

Suborder	Infraorder	Family	Species	GenBank accession numbers	Genome Size (bp)	Gene number	A+T%	AT-skew	GC-skew
Mesothelae	-	Liphistiidae	*Liphistius erawan*	NC_020323	14197	37	67.72	0.024	-0.361
Mesothelae	-	Liphistiidae	*Heptathela hangzhouensis*	NC_010780	14215	37	72.22	-0.023	-0.235
Mesothelae	-	Liphistiidae	*Songthela* sp*	MW822557	14222	37	74.03	-0.027	-0.250
Opisthothelae	Mygalomorphae	Atypidae	*Atypus largosaccatus**	MW832848	13211	30	75.34	-0.046	0.306
Opisthothelae	Mygalomorphae	Dipluridae	*Phyxioschema suthepium*	NC_020322	13931	37	67.40	-0.040	0.472
Opisthothelae	Mygalomorphae	Nemesiidae	*Calisoga longitarsis*	EU523754	14070	37	63.96	-0.146	0.365
Opisthothelae	Mygalomorphae	Theraphosidae	*Ornithoctonus huwena*	NC_005925	13874	37	69.80	-0.083	0.344
Opisthothelae	Araneomorphae	Agelenidae	*Agelena silvatica*	NC_033971	14776	37	74.46	-0.163	0.302
Opisthothelae	Araneomorphae	Araneidae	*Araneus angulatus*	NC_032402	14099	37	75.14	-0.059	0.246
Opisthothelae	Araneomorphae	Araneidae	*Araneus ventricosus*	NC_025634	14617	37	73.38	-0.048	0.243
Opisthothelae	Araneomorphae	Araneidae	*Araniella displicata**	MW822556	13801	37	70.59	-0.055	0.174
Opisthothelae	Araneomorphae	Araneidae	*Argiope amoena*	NC_024282	14121	37	72.12	-0.060	0.241
Opisthothelae	Araneomorphae	Araneidae	*Argiope bruennichi*	NC_024281	14063	37	73.43	-0.035	0.263
Opisthothelae	Araneomorphae	Araneidae	*Argiope perforata*	NC_044695	14032	37	74.19	-0.049	0.252
Opisthothelae	Araneomorphae	Araneidae	*Cyclosa argenteoalba*	NC_027682	14575	37	73.71	-0.015	0.171
Opisthothelae	Araneomorphae	Araneidae	*Cyclosa japonica*	NC_044696	14724	37	63.96	-0.024	0.196
Opisthothelae	Araneomorphae	Araneidae	*Cyrtarachne nagasakiensis*	NC_028077	14402	37	75.70	-0.036	0.211
Opisthothelae	Araneomorphae	Araneidae	*Cyrtophora moluccensis*	KM820884	14344	37	73.70	0.007	0.205
Opisthothelae	Araneomorphae	Araneidae	*Hypsosinga pygmaea*	NC_028078	14193	37	76.10	-0.061	0.232
Opisthothelae	Araneomorphae	Araneidae	*Neoscona adianta*	NC_029756	14161	37	74.58	-0.051	0.244
Opisthothelae	Araneomorphae	Araneidae	*Neoscona multiplicans*	NC_044653	14098	37	74.82	-0.053	0.243
Opisthothelae	Araneomorphae	Araneidae	*Neoscona nautica*	NC_029755	14049	37	78.77	-0.035	0.182
Opisthothelae	Araneomorphae	Araneidae	*Neoscona scylla*	NC044101	14092	37	74.63	-0.055	0.226
Opisthothelae	Araneomorphae	Araneidae	*Neoscona theisi*	NC_026290	14156	37	75.16	-0.059	0.252

Suborder	Infraorder	Family	Species	GenBank accession numbers	Genome Size (bp)	Gene number	A+T%	AT-skew	GC-skew
Opisthothelae	Araneomorphae	Araneidae	*Singa* sp*	MW832857	14015	37	76.98	-0.030	0.209
Opisthothelae	Araneomorphae	Araneidae	*Trichonephila clavata*	NC_008063	14436	37	76.03	-0.053	0.242
Opisthothelae	Araneomorphae	Clubionidae	*Clubiona* sp*	MW832856	14197	37	77.74	-0.124	0.219
Opisthothelae	Araneomorphae	Cybaeidae	*Argyroneta aquatica*	NC_026863	16000	37	72.21	-0.134	0.368
Opisthothelae	Araneomorphae	Dysderidae	*Harpactocrates apennicola*	NC_044081	14213	37	71.83	-0.134	0.339
Opisthothelae	Araneomorphae	Dysderidae	*Parachtes ignavus*	MN052920	14667	37	70.55	-0.160	0.392
Opisthothelae	Araneomorphae	Dysderidae	*Parachtes limbarae*	MN052922	14111	37	70.64	-0.147	0.377
Opisthothelae	Araneomorphae	Dysderidae	*Parachtes riberai*	MN052919	14632	37	71.46	-0.123	0.344
Opisthothelae	Araneomorphae	Dysderidae	*Parachtes romandiolae*	NC_044099	14220	37	71.39	-0.143	0.381
Opisthothelae	Araneomorphae	Dysderidae	*Parachtes teruelis*	MN052921	13850	37	70.83	-0.146	0.345
Opisthothelae	Araneomorphae	Eresidae	*Stegodyphus lineatus**	MW832854	14310	37	73.25	-0.048	0.368
Opisthothelae	Araneomorphae	Gnaphosidae	*Gnaphosa licenti**	MW776432	14199	37	75.24	-0.115	0.347
Opisthothelae	Araneomorphae	Gnaphosidae	*Gnaphosa kompirensis**	MW776433	14723	37	76.27	-0.099	0.317
Opisthothelae	Araneomorphae	Hypochilidae	*Hypochilus thorelli*	NC_010777	13991	37	70.34	-0.140	0.266
Opisthothelae	Araneomorphae	Linyphiidae	*Microlinyphia pusilla**	MW776436	14103	37	75.36	-0.112	0.189
Opisthothelae	Araneomorphae	Lycosidae	*Alopecosa cursor**	MW776435	15017	37	74.10	-0.156	0.318
Opisthothelae	Araneomorphae	Lycosidae	*Lycosa sinensis**	MW776434	14339	37	79.29	-0.103	0.220
Opisthothelae	Araneomorphae	Lycosidae	*Pardosa laura*	NC_025223	14513	37	77.42	-0.109	0.285
Opisthothelae	Araneomorphae	Lycosidae	*Pirata subpiraticus*	NC_025523	14528	36	75.63	-0.111	0.295
Opisthothelae	Araneomorphae	Lycosidae	*Wadicosa fidelis*	NC_026123	14741	37	76.03	-0.130	0.312
Opisthothelae	Araneomorphae	Miturgidae	*Cheiracanthium erraticum**	MW832845	14573	37	77.16	-0.111	0.222
Opisthothelae	Araneomorphae	Miturgidae	*Cheiracanthium triviale*	MN334527	14595	37	77.93	-0.109	0.193
Opisthothelae	Araneomorphae	Oecobiidae	*Uroctea compactilis*	MH752074	14484	37	71.64	-0.141	0.309
Opisthothelae	Araneomorphae	Oxyopidae	*Oxyopes sertatus*	NC_025224	14443	37	75.94	-0.130	0.321
Opisthothelae	Araneomorphae	Oxyopidae	*Peucetia latikae**	MW832846	14566	37	75.24	-0.136	0.313
Opisthothelae	Araneomorphae	Philodromidae	*Philodromus cespitum**	MW776438	14663	37	78.49	-0.081	0.148
Opisthothelae	Araneomorphae	Pholcidae	*Mesabolivar* sp1	NC_040859	14941	37	70.59	-0.209	0.366

Suborder	Infraorder	Family	Species	GenBank accession numbers	Genome Size (bp)	Gene number	A+T%	AT-skew	GC-skew
Opisthothelae	Araneomorphae	Pholcidae	*Mesabolivar* sp2	NC_040860	14845	37	68.32	-0.212	0.360
Opisthothelae	Araneomorphae	Pholcidae	*Pholcus phalangioides*	NC_020324	14459	37	65.86	-0.191	0.371
Opisthothelae	Araneomorphae	Pholcidae	*Pholcus* sp	KJ782458	14280	37	65.78	-0.188	0.372
Opisthothelae	Araneomorphae	Pisauridae	*Dolomedes angustivirgatus*	NC_031355	14783	37	76.78	-0.120	0.264
Opisthothelae	Araneomorphae	Pisauridae	*Pisaura bicornis*	MN296112	15282	37	78.41	-0.091	0.248
Opisthothelae	Araneomorphae	Salticidae	*Carrhotus xanthogramma*	NC_027492	14564	37	75.05	-0.089	0.260
Opisthothelae	Araneomorphae	Salticidae	*Cheliceroides longipalpis*	NC_041128	14335	37	79.04	-0.075	0.232
Opisthothelae	Araneomorphae	Salticidae	*Dendryphantes* sp*	MW832855	14336	37	78.65	-0.093	0.189
Opisthothelae	Araneomorphae	Salticidae	*Epeus alboguttatus*	NC_042829	14625	37	77.59	-0.052	0.239
Opisthothelae	Araneomorphae	Salticidae	*Evarcha* sp*	MW832847	14331	37	75.81	-0.083	0.263
Opisthothelae	Araneomorphae	Salticidae	*Habronattus oregonensis*	NC_005942	14381	37	74.38	-0.112	0.301
Opisthothelae	Araneomorphae	Salticidae	*Heliophanus lineiventris**	MW832849	14651	37	75.67	-0.110	0.270
Opisthothelae	Araneomorphae	Salticidae	*Plexippus paykulli*	NC_024877	14316	37	73.49	-0.105	0.318
Opisthothelae	Araneomorphae	Salticidae	*Telamonia vlijmi*	NC_024287	14601	37	77.30	-0.081	0.235
Opisthothelae	Araneomorphae	Selenopidae	*Selenops bursarius*	NC_024878	14272	37	74.40	-0.123	0.321
Opisthothelae	Araneomorphae	Sicariidae	*Loxosceles rufescens*	MK257773	15210	37	63.80	-0.145	0.413
Opisthothelae	Araneomorphae	Sicariidae	*Loxosceles similis*	NC_042902	14683	37	72.78	-0.160	0.332
Opisthothelae	Araneomorphae	Sparassidae	*Heteropoda venatoria**	MW832853	14356	37	72.53	-0.155	0.368
Opisthothelae	Araneomorphae	Tetragnathidae	*Leucauge celebesiana*	MN692353	13901	37	76.76	-0.119	0.241
Opisthothelae	Araneomorphae	Tetragnathidae	*Tetragnatha maxillosa*	NC_025775	14578	37	74.51	-0.087	0.247
Opisthothelae	Araneomorphae	Tetragnathidae	*Tetragnatha nitens*	NC_028068	14639	37	74.27	-0.055	0.200
Opisthothelae	Araneomorphae	Theridiidae	*Chrysso nordica**	MW776437	14378	37	77.26	-0.055	0.273
Opisthothelae	Araneomorphae	Thomisidae	*Heriaeus melloteei**	MW832850	14502	37	76.21	-0.107	0.262
Opisthothelae	Araneomorphae	Thomisidae	*Misumenops tricuspidata**	MW832851	14532	37	76.76	-0.104	0.209
Opisthothelae	Araneomorphae	Thomisidae	*Oxytate striatipes*	NC_025557	14407	37	78.21	-0.084	0.212
Opisthothelae	Araneomorphae	Thomisidae	*Thomisus onustus**	MW832852	14484	37	77.26	-0.081	0.256
Opisthothelae	Araneomorphae	Titanoecidae	*Titanoeca* sp*	MW832858	14858	37	74.38	-0.199	0.369

Supplementary Table S3. Saturation test for 13 PCG sequences, concentrations of 13 PCGs and two rRNAs, and three positions of 13 PCGs, as implemented in DAMBE.

Datasets		NumOTU-4			NumOTU-8			NumOTU-16			NumOTU-32		
	Size	Iss	Iss.c	*P*	Iss	Iss.c	*P*	Iss	Iss.c	*P*	Iss	Iss.c	*P*
13P123RNA_Araneae	11856	0.520	0.858	0.0000	0.516	0.845	0.0000	0.510	0.851	0.0000	0.531	0.818	0.0000
13P123Degen_Araneae	10413	0.702	0.857	0.0000	0.614	0.845	0.0000	0.589	0.849	0.0000	0.580	0.817	0.0000
13P123_Araneae	10413	0.499	0.857	0.0000	0.521	0.845	0.0000	0.516	0.849	0.0000	0.521	0.817	0.0000
Position 1st	3471	0.459	0.849	0.0000	0.476	0.840	0.0000	0.481	0.826	0.0000	0.487	0.808	0.0000
Position 2nd	3471	0.326	0.849	0.0000	0.320	0.840	0.0000	0.317	0.826	0.0000	0.329	0.808	0.0000
Position 3rd	3471	0.813	0.849	0.0000	0.808	0.840	0.0001	0.816	0.826	0.1986	0.820	0.808	0.0895

Supplementary Table S4. Best partitioning schemes and substitution models selected by PartitionFinder for four datasets.

Dataset	Subset	Best-fit scheme	Model
13P123	P1	*nad2*_pos1, *nad3*_pos1, *atp6*_pos1, *atp8*_pos1, *nad6*_pos1, *cox1*_pos1, *cox2*_pos1, *cob*_pos1, *cox3*_pos1	GTR+I+G
	P2	*nad5*_pos2, *nad4*_pos2, *nad4L*_pos2, *nad1*_pos2, *nad2*_pos2, *atp8*_pos2, *nad3*_pos2, *nad6*_pos2, *cox1*_pos2, *atp6*_pos2, *cob*_pos2, *cox2*_pos2, *cox3*_pos2	GTR+I+G
	P3	*cox1*_pos3, *nad2*_pos3, *cox2*_pos3, *nad3*_pos3, *nad6*_pos3, *atp8*_pos3, *cob*_pos3, *cox3*_pos3, *atp6*_pos3	GTR+I+G
	P4	*nad4L*_pos1, *nad1*_pos1, *nad5*_pos1, *nad4*_pos1	GTR+I+G
	P5	*nad1*_pos3, *nad5*_pos3, *nad4*_pos3, *nad4L*_pos3	GTR+G
13P123Degen	P1	*cox1*_pos1, *cox3*_pos1, *cox2*_pos1, *cob*_pos1, *nad2*_pos1, *atp6*_pos1, *nad3*_pos1, *atp8*_pos1, *nad6*_pos1	GTR+I+G
	P2	*nad5*_pos2, *nad4*_pos2, *nad4L*_pos2, *nad1*_pos2, *nad2*_pos2, *nad6*_pos2, *nad3*_pos2, *atp8*_pos2, *atp8*_pos3, *cox1*_pos2, *atp6*_pos2, *cox2*_pos2, *cox3*_pos2, *cob*_pos2	GTR+I+G
	P3	*nad1*_pos3, *cob*_pos3, *cox2*_pos3, *cox1*_pos3, *atp6*_pos3, *cox3*_pos3, *nad2*_pos3, *nad3*_pos3, *nad6*_pos3, *nad5*_pos3, *nad4L*_pos3, *nad4*_pos3	GTR+G
	P4	*nad4L*_pos1, *nad1*_pos1, *nad5*_pos1, *nad4*_pos1	GTR+I+G
13P123RNA	P1	*nad2*_pos1, *nad3*_pos1, *atp6*_pos1, *atp8*_pos1, *nad6*_pos1, *cox1*_pos1, *cox2*_pos1, *cox3*_pos1, *cob*_pos1	GTR+I+G
	P2	*nad4*_pos2, *nad5*_pos2, *nad2*_pos2, *atp8*_pos2, *nad3*_pos2, *nad6*_pos2, *cox1*_pos2, *nad4L*_pos2, *nad1*_pos2, *atp6*_pos2, *cox3*_pos2, *cox2*_pos2, *cob*_pos2	GTR+I+G
	P3	*nad3*_pos3, *nad6*_pos3, *atp8*_pos3, *cob*_pos3, *cox3*_pos3, *atp6*_pos3, *cox1*_pos3, *nad2*_pos3, *cox2*_pos3	GTR+I+G
	P4	*rrnL*, *rrnS*, *nad5*_pos1, *nad4*_pos1, *nad4L*_pos1, *nad1*_pos1	GTR+I+G
	P5	*nad1*_pos3, *nad5*_pos3, *nad4*_pos3, *nad4L*_pos3	GTR+G
13P123AA	P1	*atp6*, *atp8*, *cob*, *cox1*, *cox2*, *cox3*, *nad1*, *nad2*, *nad3*, *nad4*, *nad4L*, *nad5*, *nad6*	MTREV+I+G

Supplementary Table S5. Eighteen tRNAs of 14 spider species incorrectly annotated in GenBank.

Family	Species	tRNA	Mistakes
Agelenidae	*Agelena silvatica*	*trnI*	The gene direction was wrong.
Agelenidae	*Agelena silvatica*	*trnV*	The anticodon was wrong.
Araneidae	*Argiope bruennichi*	*trnM*	The gene was missing.
Araneidae	*Argiope amoena*	*trnM*	The gene was missing.
Araneidae	*Cyrtophora moluccensis*	*trnD*	The gene was missing.
Araneidae	*Cyrtophora moluccensis*	*trnC*	The gene was missing.
Araneidae	*Trichonephila clavata*	*trnM*	The anticodon was wrong.
Cybaeidae	*Argyroneta aquatica*	*trnN*	The gene direction was wrong.
Pholcidae	*Mesabolivar* sp2	*trnS2*	The anticodon was wrong.
Salticidae	*Carrhotus xanthogramma*	*trnW*	The anticodon was wrong.
Sicariidae	*Loxosceles similis*	*trnA*	The anticodon was wrong.
Tetragnathidae	*Tetragnatha nitens*	*trnY*	The gene direction was wrong.
Tetragnathidae	*Leucauge celebesiana*	*trnH*	The gene was missing.
Tetragnathidae	*Leucauge celebesiana*	*trnW*	The anticodon was wrong.
Tetragnathidae	*Tetragnatha maxillosa*	*trnV*	The anticodon was wrong.
Tetragnathidae	*Tetragnatha nitens*	*trnV*	The anticodon was wrong.
Thomisidae	*Oxytate striatipes*	*trnL1*	The anticodon was wrong.
Thomisidae	*Oxytate striatipes*	*trnW*	The anticodon was wrong.

Supplementary Table S6. Classification and score of web traits in spiders.

Family	Species	Web type	Refference
Liphistiidae	*Liphistius erawan*	silk-lined burrow	Fernandez et al., 2018; Shao & Li, 2018; Opatova et al., 2019
Liphistiidae	*Heptathela hangzhouensis*	silk-lined burrow	Fernandez et al., 2018; Shao & Li, 2018; Opatova et al., 2019
Liphistiidae	*Songthela* sp	silk-lined burrow	Fernandez et al., 2018; Shao & Li, 2018; Opatova et al., 2019
Titanoecidae	*Titanoeca* sp	unknown web	Zhang & Wang, 2017
Araneidae	*Araneus angulatus*	orb web	Blackledge et al., 2009; Dimitrov et al., 2012; Lawrence et al., 2017; Shao & Li, 2018
Araneidae	*Araneus ventricosus*	orb web	Blackledge et al., 2009; Dimitrov et al., 2012; Lawrence et al., 2017; Shao & Li, 2018
Araneidae	*Araniella displicata*	orb web	Lawrence et al., 2017; Fernandez et al., 2018; Shao & Li, 2018
Araneidae	*Argiope amoena*	orb web	Blackledge et al., 2009; Dimitrov et al., 2012; Lawrence et al., 2017; Shao & Li, 2018
Araneidae	*Argiope bruennichi*	orb web	Blackledge et al., 2009; Dimitrov et al., 2012; Lawrence et al., 2017; Shao & Li, 2018
Araneidae	*Argiope perforata*	orb web	Blackledge et al., 2009; Dimitrov et al., 2012; Lawrence et al., 2017; Shao & Li, 2018
Araneidae	*Cyclosa argenteoalba*	orb web	Dimitrov et al., 2012; Lawrence et al., 2017; Shao & Li, 2018; Kallal et al., 2020
Araneidae	*Cyclosa japonica*	orb web	Dimitrov et al., 2012; Lawrence et al., 2017; Shao & Li, 2018; Kallal et al., 2020
Araneidae	*Cyrtarachne nagasakiensis*	orb web	Lawrence et al., 2017; Shao & Li, 2018
Araneidae	*Cyrtophora moluccensis*	orb web	Blackledge et al., 2009; Dimitrov et al., 2012; Shao & Li, 2018; Lawrence et al., 2017; Fernandez et al., 2018
Araneidae	*Hypsosinga pygmaea*	orb web	Lawrence et al., 2017; Shao & Li, 2018
Araneidae	*Neoscona adianta*	orb web	Dimitrov et al., 2012; Lawrence et al., 2017; Fernandez et al., 2018; Shao & Li, 2018
Araneidae	*Neoscona multiplicans*	orb web	Lawrence et al., 2017; Alfaro et al., 2018; Fernandez et al., 2018; Shao & Li, 2018
Araneidae	*Neoscona nautica*	orb web	Dimitrov et al., 2012; Lawrence et al., 2017; Alfaro et al., 2018; Fernandez et al., 2018; Shao & Li, 2018
Araneidae	*Neoscona scylla*	orb web	Dimitrov et al., 2012; Lawrence et al., 2017; Shao & Li, 2018; Alfaro et al., 2018; Fernandez et al., 2018; Kallal et al., 2020
Araneidae	*Neoscona theisi*	orb web	Dimitrov et al., 2012; Lawrence et al., 2017; Shao & Li, 2018; Alfaro et al., 2018; Fernandez et al., 2018
Araneidae	*Trichonephila clavata*	orb web	Blackledge et al., 2009; Nentwig 2013; Shao & Li, 2018; Blackledge et al., 2009; Shao & Li, 2018
Araneidae	*Singa* sp	orb web	Lawrence et al., 2017; Shao & Li, 2018

Family	Species	Web type	Refference
Linyphiidae	*Microlinyphia pusilla*	Stereotyped aerial sheet	Dimitrov et al., 2012; Shao & Li, 2018
Tetragnathidae	*Leucauge celebesiana*	orb web	Blackledge et al., 2009; Lawrence et al., 2017; Fernandez et al., 2018; Shao & Li, 2018
Tetragnathidae	*Tetragnatha maxillosa*	orb web	Blackledge et al., 2009; Nentwig 2013; Lawrence et al., 2017; Shao & Li, 2018
Tetragnathidae	*Tetragnatha nitens*	orb web	Blackledge et al., 2009; Nentwig 2013; Lawrence et al., 2017; Shao & Li, 2018
Theridiidae	*Chrysso nordica*	cobweb	Dimitrov et al., 2012; Nentwig 2013; Shao & Li, 2018
Eresidae	*Stegodyphus lineatus*	irregular aerial sheet	Dimitrov et al., 2012; Fernandez et al., 2018; Kallal et al., 2020
Hypochilidae	*Hypochilus thorelli*	Stereotyped aerial sheet	Shao & Li, 2018; Kallal et al., 2020
Oecobiidae	*Uroctea compactilis*	brush sheet	Dimitrov et al., 2012; Fernandez et al., 2018; Shao & Li, 2018
Agelenidae	*Agelena silvatica*	brush sheet	Lawrence et al., 2017; Shao & Li, 2018
Clubionidae	*Clubiona* sp	No foraging web	Fernandez et al., 2018; Shao & Li, 2018; Kallal et al., 2020
Cybaeidae	*Argyroneta aquatica*	Sheet web	Alfaro et al., 2018
Gnaphosidae	*Gnaphosa licenti*	No foraging web	Fernandez et al., 2018; Shao & Li, 2018
Gnaphosidae	*Gnaphosa kompirensis*	No foraging web	Fernandez et al., 2018; Shao & Li, 2018
Lycosidae	*Alopecosa cursor*	No foraging web	Foelix, 2011; Fernandez et al., 2018; Shao & Li, 2018; Kallal et al., 2020
Lycosidae	*Lycosa sinensis*	No foraging web	Foelix, 2011; Shao & Li, 2018; Kallal et al., 2020
Lycosidae	*Pardosa laura*	No foraging web	Foelix, 2011; Shao & Li, 2018; Fernandez et al., 2018; Kallal et al., 2020
Lycosidae	*Pirata subpiraticus*	No foraging web	Foelix, 2011; Shao & Li, 2018; Fernandez et al., 2018
Lycosidae	*Wadicosa fidelis*	No foraging web	Foelix, 2011; Shao & Li, 2018
Miturgidae	*Cheiracanthium erraticum*	No foraging web	Dimitrov et al., 2012; Nentwig 2013; Shao & Li, 2018
Miturgidae	*Cheiracanthium triviale*	No foraging web	Dimitrov et al., 2012; Nentwig 2013; Shao & Li, 2018
Oxyopidae	*Oxyopes sertatus*	No foraging web	Foelix, 2011; Shao & Li, 2018; Kallal et al., 2020
Oxyopidae	*Peucetia latikae*	No foraging web	Blackledge et al., 2009; Foelix, 2011; Fernandez et al., 2018; Shao & Li, 2018; Kallal et al., 2020
Philodromidae	*Philodromus cespitum*	No foraging web	Fernandez et al., 2018; Shao & Li, 2018
Pisauridae	*Dolomedes angustivirgatus*	No foraging web	Blackledge et al., 2009; Foelix, 2011; Fernandez et al., 2018; Shao & Li, 2018
Pisauridae	*Pisaura bicornis*	No foraging web	Foelix, 2011; Shao & Li, 2018
Salticidae	*Carrhotus xanthogramma*	No foraging web	Lund, 2014; Fernandez et al., 2018; Shao & Li, 2018
Salticidae	*Cheliceroides longipalpis*	No foraging web	Lund 2014; Shao & Li, 2018
Salticidae	*Dendryphantes* sp	No foraging web	Lund, 2014; Shao & Li, 2018

Family	Species	Web type	Refference
Salticidae	*Epeus alboguttatus*	No foraging web	Lund, 2014; Shao & Li, 2018
Salticidae	*Evarcha* sp	No foraging web	Lund, 2014; Shao & Li, 2018
Salticidae	*Habronattus oregonensis*	No foraging web	Lund, 2014; Fernandez et al., 2018 ; Shao & Li, 2018; Kallal et al., 2020
Salticidae	*Heliophanus lineiventris*	No foraging web	Lund, 2014; Shao & Li, 2018
Salticidae	*Plexippus paykulli*	No foraging web	Lund, 2014; Fernandez et al., 2018; Shao & Li, 2018
Salticidae	*Telamonia vlijmi*	No foraging web	Lund, 2014; Shao & Li, 2018
Selenopidae	*Selenops bursarius*	No foraging web	Fernandez et al., 2018; Shao & Li, 2018
Sparassidae	*Heteropoda venatoria*	No foraging web	Fernandez et al., 2018; Shao & Li, 2018
Thomisidae	*Heriaeus melloteei*	No foraging web	Foelix 2011; Cheng and Piel 2018; Shao & Li, 2018
Thomisidae	*Misumenops tricuspidata*	No foraging web	Foelix, 2011; Cheng et al., 2018; Shao & Li, 2018
Thomisidae	*Oxytate striatipes*	No foraging web	Foelix, 2011; Cheng et al., 2018; Shao & Li, 2018
Thomisidae	*Thomisus onustus*	No foraging web	Cheng et al., 2018; Fernandez et al., 2018; Shao & Li, 2018; Kallal et al., 2020
Dysderidae	*Harpactocrates apennicola*	No foraging web	Fernandez et al., 2018; Shao & Li, 2018
Dysderidae	*Parachtes ignavus*	No foraging web	Fernandez et al., 2018; Shao & Li, 2018
Dysderidae	*Parachtes limbarae*	No foraging web	Fernandez et al., 2018; Shao & Li, 2018
Dysderidae	*Parachtes riberai*	No foraging web	Fernandez et al., 2018; Shao & Li, 2018
Dysderidae	*Parachtes romandiolae*	No foraging web	Fernandez et al., 2018; Shao & Li, 2018
Dysderidae	*Parachtes teruelis*	No foraging web	Fernandez et al., 2018; Shao & Li, 2018
Pholcidae	*Mesabolivar* sp1	irregular aerial sheet	Fernandez et al., 2018
Pholcidae	*Mesabolivar* sp2	irregular aerial sheet	Fernandez et al., 2018
Pholcidae	*Pholcus phalangioides*	irregular aerial sheet	Fernandez et al., 2018; Kallal et al., 2020
Pholcidae	*Pholcus* sp	irregular aerial sheet	Fernandez et al., 2018; Kallal et al., 2020
Sicariidae	*Loxosceles rufescens*	irregular ground sheet	Fernandez et al., 2018; Shao & Li, 2018; Kallal et al., 2020
Sicariidae	*Loxosceles similis*	irregular ground sheet	Fernandez et al., 2018; Shao & Li, 2018; Kallal et al., 2020
Atypidae	*Atypus largosaccatus*	purse web	Opatova et al., 2019
Dipluridae	*Phyxioschema suthepium*	brush sheet	Opatova et al., 2019; Shao & Li, 2018
Nemesiidae	*Calisoga longitarsis*	open burrow	Shao & Li, 2018; Opatova et al., 2019
Theraphosidae	*Ornithoctonus huwena*	open burrow	Shao & Li, 2018; Opatova et al., 2019

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Supplementary Table S7. Topology test results of seven phylogenies based on four datasets (13P123, 13P123AA, 13P123Degen, and 13P123RNA) and two analytical methods (maximum-likelihood and Bayesian inference using RAxML and MrBayes, respectively). Phylogeny 1 is summarized from Supplementary Figures S1A and S1F and phylogenies 2–7 are summarized from six other phylogenies shown in Supplementary Figure S1. Acronyms: logL (log-likelihood); deltaL (logL difference from maximal logl in the set; bp-RELL (bootstrap proportion using RELL method (Kishino et al., 1990); p-KH (*P*-value of one-sided Kishino-Hasegawa test) (Kishino & Hasegawa, 1989); p-SH (*P*-value of Shimodaira-Hasegawa test) (Shimodaira & Hasegawa, 1999); c-ELW (expected likelihood weight (Strimmer & Rambaut, 2002); and p-AU (*P*-value of approximately unbiased test) (Shimodaira, 2002).

Dataset	Tree	logL	deltaL	bp-RELL	p-KH	p-SH	c-ELW	p-AU
13P123Degen	Phylogeny 1	-536166	42.254	0.123	0.159	0.560	0.123	0.294
	Phylogeny 2	-536167	43.403	0.119	0.145	0.509	0.120	0.214
	Phylogeny 3	-536124	0	0.674	0.841	1.000	0.673	0.931
	Phylogeny 4	-536235	111.260	-0.011	-0.021	0.098	-0.011	-0.048
	Phylogeny 5	-536197	72.816	0.029	0.060	0.268	0.029	0.131
	Phylogeny 6	-536211	86.596	0.026	-0.033	0.230	0.026	0.057
	Phylogeny 7	-536225	101.110	-0.018	-0.039	0.154	-0.018	0.063
13P123RNA	Phylogeny 1	-651044	11.302	0.199	0.309	0.756	0.199	0.469
	Phylogeny 2	-651080	47.240	0.036	0.097	0.233	0.036	0.117
	Phylogeny 3	-651062	29.438	0.039	0.132	0.456	0.040	0.247
	Phylogeny 4	-651041	8.642	0.264	0.347	0.752	0.262	0.485
	Phylogeny 5	-651033	0.000	0.386	0.653	1.000	0.387	0.788
	Phylogeny 6	-651086	53.305	-0.022	0.076	0.184	-0.022	0.089
	Phylogeny 7	-651056	23.746	0.055	0.119	0.513	0.054	0.180

Dataset	Tree	logL	deltaL	bp-RELL	p-KH	p-SH	c-ELW	p-AU
13P123AA	Phylogeny 1	-281232	0	0.373	0.564	1.000	0.375	0.672
	Phylogeny 2	-281237	4.491	0.294	0.429	0.730	0.293	0.459
	Phylogeny 3	-281236	3.983	0.239	0.436	0.887	0.237	0.611
	Phylogeny 4	-281270	37.710	-0.017	0.086	0.256	-0.017	0.089
	Phylogeny 5	-281266	33.366	-0.011	0.069	0.299	-0.011	0.097
	Phylogeny 6	-281264	32.020	0.038	0.161	0.346	0.038	0.127
	Phylogeny 7	-281271	38.399	0.029	0.072	0.263	0.029	0.117
13P123	Phylogeny 1	-580245	8.609	0.131	0.351	0.793	0.131	0.480
	Phylogeny 2	-580253	15.853	0.172	0.315	0.600	0.172	0.391
	Phylogeny 3	-580254	17.517	-0.046	0.238	0.667	-0.047	0.325
	Phylogeny 4	-580244	7.443	0.186	0.356	0.765	0.186	0.501
	Phylogeny 5	-580237	0	0.247	0.644	1.000	0.247	0.712
	Phylogeny 6	-580265	28.627	0.078	0.203	0.428	0.078	0.227
	Phylogeny 7	-580247	10.009	0.139	0.297	0.705	0.140	0.391

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Supplementary Table S8. Gene order of 77 spider species and rearrangement scores of each species obtained from qMGR. Abbreviations of each mitochondrial gene are provided in Figure 2. Genes coded in the minor strand of the mitogenome are indicated by a short dash.

Families	Species	Gene order	Rearrangement score
Agelenidae	*Agelena silvatica*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 S1 R E -L2 A N -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	38
Araneidae	*Araneus angulatus*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Araneidae	*Araneus ventricosus*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Araneidae	*Araniella displicata*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Araneidae	*Argiope amoena*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Araneidae	*Argiope bruennichi*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Araneidae	*Argiope perforata*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Araneidae	*Cyclosa argenteoalba*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Araneidae	*Cyclosa japonica*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Araneidae	*Cyrtarachne nagasakiensis*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Araneidae	*Cyrtophora moluccensis*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Araneidae	*Hypsosinga pygmaea*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I*	36

Families	Species	Gene order	Rearrangement score
		cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C	
Araneidae	*Neoscona adianta*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Araneidae	*Neoscona multiplicans*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Araneidae	*Neoscona nautica*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Araneidae	*Neoscona scylla*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Araneidae	*Neoscona theisi*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Araneidae	*Trichonephila clavata*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Araneidae	*Singa* sp	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Clubionidae	*Clubiona* sp	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Cybaeidae	*Argyroneta aquatica*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Dipluridae	*Phyxioschema suthepium*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 cytb S2 T -nad1 -L1 -rrnL -V -rrnS -I -Q CR M nad3 W -Y -C*	34
Dysderidae	*Harpactocrates apennicola*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 CR N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M I nad2 W -Y -C*	38
Dysderidae	*Parachtes ignavus*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 CR N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M I nad2 W -Y -C*	38
Dysderidae	*Parachtes limbarae*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 CR N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M I nad2 W -Y -C*	38

Families	Species	Gene order	Rearrangement score
Dysderidae	*Parachtes riberai*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 CR N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M I nad2 W -Y -C*	38
Dysderidae	*Parachtes romandiolae*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 CR N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M I nad2 W -Y -C*	38
Dysderidae	*Parachtes teruelis*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 CR N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M I nad2 W -Y -C*	38
Eresidae	*Stegodyphus lineatus*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Gnaphosidae	*Gnaphosa licenti*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Gnaphosidae	*Gnaphosa kompirensis*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Hypochilidae	*Hypochilus thorelli*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 cytb S2 T -nad1 -L1 -rrnL -V -rrnS I -Q CR M nad2 W -Y -C*	32
Linyphiidae	*Microlinyphia pusilla*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Liphistiidae	*Liphistius erawan*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 A R N S1 E -F -nad5 -H -nad4 -nad4l T -P nad6 cytb S2 -nad1 -L2 -L1 -rrnL -V -rrnS CR I -Q M nad2 W -C –Y*	0
Liphistiidae	*Heptathela hangzhouensis*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 A R N S1 E -F -nad5 -H -nad4 -nad4l T -P nad6 cytb S2 -nad1 -L2 -L1 -rrnL -V -rrnS CR I -Q M nad2 W -C –Y*	0
Liphistiidae	*Songthela* sp	*cox1 cox2 K D atp8 atp6 cox3 G nad3 A R N S1 E -F -nad5 -H -nad4 -nad4l T -P nad6 cytb S2 -nad1 -L2 -L1 -rrnL -V -rrnS CR I -Q M nad2 W -C –Y*	0
Lycosidae	*Alopecosa cursor*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Lycosidae	*Lycosa sinensis*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Lycosidae	*Pardosa laura*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I*	36

Families	Species	Gene order	Rearrangement score
		cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C	
Lycosidae	*Pirata subpiraticus*	*cox1 cox2 K D atp8 atp6 cox3 nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I* *cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	40
Lycosidae	*Wadicosa fidelis*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I* *cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Miturgidae	*Cheiracanthium erraticum*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I* *cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Miturgidae	*Cheiracanthium triviale*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I* *cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Nemesiidae	*Calisoga longitarsis*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6* *cytb S2 T -nad1 -L1 -rrnL -V -rrnS -I -Q CR M nad2 W -Y -C*	34
Oecobiidae	*Uroctea compactilis*	*cox1 cox2 K atp8 D atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I* *cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	42
Oxyopidae	*Oxyopes sertatus*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I* *cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Oxyopidae	*Peucetia latikae*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I* *cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Philodromidae	*Philodromus cespitum*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I* *cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Pholcidae	*Mesabolivar* sp1	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6* *cytb S2 T -nad1 -L1 -rrnL -V -rrnS I -Q CR M nad2 W -Y -C*	32
Pholcidae	*Mesabolivar* sp2	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6* *cytb S2 T -nad1 -L1 -rrnL -V -rrnS I -Q CR M nad2 W -Y -C*	32
Pholcidae	*Pholcus phalangioides*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6* *cytb S2 T -nad1 -L1 -rrnL -V -rrnS I -Q CR M nad2 W -Y -C*	32
Pholcidae	*Pholcus* sp	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6* *cytb S2 T -nad1 -L1 -rrnL -V -rrnS I -Q CR M nad2 W -Y -C*	32

Families	Species	Gene order	Rearrangement score
Pisauridae	*Dolomedes angustivirgatus*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Pisauridae	*Pisaura bicornis*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Salticidae	*Carrhotus xanthogramma*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Salticidae	*Cheliceroides longipalpis*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Salticidae	*Dendryphantes* sp	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Salticidae	*Epeus alboguttatus*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Salticidae	*Evarcha* sp	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Salticidae	*Habronattus oregonensis*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Salticidae	*Heliophanus lineiventris*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 N -L2 A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Salticidae	*Plexippus paykulli*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Salticidae	*Telamonia vlijmi*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Selenopidae	*Selenops bursarius*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C*	36
Sicariidae	*Loxosceles rufescens*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 cytb S2 T -nad1 -L1 -rrnL -V -rrnS I -Q CR M nad2 W -Y -C*	32
Sicariidae	*Loxosceles similis*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6*	32

Families	Species	Gene order	Rearrangement score
		cytb S2 T -nad1 -L1 -rrnL -V -rrnS I -Q CR M nad2 W -Y -C	
Sparassidae	*Heteropoda venatoria*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I*	36
		cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C	
Tetragnathidae	*Leucauge celebesiana*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I*	36
		cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C	
Tetragnathidae	*Tetragnatha maxillosa*	*cox1 cox2 K D atp8 atp6 cox3 nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I*	42
		cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR W G M nad2 -Y -C	
Tetragnathidae	*Tetragnatha nitens*	*cox1 cox2 K D atp8 atp6 cox3 nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I*	42
		cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q W G CR M nad2 -Y -C	
Theraphosidae	*Ornithoctonus huwena*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6*	34
		cytb S2 T -nad1 -L1 -rrnL -V -rrnS -I -Q CR M nad2 W -Y -C	
Theridiidae	*Chrysso nordica*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I*	36
		cytb S2 T -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C	
Thomisidae	*Heriaeus melloteei*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I*	38
		cytb S2 T -nad1 -rrnL -V -rrnS -Q CR M nad2 W -L1 -Y -C	
Thomisidae	*Misumenops tricuspidata*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I*	38
		cytb S2 T -nad1 -rrnL -V -rrnS -Q CR M nad2 W -L1 -Y -C	
Thomisidae	*Oxytate striatipes*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I*	38
		cytb S2 T -nad1 -rrnL -V -rrnS -Q CR M nad2 W -L1 -Y -C	
Thomisidae	*Thomisus onustus*	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I*	38
		cytb S2 T -nad1 -rrnL -V -rrnS -Q CR M nad2 W -L1 -Y -C	
Titanoecidae	*Titanoeca* sp	*cox1 cox2 K D atp8 atp6 cox3 G nad3 -L2 N A S1 R E -F -nad5 -H -nad4 -nad4l -P nad6 I*	38
		cytb S2 T CR -nad1 -L1 -rrnL -V -rrnS -Q CR M nad2 W -Y -C	

Supplementary Table S9. Pairwise comparisons of 11 gene arrangement modes (M1–M11) in spider mitogenomes obtained from CREx analysis. Numbers indicate similarities among compared gene orders.

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
M1	1400	432	394	216	240	168	432	226	136	132	216
M2	432	1400	1192	664	922	634	1400	866	418	390	866
M7	432	1400	1192	664	922	634	1400	866	418	390	866
M3	394	1192	1400	580	808	640	1192	758	358	342	758
M5	240	922	808	1062	1400	922	922	1328	688	644	1328
M8	226	866	758	1064	1328	866	866	1400	642	600	1258
M4	216	664	580	1400	1062	664	664	1064	480	446	1000
M11	216	866	758	1000	1328	866	866	1258	672	628	1400
M6	168	634	640	664	922	1400	634	866	450	446	866
M9	136	418	358	480	688	450	418	642	1400	1258	672
M10	132	390	342	446	644	446	390	600	1258	1400	628

Supplementary Table S10. Evolutionary rate of 22 mitochondrial tRNA genes from 77 spider species in pairwise comparisons against reference mitogenome of *Mastigoproctus giganteus* (Uropygi).

Family	Species	*trnA*	*trnC*	*trnD*	*trnE*	*trnF*	*trnG*	*trnH*	*trnI*	*trnK*	*trnL1*	*trnL2*	*trnM*	*trnN*	*trnP*	*trnQ*	*trnR*	*trnS1*	*trnS2*	*trnT*	*trnV*	*trnW*	*trnY*	*rrnL*	*rrnS*	tRNA average	rRNA average	RD	RS	BP
Agelenidae	*Agelena silvatica*	0.7260	0.6355	0.5532	0.5716	0.9607	0.2880	0.8240	0.7951	1.244	1.2282	0.6157	0.43	1.228	0.6566	1.0124	1.3089	0.7037	0.6431	0.4141	0.6671	0.5199	0.6431	0.3810	0.4297	0.7577	0.4053	16	38	19
Araneidae	*Araneus angulatus*	0.7260	0.6932	0.6001	0.4819	0.6566	0.2567	0.4279	0.642	1.764	1.0397	0.4529	0.6116	0.961	0.7083	0.9313	0.7557	0.8240	0.6987	0.5429	0.5617	0.7083	0.9745	0.3840	0.4942	0.7281	0.4391	16	36	18
Araneidae	*Araneus ventricosus*	0.6671	0.6932	0.6001	0.6735	0.8240	0.2267	0.7037	0.642	1.596	1.0397	0.6157	0.5716	0.889	0.8892	0.9313	0.824	0.6501	0.7587	0.5913	0.5617	0.6566	0.9745	0.3991	0.4890	0.7536	0.4440	16	36	18
Araneidae	*Araniella displicata*	0.7899	0.6355	0.7037	0.5716	0.7639	0.3206	0.8240	0.6897	1.344	1.0397	0.6626	0.5716	0.889	0.7083	0.9313	1.1836	0.9673	0.5913	0.5429	0.6671	0.4793	0.7587	0.3722	0.4587	0.7562	0.4155	16	36	18
Araneidae	*Argiope amoena*	0.7899	0.6932	0.6501	0.5254	1.0397	0.1701	0.8240	1.0646	1.344	0.8892	0.7126	0.43	1.228	0.6082	0.8581	1.0763	0.9673	0.7587	0.6431	0.7260	0.6566	0.8240	0.3781	0.4687	0.7945	0.4234	16	36	18
Araneidae	*Argiope bruennichi*	0.7260	0.6932	0.6001	0.5716	0.8892	0.1979	0.8240	0.854	1.244	1.0397	0.7126	0.43	0.961	0.6082	0.8581	1.1836	1.0507	0.7587	0.5913	0.6126	0.6082	0.8954	0.3900	0.4737	0.7686	0.4319	16	36	18
Araneidae	*Argiope perforata*	0.7260	0.6355	0.5532	0.5254	0.8892	0.2567	0.7614	0.6897	1.244	0.9607	0.7126	0.43	1.040	0.6566	0.7913	1.0763	0.9673	0.8954	0.6431	0.6671	0.6082	0.8954	0.3810	0.4587	0.7557	0.4199	16	36	18
Araneidae	*Cyclosa argenteoalba*	0.7260	0.7557	0.5532	0.6208	0.8240	0.2567	0.6001	0.7951	1.596	1.0397	0.6626	0.5336	0.961	0.7083	0.8581	1.3089	0.9673	0.9745	0.5913	0.7899	0.5627	0.8240	0.3930	0.4587	0.7959	0.4259	16	36	18
Araneidae	*Cyclosa japonica*	0.7260	0.6932	0.6001	0.5254	0.8240	0.1979	0.6501	0.6897	1.459	0.8892	0.7126	0.4975	1.128	0.7083	0.8581	1.1836	0.7614	0.9745	0.5913	0.6126	0.6082	0.7587	0.3930	0.4788	0.7568	0.4359	16	36	18
Araneidae	*Cyrtarachne nagasakiensis*	0.7260	0.6355	0.6501	0.5716	0.7639	0.3206	0.7037	0.7951	1.596	0.9607	0.6626	0.5336	0.961	0.6566	0.7301	0.9824	0.8922	0.7587	0.6431	0.7899	0.5199	0.7587	0.3576	0.4788	0.7551	0.4182	16	36	18
Araneidae	*Cyrtophora moluccensis*	0.9367	0.5819	0.6001	0.4408	0.8240	0.1979	0.7614	0.854	1.459	1.3438	0.7126	0.463	1.344	0.5627	0.7913	1.1836	0.7614	0.7587	0.5913	0.6126	0.7639	0.6431	0.4145	0.4489	0.7813	0.4317	16	36	18
Araneidae	*Hypsosinga pygmaea*	0.7260	0.5819	0.7037	0.4408	0.7639	0.2880	0.6001	0.642	1.459	0.8240	0.6626	0.4975	1.040	0.6082	0.8581	1.0763	0.9673	0.8240	0.4975	0.7899	0.5627	0.6987	0.4176	0.4890	0.7324	0.4533	16	36	18
Araneidae	*Neoscona adianta*	0.6126	0.6932	0.5091	0.4819	0.9607	0.2880	0.7037	0.6897	1.596	1.0397	0.7126	0.4975	1.344	0.6082	0.9313	1.0763	0.8240	0.7587	0.6431	0.6671	0.5199	0.6987	0.3961	0.4587	0.7662	0.4274	16	36	18
Araneidae	*Neoscona multiplicans*	0.7260	0.7557	0.4674	0.4819	0.8892	0.2567	0.5091	0.642	1.596	1.1281	0.7126	0.4975	1.228	0.5627	0.9313	1.1836	0.8922	0.7587	0.5913	0.7260	0.4793	0.7587	0.3930	0.4737	0.7625	0.4334	16	36	18
Araneidae	*Neoscona nautica*	0.6126	0.5319	0.5532	0.4408	0.8240	0.2880	0.7037	0.6897	2.283	1.0397	0.7126	0.5336	1.864	0.5199	0.8581	1.1836	0.8240	0.7587	0.6431	0.7899	0.6082	0.6431	0.4083	0.4737	0.8139	0.4410	16	36	18
Araneidae	*Neoscona scylla*	0.7260	0.6355	0.5532	0.4408	0.8240	0.2567	0.6501	0.642	1.764	1.1281	0.7126	0.4975	1.228	0.6082	0.9313	1.0763	0.9673	0.7587	0.6987	0.7260	0.5199	0.6987	0.4145	0.4737	0.7747	0.4441	16	36	18
Araneidae	*Neoscona theisi*	0.7260	0.6932	0.4674	0.4819	0.8240	0.3206	0.7037	0.7405	1.764	1.0397	0.7126	0.5716	1.128	0.5627	0.8581	1.1836	0.9673	0.8240	0.6431	0.9367	0.5199	0.6987	0.4052	0.4839	0.7894	0.4445	16	36	18
Araneidae	*Singa* sp	0.7260	0.6932	0.4674	0.4819	0.6566	0.2567	0.6501	0.6897	1.459	1.2282	0.6626	0.463	1.040	0.5199	0.8581	1.3089	0.8922	0.6987	0.5913	0.7899	0.5627	0.8240	0.4052	0.4839	0.7509	0.4445	16	36	18
Araneidae	*Trichonephila clavata*	0.6671	0.6355	0.6001	0.5254	0.7083	0.2267	0.7037	0.7951	1.596	0.7639	0.7126	0.4975	1.344	0.8240	0.8581	1.0763	0.7614	0.8240	0.5913	0.5617	0.4793	0.8240	0.3433	0.4392	0.7535	0.3913	16	36	18
Clubionidae	*Clubiona* sp	0.8597	0.5819	0.6001	0.6735	0.9607	0.2880	0.7037	0.7951	1.155	1.1281	0.6626	0.5336	1.864	0.5627	0.9313	1.1836	0.7614	1.0628	0.4546	0.4270	0.6566	0.6987	0.3547	0.4538	0.7975	0.4043	16	36	18
Cybaeidae	*Argyroneta aquatica*	0.5617	0.5819	0.7614	0.6735	0.8892	0.5532	0.7037	0.854	1.076	0.8892	0.7126	0.6116	1.128	0.6566	0.8581	1.4594	0.6501	0.7587	0.4975	0.5617	0.6082	0.6987	0.3961	0.4392	0.7612	0.4176	16	36	18
Dipluridae	*Phyxioschema suthepium*	0.6671	1.1836	0.9673	0.6735	0.8240	0.5532	0.5532	0.854	1.459	1.2282	0.7662	0.3109	0.961	0.7083	1.2071	1.0763	1.1445	0.8240	0.5429	0.5617	0.8240	0.8954	0.4207	0.4890	0.8539	0.4549	15	34	17
Dysderidae	*Harpactocrates apennicola*	0.9367	0.8990	0.5532	0.6735	0.7639	0.4674	0.4674	0.6897	1.344	0.6082	0.7662	0.6987	1.228	0.5627	0.9313	0.5319	0.8240	0.8954	0.5429	0.6671	0.6566	0.6987	0.4593	0.4637	0.7458	0.4615	17	36	18
Dysderidae	*Parachtes ignavus*	1.1194	0.8990	0.6001	0.8581	0.8240	0.2880	0.6001	0.642	1.344	0.8892	0.7126	0.6116	1.040	0.4793	0.9313	0.824	0.8922	0.7587	0.5429	0.6126	0.5199	0.5429	0.4593	0.4890	0.7514	0.4742	17	36	18
Dysderidae	*Parachtes limbarae*	1.5199	0.8240	0.6501	0.7913	0.7639	0.2880	0.5532	0.6897	1.459	0.8892	0.8240	0.7463	1.128	0.5199	0.8581	1.1836	0.7614	1.0628	0.6431	0.5617	0.5199	0.6431	0.4560	0.4994	0.8128	0.4777	17	36	18

Family	Species	*trnA*	*trnC*	*trnD*	*trnE*	*trnF*	*trnG*	*trnH*	*trnI*	*trnK*	*trnL1*	*trnL2*	*trnM*	*trnN*	*trnP*	*trnQ*	*trnR*	*trnS1*	*trnS2*	*trnT*	*trnV*	*trnW*	*trnY*	*rrnL*	*rrnS*	tRNA average	rRNA average	RD	RS	BP
Dysderidae	*Parachtes riberai*	1.2307	0.8240	0.5091	0.9313	0.8240	0.3904	0.7037	0.555	2.283	0.7083	0.7126	0.7972	1.344	0.6566	1.0124	0.824	0.7037	0.9745	0.6431	0.5141	0.5199	0.7587	0.4965	0.4788	0.8373	0.4877	17	36	18
Dysderidae	*Parachtes romandiolae*	1.3615	0.8990	0.6001	0.7913	0.8892	0.4279	0.8922	0.5972	1.344	0.9607	0.7662	0.6539	1.040	0.5199	1.1035	0.6932	1.0507	0.8240	0.4975	0.5617	0.5627	0.6431	0.4862	0.4687	0.8036	0.4774	17	36	18
Dysderidae	*Parachtes teruelis*	1.1194	0.7557	0.6001	0.7913	0.8892	0.4674	0.7037	0.642	1.459	0.9607	0.8240	0.6539	1.228	0.6082	0.8581	0.899	0.6501	0.9745	0.5913	0.5617	0.6082	0.5913	0.4760	0.4994	0.7926	0.4877	17	36	18
Eresidae	*Stegodyphus lineatus*	1.1194	0.6932	0.6501	0.4819	0.9607	0.3206	0.6501	0.9178	1.459	0.8892	0.6626	0.5716	1.128	0.6082	0.7301	1.0763	0.6001	0.6987	0.4975	0.6126	0.6566	0.7587	0.3547	0.4392	0.7611	0.3970	16	36	18
Gnaphosidae	*Gnaphosa kompirensis*	0.7260	0.6932	0.6001	0.5716	0.8892	0.3904	0.6501	0.555	1.596	0.8240	0.6157	0.6987	1.648	0.7083	0.8581	0.899	0.7037	0.9745	0.6431	0.4693	0.5627	0.5429	0.4145	0.4109	0.7645	0.4127	16	36	18
Gnaphosidae	*Gnaphosa licenti*	0.7899	0.6355	0.6001	0.5254	1.0397	0.3904	0.7037	0.5972	1.596	0.8240	0.5716	0.6987	1.128	0.6082	0.8581	1.3089	0.7037	0.6987	0.5429	0.5617	0.5627	0.5913	0.4239	0.4538	0.7517	0.4388	16	36	18
Hypochilidae	*Hypochilus thorelli*	1.2307	1.0763	0.7037	0.8581	1.0397	0.3547	0.6501	0.642	1.005	0.8892	0.7662	0.5336	1.648	0.5627	1.0124	1.1836	0.5532	0.8954	0.4546	0.6126	0.5627	0.5913	0.4862	0.4737	0.8103	0.4800	15	32	16
Linyphiidae	*Microlinyphia pusilla*	0.7899	0.7557	0.7037	0.5254	0.6566	0.3206	0.7037	0.7405	1.596	0.8240	0.5299	0.4975	1.344	0.7639	1.3273	1.3089	0.8240	0.8240	0.6987	0.5617	0.8240	0.8954	0.3840	0.4441	0.8189	0.4140	16	36	18
Liphistiidae	*Heptathela hangzhouensis*	0.9367	1.0763	0.6001	0.5254	0.8240	0.1979	0.6001	0.9876	0.824	1.3438	0.6626	0.3109	0.824	0.1885	1.3273	1.0763	1.1445	0.8954	0.4546	1.1194	0.1622	0.8954	0.4366	0.3193	0.7717	0.3779	0	0	0
Liphistiidae	*Liphistius erawan*	0.9367	1.3089	0.6001	0.4408	0.8892	0.2267	0.7037	0.854	0.724	1.4806	0.4904	0.2578	0.824	0.1622	1.2071	1.1836	0.7614	0.8240	0.5913	0.8597	0.3360	0.8240	0.3900	0.3836	0.7494	0.3868	0	0	0
Liphistiidae	*Songthela* sp	1.1194	0.9824	0.5532	0.3648	0.7639	0.1701	0.6501	0.7405	0.595	1.4806	0.4904	0.2839	0.889	0.1885	1.3273	1.1836	1.3772	0.7587	0.4975	0.7899	0.2158	0.7587	0.3930	0.3615	0.7355	0.3773	0	0	0
Lycosidae	*Alopecosa cursor*	0.8597	0.4850	0.7037	0.4408	0.8240	0.4279	0.6501	0.5972	1.244	1.2282	0.5299	0.4975	1.344	0.6082	0.7301	0.899	0.5091	0.7587	0.5429	0.6126	0.6082	0.7587	0.4083	0.4392	0.7209	0.4238	16	36	18
Lycosidae	*Lycosa sinensis*	0.8597	0.4850	0.7614	0.4408	0.8240	0.3904	0.7614	0.5972	1.244	1.0397	0.4529	0.463	1.344	0.5627	0.6735	0.824	0.6501	0.8240	0.4546	0.6671	0.5627	0.6987	0.4021	0.4249	0.7082	0.4135	16	36	18
Lycosidae	*Pardosa laura*	0.7899	0.5819	0.7614	0.4408	0.9607	0.3904	0.7037	0.6897	1.076	0.9607	0.5299	0.4975	1.344	0.5627	0.7301	0.899	0.8240	0.7587	0.6987	0.6126	0.5627	0.6987	0.3991	0.4489	0.7306	0.4240	16	36	18
Lycosidae	*Pirata subpiraticus*	0.6126	0.6355	0.7037	0.4408	0.8240	-	0.8240	0.5972	1.076	1.1281	0.7126	0.463	1.040	0.5199	0.7913	0.7557	0.7614	0.8240	0.5429	0.6671	0.5199	0.6987	0.3870	0.4441	0.7209	0.4155	16	36	18
Lycosidae	*Wadicosa fidelis*	0.9367	0.6355	0.7037	0.6208	0.8240	0.3547	0.8240	0.5972	1.155	1.0397	0.5299	0.5336	1.228	0.6082	0.7913	1.3089	0.7037	0.8240	0.5913	0.6126	0.5199	0.5913	0.3991	0.4538	0.7516	0.4265	16	36	18
Miturgidae	*Cheiracanthium erraticum*	0.8597	0.8240	0.6501	0.5254	0.6566	0.3206	0.5532	0.515	1.076	0.7639	0.5716	0.6116	1.228	0.6566	0.8581	0.7557	0.8240	0.6431	0.4975	0.3870	0.7083	0.5913	0.4083	0.4441	0.6854	0.4262	16	36	18
Miturgidae	*Cheiracanthium triviale*	0.6126	0.7557	0.7614	0.4819	0.8892	0.3904	0.5532	0.515	1.344	0.7639	0.5716	0.5716	1.344	0.6566	0.8581	0.899	0.8240	0.5429	0.4975	0.4270	0.7639	0.5429	0.3840	0.4441	0.7076	0.4140	16	36	18
Nemesiidae	*Calisoga longitarsis*	0.7260	1.0763	0.8240	0.4819	0.9607	0.6001	0.7037	1.0646	1.076	1.2282	0.5716	0.6987	1.040	0.5199	0.9313	1.4594	0.7614	1.0628	0.5913	0.6126	0.9607	0.8954	0.4495	0.5205	0.8567	0.4850	15	34	17
Oecobiidae	*Uroctea compactilis*	1.1194	0.5819	0.4674	0.5716	0.9607	0.3547	0.6001	0.6897	1.155	1.2282	0.7126	0.5716	1.128	0.6566	0.9313	1.0763	0.7614	0.8954	0.5429	0.5141	0.5627	0.6987	0.3663	0.4155	0.7628	0.3909	19	42	21
Oxyopidae	*Oxyopes sertatus*	1.0225	0.6932	0.6501	0.8581	0.7639	0.5091	0.7037	0.7951	1.459	1.0397	0.5299	0.43	1.040	0.6566	0.7913	0.824	0.8922	0.6987	0.5429	0.5617	0.5627	0.6987	0.3547	0.4737	0.7602	0.4142	16	36	18
Oxyopidae	*Peucetia latikae*	0.7260	0.6932	0.7037	0.6208	1.1281	0.3547	0.7037	0.5972	1.244	0.8892	0.5716	0.5716	1.128	0.6566	0.9313	1.1836	0.7614	0.6987	0.4546	0.5141	0.6082	0.6431	0.4052	0.4994	0.7447	0.4523	16	36	18
Philodromidae	*Philodromus cespitum*	0.8597	0.6932	0.6501	0.7301	0.8892	0.3206	0.7614	0.642	1.155	1.2282	0.4904	0.5336	1.128	0.5199	1.3273	0.824	0.8240	0.7587	0.4546	0.5141	0.4793	0.6987	0.3692	0.4994	0.7492	0.4343	16	36	18
Pholcidae	*Mesabolivar* sp1	0.6671	0.8990	0.7037	0.6735	0.8240	0.4279	0.7037	0.7405	1.344	1.1281	0.7126	0.6539	1.228	0.7083	0.9313	1.3089	0.8240	0.9745	0.5913	0.4693	0.8892	0.9745	0.4398	0.4890	0.8353	0.4644	15	32	16
Pholcidae	*Mesabolivar* sp2	1.1194	0.8990	0.8240	0.6208	0.7639	0.3904	0.8922	0.6897	1.344	1.1281	0.8865	0.5336	0.889	0.8892	1.1035	0.9824	0.8240	0.9745	0.5429	0.5141	0.6566	0.9745	0.4693	0.5152	0.8383	0.4922	15	32	16
Pholcidae	*Pholcus phalangioides*	0.8597	0.6932	0.8922	0.6735	0.9607	0.5091	0.7614	0.7951	1.459	0.9607	0.8240	0.4975	1.128	0.7083	0.7301	0.9824	0.8922	0.9745	0.6431	1.0225	0.7083	0.8954	0.4726	0.4890	0.8442	0.4808	15	32	16
Pholcidae	*Pholcus* sp	0.7899	0.6932	0.8922	0.6735	0.9607	0.5091	0.7614	0.854	1.459	0.9607	0.8240	0.463	1.128	0.7083	0.7301	1.1836	0.8922	0.9745	0.6431	0.8597	0.7083	0.8954	0.4593	0.4994	0.8438	0.4793	15	32	16

Family	Species	*trnA*	*trnC*	*trnD*	*trnE*	*trnF*	*trnG*	*trnH*	*trnI*	*trnK*	*trnL1*	*trnL2*	*trnM*	*trnN*	*trnP*	*trnQ*	*trnR*	*trnS1*	*trnS2*	*trnT*	*trnV*	*trnW*	*trnY*	*rrnL*	*rrnS*	tRNA average	rRNA average	RD	RS	BP
Pisauridae	*Dolomedes angustivirgatus*	1.0225	0.6932	0.6501	0.4819	0.8240	0.5091	0.7037	0.7951	1.459	0.9607	0.3831	0.463	1.344	0.5627	0.7913	1.0763	1.1445	0.6431	0.5913	0.7260	0.4793	0.6987	0.3870	0.4392	0.7729	0.4131	16	36	18
Pisauridae	*Pisaura bicornis*	0.8597	0.6932	0.6001	0.4819	0.7639	0.3904	0.7037	0.7405	1.596	1.0397	0.4529	0.5336	2.168	0.5627	1.0124	0.6932	0.8240	0.5913	0.4546	0.7260	0.4408	0.5429	0.3722	0.4538	0.7669	0.4130	16	36	18
Salticidae	*Carrhotus xanthogramma*	0.7899	0.5319	0.7037	0.6208	0.7639	0.3547	0.6001	0.6897	1.076	1.2282	0.6626	0.6116	1.128	0.5627	0.7301	0.9824	0.7614	0.8240	0.3756	0.4270	0.4793	0.8240	0.3490	0.4538	0.7149	0.4014	16	36	18
Salticidae	*Cheliceroides longipalpis*	0.7260	0.5819	0.6501	0.4408	0.6566	0.2880	0.5532	0.6897	1.076	0.8892	0.6626	0.6116	1.344	0.6566	0.7913	0.9824	0.8922	0.8954	0.5429	0.5141	0.4408	0.5429	0.3900	0.4538	0.7013	0.4219	16	36	18
Salticidae	*Dendryphantes* sp	1.0225	0.6355	0.6501	0.7301	0.8892	0.2267	0.5091	0.555	1.344	0.9607	0.6157	0.7972	1.128	0.5627	0.7301	1.1836	0.9673	0.8954	0.4141	0.7260	0.4793	0.7587	0.3961	0.4109	0.7628	0.4035	16	36	18
Salticidae	*Epeus alboguttatus*	1.3615	0.7557	0.6001	0.5716	0.8892	0.2880	0.6001	0.7405	1.155	1.1281	0.6157	0.6116	0.889	0.7083	0.7913	0.9824	0.8240	0.7587	0.5913	0.4693	0.5199	0.6431	0.3870	0.4109	0.7498	0.3989	16	36	18
Salticidae	*Evarcha* sp	1.0225	0.6932	0.6501	0.4819	0.7639	0.2880	0.7037	0.6897	1.155	0.9607	0.5299	0.6987	1.128	0.7639	0.6735	1.4594	0.7614	0.9745	0.5913	0.5141	0.3694	0.6987	0.3991	0.4202	0.7533	0.4097	16	36	18
Salticidae	*Habronattus oregonensis*	0.9367	0.6355	0.7614	0.5254	0.7639	0.2880	0.6501	0.6897	1.005	1.3438	0.6157	0.4975	0.824	0.6566	0.6208	1.3089	0.7614	1.0628	0.4975	0.4693	0.3360	0.5913	0.3722	0.4587	0.7201	0.4155	16	36	18
Salticidae	*Heliophanus lineiventris*	1.1194	0.5819	0.6001	0.5716	0.8892	0.3547	0.6001	0.5972	1.244	1.0397	0.4904	0.6116	1.040	0.6082	0.9313	1.6479	0.7614	0.9745	0.4546	0.3870	0.4793	0.6987	0.3930	0.4344	0.7583	0.4137	16	36	18
Salticidae	*Plexippus paykulli*	1.0225	0.6932	0.7614	0.5716	0.8240	0.4279	0.7037	0.7405	1.005	1.0397	0.6626	0.6987	1.128	0.5627	0.6208	1.1836	0.7037	1.0628	0.5429	0.5141	0.4408	0.6431	0.3870	0.5099	0.7524	0.4484	16	36	18
Salticidae	*Telamonia vlijmi*	1.0225	0.5819	0.7614	0.4819	0.8892	0.2880	0.6501	0.642	1.244	1.1281	0.6157	0.5716	1.040	0.5627	0.6735	0.9824	0.8240	0.8240	0.6431	0.3490	0.4408	0.7587	0.4083	0.4637	0.7261	0.4360	16	36	18
Selenopidae	*Selenops bursarius*	0.7899	0.5819	0.6501	0.6735	0.8892	0.2880	0.6501	0.5972	1.244	1.0397	0.6626	0.5716	1.344	0.5627	0.7301	1.3089	0.7614	0.7587	0.6987	0.4270	0.4408	0.8240	0.4021	0.4839	0.7497	0.4430	16	36	18
Sicariidae	*Loxosceles rufescens*	0.8597	0.8990	0.7614	0.7913	1.2282	0.4279	0.7614	1.0646	1.596	0.9607	0.6157	0.6116	1.128	0.6566	0.7913	1.9003	1.0507	1.4153	0.7587	0.7899	0.8240	0.6987	0.4794	0.5152	0.9360	0.4973	15	32	16
Sicariidae	*Loxosceles similis*	1.0225	0.5819	0.7037	0.6735	0.9607	0.3547	0.7614	1.0646	1.764	0.9607	0.6157	0.43	1.864	0.8240	1.1035	1.3089	0.8922	0.6431	0.7587	0.6126	0.6082	0.7587	0.4398	0.5534	0.8757	0.4966	15	32	16
Sparassidae	*Heteropoda venatoria*	0.7899	0.6355	0.7037	0.6735	0.8892	0.3547	0.7037	0.642	1.344	0.8240	0.7662	0.4975	1.040	0.6082	0.7301	1.1836	0.7614	0.9745	0.5913	0.5141	0.3694	0.6987	0.3781	0.4297	0.7407	0.4039	16	36	18
Tetragnathidae	*Leucauge celebesiana*	0.9367	0.6355	0.6001	0.6735	0.7639	0.3206	0.7037	0.7405	1.155	0.9607	0.7126	0.4975	0.708	0.6082	1.1035	1.4594	0.7037	0.8954	0.4975	0.7260	0.6566	0.6431	0.3462	0.4344	0.7592	0.3903	16	36	18
Tetragnathidae	*Tetragnatha maxillosa*	0.6671	0.6355	0.5532	0.4408	0.8240	0.5091	0.7037	0.7951	1.344	0.7083	0.7126	0.3984	1.040	0.7639	0.7301	0.7557	0.6501	0.7587	0.5429	0.9367	0.6566	0.8954	0.3156	0.4942	0.7283	0.4049	19	42	21
Tetragnathidae	*Tetragnatha nitens*	0.8597	0.6355	0.5532	0.4019	0.7639	0.2267	0.8240	0.642	1.344	0.9607	0.6157	0.3984	0.889	0.7083	0.8581	0.9824	0.7037	0.8240	0.3756	1.2307	0.8892	0.8240	0.3293	0.4737	0.7505	0.4015	19	42	21
Theraphosidae	*Ornithoctonus huwena*	0.9367	0.8990	0.7614	0.6208	0.8240	0.4674	0.8240	0.854	1.596	0.8240	0.6157	0.463	0.961	0.5199	1.2071	0.9824	0.7037	0.6987	0.6987	0.5617	0.5199	0.9745	0.4560	0.5368	0.7961	0.4964	15	34	17
Theridiidae	*Chrysso nordica*	1.0225	0.6355	0.6001	0.4408	0.8240	0.3206	0.7614	0.6897	1.344	0.7639	0.5716	0.463	1.228	0.5199	0.9313	0.899	0.6001	0.8240	0.3390	0.5141	0.5199	0.6987	0.3433	0.4297	0.7050	0.3865	16	36	18
Thomisidae	*Heriaeus melloteei*	0.9367	0.5319	0.6501	0.5254	0.8892	0.2880	0.6501	0.7405	0.880	1.3438	0.4172	0.4975	1.648	0.5627	0.8581	1.0763	0.7037	0.8240	0.4975	1.5199	0.4793	0.8954	0.3930	0.4538	0.7916	0.4234	17	38	19
Thomisidae	*Misumenops tricuspidata*	0.9367	0.7557	0.6001	0.5716	0.8240	0.4674	0.7037	0.7951	0.880	1.1281	0.4904	0.463	1.648	0.6082	0.7301	1.3089	0.7614	0.6431	0.4975	0.7899	0.5199	0.9745	0.4207	0.4737	0.7771	0.4472	17	38	19
Thomisidae	*Oxytate striatipes*	0.9367	0.5819	0.4674	0.5716	0.8892	0.2880	0.7614	0.5972	1.244	1.0397	0.3831	0.463	1.481	0.5199	1.2071	0.9824	0.5091	0.8954	0.4141	0.7260	0.6082	0.7587	0.3961	0.4441	0.7420	0.4201	17	38	19
Thomisidae	*Thomisus onustus*	0.9367	0.8240	0.6501	0.5254	0.9607	0.2267	0.6501	0.6897	0.880	1.0397	0.4529	0.4975	1.648	0.6566	0.7913	0.9824	0.7614	0.7587	0.4975	0.6126	0.4042	0.8240	0.4083	0.4538	0.7395	0.4311	17	38	19
Titanoecidae	*Titanoeca* sp	0.7260	0.4850	0.6501	0.6735	0.8240	0.3904	0.5532	0.5972	1.155	1.0397	0.7126	0.339	0.889	0.7083	0.9313	1.6479	0.6501	0.9745	0.6987	0.4693	0.4042	0.5429	0.3991	0.4587	0.7301	0.4289	16	36	18

Supplementary Table S11. Nonsynonymous (*dN*) substitution rates of 13 PCGs from 77 spider species in pairwise comparisons against reference mitogenome of *Mastigoproctus giganteus* (Uropygi).

Species	*atp6*	*atp8*	*cob*	*cox1*	*cox2*	*cox3*	*nad1*	*nad2*	*nad3*	*nad4*	*nad4L*	*nad5*	*nad6*
Agelenidae_Agelena_silvatica	0.67	1.38	0.35	0.16	0.33	0.33	0.47	0.94	0.62	0.67	1.81	0.73	1.27
Araneidae_Araneus_angulatus	0.56	1.27	0.33	0.16	0.32	0.37	0.48	1.06	0.54	0.68	1.70	0.70	1.21
Araneidae_Araneus_ventricosus	0.54	1.78	0.36	0.16	0.33	0.40	0.49	1.06	0.55	0.67	1.71	0.67	1.35
Araneidae_Araniella_displicata	0.56	1.28	0.37	0.16	0.34	0.38	0.50	1.05	0.63	0.69	1.82	0.70	1.10
Araneidae_Argiope_amoena	0.56	1.23	0.39	0.17	0.32	0.40	0.50	0.99	0.67	0.67	24.74	0.66	1.17
Araneidae_Argiope_bruennichi	0.54	1.13	0.35	0.16	0.32	0.38	0.47	0.98	0.65	0.67	1.54	0.68	1.02
Araneidae_Argiope_perforata	0.57	0.92	0.36	0.16	0.32	0.40	0.46	0.94	0.61	0.66	1.40	0.68	1.14
Araneidae_Cyclosa_argenteoalba	0.58	1.57	0.35	0.16	0.34	0.38	0.48	0.92	0.57	0.69	1.70	0.68	1.03
Araneidae_Cyclosa_japonica	0.59	23.42	0.36	0.16	0.35	0.38	0.48	0.91	0.61	0.67	2.24	0.68	1.19
Araneidae_Cyrtarachne_nagasakiensis	0.54	1.61	0.35	0.16	0.31	0.49	0.48	0.92	0.61	0.65	2.04	0.66	1.39
Araneidae_Cyrtophora_moluccensis	0.60	7.70	0.35	0.15	0.33	0.36	0.46	0.99	0.59	0.64	1.37	0.66	1.00
Araneidae_Hypsosinga_pygmaea	0.54	1.03	0.36	0.16	0.35	0.36	0.45	1.09	0.62	0.65	1.60	0.67	1.26
Araneidae_Neoscona_adianta	0.51	1.54	0.38	0.16	0.33	0.40	0.46	0.92	0.59	0.67	1.73	0.67	1.21
Araneidae_Neoscona_multiplicans	0.55	1.19	0.37	0.16	0.34	0.37	0.46	1.01	0.55	0.65	1.48	0.66	1.14
Araneidae_Neoscona_nautica	0.56	1.35	0.35	0.16	0.33	0.39	0.46	0.93	0.63	0.62	1.77	0.65	1.23
Araneidae_Neoscona_scylla	0.53	1.25	0.37	0.16	0.33	0.38	0.46	0.99	0.58	0.66	1.63	0.65	1.28
Araneidae_Neoscona_theisi	0.54	1.60	0.36	0.16	0.33	0.39	0.48	1.00	0.64	0.67	1.62	0.67	1.18
Araneidae_Trichonephila_clavata	0.53	1.21	0.37	0.16	0.30	0.38	0.45	1.03	0.70	0.69	1.67	0.64	1.15
Araneidae_Singa_sp	0.57	18.50	0.34	0.16	0.32	0.38	0.46	0.90	0.56	0.63	1.51	0.68	1.23
Clubionidae_Clubiona_sp	0.61	1.25	0.38	0.17	0.38	0.34	0.46	0.83	0.56	0.68	2.22	0.71	1.44
Cybaeidae_Argyroneta_aquatica	0.66	1.56	0.39	0.17	0.31	0.37	0.47	1.01	0.65	0.65	2.71	0.74	1.33
Dipluridae_Phyxioschema_suthepium	0.78	1.77	0.37	0.18	0.40	0.38	0.52	1.28	0.83	0.71	1.63	0.77	1.53
Dysderidae_Harpactocrates_apennicola	0.69	1.45	0.41	0.19	0.45	0.41	0.53	1.20	0.58	0.68	1.60	0.73	1.25

Species	*atp6*	*atp8*	*cob*	*cox1*	*cox2*	*cox3*	*nad1*	*nad2*	*nad3*	*nad4*	*nad4L*	*nad5*	*nad6*
Dysderidae_Parachtes_ignavus	0.71	1.19	0.40	0.18	0.46	0.41	0.53	1.31	0.67	0.68	2.02	0.78	1.45
Dysderidae_Parachtes_limbarae	0.74	1.64	0.39	0.17	0.45	0.42	0.52	1.28	0.71	0.69	1.58	0.78	1.37
Dysderidae_Parachtes_riberai	0.75	1.16	0.39	0.18	0.46	0.40	0.50	1.15	0.85	0.70	1.63	0.75	1.26
Dysderidae_Parachtes_romandiolae	0.67	1.48	0.40	0.18	0.46	0.40	0.51	1.31	0.53	0.66	1.87	0.77	1.36
Dysderidae_Parachtes_teruelis	0.73	1.55	0.41	0.18	0.45	0.44	0.48	1.19	0.72	0.71	2.06	0.74	1.27
Eresidae_Stegodyphus_lineatus	0.66	1.41	0.35	0.17	0.31	0.35	0.47	1.09	0.69	0.64	23.22	0.70	1.42
Gnaphosidae_Gnaphosa_kompirensis	0.63	1.47	0.38	0.17	0.32	0.35	0.46	0.99	0.61	0.68	2.78	0.73	1.42
Gnaphosidae_Gnaphosa_licenti	0.61	1.48	0.39	0.17	0.33	0.35	0.47	1.00	0.60	0.69	2.35	0.73	1.30
Hypochilidae_Hypochilus_thorelli	0.74	0.90	0.40	0.18	0.36	0.39	0.50	1.05	0.76	0.82	23.54	0.74	1.29
Linyphiidae_Microlinyphia_pusilla	0.66	1.41	0.34	0.17	0.37	0.37	0.51	0.99	0.56	0.65	2.14	0.69	1.48
Liphistiidae_Heptathela_hangzhouensis	0.56	1.04	0.36	0.12	0.28	0.23	0.39	0.71	0.36	0.60	0.81	0.54	0.92
Liphistiidae_Liphistius_erawan	0.50	1.29	0.34	0.13	0.28	0.27	0.38	0.64	0.49	0.54	0.95	0.57	0.84
Liphistiidae_Songthela_sp	0.53	1.10	0.33	0.12	0.25	0.24	0.34	0.64	0.38	0.58	0.94	0.55	1.04
Lycosidae_Alopecosa_cursor	0.67	1.56	0.39	0.17	0.34	0.32	0.47	0.87	0.73	0.64	1.90	0.72	1.12
Lycosidae_Lycosa_sinensis	0.62	1.28	0.36	0.17	0.34	0.32	0.44	0.84	0.77	0.64	1.72	0.72	1.19
Lycosidae_Pardosa_laura	0.69	1.26	0.38	0.17	0.35	0.34	0.48	0.85	0.79	0.66	2.28	0.71	1.12
Lycosidae_Pirata_subpiraticus	0.70	1.32	0.38	0.18	0.34	0.33	0.47	0.94	0.77	0.70	1.58	0.71	1.08
Lycosidae_Wadicosa_fidelis	0.69	1.40	0.38	0.18	0.34	0.33	0.45	0.94	0.81	0.69	1.74	0.73	1.16
Miturgidae_Cheiracanthium_erraticum	0.54	1.20	0.35	0.17	0.34	0.32	0.50	0.89	0.50	0.65	1.62	0.68	1.31
Miturgidae_Cheiracanthium_triviale	0.60	1.69	0.34	0.16	0.34	0.33	0.51	0.89	0.57	0.67	1.48	0.73	1.36
Nemesiidae_Calisoga_longitarsis	0.68	1.67	0.39	0.19	0.35	0.43	0.52	1.24	0.84	0.76	2.65	0.76	1.28
Oecobiidae_Uroctea_compactilis	0.65	1.47	0.40	0.18	0.37	0.32	0.45	1.03	0.69	0.66	1.21	0.69	1.18
Oxyopidae_Oxyopes_sertatus	0.68	2.17	0.36	0.17	0.34	0.32	0.45	1.01	0.82	0.69	2.42	0.76	1.32
Oxyopidae_Peucetia_latikae	0.62	1.32	0.36	0.17	0.34	0.34	0.51	0.91	0.82	0.68	1.73	0.75	1.14
Philodromidae_Philodromus_cespitum	0.64	1.72	0.35	0.16	0.34	0.31	0.47	0.82	0.64	0.62	1.46	0.72	1.49
Pholcidae_Mesabolivar_sp1	0.71	1.33	0.44	0.18	0.39	0.41	0.49	1.35	1.08	0.76	1.61	0.79	1.27
Pholcidae_Mesabolivar_sp2	0.75	18.92	0.45	0.18	0.42	0.39	0.49	1.43	1.09	0.76	2.25	0.77	1.26

Species	*atp6*	*atp8*	*cob*	*cox1*	*cox2*	*cox3*	*nad1*	*nad2*	*nad3*	*nad4*	*nad4L*	*nad5*	*nad6*
Pholcidae_Pholcus_phalangioides	0.64	1.99	0.40	0.20	0.42	0.39	0.50	1.27	1.06	0.83	1.70	0.78	1.17
Pholcidae_Pholcus_sp	0.63	2.22	0.41	0.20	0.43	0.39	0.52	1.30	1.06	0.84	1.44	0.79	1.09
Pisauridae_Dolomedes_angustivirgatus	0.61	1.45	0.37	0.18	0.33	0.32	0.46	0.89	0.68	0.65	1.94	0.72	1.15
Pisauridae_Pisaura_bicornis	0.60	1.29	0.37	0.16	0.30	0.32	0.45	0.86	0.71	0.66	1.96	0.71	1.33
Salticidae_Carrhotus_xanthogramma	0.60	1.37	0.36	0.16	0.36	0.33	0.47	0.89	0.59	0.70	1.64	0.71	1.26
Salticidae_Cheliceroides_longipalpis	0.63	1.24	0.34	0.16	0.32	0.30	0.46	0.98	0.52	0.69	1.57	0.70	1.29
Salticidae_Dendryphantes_sp	0.61	1.50	0.33	0.16	0.33	0.32	0.48	0.96	0.63	0.69	1.21	0.69	1.11
Salticidae_Epeus_alboguttatus	0.65	1.27	0.36	0.17	0.34	0.30	0.45	0.96	0.58	0.67	1.62	0.72	1.55
Salticidae_Evarcha_sp	0.60	1.18	0.35	0.16	0.34	0.31	0.46	0.99	0.58	0.69	1.54	0.71	1.18
Salticidae_Habronattus_oregonensis	0.64	1.46	0.36	0.17	0.36	0.30	0.49	1.08	0.58	0.66	1.44	0.70	1.34
Salticidae_Heliophanus_lineiventris	0.63	1.21	0.36	0.16	0.34	0.31	0.49	0.91	0.58	0.69	1.70	0.68	1.18
Salticidae_Plexippus_paykulli	0.65	1.44	0.36	0.17	0.36	0.31	0.48	1.01	0.58	0.68	1.73	0.73	1.40
Salticidae_Telamonia_vlijmi	0.58	1.49	0.34	0.16	0.35	0.30	0.47	1.04	0.58	0.69	1.82	0.69	1.24
Selenopidae_Selenops_bursarius	0.60	1.53	0.37	0.16	0.31	0.29	0.47	0.90	0.57	0.68	2.37	0.71	1.41
Sicariidae_Loxosceles_rufescens	0.67	1.46	0.49	0.18	0.45	0.36	0.56	1.26	0.92	0.68	1.70	0.82	1.60
Sicariidae_Loxosceles_similis	0.67	1.20	0.44	0.18	0.40	0.42	0.56	1.05	0.68	0.74	7.28	0.74	1.75
Sparassidae_Heteropoda_venatoria	0.65	1.10	0.39	0.17	0.36	0.31	0.47	1.05	0.60	0.70	2.38	0.69	1.31
Tetragnathidae_Leucauge_celebesiana	0.66	1.01	0.33	0.17	0.36	0.41	0.42	0.92	0.64	0.63	1.86	0.67	1.57
Tetragnathidae_Tetragnatha_maxillosa	0.59	1.09	0.38	0.18	0.37	0.44	0.54	1.05	0.74	0.70	2.93	0.70	1.70
Tetragnathidae_Tetragnatha_nitens	0.62	1.51	0.37	0.18	0.34	0.42	0.57	1.23	0.65	0.69	1.82	0.74	1.43
Theraphosidae_Ornithoctonus_huwena	0.61	1.49	0.36	0.18	0.37	0.36	0.46	1.05	0.95	0.71	1.46	0.74	1.32
Theridiidae_Chrysso_nordica	0.64	1.32	0.35	0.17	0.34	0.35	0.47	0.93	0.72	0.66	2.31	0.69	1.03
Thomisidae_Heriaeus_melloteei	0.61	1.47	0.37	0.17	0.36	0.33	0.48	0.93	0.57	0.62	1.75	0.67	1.08
Thomisidae_Misumenops_tricuspidata	0.62	1.40	0.37	0.17	0.35	0.35	0.49	0.92	0.61	0.62	1.73	0.68	1.16
Thomisidae_Oxytate_striatipes	0.60	1.16	0.36	0.17	0.33	0.35	0.46	0.96	0.60	0.65	1.68	0.69	1.16
Thomisidae_Thomisus_onustus	0.63	1.61	0.36	0.17	0.35	0.35	0.47	0.86	0.63	0.67	1.77	0.66	1.25
Titanoecidae_Titanoeca_sp	0.59	1.22	0.37	0.18	0.34	0.36	0.52	1.01	0.88	0.67	2.10	0.74	1.45

Supplementary Table S12. Synonymous (*dS*) substitution rates of 13 PCGs from 77 spider species in pairwise comparisons against reference mitogenome of *Mastigoproctus giganteus* (Uropygi).

Species	*atp6*	*atp8*	*cob*	*cox1*	*cox2*	*cox3*	*nad1*	*nad2*	*nad3*	*nad4*	*nad4L*	*nad5*	*nad6*
Agelenidae_Agelena_silvatica	13.29	17.97	107.36	11.14	12.85	74.96	36.05	105.88	22.67	97.71	37.56	39.07	77.55
Araneidae_Araneus_angulatus	12.88	54.51	73.94	18.50	8.10	42.43	59.99	9.65	33.71	108.13	28.33	119.20	93.38
Araneidae_Araneus_ventricosus	15.32	2.91	68.54	18.34	8.34	25.56	14.23	10.73	78.92	109.45	33.81	112.94	69.80
Araneidae_Araniella_displicata	25.68	70.02	6.39	24.59	4.78	17.60	21.41	99.83	5.56	93.63	15.47	100.54	11.10
Araneidae_Argiope_amoena	30.41	15.37	85.91	6.30	13.08	24.27	97.35	10.12	58.07	99.85	1.69	102.73	9.33
Araneidae_Argiope_bruennichi	7.57	80.11	94.74	71.59	8.41	100.61	26.15	68.89	79.58	106.56	13.55	108.48	76.12
Araneidae_Argiope_perforata	14.19	94.23	92.76	66.61	9.38	6.64	20.81	124.03	78.43	111.89	40.53	109.45	9.10
Araneidae_Cyclosa_argenteoalba	23.30	22.04	95.68	23.22	10.73	7.25	54.20	9.48	32.71	106.25	9.15	38.14	82.45
Araneidae_Cyclosa_japonica	9.77	0.66	6.63	90.48	4.19	14.37	82.70	6.56	24.14	107.10	4.39	110.57	75.15
Araneidae_Cyrtarachne_nagasakiensis	8.03	6.61	77.07	23.40	9.65	17.41	28.92	117.48	31.03	110.24	17.78	119.53	17.53
Araneidae_Cyrtophora_moluccensis	11.97	0.94	26.16	17.67	13.76	66.44	28.07	108.41	3.44	105.99	147.14	119.47	85.52
Araneidae_Hypsosinga_pygmaea	17.35	8.13	97.10	8.05	7.44	13.91	36.22	7.21	66.03	119.22	22.02	124.70	89.52
Araneidae_Neoscona_adianta	15.67	12.87	89.98	96.71	10.14	13.52	35.75	128.70	81.96	109.65	26.50	117.35	80.75
Araneidae_Neoscona_multiplicans	13.57	88.59	95.79	34.94	10.54	27.69	32.82	114.99	97.37	108.52	30.99	121.26	14.32
Araneidae_Neoscona_nautica	8.71	35.50	108.94	61.15	11.14	25.32	88.91	136.59	63.11	138.18	27.25	140.12	94.21
Araneidae_Neoscona_scylla	14.63	38.30	92.05	8.97	8.12	28.26	22.78	128.10	59.52	110.41	19.63	121.35	75.02
Araneidae_Neoscona_theisi	8.83	8.23	97.21	81.29	7.44	95.91	18.19	113.99	85.93	111.40	31.76	41.09	21.85
Araneidae_Trichonephila_clavata	17.21	118.88	31.73	37.77	7.79	99.04	18.23	84.22	25.79	119.31	20.71	134.71	15.94
Araneidae_Singa_sp	12.39	11.92	102.54	60.80	10.34	21.16	31.47	56.49	13.48	128.06	113.78	136.13	94.62
Clubionidae_Clubiona_sp	83.21	14.15	101.52	17.59	8.50	13.07	18.28	115.54	122.49	111.44	34.49	28.12	9.95
Cybaeidae_Argyroneta_aquatica	8.88	2.48	35.65	8.50	11.61	83.67	84.83	97.70	39.04	87.74	4.26	28.04	71.97
Dipluridae_Phyxioschema_suthepium	20.13	90.42	80.74	78.68	9.52	79.30	24.85	15.52	16.45	91.24	35.05	33.13	63.86
Dysderidae_Harpactocrates_apennicola	65.51	97.29	93.31	38.51	64.76	28.68	37.72	23.69	13.52	104.25	16.96	44.12	36.97

Species	*atp6*	*atp8*	*cob*	*cox1*	*cox2*	*cox3*	*nad1*	*nad2*	*nad3*	*nad4*	*nad4L*	*nad5*	*nad6*
Dysderidae_Parachtes_ignavus	82.50	14.22	89.45	75.17	14.46	65.10	12.63	15.40	23.55	86.37	8.14	25.10	39.94
Dysderidae_Parachtes_limbarae	77.18	36.32	94.68	17.20	21.01	85.39	19.18	12.61	24.83	92.87	23.80	25.62	20.50
Dysderidae_Parachtes_riberai	11.33	8.94	87.92	30.00	7.95	15.80	82.34	52.97	9.70	89.26	63.28	101.99	74.24
Dysderidae_Parachtes_romandiolae	16.69	17.92	85.01	26.27	14.53	19.38	9.48	9.05	30.90	88.41	10.15	64.31	88.54
Dysderidae_Parachtes_teruelis	18.25	24.23	87.42	16.01	16.66	10.31	86.01	13.29	16.54	86.24	57.85	89.85	84.35
Eresidae_Stegodyphus_lineatus	93.96	14.88	93.67	21.97	7.20	12.55	30.78	96.02	6.40	99.39	1.04	101.79	16.65
Gnaphosidae_Gnaphosa_kompirensis	11.97	78.56	45.69	9.58	21.33	18.04	23.66	110.80	12.51	105.08	6.24	24.18	12.56
Gnaphosidae_Gnaphosa_licenti	16.33	72.68	97.76	14.63	14.49	22.01	91.17	29.40	7.50	103.10	8.14	108.04	16.88
Hypochilidae_Hypochilus_thorelli	23.52	109.97	12.85	9.12	6.94	17.81	21.18	19.22	15.00	86.28	1.64	39.41	69.81
Linyphiidae_Microlinyphia_pusilla	19.28	4.37	100.10	16.37	19.63	58.08	13.13	47.03	92.00	110.21	14.94	113.65	13.60
Liphistiidae_Heptathela_hangzhouensis	20.81	85.03	4.66	5.06	4.40	90.50	15.14	119.37	35.91	66.58	81.47	117.51	96.56
Liphistiidae_Liphistius_erawan	5.36	67.43	7.54	4.98	3.14	12.70	6.26	39.01	5.08	90.33	70.20	36.15	90.06
Liphistiidae_Songthela_sp	5.44	94.99	21.18	6.82	25.75	10.83	103.19	123.40	14.91	112.80	3.17	54.22	91.67
Lycosidae_Alopecosa_cursor	11.90	68.01	96.04	10.26	8.80	21.96	50.71	112.02	96.11	100.52	29.67	110.89	53.63
Lycosidae_Lycosa_sinensis	26.47	110.85	116.02	25.93	8.28	10.97	108.20	142.94	99.28	127.61	19.15	65.39	102.19
Lycosidae_Pardosa_laura	18.61	79.98	99.85	20.33	8.86	14.36	28.04	10.34	43.32	116.70	29.43	123.95	17.30
Lycosidae_Pirata_subpiraticus	12.75	77.63	104.67	10.36	9.60	16.11	27.70	56.26	39.73	108.06	15.56	115.09	21.68
Lycosidae_Wadicosa_fidelis	20.51	75.31	98.47	28.52	8.01	25.98	103.96	117.11	26.70	104.72	21.60	107.68	69.88
Miturgidae_Cheiracanthium_erraticum	44.22	15.33	93.64	19.83	11.78	23.69	39.31	123.36	59.50	115.75	13.17	115.28	90.36
Miturgidae_Cheiracanthium_triviale	30.13	22.91	104.95	40.62	98.54	13.49	113.39	35.23	38.71	120.65	39.34	119.57	18.71
Nemesiidae_Calisoga_longitarsis	78.56	82.57	71.63	16.18	8.99	46.29	20.80	11.73	34.16	61.80	6.99	85.42	73.71
Oecobiidae_Uroctea_compactilis	92.23	111.37	96.49	21.33	6.92	94.13	39.41	77.87	25.80	93.98	7.59	57.28	10.96
Oxyopidae_Oxyopes_sertatus	9.55	1.83	94.95	25.15	9.66	94.74	94.51	14.40	33.41	105.69	8.67	88.65	9.67
Oxyopidae_Peucetia_latikae	16.82	98.13	98.27	14.91	7.78	65.22	46.22	90.29	21.57	98.46	74.35	42.20	15.17
Philodromidae_Philodromus_cespitum	11.20	9.27	113.23	17.68	9.94	17.27	26.42	77.99	22.70	127.07	11.48	86.83	17.87
Pholcidae_Mesabolivar_sp1	24.79	3.86	87.27	16.73	22.77	39.95	30.14	85.88	24.45	90.68	68.78	26.57	81.34
Pholcidae_Mesabolivar_sp2	5.22	0.19	72.32	9.24	6.71	83.25	55.27	80.41	13.50	90.76	11.29	83.16	77.49

Species	*atp6*	*atp8*	*cob*	*cox1*	*cox2*	*cox3*	*nad1*	*nad2*	*nad3*	*nad4*	*nad4L*	*nad5*	*nad6*
Pholcidae_Pholcus_phalangioides	14.15	17.60	82.75	9.74	8.48	36.83	36.72	76.76	17.91	82.29	8.23	25.62	25.47
Pholcidae_Pholcus_sp	83.24	10.18	80.73	17.54	7.23	63.26	71.59	76.14	15.85	81.36	88.74	28.70	29.17
Pisauridae_Dolomedes_angustivirgatus	112.58	82.02	96.73	17.31	10.50	44.02	38.29	64.58	111.26	120.90	26.86	122.34	99.91
Pisauridae_Pisaura_bicornis	15.86	35.56	107.59	11.19	7.81	104.35	114.22	41.41	130.26	124.65	8.59	124.82	17.07
Salticidae_Carrhotus_xanthogramma	107.36	107.94	99.39	18.87	14.02	16.82	38.18	106.40	23.61	106.85	5.10	106.99	11.84
Salticidae_Cheliceroides_longipalpis	31.96	111.44	96.52	31.93	11.88	16.07	24.13	63.60	115.77	124.61	10.04	35.72	114.81
Salticidae_Dendryphantes_sp	19.25	32.40	93.55	16.55	9.48	35.58	34.48	11.92	137.14	133.43	18.17	129.02	15.90
Salticidae_Epeus_alboguttatus	19.37	4.70	101.39	42.00	11.59	17.96	20.22	123.19	33.36	121.99	33.78	121.67	7.48
Salticidae_Evarcha_sp	112.12	115.55	54.75	20.76	8.82	16.76	46.05	122.99	31.15	121.43	11.30	117.64	42.83
Salticidae_Habronattus_oregonensis	15.97	81.62	95.45	39.11	15.44	8.71	24.02	52.21	19.67	103.98	18.17	80.39	10.27
Salticidae_Heliophanus_lineiventris	16.99	106.50	103.23	35.64	7.41	12.83	13.38	113.46	24.44	112.53	73.03	96.92	100.84
Salticidae_Plexippus_paykulli	24.22	91.05	91.89	18.95	22.81	13.24	95.98	90.84	26.66	112.44	10.96	32.90	28.72
Salticidae_Telamonia_vlijmi	115.40	101.61	111.71	13.45	14.11	14.75	19.92	12.58	97.49	124.31	4.93	39.81	17.01
Selenopidae_Selenops_bursarius	23.40	94.26	99.61	12.30	17.99	18.86	16.91	115.32	33.78	78.37	8.34	60.95	7.61
Sicariidae_Loxosceles_rufescens	8.71	111.74	72.48	5.22	53.00	76.83	36.59	84.19	62.61	78.37	14.95	77.62	25.21
Sicariidae_Loxosceles_similis	12.08	103.61	82.98	44.01	8.19	11.02	14.81	97.61	7.90	102.58	43.03	47.62	11.06
Sparassidae_Heteropoda_venatoria	88.60	101.99	93.31	16.15	26.03	41.19	11.59	91.55	56.18	92.41	9.63	89.83	85.37
Tetragnathidae_Leucauge_celebesiana	11.65	39.53	106.09	37.43	6.92	106.53	94.12	119.56	28.53	107.63	13.26	60.51	71.85
Tetragnathidae_Tetragnatha_maxillosa	15.89	85.94	77.14	10.10	20.45	61.74	26.31	103.83	49.19	104.35	7.12	117.77	18.85
Tetragnathidae_Tetragnatha_nitens	103.85	64.90	6.94	14.39	35.12	19.49	22.81	11.44	33.00	100.82	13.47	131.63	75.57
Theraphosidae_Ornithoctonus_huwena	39.47	90.10	91.31	18.94	27.44	14.88	58.31	91.39	69.34	92.73	108.93	102.01	34.61
Theridiidae_Chrysso_nordica	23.62	81.81	107.40	84.57	10.35	20.79	105.50	8.19	23.29	113.96	26.27	124.81	85.42
Thomisidae_Heriaeus_melloteei	28.69	24.10	79.84	18.50	16.31	108.84	12.52	57.13	112.38	121.55	19.32	131.62	10.11
Thomisidae_Misumenops_tricuspidata	35.22	95.66	102.51	12.42	10.05	82.98	29.38	15.88	52.26	118.59	8.32	21.02	10.82
Thomisidae_Oxytate_striatipes	29.64	42.13	100.53	15.98	13.37	24.78	17.59	36.46	32.33	124.41	16.29	139.26	39.54
Thomisidae_Thomisus_onustus	9.51	10.45	108.28	32.35	16.96	27.00	110.20	43.89	103.65	122.92	75.24	82.20	14.67
Titanoecidae_Titanoeca_sp	110.62	77.63	99.63	14.70	12.44	31.90	17.96	102.09	7.04	100.23	60.79	110.51	13.67

Supplementary Table S13. Ratio of *dN* and *dS* substitution rates of 13 PCGs from 77 spider species in pairwise comparisons against reference mitogenome of *Mastigoproctus giganteus* (Uropygi).

Species	*atp6*	*atp8*	*cob*	*cox1*	*cox2*	*cox3*	*nad1*	*nad2*	*nad3*	*nad4*	*nad4L*	*nad5*	*nad6*	average
Agelenidae_Agelena_silvatica	0.05	0.08	0.00	0.01	0.03	0.00	0.01	0.01	0.03	0.01	0.05	0.02	0.02	0.02
Araneidae_Araneus_angulatus	0.04	0.02	0.00	0.01	0.04	0.01	0.01	0.11	0.02	0.01	0.06	0.01	0.01	0.03
Araneidae_Araneus_ventricosus	0.04	0.61	0.01	0.01	0.04	0.02	0.03	0.10	0.01	0.01	0.05	0.01	0.02	0.07
Araneidae_Araniella_displicata	0.02	0.02	0.06	0.01	0.07	0.02	0.02	0.01	0.11	0.01	0.12	0.01	0.10	0.04
Araneidae_Argiope_amoena	0.02	0.08	0.00	0.03	0.02	0.02	0.01	0.10	0.01	0.01	14.68	0.01	0.13	1.16
Araneidae_Argiope_bruennichi	0.07	0.01	0.00	0.00	0.04	0.00	0.02	0.01	0.01	0.01	0.11	0.01	0.01	0.02
Araneidae_Argiope_perforata	0.04	0.01	0.00	0.00	0.03	0.06	0.02	0.01	0.01	0.01	0.03	0.01	0.12	0.03
Araneidae_Cyclosa_argenteoalba	0.02	0.07	0.00	0.01	0.03	0.05	0.01	0.10	0.02	0.01	0.19	0.02	0.01	0.04
Araneidae_Cyclosa_japonica	0.06	35.46	0.05	0.00	0.08	0.03	0.01	0.14	0.03	0.01	0.51	0.01	0.02	2.80
Araneidae_Cyrtarachne_nagasakiensis	0.07	0.24	0.00	0.01	0.03	0.03	0.02	0.01	0.02	0.01	0.11	0.01	0.08	0.05
Araneidae_Cyrtophora_moluccensis	0.05	8.22	0.01	0.01	0.02	0.01	0.02	0.01	0.17	0.01	0.01	0.01	0.01	0.66
Araneidae_Hypsosinga_pygmaea	0.03	0.13	0.00	0.02	0.05	0.03	0.01	0.15	0.01	0.01	0.07	0.01	0.01	0.04
Araneidae_Neoscona_adianta	0.03	0.12	0.00	0.00	0.03	0.03	0.01	0.01	0.01	0.01	0.07	0.01	0.01	0.03
Araneidae_Neoscona_multiplicans	0.04	0.01	0.00	0.00	0.03	0.01	0.01	0.01	0.01	0.01	0.05	0.01	0.08	0.02
Araneidae_Neoscona_nautica	0.06	0.04	0.00	0.00	0.03	0.02	0.01	0.01	0.01	0.00	0.06	0.00	0.01	0.02
Araneidae_Neoscona_scylla	0.04	0.03	0.00	0.02	0.04	0.01	0.02	0.01	0.01	0.01	0.08	0.01	0.02	0.02
Araneidae_Neoscona_theisi	0.06	0.19	0.00	0.00	0.04	0.00	0.03	0.01	0.01	0.01	0.05	0.02	0.05	0.04
Araneidae_Trichonephila_clavata	0.03	0.01	0.01	0.00	0.04	0.00	0.02	0.01	0.03	0.01	0.08	0.00	0.07	0.03
Araneidae_Singa_sp	0.05	1.55	0.00	0.00	0.03	0.02	0.01	0.02	0.04	0.00	0.01	0.01	0.01	0.14
Clubionidae_Clubiona_sp	0.01	0.09	0.00	0.01	0.04	0.03	0.03	0.01	0.00	0.01	0.06	0.03	0.15	0.04
Cybaeidae_Argyroneta_aquatica	0.07	0.63	0.01	0.02	0.03	0.00	0.01	0.01	0.02	0.01	0.64	0.03	0.02	0.11
Dipluridae_Phyxioschema_suthepium	0.04	0.02	0.00	0.00	0.04	0.00	0.02	0.08	0.05	0.01	0.05	0.02	0.02	0.03
Dysderidae_Harpactocrates_apennicola	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.05	0.04	0.01	0.09	0.02	0.03	0.02

Species	*atp6*	*atp8*	*cob*	*cox1*	*cox2*	*cox3*	*nad1*	*nad2*	*nad3*	*nad4*	*nad4L*	*nad5*	*nad6*	average
Dysderidae_Parachtes_ignavus	0.01	0.08	0.00	0.00	0.03	0.01	0.04	0.09	0.03	0.01	0.25	0.03	0.04	0.05
Dysderidae_Parachtes_limbarae	0.01	0.05	0.00	0.01	0.02	0.00	0.03	0.10	0.03	0.01	0.07	0.03	0.07	0.03
Dysderidae_Parachtes_riberai	0.07	0.13	0.00	0.01	0.06	0.03	0.01	0.02	0.09	0.01	0.03	0.01	0.02	0.04
Dysderidae_Parachtes_romandiolae	0.04	0.08	0.00	0.01	0.03	0.02	0.05	0.14	0.02	0.01	0.18	0.01	0.02	0.05
Dysderidae_Parachtes_teruelis	0.04	0.06	0.00	0.01	0.03	0.04	0.01	0.09	0.04	0.01	0.04	0.01	0.02	0.03
Eresidae_Stegodyphus_lineatus	0.01	0.09	0.00	0.01	0.04	0.03	0.02	0.01	0.11	0.01	22.25	0.01	0.09	1.74
Gnaphosidae_Gnaphosa_kompirensis	0.05	0.02	0.01	0.02	0.02	0.02	0.02	0.01	0.05	0.01	0.45	0.03	0.11	0.06
Gnaphosidae_Gnaphosa_licenti	0.04	0.02	0.00	0.01	0.02	0.02	0.01	0.03	0.08	0.01	0.29	0.01	0.08	0.05
Hypochilidae_Hypochilus_thorelli	0.03	0.01	0.03	0.02	0.05	0.02	0.02	0.05	0.05	0.01	14.32	0.02	0.02	1.13
Linyphiidae_Microlinyphia_pusilla	0.03	0.32	0.00	0.01	0.02	0.01	0.04	0.02	0.01	0.01	0.14	0.01	0.11	0.06
Liphistiidae_Heptathela_hangzhouensis	0.03	0.01	0.08	0.02	0.06	0.00	0.03	0.01	0.01	0.01	0.01	0.00	0.01	0.02
Liphistiidae_Liphistius_erawan	0.09	0.02	0.04	0.03	0.09	0.02	0.06	0.02	0.10	0.01	0.01	0.02	0.01	0.04
Liphistiidae_Songthela_sp	0.10	0.01	0.02	0.02	0.01	0.02	0.00	0.01	0.03	0.01	0.30	0.01	0.01	0.04
Lycosidae_Alopecosa_cursor	0.06	0.02	0.00	0.02	0.04	0.01	0.01	0.01	0.01	0.01	0.06	0.01	0.02	0.02
Lycosidae_Lycosa_sinensis	0.02	0.01	0.00	0.01	0.04	0.03	0.00	0.01	0.01	0.00	0.09	0.01	0.01	0.02
Lycosidae_Pardosa_laura	0.04	0.02	0.00	0.01	0.04	0.02	0.02	0.08	0.02	0.01	0.08	0.01	0.06	0.03
Lycosidae_Pirata_subpiraticus	0.06	0.02	0.00	0.02	0.04	0.02	0.02	0.02	0.02	0.01	0.10	0.01	0.05	0.03
Lycosidae_Wadicosa_fidelis	0.03	0.02	0.00	0.01	0.04	0.01	0.00	0.01	0.03	0.01	0.08	0.01	0.02	0.02
Miturgidae_Cheiracanthium_erraticum	0.01	0.08	0.00	0.01	0.03	0.01	0.01	0.01	0.01	0.01	0.12	0.01	0.01	0.02
Miturgidae_Cheiracanthium_triviale	0.02	0.07	0.00	0.00	0.00	0.02	0.00	0.03	0.01	0.01	0.04	0.01	0.07	0.02
Nemesiidae_Calisoga_longitarsis	0.01	0.02	0.01	0.01	0.04	0.01	0.02	0.11	0.02	0.01	0.38	0.01	0.02	0.05
Oecobiidae_Uroctea_compactilis	0.01	0.01	0.00	0.01	0.05	0.00	0.01	0.01	0.03	0.01	0.16	0.01	0.11	0.03
Oxyopidae_Oxyopes_sertatus	0.07	1.18	0.00	0.01	0.04	0.00	0.00	0.07	0.02	0.01	0.28	0.01	0.14	0.14
Oxyopidae_Peucetia_latikae	0.04	0.01	0.00	0.01	0.04	0.01	0.01	0.01	0.04	0.01	0.02	0.02	0.08	0.02
Philodromidae_Philodromus_cespitum	0.06	0.19	0.00	0.01	0.03	0.02	0.02	0.01	0.03	0.00	0.13	0.01	0.08	0.05
Pholcidae_Mesabolivar_sp1	0.03	0.35	0.01	0.01	0.02	0.01	0.02	0.02	0.04	0.01	0.02	0.03	0.02	0.04
Pholcidae_Mesabolivar_sp2	0.14	99.00	0.01	0.02	0.06	0.00	0.01	0.02	0.08	0.01	0.20	0.01	0.02	7.66

Species	*atp6*	*atp8*	*cob*	*cox1*	*cox2*	*cox3*	*nad1*	*nad2*	*nad3*	*nad4*	*nad4L*	*nad5*	*nad6*	average
Pholcidae_Pholcus_phalangioides	0.05	0.11	0.00	0.02	0.05	0.01	0.01	0.02	0.06	0.01	0.21	0.03	0.05	0.05
Pholcidae_Pholcus_sp	0.01	0.22	0.01	0.01	0.06	0.01	0.01	0.02	0.07	0.01	0.02	0.03	0.04	0.04
Pisauridae_Dolomedes_angustivirgatus	0.01	0.02	0.00	0.01	0.03	0.01	0.01	0.01	0.01	0.01	0.07	0.01	0.01	0.02
Pisauridae_Pisaura_bicornis	0.04	0.04	0.00	0.01	0.04	0.00	0.00	0.02	0.01	0.01	0.23	0.01	0.08	0.04
Salticidae_Carrhotus_xanthogramma	0.01	0.01	0.00	0.01	0.03	0.02	0.01	0.01	0.02	0.01	0.32	0.01	0.11	0.04
Salticidae_Cheliceroides_longipalpis	0.02	0.01	0.00	0.01	0.03	0.02	0.02	0.02	0.00	0.01	0.16	0.02	0.01	0.02
Salticidae_Dendryphantes_sp	0.03	0.05	0.00	0.01	0.04	0.01	0.01	0.08	0.00	0.01	0.07	0.01	0.07	0.03
Salticidae_Epeus_alboguttatus	0.03	0.27	0.00	0.00	0.03	0.02	0.02	0.01	0.02	0.01	0.05	0.01	0.21	0.05
Salticidae_Evarcha_sp	0.01	0.01	0.01	0.01	0.04	0.02	0.01	0.01	0.02	0.01	0.14	0.01	0.03	0.02
Salticidae_Habronattus_oregonensis	0.04	0.02	0.00	0.00	0.02	0.03	0.02	0.02	0.03	0.01	0.08	0.01	0.13	0.03
Salticidae_Heliophanus_lineiventris	0.04	0.01	0.00	0.00	0.05	0.02	0.04	0.01	0.02	0.01	0.02	0.01	0.01	0.02
Salticidae_Plexippus_paykulli	0.03	0.02	0.00	0.01	0.02	0.02	0.01	0.01	0.02	0.01	0.16	0.02	0.05	0.03
Salticidae_Telamonia_vlijmi	0.01	0.01	0.00	0.01	0.02	0.02	0.02	0.08	0.01	0.01	0.37	0.02	0.07	0.05
Selenopidae_Selenops_bursarius	0.03	0.02	0.00	0.01	0.02	0.02	0.03	0.01	0.02	0.01	0.28	0.01	0.19	0.05
Sicariidae_Loxosceles_rufescens	0.08	0.01	0.01	0.04	0.01	0.00	0.02	0.01	0.01	0.01	0.11	0.01	0.06	0.03
Sicariidae_Loxosceles_similis	0.06	0.01	0.01	0.00	0.05	0.04	0.04	0.01	0.09	0.01	0.17	0.02	0.16	0.05
Sparassidae_Heteropoda_venatoria	0.01	0.01	0.00	0.01	0.01	0.01	0.04	0.01	0.01	0.01	0.25	0.01	0.02	0.03
Tetragnathidae_Leucauge_celebesiana	0.06	0.03	0.00	0.00	0.05	0.00	0.00	0.01	0.02	0.01	0.14	0.01	0.02	0.03
Tetragnathidae_Tetragnatha_maxillosa	0.04	0.01	0.00	0.02	0.02	0.01	0.02	0.01	0.02	0.01	0.41	0.01	0.09	0.05
Tetragnathidae_Tetragnatha_nitens	0.01	0.02	0.05	0.01	0.01	0.02	0.02	0.11	0.02	0.01	0.14	0.01	0.02	0.03
Theraphosidae_Ornithoctonus_huwena	0.02	0.02	0.00	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.01
Theridiidae_Chrysso_nordica	0.03	0.02	0.00	0.00	0.03	0.02	0.00	0.11	0.03	0.01	0.09	0.01	0.01	0.03
Thomisidae_Heriaeus_melloteei	0.02	0.06	0.00	0.01	0.02	0.00	0.04	0.02	0.01	0.01	0.09	0.01	0.11	0.03
Thomisidae_Misumenops_tricuspidata	0.02	0.01	0.00	0.01	0.03	0.00	0.02	0.06	0.01	0.01	0.21	0.03	0.11	0.04
Thomisidae_Oxytate_striatipes	0.02	0.03	0.00	0.01	0.02	0.01	0.03	0.03	0.02	0.01	0.10	0.00	0.03	0.02
Thomisidae_Thomisus_onustus	0.07	0.15	0.00	0.01	0.02	0.01	0.00	0.02	0.01	0.01	0.02	0.01	0.09	0.03
Titanoecidae_Titanoeca_sp	0.01	0.02	0.00	0.01	0.03	0.01	0.03	0.01	0.13	0.01	0.03	0.01	0.11	0.03

Supplementary Table S14. tRNA structure coded as either presence or absence of DHU and TΨC arms for spiders used in this study. tRNA identity is abbreviated with standard one-letter code, where L1=CUN, L2=UUR, S1=AGN, and S2=UCN anticodons. DHU arm and TΨC arm are on left and right of "/", respectively. + indicates presence of a DHU arm/TΨC arm. - indicates absence of a DHU arm/TΨC arm. * indicates that tRNA gene is not present in the genome.

Family	Speceis	A	C	D	E	F	G	H	I	K	L1	L2	M	N	P	Q	R	S1	S2	T	V	W	Y
Agelenidae	*Agelena silvatica*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Araneidae	*Araneus angulatus*	−/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Araneidae	*Araneus ventricosus*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Araneidae	*Araniella displicata*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Araneidae	*Argiope amoena*	−/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Araneidae	*Argiope bruennichi*	−/+	+/+	+/−	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	+/+	+/+	+/+	+/+	+/+
Araneidae	*Argiope perforata*	−/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Araneidae	*Cyclosa argenteoalba*	−/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Araneidae	*Cyclosa japonica*	−/+	+/+	+/−	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Araneidae	*Cyrtarachne nagasakiensis*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	+/+	+/+	+/+	+/+	+/+
Araneidae	*Cyrtophora moluccensis*	−/+	+/+	+/−	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Araneidae	*Hypsosinga pygmaea*	−/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Araneidae	*Neoscona adianta*	−/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Araneidae	*Neoscona multiplicans*	−/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Araneidae	*Neoscona nautica*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Araneidae	*Neoscona scylla*	−/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Araneidae	*Neoscona theisi*	−/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Araneidae	*Trichonephila clavata*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Araneidae	*Singa* sp	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Clubionidae	*Clubiona* sp	−/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/−	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Cybaeidae	*Argyroneta aquatica*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Dipluridae	*Phyxioschema suthepium*	−/+	+/−	+/+	+/−	+/−	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/−

Family	Speceis	A	C	D	E	F	G	H	I	K	L1	L2	M	N	P	Q	R	S1	S2	T	V	W	Y
Dysderidae	*Harpactocrates apennicola*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	−/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Dysderidae	*Parachtes ignavus*	−/+	+/+	+/+	+/+	+/−	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	−/+	+/+	−/+	−/+	+/+	+/+	+/+	+/−
Dysderidae	*Parachtes limbarae*	−/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	−/+	+/+	−/+	−/+	+/+	+/+	+/+	+/−
Dysderidae	*Parachtes riberai*	−/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	−/+	+/+	−/+	−/+	+/+	+/+	+/+	+/−
Dysderidae	*Parachtes romandiolae*	−/+	+/+	+/+	+/+	+/−	+/+	+/−	+/+	+/+	+/+	+/−	+/+	+/+	+/+	−/+	+/+	−/+	−/+	+/+	+/+	+/+	+/−
Dysderidae	*Parachtes teruelis*	−/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/−	−/+	+/+	−/+	−/+	+/+	+/+	+/+	+/−
Eresidae	*Stegodyphus lineatus*	−/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Gnaphosidae	*Gnaphosa kompirensis*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Gnaphosidae	*Gnaphosa licenti*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Hypochilidae	*Hypochilus thorelli*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Linyphiidae	*Microlinyphia pusilla*	−/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Liphistiidae	*Heptathela hangzhouensis*	−/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Liphistiidae	*Liphistius erawan*	−/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Liphistiidae	*Songthela* sp	−/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Lycosidae	*Alopecosa cursor*	−/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Lycosidae	*Lycosa sinensis*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Lycosidae	*Pardosa laura*	−/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Lycosidae	*Pirata subpiraticus*	−/+	+/+	+/+	+/+	+/+	*	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Lycosidae	*Wadicosa fidelis*	−/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Miturgidae	*Cheiracanthium erraticum*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/−	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Miturgidae	*Cheiracanthium triviale*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Nemesiidae	*Calisoga longitarsis*	−/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/−
Oecobiidae	*Uroctea compactilis*	−/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Oxyopidae	*Oxyopes sertatus*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Oxyopidae	*Peucetia latikae*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Philodromidae	*Philodromus cespitum*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/−	+/+
Pholcidae	*Mesabolivar* sp1	−/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/−	+/+	+/+	+/−
Pholcidae	*Mesabolivar* sp2	−/+	+/−	+/−	+/+	+/+	+/−	+/−	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/−	+/+	+/+	+/−

Family	Speceis	A	C	D	E	F	G	H	I	K	L1	L2	M	N	P	Q	R	S1	S2	T	V	W	Y
Pholcidae	*Pholcus phalangioides*	−/+	+/−	+/−	+/+	+/−	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/−
Pholcidae	*Pholcus* sp	−/+	+/−	+/−	+/+	+/−	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/−
Pisauridae	*Dolomedes angustivirgatus*	−/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Pisauridae	*Pisaura bicornis*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Salticidae	*Carrhotus xanthogramma*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Salticidae	*Cheliceroides longipalpis*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Salticidae	*Dendryphantes* sp	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Salticidae	*Epeus alboguttatus*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	+/+	+/+	+/+	+/+	+/+
Salticidae	*Evarcha* sp	−/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Salticidae	*Habronattus oregonensis*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Salticidae	*Heliophanus lineiventris*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Salticidae	*Plexippus paykulli*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Salticidae	*Telamonia vlijmi*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Selenopidae	*Selenops bursarius*	−/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Sicariidae	*Loxosceles rufescens*	−/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Sicariidae	*Loxosceles similis*	−/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/−	+/+	+/+	+/−	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Sparassidae	*Heteropoda venatoria*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Tetragnathidae	*Leucauge celebesiana*	−/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Tetragnathidae	*Tetragnatha maxillosa*	−/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Tetragnathidae	*Tetragnatha nitens*	−/+	+/−	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/−	+/+	+/+	+/+
Theraphosidae	*Ornithoctonus huwena*	−/+	+/+	+/+	+/+	+/+	+/−	+/−	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/−
Theridiidae	*Chrysso nordica*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	+/+	+/+	+/+	+/+	+/+
Thomisidae	*Heriaeus melloteei*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Thomisidae	*Misumenops tricuspidata*	−/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Thomisidae	*Oxytate striatipes*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Thomisidae	*Thomisus onustus*	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
Titanoecidae	*Titanoeca* sp	−/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/−	+/+	+/+	+/+	+/+	+/+	−/+	−/+	+/+	+/+	+/+	+/+
	Total numbers	0/77	77/71	77/63	77/73	77/69	77/55	77/71	77/77	77/77	77/77	77/0	77/77	77/77	77/73	71/77	77/77	0/77	4/77	77/74	77/77	77/76	77/65

Supplementary Table S15. Pearson correlation test results of lengths of PCGs, rRNAs, and tRNAs. * $P<0.05$, ** $P<0.01$.

		Size of 13 PCGs (bp)	Size of *rrnL* (bp)	Size of *rrnS* (bp)	Size of two rRNAs (bp)	Size of 22 tRNAs (bp)
Size of 13 PCGs (bp)	Pearson correlation coefficient	1	0.253*	0.229*	0.269*	0.265*
	Sig.		0.027	0.045	0.018	0.020
Size of *rrnL* (bp)	Pearson correlation coefficient	0.253*	1	0.521**	0.984**	0.230*
	Sig.	0.027		0.000	0.000	0.044
Size of *rrnS* (bp)	Pearson correlation coefficient	0.229*	0.521**	1	0.666**	0.403**
	Sig.	0.045	0.000		0.000	0.000
Size of two rRNAs (bp)	Pearson correlation coefficient	0.269*	0.984**	0.666**	1	0.286*
	Sig.	0.018	0.000	0.000		0.012
Size of 22 tRNAs (bp)	Pearson correlation coefficient	.265*	0.230*	0.403**	0.286*	1
	Sig.	0.020	0.044	0.000	0.012	

Supplementary Data S1. Sequence alignments used for phylogenetic analyses.

Supplementary Data S2. All inferred phylogenetic trees using four mitogenomic datasets and two analytical methods.

Supplementary Data S3. Ancestral reconstruction results of web types in spiders using PastML.