Supporting Information

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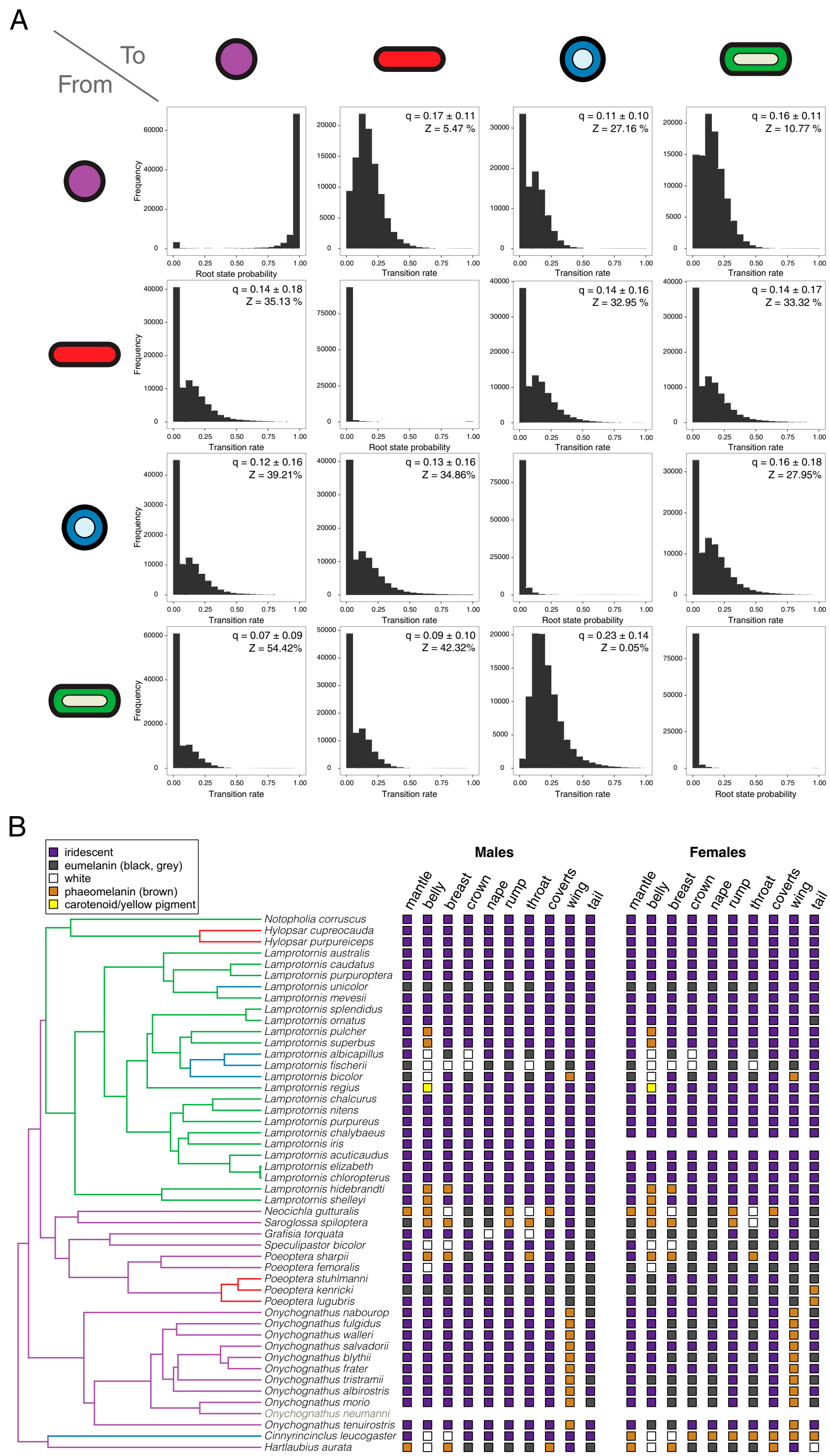

Fig. S1. (*A*) Posterior probabilities for the transition rates (off-diagonal) and root ancestral states (diagonal) for the different melanosome morphologies obtained from the reversible-jump Markov chain Monte Carlo analysis. Mean and SD for transition rates (q), as well as the frequency that the parameter was estimated to be zero (Z), are shown for each transition. (*B*) Maximum clade credibility tree for the African starlings, showing the melanosome regime used in evolutionary models for all color patches (Table S2) and the color phenotype observed for each sex of each species. *Onychognathus neumanni* and females of *Lamprotornis iris* were not sampled and therefore are not included in analyses.

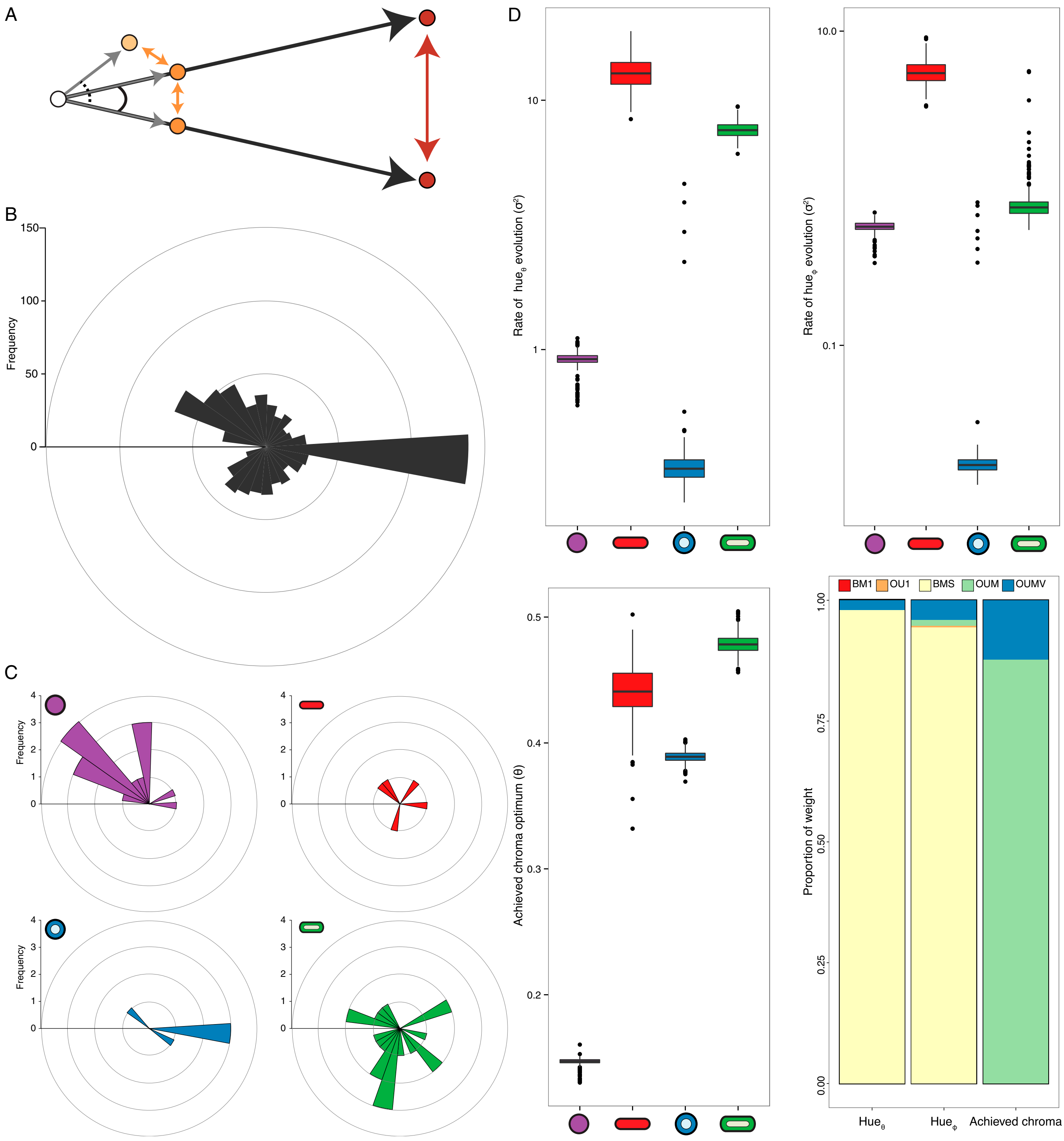

Fig. S2. Problems in using univariate descriptors of hue and saturation in describing color diversification. (*A*) In the tetrachromatic colorspace model, hue is described as the angles between the color point, the achromatic center (white circle), and either the *sml* cones plane (Hue$_\theta$) or the *u* vertex (Hue$_\phi$) and saturation as the distance between the color point and the achromatic center (black and gray arrows). If we define phenotypic disparity as the distance between points in colorspace, for a given hue difference (angle solid line), two color points can be very similar if close to the achromatic center (orange circles) or very different if these colors have higher chroma (i.e., distant from the achromatic center, red circles). Similarly, points with considerably different hue distances (dashed and solid angle lines) can be equidistant from each other (i.e., similar level of morphological disparity) depending on their distance from the achromatic center (as shown in the distance between the two dark orange circles and the light orange circles). (*B*) Further, as hue is described by angular variables, treating it as a linear variable results in an overestimation of the hue differences between points found near the zero angle (black line), which are treated as being at the extremes of a linear variable circular histogram of Hue$_\theta$ angles for the iridescent colors across all body patches of African starlings, for both sexes. If measured colors spanned a restricted range of angles, treating this variable as a linear variable would be less problematic, but colors observed range across nearly all possible angles. (*C*) Circular histograms of Hue$_\theta$ for the upper back of male African starlings by melanosome morphology, showing that this broad hue span is present even when a single body patch is considered. Therefore, the interactive effects of independent color descriptors were considered by summarizing color disparity in terms of multivariate orthogonal principal components for our analyses. (*D*) Parameter estimates and model selection results for the univariate descriptors hue and saturation for the male mantle patch color evolution across the 500 trees sampled from the posterior distribution.

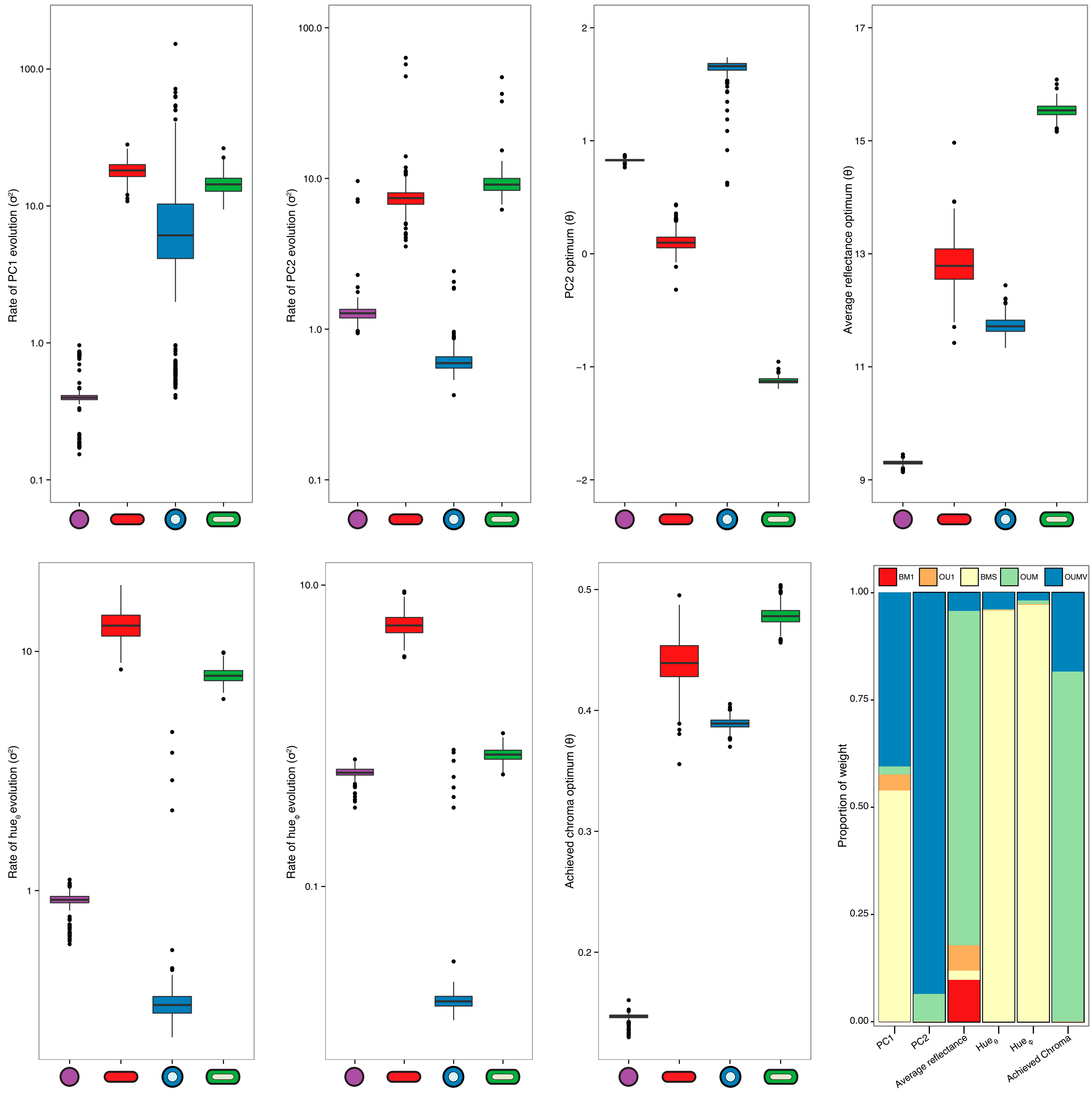

Fig. S3. Parameter estimates and model selection results under the best models for the principal components and univariate color descriptors for the male mantle patch color evolution across the 500 trees sampled from the posterior distribution, excluding *Lamprotornis elisabeth*.

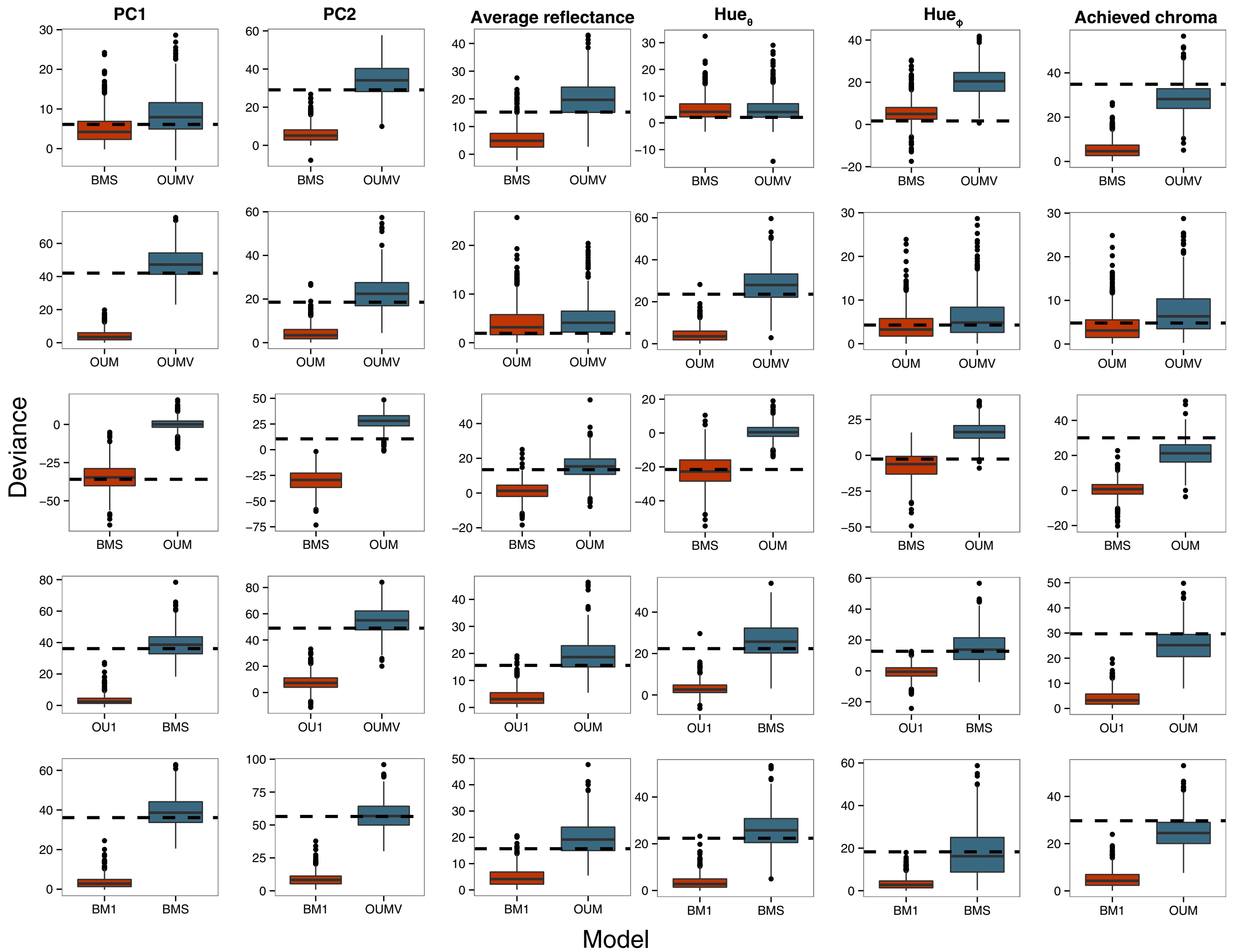

Fig. S4. Phylogenetic Monte Carlo results for the pairwise comparisons of evolutionary models for the male mantle patch variables, excluding *Lamprotornis elisabeth*. Boxes indicate the deviance value calculated by comparing the two models in the comparison after data were simulated under the respective model given the estimated maximum-likelihood estimates obtained from the maximum clade credibility tree (Fig. S1*B*). The dashed line indicates the deviance calculated from the maximum-likelihood models. Values below the line indicate low support for that model, and values that fall within the distribution obtained from a simulated model indicate a high probability of obtaining such deviance values under data simulated under that model. If the line falls within the distribution of both models, there is low power to distinguish between them, resulting from parameter estimates for different melanosome morphologies being similar for the parameters that distinguish both models (Table S2).

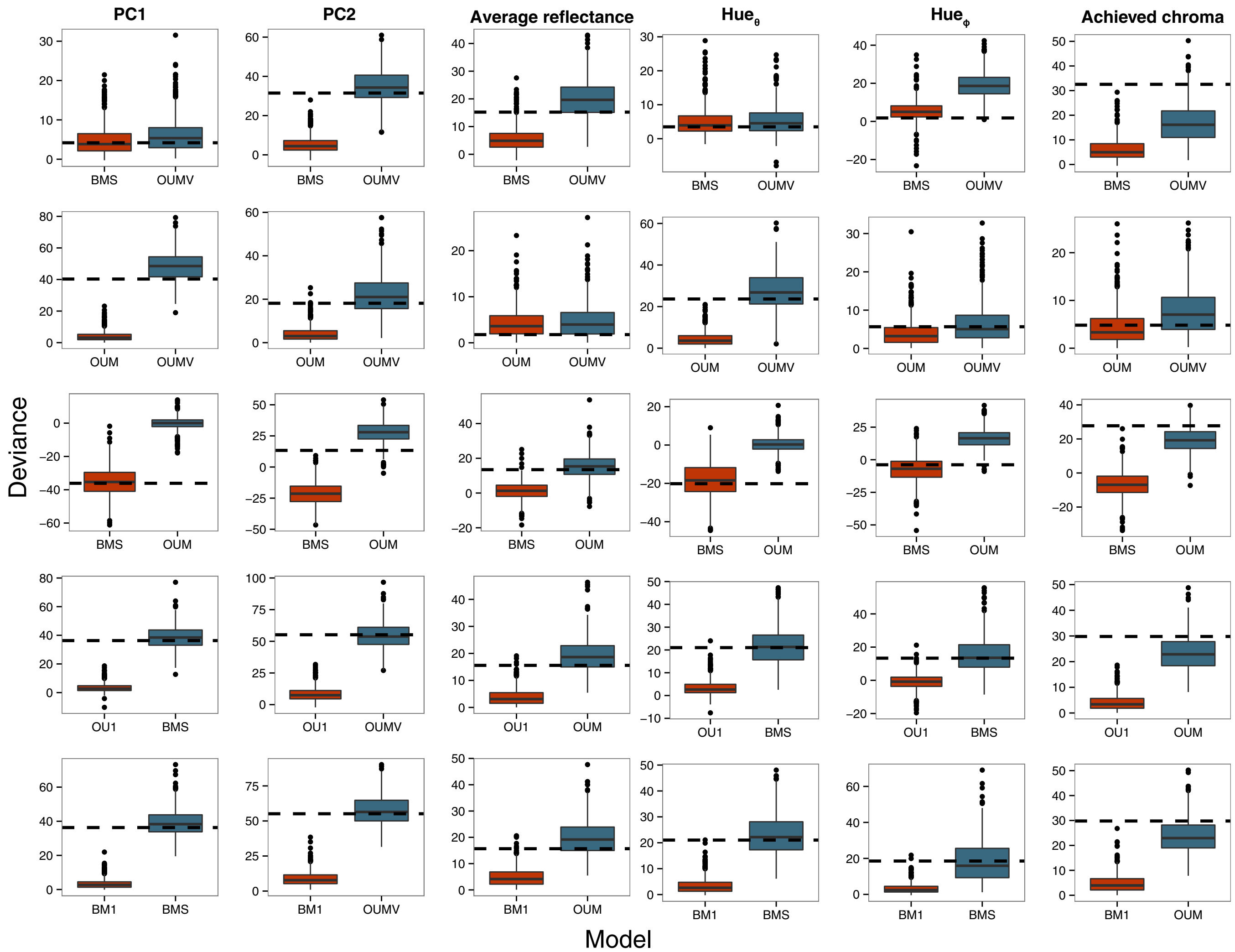

Fig. S5. Phylogenetic Monte Carlo results for the pairwise comparisons of evolutionary models for the male mantle patch variables. Boxes indicate the deviance value calculated by comparing the two models in the comparison after data were simulated under the respective model given the estimated maximum-likelihood estimates obtained from the maximum clade credibility tree (Fig. S1*B*). The dashed line indicates the deviance calculated from the maximum-likelihood models. Values below the line indicate low support for that model, and values that fall within the distribution obtained from a simulated model indicate a high probability of obtaining such deviance values under data simulated under that model. If the line falls within the distribution of both models, there is low power to distinguish between them, resulting from parameter estimates for different melanosome morphologies being similar for the parameters that distinguish both models (Table S2).

Table S1. Principal component analysis loadings and the variance explained by each component, obtained from the four cone stimuli that characterize avian color vision

	Component loadings			
Variable	PC1	PC2	PC3	PC4
Qu	0.52	0.46	−0.47	−0.54
Qs	0.46	−0.58	0.48	−0.48
Qm	−0.48	−0.52	−0.57	−0.41
Ql	−0.53	0.43	0.47	−0.56
Variance, %	64.43	31.22	04.35	<0.01

The first two components were used in the analyses. PC, principal component.

Table S2. Model selection results for the evolutionary models under the maximum clade credibility tree for all color patches and both sexes, including and excluding *Lamprotornis elisabeth*

			All iridescent species, AICc					log(Lik)					Excluding *Lamprotornis Elisabeth*, AICc					log(Lik)				
Sex			BM1, $k = 2$	OU1, $k = 3$	BMS, $k = 5$	OUM, $k = 6$	OUMV, $k = 9$	BM1	OU1	BMS	OUM	OUMV	BM1, $k = 2$	OU1, $k = 3$	BMS, $k = 5$	OUM, $k = 6$	OUMV, $k = 9$	BM1	OU1	BMS	OUM	OUMV
Males																						
	Mantle	PC1	193.98	196.28	**163.44**	203.75	170.92	−94.85	−94.85	−75.95	−94.77	−73.89	195.57	197.87	**164.71**	205.39	171.98	−95.64	−95.63	−76.56	−95.56	−74.34
		PC2	143.10	145.40	126.17	114.86	**106.41**	−69.41	−69.41	−57.31	−50.32	−41.63	146.04	140.93	128.35	116.98	**108.62**	−70.87	−67.17	−58.38	−51.35	−42.66
		Brightness	−16.72	−14.52	−12.09	**−23.56**	−16.28	10.50	10.55	11.81	18.88	19.71	−12.30	−10.03	−8.09	**−18.77**	−11.53	8.30	8.31	9.84	16.52	17.41
	Belly	PC1	136.96	139.41	**106.15**	146.40	108.23	−66.27	−66.27	−46.92	−65.52	−41.02	125.70	128.16	**100.06**	134.53	112.00	−60.64	−60.64	−43.83	−59.51	−42.71
		PC2	103.87	99.05	**89.89**	104.29	97.61	−49.73	−46.09	−38.79	−44.47	−35.71	106.65	109.11	**92.12**	106.29	99.53	−51.11	−51.11	−39.86	−45.40	−36.48
		Brightness	23.73	17.40	20.42	8.33	**0.51**	−9.66	−5.27	−4.05	3.51	12.84	11.93	12.01	13.11	**4.21**	13.55	−3.75	−2.56	−0.36	5.64	6.51
	Breast	PC1	177.32	179.66	138.20	184.37	**135.59**	−86.49	−86.49	−63.19	−84.87	−55.69	178.09	180.45	138.78	148.34	**132.21**	−86.88	−86.87	−63.45	−66.82	−53.89
		PC2	117.12	119.47	**106.84**	112.34	106.96	−56.40	−56.39	−47.51	−48.86	−41.38	112.70	115.06	**105.05**	111.55	106.94	−54.18	−54.18	−46.59	−48.42	−41.26
		Brightness	21.42	16.02	14.97	**−10.77**	−7.35	−8.54	−4.67	−1.57	12.70	15.78	6.95	7.65	3.51	**−9.98**	−7.00	−1.30	−0.47	4.18	12.35	15.72
	Crown	PC1	187.21	189.51	**165.68**	196.22	175.68	−91.46	−91.46	−77.07	−91.01	−76.27	174.14	176.44	**156.34**	182.85	166.54	−84.92	−84.92	−72.38	−84.29	−71.62
		PC2	146.38	139.48	**117.97**	132.47	**110.37***	−71.05	−66.45	−53.22	−59.13	−43.61	129.31	130.62	**109.06**	126.96	**106.55***	−62.51	−62.01	−48.74	−56.35	−41.63
		Brightness	52.81	51.92	**26.38**	47.40	31.36	−24.26	−22.67	−7.42	−16.59	−4.11	57.79	56.40	**31.39**	51.25	34.86	−26.75	−24.90	−9.91	−18.49	−5.78
	Nape	PC1	191.04	193.33	**171.55**	200.42	182.25	−93.38	−93.38	−80.02	−93.13	−79.62	187.57	189.87	**168.69**	196.95	179.71	−91.64	−91.64	−78.57	−91.37	−78.28
		PC2	135.05	137.34	123.36	118.40	**107.04**	−65.39	−65.38	−55.93	−52.12	−42.02	132.78	132.79	123.04	118.20	**107.50**	−64.25	−63.10	−55.75	−51.99	−42.18
		Brightness	16.49	14.14	17.00	**13.24**	18.74	−6.11	−3.79	−2.75	0.46	2.13	**−5.12**	−2.83	0.16	0.57	6.77	4.71	4.71	5.69	6.82	8.19
	Rump	PC1	196.37	166.00	**162.08**	205.55	164.52	−96.04	−79.71	−75.27	−95.67	−70.69	178.44	180.74	**152.37**	187.27	156.47	−87.07	−87.07	−70.40	−86.50	−66.59
		PC2	174.02	157.27	142.21	181.85	**136.86**	−84.87	−75.34	−65.34	−83.82	−56.86	156.38	158.69	133.91	163.11	**133.18**	−76.04	−76.04	−61.16	−74.42	−54.94
		Brightness	−32.14	−29.84	−25.48	**−40.55**	−31.96	18.21	18.21	18.51	27.38	27.55	−26.28	−23.97	−19.61	**−34.66**	−25.97	15.28	15.28	15.60	24.46	24.63
	Coverts	PC1	168.38	170.69	**148.70**	166.50	157.46	−82.05	−82.05	−68.58	−76.14	−67.16	161.13	157.09	**142.67**	163.84	154.49	−78.42	−75.24	−65.54	−74.78	−65.60
		PC2	151.46	153.76	129.82	123.13	**109.81**	−73.59	−73.59	−59.14	−54.46	−43.33	120.41	122.72	116.60	105.52	**100.11**	−58.06	−58.06	−52.51	−45.62	−38.41
		Brightness	6.86	5.12	4.84	**−14.10**	−7.42	−1.29	0.73	3.35	14.15	15.28	2.79	3.49	3.25	**−13.04**	−6.26	0.75	1.56	4.16	13.66	14.78
	Throat	PC1	191.21	193.52	**166.15**	200.50	169.58	−93.45	−93.45	−77.24	−93.05	−72.98	190.81	193.14	**166.68**	200.15	**171.81***	−93.25	−93.24	−77.48	−92.84	−74.00
		PC2	143.23	145.55	122.52	131.64	**116.66**	−69.46	−69.46	−55.43	−58.62	−46.52	129.93	132.25	115.83	126.28	**113.06**	−62.81	−62.80	−52.06	−55.91	−44.63
		Brightness	60.32	45.90	50.24	38.81	**36.98**	−28.01	−19.63	−19.29	−12.21	−6.68	39.69	37.09	37.64	**33.58**	34.78	−17.69	−15.22	−12.96	−9.55	−5.49
	Wing	PC1	138.19	140.58	**131.77**	148.06	141.66	−66.91	−66.90	−59.85	−66.53	−58.23	140.32	142.73	**133.72**	150.32	142.36	−67.97	−67.96	−60.79	−67.60	−58.43
		PC2	126.39	113.66	101.46	**95.73**	**93.94***	−61.01	−53.44	−44.69	−40.37	−34.37	123.47	125.88	100.39	**95.13**	**93.01***	−59.54	−59.54	−44.12	−40.01	−33.75
		Brightness	−9.66	−7.26	−4.59	**−11.35**	−4.55	7.02	7.02	8.33	13.18	14.88	−7.73	−5.32	−2.84	**−8.50**	−1.87	6.06	6.06	7.49	11.80	13.69
	Tail	PC1	167.50	163.18	**152.30**	165.19	161.23	−81.61	−78.31	−70.42	−75.54	−69.18	163.63	162.28	**150.22**	164.60	160.85	−79.67	−77.86	−69.36	−75.22	−68.92
		PC2	182.33	135.34	117.85	135.76	**95.05**	−89.03	−64.39	−53.19	−60.83	−36.09	117.53	116.81	**85.57**	118.98	91.40	−56.62	−55.12	−37.03	−52.41	−34.20
		Brightness	86.02	68.18	76.96	62.51	**50.03**	−40.87	−30.81	−32.75	−24.21	−13.58	**36.22**	38.51	39.15	44.41	48.58	−15.97	−15.97	−13.83	−15.13	−12.79
Females																						
	Mantle	PC1	191.29	193.63	163.04	199.38	**159.69**	−93.49	−93.49	−75.66	−92.45	−67.94	165.08	167.41	**147.98***	171.16	**152.57**	−80.38	−80.37	−68.11	−78.31	−64.29
		PC2	190.14	192.48	138.67	98.95	**91.00**	−92.91	−92.91	−63.48	−42.24	−33.60	145.47	124.66	116.31	95.78	**88.33**	−70.57	−58.99	−52.27	−40.62	−32.16
		Brightness	−22.65	−20.31	−17.98	**−34.79**	−29.40	13.48	13.48	14.85	24.63	26.60	−20.02	−17.68	−16.92	**−31.77**	−27.32	12.17	12.17	14.34	23.16	25.66
	Belly	PC1	136.39	99.44	116.44	**96.75**	129.04	−65.96	−46.24	−51.91	−40.47	−50.79	121.84	124.36	**108.06**	130.29	114.43	−58.68	−58.68	−47.67	−57.14	−43.22
		PC2	77.54	**76.31**	**62.70***	81.71	**71.52***	−36.54	−34.67	−25.05	−32.95	−22.02	80.23	**78.76**	**65.25***	84.17	**73.99***	−37.87	−35.88	−26.26	−34.09	−23.00
		Brightness	16.60	11.25	15.49	−4.99	**−9.28**	−6.07	−2.15	−1.44	10.40	18.38	9.82	9.01	11.80	−3.06	**−7.04**	−2.67	−1.00	0.46	9.53	17.52
	Breast	PC1	165.98	168.37	**142.89**	173.44	143.35	−80.81	−80.81	−65.44	−79.27	−59.21	159.59	161.98	**139.66**	166.42	143.54	−77.61	−77.60	−63.79	−75.71	−59.17
		PC2	123.63	126.01	97.65	100.23	**82.68**	−59.63	−59.63	−42.83	−42.67	−28.88	108.99	111.38	90.30	99.17	**81.93**	−52.31	−52.30	−39.11	−42.08	−28.37
		Brightness	10.57	8.81	13.05	**5.89**	13.53	−3.10	−1.03	−0.53	4.50	5.70	15.61	13.72	18.14	**10.12**	18.27	−5.62	−3.47	−3.04	2.44	3.47

Table S2. Cont.

Sex		All iridescent species, AICc BM1, $k = 2$	OU1, $k = 3$	BMS, $k = 5$	OUM, $k = 6$	OUMV, $k = 9$	log(Lik) BM1	OU1	BMS	OUM	OUMV	Excluding *Lamprotornis Elisabeth*, AICc BM1, $k = 2$	OU1, $k = 3$	BMS, $k = 5$	OUM, $k = 6$	OUMV, $k = 9$	log(Lik) BM1	OU1	BMS	OUM	OUMV
Crown	PC1	190.44	192.77	162.49	**147.02**	160.24	−93.06	−93.06	−75.39	−66.27	−68.22	149.38	146.08	**139.54**	153.05	144.79	−72.53	−69.71	−63.89	−69.25	−60.40
	PC2	183.00	120.03	115.67	112.66	**86.12**	−89.34	−56.69	−51.98	−49.09	−31.16	106.96	106.37	**74.55**	106.20	79.32	−51.32	−49.85	−31.39	−45.83	−27.66
	Brightness	41.02	**36.76**	40.33	37.29	39.22	−18.35	−15.06	−14.31	−11.41	−7.71	41.85	**39.05**	41.14	40.03	42.07	−18.76	−16.19	−14.69	−12.74	−9.03
Nape	PC1	192.08	194.41	**167.58**	199.82	177.06	−93.89	−93.89	−77.96	−92.71	−76.72	154.94	157.27	146.97	146.12	**137.50**	−75.31	−75.31	−67.63	−65.82	−56.85
	PC2	185.47	124.84	117.85	101.58	**75.89**	−90.58	−59.11	−53.09	−43.59	−26.13	115.33	111.51	**83.83**	98.50	**73.35***	−55.51	−52.43	−36.06	−42.01	−24.77
	Brightness	**6.07**	6.19	13.23	12.85	21.75	−0.88	0.22	−0.78	0.78	0.94	**5.38**	7.03	11.38	14.16	22.79	−0.53	−0.19	0.17	0.16	0.51
Rump	PC1	223.51	225.86	**173.91**	232.76	184.85	−109.60	−109.60	−81.10	−109.14	−80.52	153.04	141.45	136.61	136.69	**129.68**	−74.36	−67.39	−62.42	−61.07	−52.84
	PC2	192.17	194.52	130.36	131.29	**125.57**	−93.93	−93.93	−59.32	−58.41	−50.88	123.10	125.44	**96.36**	121.10	98.44	−59.39	−59.38	−42.30	−53.28	−37.22
	Brightness	−3.37	−1.99	−3.16	**−16.73**	−12.32	3.84	4.32	7.44	15.60	18.06	−5.73	−3.42	−4.83	**−16.06**	−12.04	5.03	5.04	8.30	15.30	18.02
Coverts	PC1	187.70	190.04	**155.04**	196.49	161.61	−91.69	−91.69	−71.66	−91.01	−68.90	131.09	133.43	**124.56**	130.66	130.69	−63.38	−63.38	−56.40	−58.06	−53.34
	PC2	155.94	158.27	122.59	92.97	**91.30**	−75.81	−75.81	−55.44	−39.25	−33.75	97.92	100.26	94.99	**78.55**	82.10	−46.80	−46.80	−41.61	−32.00	−29.05
	Brightness	−0.09	0.65	1.26	**−12.89**	−4.98	2.20	3.00	5.23	13.68	14.39	−9.37	−7.03	−3.02	**−16.20**	−6.87	6.85	6.85	7.39	15.37	15.43
Throat	PC1	178.52	180.89	154.24	186.19	**150.47**	−87.09	−87.09	−71.18	−85.74	−63.02	162.79	164.80	145.98	168.97	**142.39**	−79.22	−79.04	−67.02	−77.09	−58.86
	PC2	156.37	118.36	**99.35**	111.98	**76.02***	−76.01	−55.83	−43.74	−48.64	−25.79	113.26	110.21	76.75	109.17	**73.56**	−54.46	−51.74	−32.41	−47.18	−24.44
	Brightness	40.82	**30.96**	47.15	35.79	44.98	−18.24	−12.13	−17.64	−10.54	−10.27	45.91	**34.98**	52.46	39.61	49.06	−20.78	−14.12	−20.26	−12.40	−12.20
Wing	PC1	123.23	125.69	117.70	132.00	**115.24**	−59.40	−59.40	−52.65	−58.25	−44.33	123.47	125.95	118.31	132.30	**117.64**	−59.51	−59.51	−52.90	−58.33	−45.32
	PC2	109.62	112.08	90.91	83.74	**66.32**	−52.60	−52.60	−39.25	−34.12	−19.87	103.68	97.65	88.23	**83.33**	**66.22***	−49.62	−45.36	−37.86	−33.84	−19.61
	Brightness	−12.58	−10.12	−9.38	**−15.36**	−5.26	8.51	8.51	10.89	15.43	15.92	−6.37	−3.90	−2.82	**−9.05**	1.36	5.41	5.41	7.66	12.35	12.82
Tail	PC1	185.61	187.93	142.65	191.32	**130.27**	−90.66	−90.66	−65.51	−88.49	−53.41	139.05	136.93	121.51	126.84	**119.34**	−67.37	−65.15	−54.92	−56.22	−47.86
	PC2	166.33	120.87	104.51	118.63	**80.36**	−81.01	−57.13	−46.45	−52.15	−28.45	109.48	105.80	**77.06**	108.39	81.10	−52.59	−49.58	−32.70	−46.99	−28.74
	Brightness	**28.32**	30.63	30.85	36.20	39.42	−12.01	−12.01	−9.61	−10.93	−7.98	**32.65**	34.98	35.05	40.58	43.67	−14.17	−14.17	−11.69	−13.09	−10.02

Bold values indicate best-supported models. AICc, second-order Akaike information criteria.

*In some cases, the sample size for some melanosome morphologies (after excluding noniridescent colors) did not allow the reliable estimation of all parameters in the model, and therefore the next best model was used for parameter estimates presented in Tables S3 and S4.

Table S3. Parameter estimates (and SEs) for the best model under the maximum clade credibility tree for all color patches and both sexes, as determined from AICc comparison (Table S2)

		α		σ^2								θ							
Sex		Estimate	SE	Rod estimate	SE	Flat estimate	SE	Hollow estimate	SE	Platelet estimate	SE	Rod estimate	SE	Flat estimate	SE	Hollow estimate	SE	Platelet estimate	SE
Males																			
Mantle	PC1			0.39	0.14	20.16	13.60	5.86	6.39	13.32	4.33	0.96	0.30	0.96	0.30	0.96	0.30	0.96	0.30
	PC2	4.06	1.18	1.45	0.73	4.28	4.89	0.60	0.54	9.32	3.68	0.84	0.12	0.39	0.66	1.68	0.23	−1.23	0.29
	Brightness	2.23	0.99	0.14	0.05	0.14	0.05	0.14	0.05	0.14	0.05	2.23	0.06	2.54	0.25	2.49	0.13	2.76	0.06
Belly	PC1			0.17	0.07	5.45	3.84	9.11	27.45	16.07	5.67	0.78	0.22	0.78	0.22	0.78	0.22	0.78	0.22
	PC2			0.43	0.18	0.39	0.32	0.11	15.57	5.94	2.03	0.63	0.31	0.63	0.31	0.63	0.31	0.63	0.31
	Brightness	370.84	0.01	25.36	10.81	87.62	55.42	0.01	0.01	32.04	11.70	2.04	0.06	2.05	0.15	2.80	0.01	2.46	0.05
Breast	PC1	2.87	1.36	0.58	0.35	10.59	5.66	0.31	0.43	17.26	4.48	0.98	0.11	3.22	1.37	−3.31	0.97	0.62	0.54
	PC2			0.31	0.12	3.07	2.22	0.35	0.64	4.14	1.29	0.71	0.26	0.71	0.26	0.71	0.26	0.71	0.26
	Brightness	57.74	88.77	3.64	5.54	3.64	5.54	3.64	5.54	3.64	5.54	2.10	0.05	2.08	0.08	2.70	0.10	2.65	0.04
Crown	PC1			0.69	0.23	16.34	11.64	13.62	13.45	10.51	3.25	0.27	0.34	0.27	0.34	0.27	0.34	0.27	0.34
	PC2			0.20	0.07	2.91	2.07	2.13	2.15	5.18	1.56	0.65	0.18	0.65	0.18	0.65	0.18	0.65	0.18
	Brightness			0.05	0.02	1.92	1.38	0.01	0.09	0.36	0.12	2.09	0.08	2.09	0.08	2.09	0.08	2.09	0.08
Nape	PC1			0.79	0.27	23.53	16.28	13.48	17.57	9.08	2.91	0.39	0.37	0.39	0.37	0.39	0.37	0.39	0.37
	PC2	2.93	0.93	1.13	0.54	3.98	2.81	0.19	0.16	6.68	2.70	0.72	0.13	0.53	0.90	1.95	0.18	−1.06	0.32
	Brightness	2.57	1.36	0.36	0.17	0.36	0.17	0.36	0.17	0.36	0.17	2.11	0.08	2.29	0.34	2.43	0.19	2.58	0.09
Rump	PC1			0.38	0.14	9.47	6.59	2.56	2.19	16.73	5.01	0.76	0.27	0.76	0.27	0.76	0.27	0.76	0.27
	PC2	1.46	0.71	0.65	0.30	0.90	0.68	0.85	0.70	14.43	4.97	0.75	0.16	1.83	1.39	2.43	0.53	−0.65	0.82
	Brightness	1.09	0.70	0.06	0.02	0.06	0.02	0.06	0.02	0.06	0.02	2.12	0.06	2.60	0.32	2.50	0.14	2.68	0.07
Coverts	PC1			0.46	0.16	12.90	8.68	9.83	10.75	6.15	1.94	0.89	0.32	0.89	0.32	0.89	0.32	0.89	0.32
	PC2	3.84	0.94	1.25	0.54	8.76	7.62	0.22	0.18	9.61	3.35	0.76	0.12	−0.05	0.91	1.88	0.16	−1.20	0.30
	Brightness	4.74	1.71	0.33	0.13	0.33	0.13	0.33	0.13	0.33	0.13	2.12	0.05	2.46	0.16	2.60	0.11	2.71	0.05
Throat	PC1			0.57	0.22	10.39	7.41	3.61	4.17	19.03	5.79	0.66	0.34	0.66	0.34	0.66	0.34	0.66	0.34
	PC2	2.72	0.93	1.30	0.75	1.68	1.55	0.09	0.10	12.45	5.59	0.59	0.16	2.03	0.91	2.39	0.13	−0.31	0.47
	Brightness	6.65	3.68	0.37	0.25	1.06	0.87	1.50	1.33	2.39	1.47	1.89	0.05	1.91	0.19	2.30	0.20	2.42	0.10
Wing	PC1			0.51	0.30	1.28	1.12	7.74	7.45	8.37	2.59	−0.09	0.40	−0.09	0.40	−0.09	0.40	−0.09	0.40
	PC2	8.16	4.22	10.56	5.80	10.56	5.80	10.56	5.80	10.56	5.80	0.73	0.33	−0.38	0.48	1.10	0.45	−1.17	0.19
	Brightness	1.56	0.97	0.13	0.06	0.13	0.06	0.13	0.06	0.13	0.06	2.02	0.09	2.89	0.34	2.46	0.16	2.58	0.08
Tail	PC1			0.70	0.23	1.07	0.80	10.62	9.84	6.18	2.04	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
	PC2	60.85	80.09	9.11	12.40	0.77	1.12	172.18	251.45	178.46	231.32	0.53	0.07	0.75	0.04	0.41	0.53	−0.17	0.28
	Brightness	200.67	883.16	127.51	562.53	4.05	18.13	7.91	34.75	44.97	194.70	2.08	0.14	1.98	0.04	2.64	0.06	2.48	0.08
Females																			
Mantle	PC1	4.03	2.07	5.46	3.61	28.62	15.99	1.04	1.03	19.04	5.31	0.51	0.23	1.53	1.44	−2.44	0.64	0.12	0.42
	PC2	252.59	427.46	75.56	131.49	162.77	305.97	17.89	32.54	420.77	704.49	0.68	0.10	−0.39	0.33	0.57	0.09	−1.08	0.21
	Brightness	1.60	0.78	0.08	0.03	0.08	0.03	0.08	0.03	0.08	0.03	2.12	0.05	2.59	0.21	2.39	0.19	2.70	0.06
Belly	PC1	111.72	225.63	218.63	434.60	218.63	434.60	218.63	434.60	218.63	434.60	0.05	0.30	0.06	0.57	−1.57	0.99	1.23	0.27
	PC2	1.45	0.87	2.92	1.25	2.92	1.25	2.92	1.25	2.92	1.25	0.04	0.29	0.04	0.29	0.04	0.29	0.04	0.29
	Brightness	370.84	0.01	20.66	8.81	20.18	16.47	0.01	0.01	25.27	9.55	1.96	0.05	2.39	0.10	2.76	0.01	2.42	0.05
Breast	PC1			0.74	0.30	1.75	2.12	0.34	0.54	21.45	6.63	−0.39	0.41	−0.39	0.41	−0.39	0.41	−0.39	0.41
	PC2	26.25	98.35	4.04	15.46	25.63	97.78	0.82	3.60	62.92	225.89	0.32	0.08	0.77	0.40	0.53	0.07	−0.81	0.27
	Brightness	7.00	5.35	0.70	0.54	0.70	0.54	0.70	0.54	0.70	0.54	2.20	0.07	2.17	0.15	2.75	0.16	2.59	0.06
Crown	PC1	107.99	164.70	326.60	494.67	326.60	494.67	326.60	494.67	326.60	494.67	−0.47	0.30	2.02	0.71	−1.67	0.87	−0.25	0.29

Table S3. Cont.

Sex		α		σ²								θ							
		Estimate	SE	Rod estimate	SE	Flat estimate	SE	Hollow estimate	SE	Platelet estimate	SE	Rod estimate	SE	Flat estimate	SE	Hollow estimate	SE	Platelet estimate	SE
	PC2	237.01	705.63	26.76	80.35	396.76	1232.93	8.78	27.48	580.81	1721.92	0.40	0.06	0.48	0.53	0.59	0.10	−0.66	0.26
	Brightness	1.81	0.87	0.58	0.23	0.58	0.23	0.58	0.23	0.58	0.23	2.24	0.09	2.24	0.09	2.24	0.09	2.24	0.09
Nape	PC1			1.08	0.38	15.58	15.47	0.53	0.54	19.84	6.03	−0.38	0.44	−0.38	0.44	−0.38	0.44	−0.38	0.44
	PC2	338.42	0.10	50.67	17.98	72.88	59.22	8.12	5.69	641.27	206.77	0.48	0.07	0.31	0.19	0.47	0.05	−1.00	0.23
	Brightness			0.13	0.03	0.13	0.03	0.13	0.03	0.13	0.03	2.31	0.13	2.31	0.13	2.31	0.13	2.31	0.13
Rump	PC1			0.64	0.23	9.07	9.21	0.25	0.25	49.17	14.82	0.05	0.36	0.05	0.36	0.05	0.36	0.05	0.36
	PC2	1.60	0.79	0.31	0.15	0.05	0.06	0.87	0.85	25.99	8.14	0.67	0.11	0.19	0.46	1.61	2.34	−0.82	1.04
	Brightness	2.93	1.17	0.19	0.08	0.19	0.08	0.19	0.08	0.19	0.08	2.08	0.05	2.50	0.18	2.71	0.18	2.65	0.06
Coverts	PC1			0.57	0.20	5.33	5.58	0.63	0.62	21.49	6.56	0.20	0.32	0.20	0.32	0.20	0.32	0.20	0.32
	PC2	205.49	403.07	61.21	122.20	472.51	1003.09	46.71	97.76	223.24	432.43	0.62	0.10	−0.97	0.62	0.71	0.17	−1.21	0.17
	Brightness	3.42	1.79	0.24	0.12	0.24	0.12	0.24	0.12	0.24	0.12	2.09	0.05	2.48	0.17	2.58	0.17	2.69	0.05
Throat	PC1	1.48	0.77	1.87	0.92	2.55	2.77	0.02	0.03	24.34	8.13	−0.88	0.30	0.88	1.58	−3.84	2.37	0.79	1.08
	PC2			0.06	0.02	0.13	0.18	0.03	0.04	12.31	3.71	0.35	0.12	0.35	0.12	0.35	0.12	0.35	0.12
	Brightness	3.67	1.94	0.94	0.49	0.94	0.49	0.94	0.49	0.94	0.49	2.23	0.07	2.23	0.07	2.23	0.07	2.23	0.07
Wing	PC1	1.41	0.80	0.73	0.52	0.01	0.01	0.25	0.36	13.49	5.67	−0.49	0.22	−2.89	0.69	−3.01	1.72	0.46	0.79
	PC2	37.40	66.44	1.35	2.53	145.43	284.36	0.57	1.15	44.60	77.11	0.71	0.05	−0.71	0.81	0.55	0.05	−1.12	0.18
	Brightness	0.96	1.21	0.08	0.05	0.08	0.05	0.08	0.05	0.08	0.05	2.04	0.08	2.88	0.29	2.69	0.27	2.60	0.08
Tail	PC1	4.10	1.71	2.50	1.42	1.78	1.86	0.31	0.31	24.42	9.28	−0.29	0.14	0.12	0.51	−2.08	0.65	1.21	0.46
	PC2	61.56	96.79	7.24	11.57	3.34	5.91	5.30	8.89	181.70	280.99	0.55	0.06	0.99	0.10	−0.26	0.10	−0.19	0.29
	Brightness			0.21	0.05	0.21	0.05	0.21	0.05	0.21	0.05	2.22	0.17	2.22	0.17	2.22	0.17	2.22	0.17
Excluding *Lamprotornis elisabeth*																			
Males																			
Mantle	PC1			0.39	0.14	20.47	14.02	5.50	5.89	14.09	4.71	0.96	0.29	0.96	0.29	0.96	0.29	0.96	0.29
	PC2	4.30	1.35	1.59	0.85	5.13	6.48	0.67	0.69	10.41	4.45	0.84	0.12	0.36	0.67	1.65	0.23	−1.23	0.29
	Brightness	2.21	1.01	0.14	0.06	0.14	0.06	0.14	0.06	0.14	0.06	2.23	0.06	2.54	0.25	2.49	0.13	2.76	0.06
Belly	PC1			0.17	0.07	5.41	3.78	12.61	27.27	10.52	3.84	0.78	0.22	0.78	0.22	0.78	0.22	0.78	0.22
	PC2			0.42	0.17	0.38	0.31	0.10	26.52	6.40	2.28	0.63	0.31	0.63	0.31	0.63	0.31	0.63	0.31
	Brightness	2.83	1.35	0.26	0.12	0.26	0.12	0.26	0.12	0.26	0.12	1.98	0.08	2.12	0.26	3.49	0.46	2.46	0.08
Breast	PC1	3.04	1.51	0.61	0.38	14.81	10.45	0.33	0.46	30.52	12.47	0.98	0.11	3.08	1.55	−3.20	1.18	0.61	0.68
	PC2			0.33	0.14	3.19	2.39	0.40	0.79	3.51	1.17	0.69	0.27	0.69	0.27	0.69	0.27	0.69	0.27
	Brightness	7.98	5.06	0.49	0.33	0.49	0.33	0.49	0.33	0.49	0.33	2.09	0.05	2.06	0.11	2.71	0.12	2.65	0.04
Crown	PC1			0.72	0.25	16.10	11.36	16.32	16.58	6.28	1.99	0.28	0.35	0.28	0.35	0.28	0.35	0.28	0.35
	PC2			0.20	0.07	2.83	1.97	2.11	2.07	3.17	0.99	0.64	0.18	0.64	0.18	0.64	0.18	0.64	0.18
	Brightness			0.05	0.02	1.90	1.35	0.01	0.08	0.37	0.12	2.09	0.08	2.09	0.08	2.09	0.08	2.09	0.08
Nape	PC1			0.81	0.28	22.92	15.50	9.78	8.88	7.68	2.55	0.40	0.37	0.40	0.37	0.40	0.37	0.40	0.37
	PC2	2.66	0.93	1.02	0.48	3.75	2.65	0.17	0.14	5.91	2.48	0.73	0.13	0.54	0.97	1.97	0.18	−1.06	0.33
	Brightness			0.09	0.02	0.09	0.02	0.09	0.02	0.09	0.02	2.24	0.11	2.24	0.11	2.24	0.11	2.24	0.11
Rump	PC1			0.38	0.14	9.40	6.50	2.87	2.64	10.28	3.19	0.76	0.27	0.76	0.27	0.76	0.27	0.76	0.27
	PC2	1.01	0.71	0.54	0.25	0.87	0.67	0.87	0.80	9.24	3.47	0.76	0.18	1.92	1.69	2.46	0.62	−0.59	0.82
	Brightness	1.11	0.71	0.06	0.02	0.06	0.02	0.06	0.02	0.06	0.02	2.12	0.06	2.60	0.32	2.50	0.14	2.68	0.07
Coverts	PC1			0.45	0.16	12.92	8.73	8.92	7.33	4.38	1.46	0.89	0.31	0.89	0.31	0.89	0.31	0.89	0.31
	PC2	2.59	1.08	0.91	0.45	5.61	5.95	0.17	0.14	4.22	1.84	0.78	0.13	−0.10	1.09	1.94	0.17	−1.16	0.29
	Brightness	3.83	1.41	0.25	0.10	0.25	0.10	0.25	0.10	0.25	0.10	2.12	0.05	2.48	0.18	2.58	0.12	2.71	0.05

Table S3. Cont.

Sex		α		σ²								θ							
		Estimate	SE	Rod estimate	SE	Flat estimate	SE	Hollow estimate	SE	Platelet estimate	SE	Rod estimate	SE	Flat estimate	SE	Hollow estimate	SE	Platelet estimate	SE
Throat	PC1	0.01	0.01	0.54	0.20	9.80	6.72	0.05	0.04	20.65	6.16	0.56	0.35	3.66	5.75	3.31	0.36	2.34	2.17
	PC2	1.92	0.93	0.87	0.51	1.39	1.22	0.07	0.07	7.40	3.41	0.63	0.17	2.20	1.15	2.43	0.15	−0.27	0.48
	Brightness	3.47	1.43	0.68	0.29	0.68	0.29	0.68	0.29	0.68	0.29	1.87	0.10	1.88	0.33	2.24	0.22	2.42	0.09
Wing	PC1			0.48	0.26	1.38	1.30	9.77	11.30	8.69	2.75	−0.11	0.38	−0.11	0.38	−0.11	0.38	−0.11	0.38
	PC2	7.07	3.23	8.83	4.48	8.83	4.48	8.83	4.48	8.83	4.48	0.74	0.32	−0.44	0.51	1.18	0.46	−1.17	0.19
	Brightness	1.14	0.93	0.10	0.05	0.10	0.05	0.10	0.05	0.10	0.05	2.02	0.09	2.97	0.39	2.45	0.16	2.57	0.09
Tail	PC1			0.70	0.23	1.06	0.80	11.81	10.01	5.14	1.72	0.35	0.34	0.35	0.34	0.35	0.34	0.35	0.34
	PC2			0.12	0.04	0.05	0.04	2.25	1.64	2.37	0.74	0.61	0.14	0.61	0.14	0.61	0.14	0.61	0.14
	Brightness			0.22	0.05	0.22	0.05	0.22	0.05	0.22	0.05	2.30	0.17	2.30	0.17	2.30	0.17	2.30	0.17
Females																			
Mantle	PC1	0.42	0.81	1.04	0.68	27.99	23.92	0.71	0.76	8.69	3.22	0.27	0.34	3.22	5.11	−5.86	2.66	0.54	1.15
	PC2	138.84	20518.88	41.31	6105.23	89.55	13251.68	9.92	1465.40	223.81	33082.33	0.68	0.10	−0.39	0.33	0.57	0.09	−1.05	0.21
	Brightness	1.26	0.76	0.06	0.03	0.06	0.03	0.06	0.03	0.06	0.03	2.11	0.06	2.63	0.23	2.36	0.20	2.70	0.07
Belly	PC1			0.56	0.24	11.98	11.39	18.00	36.81	12.50	4.75	−0.21	0.39	−0.21	0.39	−0.21	0.39	−0.21	0.39
	PC2	1.56	0.91	3.10	1.39	3.10	1.39	3.10	1.39	3.10	1.39	0.03	0.28	0.03	0.28	0.03	0.28	0.03	0.28
	Brightness	124.92	176.67	6.98	10.33	6.78	11.05	0.01	0.00	8.52	12.54	1.96	0.05	2.39	0.10	2.76	0.00	2.41	0.05
Breast	PC1			0.73	0.29	1.63	1.85	0.31	0.45	18.49	5.94	−0.38	0.40	−0.38	0.40	−0.38	0.40	−0.38	0.40
	PC2	86.20	2604.19	13.11	396.39	83.52	2523.61	2.66	79.81	205.78	6219.72	0.32	0.08	0.77	0.40	0.53	0.07	−0.79	0.26
	Brightness	10.01	13.49	1.03	1.39	1.03	1.39	1.03	1.39	1.03	1.39	2.20	0.07	2.20	0.14	2.73	0.14	2.59	0.06
Crown	PC1			0.81	0.29	22.51	67.51	9.90	13.44	5.75	2.02	−0.59	0.37	−0.59	0.37	−0.59	0.37	−0.59	0.37
	PC2			0.07	0.02	4.37	3.72	1.23	2.56	2.24	0.73	0.50	0.11	0.50	0.11	0.50	0.11	0.50	0.11
	Brightness	1.64	0.86	0.53	0.22	0.53	0.22	0.53	0.22	0.53	0.22	2.23	0.10	2.23	0.10	2.23	0.10	2.23	0.10
Nape	PC1	7.48	3.91	7.90	4.92	62.84	57.31	0.97	0.76	30.33	19.94	−0.15	0.19	1.89	1.30	−1.59	0.23	−0.08	0.35
	PC2			0.10	0.04	1.16	1.23	0.10	0.11	3.45	1.06	0.58	0.13	0.58	0.13	0.58	0.13	0.58	0.13
	Brightness			0.11	0.02	0.11	0.02	0.11	0.02	0.11	0.02	2.31	0.12	2.31	0.12	2.31	0.12	2.31	0.12
Rump	PC1	10.18	3.48	10.21	4.71	28.66	27.35	0.65	0.50	41.08	21.10	0.40	0.18	0.48	0.72	−1.50	0.13	1.22	0.34
	PC2			0.16	0.06	0.04	0.05	0.86	1.09	4.53	1.50	0.65	0.18	0.65	0.18	0.65	0.18	0.65	0.18
	Brightness	2.25	0.96	0.14	0.05	0.14	0.05	0.14	0.05	0.14	0.05	2.07	0.06	2.53	0.20	2.73	0.20	2.65	0.06
Coverts	PC1			0.59	0.22	6.27	7.66	5.91	6.10	3.60	1.23	0.25	0.32	0.25	0.32	0.25	0.32	0.25	0.32
	PC2	0.97	0.82	0.88	0.38	0.88	0.38	0.88	0.38	0.88	0.38	0.74	0.24	−1.18	1.04	3.36	0.87	−1.14	0.29
	Brightness	1.58	0.88	0.11	0.04	0.11	0.04	0.11	0.04	0.11	0.04	2.09	0.06	2.55	0.25	2.45	0.23	2.68	0.07
Throat	PC1	1.73	0.87	2.09	1.08	3.18	4.11	18.27	7.09	0.02	0.03	−0.87	0.29	−0.87	0.29	−0.87	0.29	−0.87	0.29
	PC2	127.22	116895.87	7.69	7067.89	226.92	208567.69	1.25	1151.83	348.89	320654.93	0.31	0.05	1.36	0.55	0.54	0.04	−0.54	0.28
	Brightness	4.25	2.65	1.10	0.69	1.10	0.69	1.10	0.69	1.10	0.69	2.23	0.07	2.23	0.07	2.23	0.07	2.23	0.07
Wing	PC1	0.75	0.82	0.49	0.37	0.01	0.01	0.23	0.33	10.84	4.50	−0.49	0.24	−3.66	0.91	−3.64	2.21	0.52	0.98
	PC2	389.03	0.01	434.83	112.28	434.83	112.28	434.83	112.28	434.83	112.28	0.71	0.31	−0.71	0.43	0.55	0.43	−1.11	0.18
	Brightness	1.20	1.37	0.09	0.06	0.09	0.06	0.09	0.06	0.09	0.06	2.04	0.08	2.84	0.27	2.69	0.26	2.60	0.07
Tail	PC1	2.01	2.14	1.17	1.26	1.25	1.33	0.23	0.24	7.88	5.78	−0.37	0.16	0.22	0.84	−3.46	1.03	1.19	0.49
	PC2			0.09	0.03	0.14	0.18	0.35	0.36	2.69	0.85	0.53	0.13	0.53	0.13	0.53	0.13	0.53	0.13
	Brightness			0.21	0.05	0.21	0.05	0.21	0.05	0.21	0.05	2.22	0.17	2.22	0.17	2.22	0.17	2.22	0.17

Results are shown for all iridescent species and excluding *Lamprotornis elisabeth*.

Table S4. Results from the maximum-likelihood multistate speciation and extinction (MuSSE) models under different combinations of parameters

Melanosome model	Transitions	Speciation rates	Speciation through time	log(Lik)	k	AICc	ΔAICc	λ_1	λ_2	λ_3	λ_4	λ_{slope}	q_{12}	q_{13}	q_{14}	q_{21}	q_{23}	q_{24}	q_{31}	q_{32}	q_{34}	q_{41}	q_{42}	q_{43}
Irreversible	Single	Derived	Linear	−31.58	4	72.12	0	−0.24	1.11	1.11	1.11	5.44	0.13	0.13	0.13	0	0.13	0.13	0	0.13	0.13	0	0.13	0.13
Full	Single	Derived	Linear	−32.65	4	74.26	2.14	−0.24	1.11	1.11	1.11	5.43	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Irreversible	Asymmetric	Derived	Linear	−31.52	5	74.51	2.39	−0.24	1.1	1.1	1.1	5.42	0.11	0.11	0.11	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Irreversible	Single	Single	Linear	−34.69	3	75.94	3.82	0.64	0.64	0.64	0.64	4.69	0.13	0.13	0.13	0	0.13	0.13	0	0.13	0.13	0	0.13	0.13
Irreversible	Single	Full	Linear	−31.44	6	76.99	4.87	−0.24	1.3	0.45	1.16	5.45	0.13	0.13	0.13	0	0.13	0.13	0	0.13	0.13	0	0.13	0.13
Full	Asymmetric	Derived	Linear	−31.52	6	77.15	5.03	−0.24	1.1	1.1	1.1	5.42	0.11	0.11	0.11	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Stepwise	Single	Derived	Linear	−34.21	4	77.37	5.25	−0.22	1.07	1.07	1.07	5.38	0.19	0.19	0	0.19	0	0.19	0.19	0	0.19	0	0.19	0.19
Full	Single	Single	Linear	−35.76	3	78.07	5.95	0.64	0.64	0.64	0.64	4.69	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Irreversible	Asymmetric	Single	Linear	−34.59	4	78.12	6	0.64	0.64	0.64	0.64	4.69	0.11	0.11	0.11	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Full	Single	Full	Linear	−32.52	6	79.13	7.01	−0.24	1.31	0.46	1.16	5.44	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Irreversible	Asymmetric	Full	Linear	−31.39	7	79.65	7.53	−0.24	1.3	0.45	1.16	5.43	0.12	0.12	0.12	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Full	Asymmetric	Single	Linear	−34.59	5	80.63	8.51	0.64	0.64	0.64	0.64	4.69	0.11	0.11	0.11	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Stepwise	Single	Single	Linear	−37.11	3	80.78	8.66	0.64	0.64	0.64	0.64	4.69	0.19	0.19	0	0.19	0	0.19	0.19	0	0.19	0	0.19	0.19
Stepwise	Single	Full	Linear	−34.02	6	82.13	10.01	−0.21	0.84	0.42	1.24	5.37	0.19	0.19	0	0.19	0	0.19	0.19	0	0.19	0	0.19	0.19
Full	Asymmetric	Full	Linear	−31.39	8	82.56	10.44	−0.24	1.3	0.45	1.16	5.43	0.12	0.12	0.12	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Irreversible	Single	Single	Constant	−40.5	2	85.28	13.16	2.1	2.1	2.1	2.1	0	0.13	0.13	0.13	0	0.13	0.13	0	0.13	0.13	0	0.13	0.13
Irreversible	Single	Derived	Constant	−39.9	3	86.35	14.23	1.76	2.46	2.46	2.46	0	0.13	0.13	0.13	0	0.13	0.13	0	0.13	0.13	0	0.13	0.13
Irreversible	Asymmetric	Single	Constant	−40.4	3	87.35	15.23	2.1	2.1	2.1	2.1	0	0.11	0.11	0.11	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Full	Single	Single	Constant	−41.57	2	87.41	15.29	2.1	2.1	2.1	2.1	0	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Full	Single	Derived	Constant	−40.96	3	88.48	16.36	1.76	2.46	2.46	2.46	0	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Irreversible	Asymmetric	Derived	Constant	−39.78	4	88.51	16.39	1.76	2.46	2.46	2.46	0	0.11	0.11	0.11	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Stepwise	Full	Derived	Linear	−29.88	11	89.31	17.19	−0.28	1.17	1.17	1.17	5.51	0.17	0.26	0	0	0	0	0	0	3.34	0	0	0.48
Full	Asymmetric	Single	Constant	−40.4	4	89.74	17.62	2.1	2.1	2.1	2.1	0	0.11	0.11	0.11	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Stepwise	Single	Single	Constant	−42.92	2	90.11	17.99	2.1	2.1	2.1	2.1	0	0.19	0.19	0	0.19	0	0.19	0.19	0	0.19	0	0.19	0.19
Irreversible	Single	Full	Constant	−39.54	5	90.53	18.41	1.77	2.13	1.45	2.66	0	0.13	0.13	0.13	0	0.13	0.13	0	0.13	0.13	0	0.13	0.13
Stepwise	Full	Single	Linear	−32.38	10	90.87	18.75	0.64	0.64	0.64	0.64	4.69	0	0.06	0	1.55	0	0.57	0	0	0	0	0	0.36
Full	Asymmetric	Derived	Constant	−39.78	5	91.02	18.9	1.76	2.46	2.46	2.46	0	0.11	0.11	0.11	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Stepwise	Single	Derived	Constant	−42.31	3	91.19	19.07	1.76	2.45	2.45	2.45	0	0.18	0.18	0	0.18	0	0.18	0.18	0	0.18	0	0.18	0.18
Full	Single	Full	Constant	−40.61	5	92.67	20.55	1.78	2.13	1.46	2.66	0	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Irreversible	Full	Derived	Linear	−29.88	12	92.93	20.81	−0.27	1.15	1.15	1.15	5.49	0.15	0.25	0	0	0	0	0	0.08	3.22	0	0	0.48
Irreversible	Asymmetric	Full	Constant	−39.42	6	92.93	20.81	1.77	2.12	1.44	2.66	0	0.11	0.11	0.11	0	0.17	0.17	0	0.17	0.17	0	0.17	0.17
Stepwise	Single	Full	Constant	−41.89	5	95.24	23.12	1.77	2.19	1.38	2.69	0	0.19	0.19	0	0.19	0	0.19	0.19	0	0.19	0	0.19	0.19
Irreversible	Full	Single	Linear	−32.94	11	95.43	23.31	0.64	0.64	0.64	0.64	4.69	0.21	0.08	0	0	0	1.14	0	0	0	0	0	0.31
Full	Asymmetric	Full	Constant	−39.42	7	95.7	23.58	1.77	2.12	1.44	2.66	0	0.11	0.11	0.11	0	0.17	0.17	0	0.17	0.17	0	0.17	0.17
Stepwise	Full	Full	Linear	−29.81	13	96.65	24.53	−0.21	0.79	0.4	1.26	5.38	0.21	0.09	0	0	0	1.15	0	0	0	0	0	0.32
Stepwise	Full	Derived	Constant	−36.06	10	98.23	26.11	1.28	2.63	2.63	2.63	0	0	0.08	0	1.73	0	0.53	0	0	0	0	0	0.33
Stepwise	Full	Single	Constant	−38.19	9	99.24	27.12	2.1	2.1	2.1	2.1	0	0	0.06	0	1.55	0	0.57	0	0	0	0	0	0.36
Irreversible	Full	Full	Linear	−29.81	14	100.74	28.62	−0.21	0.79	0.4	1.26	5.38	0.21	0.09	0	0	0	1.15	0	0	0	0	0	0.32
Irreversible	Full	Single	Constant	−38.75	10	103.62	31.5	2.1	2.1	2.1	2.1	0	0.21	0.08	0	0	0	1.14	0	0	0	0	0	0.31
Stepwise	Full	Full	Constant	−35.56	12	104.3	32.18	0	3.76	3.86	1.78	0	0	0.43	0	3.29	0	0	0	0	3.42	0	0	0.09
Full	Full	Derived	Linear	−29.88	15	105.24	33.12	−0.27	1.15	1.15	1.15	5.49	0.15	0.25	0	0	0	0	0	0.08	3.22	0	0	0.48
Irreversible	Full	Derived	Constant	−38.11	11	105.77	33.65	1.75	2.46	2.46	2.46	0	0.2	0.09	0	0	0	1.14	0	0	0	0	0	0.31
Full	Full	Single	Linear	−32.34	14	105.8	33.68	0.64	0.64	0.64	0.64	4.69	0	0	0	1.43	0.11	0.54	0	0	0	0	0	0.35
Irreversible	Full	Full	Constant	−37.56	13	112.16	40.04	1.72	2.24	4.03	1.51	0	0.1	0.2	0	0	0	0	0	0	3.32	0	0.16	0

Table S4. Cont.

Melanosome model	Transitions	Speciation rates	Speciation through time	log(Lik)	k	AICc	ΔAICc	λ_1	λ_2	λ_3	λ_4	λ_{slope}	q_{12}	q_{13}	q_{14}	q_{21}	q_{23}	q_{24}	q_{31}	q_{32}	q_{34}	q_{41}	q_{42}	q_{43}
Full	Full	Derived	Constant	−36.06	14	113.24	41.12	1.28	2.63	2.63	2.63	0	0	0.08	0	1.73	0	0.53	0	0	0	0	0	0.33
Full	Full	Single	Constant	−38.15	13	113.32	41.2	2.1	2.1	2.1	2.1	0	0	0	0	1.43	0.11	0.54	0	0	0	0	0	0.35
Full	Full	Full	Linear	−29.81	17	114.72	42.6	−0.21	0.79	0.4	1.26	5.38	0.21	0.09	0	0	0	1.15	0	0	0	0	0	0.32
Full	Full	Full	Constant	−35.37	16	120.88	48.76	0	3.76	3.83	1.77	0	0	0.33	0	3.17	0.12	0	0	0	3.39	0	0	0.09
Excluding *Lamprotornis elisabeth*																								
Irreversible	Single	Derived	Linear	−31.55	4	72.06	0	−0.3	0.82	0.82	0.82	5.82	0.13	0.13	0.13	0	0.13	0.13	0	0.13	0.13	0	0.13	0.13
Full	Single	Derived	Linear	−32.63	4	74.2	2.14	−0.32	0.81	0.81	0.81	5.85	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Irreversible	Asymmetric	Derived	Linear	−31.49	5	74.44	2.38	−0.31	0.81	0.81	0.81	5.84	0.11	0.11	0.11	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Irreversible	Single	Single	Linear	−33.98	3	74.52	2.46	0.31	0.31	0.31	0.31	5.62	0.13	0.13	0.13	0	0.13	0.13	0	0.13	0.13	0	0.13	0.13
Full	Single	Single	Linear	−35.05	3	76.65	4.59	0.31	0.31	0.31	0.31	5.62	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Irreversible	Asymmetric	Single	Linear	−33.88	4	76.71	4.65	0.31	0.31	0.31	0.31	5.62	0.11	0.11	0.11	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Irreversible	Single	Full	Linear	−31.43	6	76.96	4.9	−0.33	1.25	0.37	0.78	5.9	0.13	0.13	0.13	0	0.13	0.13	0	0.13	0.13	0	0.13	0.13
Full	Asymmetric	Derived	Linear	−31.49	6	77.08	5.02	−0.31	0.81	0.81	0.81	5.84	0.11	0.11	0.11	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Stepwise	Single	Derived	Linear	−34.15	4	77.25	5.19	−0.3	0.78	0.78	0.78	5.81	0.19	0.19	0	0.19	0	0.19	0.19	0	0.19	0	0.19	0.19
Full	Single	Full	Linear	−32.5	6	79.1	7.04	−0.32	1.25	0.38	0.77	5.89	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Full	Asymmetric	Single	Linear	−33.88	5	79.22	7.16	0.31	0.31	0.31	0.31	5.62	0.11	0.11	0.11	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Stepwise	Single	Single	Linear	−36.4	3	79.36	7.3	0.31	0.31	0.31	0.31	5.62	0.19	0.19	0	0.19	0	0.19	0.19	0	0.19	0	0.19	0.19
Irreversible	Asymmetric	Full	Linear	−31.36	7	79.6	7.54	−0.31	1.24	0.38	0.78	5.85	0.11	0.11	0.11	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Stepwise	Single	Full	Linear	−34.08	6	82.26	10.2	−0.29	0.78	0.35	0.86	5.79	0.19	0.19	0	0.19	0	0.19	0.19	0	0.19	0	0.19	0.19
Full	Asymmetric	Full	Linear	−31.36	8	82.52	10.46	−0.31	1.24	0.38	0.78	5.85	0.11	0.11	0.11	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Irreversible	Single	Single	Constant	−41.23	2	86.73	14.67	2.06	2.06	2.06	2.06	0	0.13	0.13	0.13	0	0.13	0.13	0	0.13	0.13	0	0.13	0.13
Irreversible	Single	Derived	Constant	−40.77	3	88.1	16.04	1.76	2.36	2.36	2.36	0	0.13	0.13	0.13	0	0.13	0.13	0	0.13	0.13	0	0.13	0.13
Irreversible	Asymmetric	Single	Constant	−41.12	3	88.81	16.75	2.06	2.06	2.06	2.06	0	0.11	0.11	0.11	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Full	Single	Single	Constant	−42.29	2	88.86	16.8	2.06	2.06	2.06	2.06	0	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Stepwise	Full	Derived	Linear	−29.91	11	89.37	17.31	−0.35	0.87	0.87	0.87	5.91	0.17	0.26	0	0	0	0	0	0	3.32	0	0	0.48
Stepwise	Full	Single	Linear	−31.67	10	89.45	17.39	0.31	0.31	0.31	0.31	5.62	0	0.06	0	1.55	0	0.57	0	0	0	0	0	0.36
Full	Single	Derived	Constant	−41.84	3	90.23	18.17	1.76	2.36	2.36	2.36	0	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Irreversible	Asymmetric	Derived	Constant	−40.65	4	90.26	18.2	1.76	2.37	2.37	2.37	0	0.11	0.11	0.11	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Full	Asymmetric	Single	Constant	−41.12	4	91.2	19.14	2.06	2.06	2.06	2.06	0	0.11	0.11	0.11	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Stepwise	Single	Single	Constant	−43.65	2	91.57	19.51	2.06	2.06	2.06	2.06	0	0.19	0.19	0	0.19	0	0.19	0.19	0	0.19	0	0.19	0.19
Irreversible	Single	Full	Constant	−40.49	5	92.44	20.38	1.77	2.13	1.46	2.54	0	0.13	0.13	0.13	0	0.13	0.13	0	0.13	0.13	0	0.13	0.13
Full	Asymmetric	Derived	Constant	−40.65	5	92.77	20.71	1.76	2.37	2.37	2.37	0	0.11	0.11	0.11	0	0.16	0.16	0	0.16	0.16	0	0.16	0.16
Stepwise	Single	Derived	Constant	−43.19	3	92.93	20.87	1.76	2.36	2.36	2.36	0	0.19	0.19	0	0.19	0	0.19	0.19	0	0.19	0	0.19	0.19
Irreversible	Full	Derived	Linear	−29.89	12	92.95	20.89	−0.34	0.85	0.85	0.85	5.87	0.14	0.24	0	0	0	0	0	0.15	3.11	0	0	0.49
Irreversible	Full	Single	Linear	−32.23	11	94.01	21.95	0.31	0.31	0.31	0.31	5.62	0.21	0.08	0	0	0	1.14	0	0	0	0	0	0.31
Full	Single	Full	Constant	−41.55	5	94.57	22.51	1.78	2.13	1.46	2.53	0	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Irreversible	Asymmetric	Full	Constant	−40.37	6	94.83	22.77	1.77	2.13	1.45	2.54	0	0.11	0.11	0.11	0	0.17	0.17	0	0.17	0.17	0	0.17	0.17
Stepwise	Full	Full	Linear	−29.8	13	96.63	24.57	−0.35	1.32	1.11	0.69	5.89	0.17	0.26	0	0	0	0	0	0	3.35	0	0	0.43
Stepwise	Single	Full	Constant	−42.85	5	97.16	25.1	1.77	2.2	1.38	2.55	0	0.19	0.19	0	0.19	0	0.19	0.19	0	0.19	0	0.19	0.19
Full	Asymmetric	Full	Constant	−40.37	7	97.6	25.54	1.77	2.13	1.45	2.54	0	0.11	0.11	0.11	0	0.17	0.17	0	0.17	0.17	0	0.17	0.17
Stepwise	Full	Derived	Constant	−37.01	10	100.13	28.07	1.28	2.55	2.55	2.55	0	0	0.08	0	1.72	0	0.53	0	0	0	0	0	0.33
Stepwise	Full	Single	Constant	−38.92	9	100.7	28.64	2.06	2.06	2.06	2.06	0	0	0.06	0	1.55	0	0.57	0	0	0	0	0	0.36
Irreversible	Full	Full	Linear	−29.8	14	100.72	28.66	−0.35	1.3	0.99	0.7	5.9	0.15	0.25	0	0	0	0	0	0.09	3.23	0	0	0.45
Full	Full	Single	Linear	−31.63	14	104.38	32.32	0.31	0.31	0.31	0.31	5.62	0	0	0	1.43	0.11	0.54	0	0	0	0	0	0.35

Table S4. Cont.

Melanosome model	Transitions	Speciation rates	Speciation through time	log(Lik)	k	AICc	ΔAICc	λ_1	λ_2	λ_3	λ_4	λ_{slope}	q_{12}	q_{13}	q_{14}	q_{21}	q_{23}	q_{24}	q_{31}	q_{32}	q_{34}	q_{41}	q_{42}	q_{43}
Irreversible	Full	Single	Constant	−39.48	10	105.08	33.02	2.06	2.06	2.06	2.06	0	0.21	0.08	0	0	0	1.14	0	0	0	0	0	0.31
Stepwise	Full	Full	Constant	−36.01	12	105.2	33.14	0	3.76	3.99	1.37	0	0	0.43	0	3.29	0	0	0	0	3.46	0	0	0
Full	Full	Derived	Linear	−29.89	15	105.26	33.2	−0.34	0.85	0.85	0.85	5.87	0.14	0.24	0	0	0	0	0	0.15	3.11	0	0	0.49
Irreversible	Full	Derived	Constant	−38.99	11	107.52	35.46	1.75	2.37	2.37	2.37	0	0.2	0.08	0	0	0	1.14	0	0	0	0	0	0.31
Irreversible	Full	Full	Constant	−37.86	13	112.75	40.69	1.72	2.26	4.16	1.17	0	0.1	0.2	0	0	0	0	0	0	3.46	0	0.16	0
Full	Full	Full	Linear	−29.8	17	114.7	42.64	−0.35	1.3	0.99	0.7	5.9	0.15	0.25	0	0	0	0	0	0.09	3.23	0	0	0.45
Full	Full	Single	Constant	−38.88	13	114.78	42.72	2.06	2.06	2.06	2.06	0	0	0	0	1.43	0.11	0.54	0	0	0	0	0	0.35
Full	Full	Derived	Constant	−37.01	14	115.14	43.08	1.28	2.55	2.55	2.55	0	0	0.08	0	1.72	0	0.53	0	0	0	0	0	0.33
Full	Full	Full	Constant	−35.81	16	121.76	49.7	0	3.76	3.97	1.36	0	0	0.33	0	3.17	0.12	0	0	0	3.43	0	0	0

Estimates represent the maximum-likelihood estimates obtained under each model after 5,000 optimization procedures starting at different points. Melanosome models considered were full (all transitions estimated), irreversible (transitions back to the ancestral state set to zero), and stepwise (transitions involving both a change in shape and hollowness set to zero); transition models considered were full (all rates different), asymmetric (two transition rates, with transitions between derived morphologies different from transitions to/from ancestral morphology), and single (all transition rates equal); speciation rate models considered were single (all melanosome morphologies share the same speciation rate), derived (derived melanosomes share the same speciation rate, which is different from the ancestral melanosome speciation rate), and full (rates different for all four melanosome morphologies); and speciation through time models were constant and linear over time. Results are shown for all species and excluding *Lamprotornis elisabeth.*