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Supplementary material

Appendix 1

Methods

Colourmetrics

The probe was fitted with a tip that standardised the measuring distance and shielded out external light. All measurements were taken relative to dark and white standards (WS-2).

To quantify the contrasts between plumage areas we applied the Vorobyev-Osorio model (Vorobyev and Osorio 1998, Siddiqi et al. 2004), this estimates differences between two areas in units of discrimination threshold or "Just Noticeable Differences" (JND) and constructs a measure of chromatic and achromatic contrasts (Vorobyev and Osorio 1998, Osorio and Vorobyev 2008). A difference of less than one JND indicates that the two stimuli are likely to be indistinguishable to a bird. The model also takes into account photoreceptor noise as a limiting factor in visual discrimination (Vorobyev and Osorio 1998, Vorobyev et al. 2001).

Absorbance curves for each colour measurement were multiplied by the oil droplet spectrums, lens and cornea (assumed to be k_{max} = 350 nm as in other birds). Quantum catches for each cone type were deduced over the avian visual spectrum (320-700nm range; Vorobyev and Osorio 1998, Endler and Mielke 2005) and the von Kries transformation was employed to account for adaptation to the light environment (Vorobyev and Osorio 1998, Siddiqi et al. 2004, Endler and Mielke 2005). As crimson finches live in open habitat and are diurnal, we assumed a long-wave photoreceptor noise of 0.05 which is relevant for these bright conditions. We used this to derive across the other photoreceptor classes using a ratio of 1:1.4:2:2.6 (Hart 2001).

References

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Table A1: Coefficients of variation for colour measures.

		Free-living	Captive
Melanin	Patch Size	12.41	13.28
Face	Chromatic	19.29	15.83
	Achromatic	13.20	8.98
Back	Chromatic	15.90	10.81
	Achromatic	9.93	10.61
Rump	Chromatic	20.70	10.13
	Achromatic	11.40	6.34
Chest	Chromatic	29.13	12.55
	Achromatic	11.62	9.87

Results

Table A2: Free-living population. Subset of the best models with Δ AICc <3. All models include the fixed effect, length of observation. 'd.f' denotes degrees of freedom of the model, 'logLik' is the log-likelihood, 'AICc' is the AIC corrected for finite sample size; 'ΔAICc' is the difference between the AICc of that model compared to the best model. Weight is the probability of each model relative to the whole set of candidate models. w_i represents the cumulative probability.

Candidate model	d.f.	logLik	AICc	Δ AICc	weight	w_i
Null	3	-195.77	397.58	0.00	0.14	0.14
Condition	4	-194.92	397.90	0.32	0.12	0.26
PC2+Condition	5	-194.11	398.30	0.72	0.10	0.22
PC1	4	-195.33	398.71	1.13	0.08	0.18
PC1+PC2+Condition	6	-193.37	398.86	1.28	0.07	0.15
Patch area	4	-195.45	398.96	1.38	0.07	0.15
PC2	4	-195.54	399.14	1.56	0.06	0.14
PC1+Condition	5	-194.55	399.19	1.61	0.06	0.13
Condition+Patch area	5	-194.85	399.79	2.21	0.05	0.11
PC1+PC2	5	-194.86	399.81	2.23	0.05	0.09
PC2+Condition+Patch area	6	-194.00	400.11	2.53	0.04	0.09
PC1+Patch area	5	-195.07	400.21	2.63	0.04	0.08
PC2+Patch area	5	-195.10	400.29	2.71	0.04	0.07

Table A3: Captive population, natural plumage dyads. Subset of the best models with Δ AICc <3. All models include the fixed effect, length of observation. 'd.f' denotes degrees of freedom of the model, 'logLik' is the log-likelihood, 'AICc' is the AIC corrected for finite sample size; 'ΔAICc' is the difference between the AICc of that model compared to the best model. Weight is the probability of each model relative to the whole set of candidate models. w_i represents the cumulative probability.

Candidate model	d.f	logLik	AICc	Δ AICc	weight	w_i
PC1+PC2	4	-8.79	27.33	0.00	0.29	0.29
PC1	3	-10.31	27.62	0.29	0.25	0.54
PC1+Condition	4	-9.37	28.47	1.15	0.16	0.70
PC1+Patch area	4	-9.95	29.64	2.31	0.09	0.79
PC1+PC2+Condition	5	-8.60	29.93	2.60	0.08	0.87

Table A4: Captive population, manipulated plumage contests. Subset of the best models with Δ AICc <3. All models include the fixed effect, length of observation. 'd.f' denotes degrees of freedom of the model, 'logLik' is the log-likelihood, 'AICc' is the AIC corrected for finite sample size; 'ΔAICc' is the difference between the AICc of that model compared to the best model. Weight is the probability of each model relative to the whole set of candidate models. w_i represents the cumulative probability.

Candidate model	d.f	logLik	AICc	Δ AICc	weight	w_i
PC1+Condition	4	-14.81	38.92	0.00	0.50	0.50
PC1+PC2+Condition	5	-14.75	41.50	2.58	0.14	0.64
PC1+Condition+Patch area	5	-14.81	41.62	2.71	0.13	0.77