

**Supplementary material**

## Appendix 1 – Crown colouration

**Table A1.** The table presents all initial models tested for crown colouration. Full results are presented in the following tables: 2, 3, 4 respectively for UV chroma, Hue, Brightness, and 5, 6,7 for *UV hue*, *visible hue* and *chroma*. Variables calculated with the avian tetrahedral colour space model are given in italics.

Crown	Tested models
<b>UV chroma</b>	
model 1.1	UV chroma ~ (parasite+sex+age) <sup>2</sup> +as.factor(year)+(1   ring)
model 1.2	UV chroma ~ (parasite+sex+age) <sup>2</sup> -parasite:age+as.factor(year)+(1   ring)
model 1.3	UV chroma ~ (parasite+sex+age) <sup>2</sup> -parasite:age-parasite:sex+as.factor(year)+(1   ring)
<b>Hue</b>	
model 2.1	Hue ~ (parasite+sex+age) <sup>2</sup> +as.factor(year)+(1   ring)
model 2.2	Hue ~ (parasite+sex+age) <sup>2</sup> -parasite:age+as.factor(year)+(1   ring)
model 2.3	Hue ~ (parasite+sex+age) <sup>2</sup> -parasite:age-parasite:sex+as.factor(year)+(1   ring)
<b>Brightness:</b>	
model 3.1	Brightness ~ (parasite+sex+age) <sup>2</sup> + as.factor(year) + (1   ring)
model 3.2	Brightness ~ (parasite+sex+age) <sup>2</sup> - parasite:sex + as.factor(year) + (1   ring)
model 3.3	Brightness ~ (parasite+sex+age) <sup>2</sup> - parasite:sex-sex:age +as.factor(year) + (1   ring)
<b>UV hue:</b>	
model 4.1	<i>UV hue</i> ~ (parasite+sex+age) <sup>2</sup> + as.factor(year) + (1   ring)
model 4.2	<i>UV hue</i> ~ (parasite+sex+age) <sup>2</sup> - parasite:sex + as.factor(year) + (1   ring)
<b>Visible hue:</b>	
model 5.1	<i>Visible hue</i> ~ (parasite+sex+age) <sup>2</sup> + as.factor(year) + (1   ring)
model 5.2	<i>Visible hue</i> ~ (parasite+sex+age) <sup>2</sup> - parasite:sex + as.factor(year) + (1   ring)
<b>Chroma:</b>	
model 6.1	<i>Chroma</i> ~ (parasite+sex+age) <sup>2</sup> + as.factor(year) + (1   ring)
model 6.2	<i>Chroma</i> ~ (parasite+sex+age) <sup>2</sup> - sex:age + as.factor(year) + (1   ring)
model 6.3	<i>Chroma</i> ~ (parasite+sex+age) <sup>2</sup> - sex:age - parasite:sex + as.factor(year) + (1   ring)

**Table A2.** Results of linear mixed models examining the relation between infection status, sex and age on **crown UV chroma** of adult blue tits. The table presents results from initial models with various interaction terms tested (see Table 1), and shows: estimates, standard errors, degrees of freedom, t-values and p-values, with significant values ( $P < 0.05$ ) marked with the asterisks. Contrast 1 and Contrast 2 means respectively: differences between parasitized and non-parasitized birds and differences between *Haemoproteus* and *Plasmodium*. Age is divided into two categories: 2 – birds in their first year and P2 – older birds. The intercept include following factor levels: females (sex), 2 (age), 2013 (year).

	Estimate	SE	df	t	p	
<b>UV chroma 1.1</b>						
Intercept	-1.001	0.071	505.2	-14.030	< 0.001	***
Contrast 1	-0.093	0.068	509.9	-1.367	0.172	
Contrast 2	-0.080	0.069	489	-1.169	0.243	
sex M	1.457	0.083	474.7	17.618	< 0.001	***
Age P2	0.296	0.091	513.7	3.247	0.001	**
year 2014	0.382	0.064	413.7	5.976	0.000	***
year 2015	0.774	0.174	412.8	4.453	0.000	***
parasitec1:sexM	-0.076	0.083	506.5	-0.909	0.364	
parasitec2:sexM	-0.029	0.090	481.1	-0.324	0.746	
parasitec1:ageP2	0.001	0.086	503.4	0.012	0.990	
parasitec2:ageP2	0.112	0.091	514	1.231	0.219	
sexM:ageP2	-0.219	0.130	503.3	-1.685	0.093	
<b>UV chroma 1.2</b>						
Intercept	-1.004	0.071	509.8	-14.208	< 0.001	***
Contrast 1	-0.091	0.059	509.7	-1.543	0.123	
Contrast 2	-0.036	0.059	487.6	-0.618	0.537	
sex M	1.454	0.082	474.5	17.639	< 0.001	***
Age P2	0.300	0.090	515.8	3.349	0.001	***
year 2014	0.381	0.064	419.8	5.975	0.000	***
year 2015	0.782	0.173	425.8	4.512	0.000	***
parasitec1:sexM	-0.065	0.083	508.4	-0.785	0.433	
parasitec2:sexM	-0.030	0.089	477.3	-0.335	0.738	
sexM:ageP2	-0.239	0.128	502.3	-1.863	0.063	
<b>UV chroma 1.3</b>						
Intercept	-0.998	0.070	508.9	-14.213	< 0.001	***
Contrast 1	-0.124	0.042	516.1	-2.935	0.003	**
Contrast 2	-0.052	0.044	470.6	-1.179	0.239	
sex M	1.435	0.079	494.1	18.089	< 0.001	***
Age P2	0.300	0.089	517.8	3.348	0.001	***
year 2014	0.381	0.064	421.1	5.981	0.000	***
year 2015	0.789	0.173	433	4.569	0.000	***
sexM:ageP2	-0.230	0.127	503.7	-1.817	0.070	

**Table A3.** Results of linear mixed models examining the relation between infection status, sex and age on **crown hue** of adult blue tits. The table presents results from initial models with various interaction terms tested (see Table 1), and shows: estimates, standard errors, degrees of freedom, t-values and p-values, with significant values ( $P < 0.05$ ) marked with the asterisks. Contrast 1 and Contrast 2 means respectively: differences between parasitized and non-parasitized birds and differences between *Haemoproteus* and *Plasmodium*. Age is divided into two categories: 2 – birds in their first year and P2 – older birds. The intercept include following factor levels: females (sex), 2 (age), 2013 (year).

	Estimate	SE	df	t	p	
<b>Hue 2.1</b>						
Intercept	0.720	0.083	493.1	8.625	< 0.001	***
Contrast 1	0.102	0.080	510.9	1.269	0.205	
Contrast 2	0.109	0.081	501	1.337	0.182	***
sex M	-1.259	0.098	471.6	-12.871	< 0.001	***
Age P2	-0.492	0.107	510.2	-4.605	0.000	
year 2014	-0.022	0.074	363	-0.301	0.764	
year 2015	-0.332	0.200	239.7	-1.654	0.099	
parasitec1:sexM	0.049	0.098	511.9	0.498	0.619	
parasitec2:sexM	-0.050	0.106	501.6	-0.473	0.637	
parasitec1:ageP2	0.087	0.100	477.2	0.866	0.387	
parasitec2:ageP2	-0.110	0.107	499.1	-1.033	0.302	
sexM:ageP2	0.412	0.153	512.4	2.694	0.007	**
<b>Hue 2.2</b>						
Intercept	0.714	0.083	498.2	8.635	< 0.001	***
Contrast 1	0.134	0.069	511.1	1.933	0.054	
Contrast 2	0.066	0.069	500.1	0.951	0.342	
sex M	-1.261	0.098	473.2	-12.923	< 0.001	***
Age P2	-0.479	0.105	512.6	-4.559	0.000	***
year 2014	-0.018	0.074	364.1	-0.239	0.812	
year 2015	-0.324	0.199	220	-1.627	0.105	
parasitec1:sexM	0.039	0.097	514.4	0.400	0.690	
parasitec2:sexM	-0.036	0.105	502.9	-0.345	0.730	
sexM:ageP2	0.442	0.151	513.7	2.927	0.004	**
<b>Hue 2.3</b>						
Intercept	0.712	0.082	494.5	8.679	< 0.001	***
Contrast 1	0.152	0.050	518	3.064	0.002	**
Contrast 2	0.052	0.052	495.1	0.994	0.320	
sex M	-1.252	0.094	490.8	-13.364	< 0.001	***
Age P2	-0.480	0.105	514.5	-4.573	0.000	***
year 2014	-0.018	0.074	365.3	-0.245	0.806	
year 2015	-0.323	0.198	223.7	-1.629	0.806	
sexM:ageP2	0.448	0.149	515.5	3.000	0.003	**

**Table A4.** Results of linear mixed models examining the relation between infection status, sex and age on **crown brightness** of adult blue tits. The table presents results from initial models with various interaction terms tested (see Table 1), and shows: estimates, standard errors, degrees of freedom, t-values and p-values, with significant values ( $P < 0.05$ ) marked with the asterisks. Contrast 1 and Contrast 2 means respectively: differences between parasitized and non-parasitized birds and differences between *Haemoproteus* and *Plasmodium*. Age is divided into two categories: 2 – birds in their first year and P2 – older birds. The intercept include following factor levels: females (sex), 2 (age), 2013 (year).

<b>Brightness</b>	<b>Estimate</b>	<b>SE</b>	<b>df</b>	<b>t</b>	<b>p</b>	
<b>model 3.1</b>						
Intercept	-0.387	0.095	508.6	-4.068	<0.001	***
Contrast 1	-0.139	0.091	510.9	-1.523	0.128	
Contrast 2	0.064	0.092	494.3	0.698	0.485	
sex M	0.732	0.110	485.5	6.652	<0.001	***
Age P2	0.233	0.121	513.9	1.918	0.056	
year 2014	-0.002	0.085	443.8	-0.022	0.983	
year 2015	-0.126	0.232	460.7	-0.543	0.587	
parasitec1:sexM	-0.045	0.111	507.9	-0.407	0.684	
parasitec2:sexM	-0.061	0.119	487	-0.513	0.608	
parasitec1:ageP2	-0.084	0.115	508.3	-0.733	0.464	
parasitec2:ageP2	0.099	0.121	513.7	0.812	0.417	
sexM:ageP2	-0.076	0.173	504.8	-0.437	0.663	
<b>model 3.2</b>						
Intercept	-0.383	0.095	508.8	-4.045	<0.001	***
Contrast 1	-0.160	0.073	514.3	-2.189	0.029	*
Contrast 2	0.038	0.076	503.9	0.499	0.618	
sex M	0.717	0.106	500.5	6.77	<0.001	***
Age P2	0.233	0.121	515.9	1.925	0.055	
year 2014	-0.001	0.085	445.7	-0.017	0.986	
year 2015	-0.114	0.231	468.8	-0.493	0.622	
parasitec1:ageP2	-0.091	0.114	511.3	-0.805	0.421	
parasitec2:ageP2	0.094	0.121	515.8	0.782	0.435	
sexM:ageP2	-0.061	0.171	506.6	-0.356	0.722	
<b>model 3.3</b>						
Intercept	-0.371	0.088	510.2	-4.205	<0.001	***
Contrast 1	-0.158	0.073	515.3	-2.176	0.030	*
Contrast 2	0.038	0.075	504.8	0.499	0.618	
sex M	0.694	0.083	431.5	8.344	<0.001	***
Age P2	0.204	0.090	515.7	2.281	0.023	
year 2014	-0.002	0.085	446.1	-0.029	0.977	
year 2015	-0.121	0.230	472.8	-0.524	0.601	
parasitec1:ageP2	-0.095	0.113	512.4	-0.839	0.402	
parasitec2:ageP2	0.100	0.119	516.4	0.836	0.403	

**Table A5.** Results of linear mixed models examining the relation between infection status, sex and age on **crown UV hue** of adult blue tits. The table presents results from initial models with various interaction terms tested (see Table 1), and shows: estimates, standard errors, degrees of freedom, t-values and p-values, with significant values ( $P < 0.05$ ) marked with the asterisks. Contrast 1 and Contrast 2 means respectively: differences between parasitized and non-parasitized birds and differences between *Haemoproteus* and *Plasmodium*. Age is divided into two categories: 2 – birds in their first year and P2 – older birds. The intercept include following factor levels: females (sex), 2 (age), 2013 (year).

<i>UV hue</i>	Estimate	SE	df	t	p	
<b>model 4.1</b>						
Intercept	-0.708	0.084	476.9	-8.416	<0.001	***
Contrast 1	-0.090	0.081	511.9	-1.106	0.269	
Contrast 2	-0.097	0.082	508.9	-1.181	0.238	
sex M	1.216	0.099	468.6	12.245	<0.001	***
Age P2	0.483	0.108	502.8	4.48	<0.001	***
year 2014	0.019	0.074	312.8	0.262	0.793	
year 2015	0.320	0.199	147	1.609	0.110	
parasitec1:sexM	-0.053	0.099	514	-0.532	0.595	
parasitec2:sexM	0.039	0.107	512.3	0.363	0.717	
parasitec1:ageP2	-0.082	0.101	440	-0.814	0.416	
parasitec2:ageP2	0.109	0.108	459.8	1.015	0.311	
sexM:ageP2	-0.364	0.155	513.3	-2.35	0.019	*
<b>model 4.2</b>						
Intercept	-0.704	0.083	471.2	-8.436	<0.001	***
Contrast 1	-0.116	0.065	513.9	-1.784	0.075	
Contrast 2	-0.080	0.068	513.9	-1.182	0.238	
sex M	1.204	0.095	486.7	12.643	< 0.001	***
Age P2	0.483	0.108	504.5	4.486	<0.001	***
year 2014	0.020	0.074	312.5	0.267	0.789	
year 2015	0.320	0.198	147.9	1.616	0.108	
parasitec1:ageP2	-0.078	0.100	451	-0.775	0.439	
parasitec2:ageP2	0.102	0.107	462.3	0.958	0.339	
sexM:ageP2	-0.371	0.153	515.6	-2.427	0.016	*

**Table A6.** Results of linear mixed models examining the relation between infection status, sex and age on **crown visible hue** of adult blue tits. The table presents results from initial models with various interaction terms tested (see Table 1), and shows: estimates, standard errors, degrees of freedom, t-values and p-values, with significant values ( $P < 0.05$ ) marked with the asterisks. Contrast 1 and Contrast 2 means respectively: differences between parasitized and non-parasitized birds and differences between *Haemoproteus* and *Plasmodium*. Age is divided into two categories: 2 – birds in their first year and P2 – older birds. The intercept include following factor levels: females (sex), 2 (age), 2013 (year).

<b>Visible hue</b>	<b>Estimate</b>	<b>SE</b>	<b>df</b>	<b>t</b>	<b>p</b>	
<b>model 5.1</b>						
Intercept	-0.485	0.089	490.8	-5.475	<0.001	***
Contrast 1	-0.120	0.085	509.7	-1.410	0.159	
Contrast 2	-0.111	0.086	494.9	-1.291	0.197	
sex M	1.063	0.104	461.4	10.246	<0.001	***
Age P2	0.488	0.113	510.4	4.299	<0.001	***
year 2014	-0.197	0.079	345.6	-2.498	0.013	*
year 2015	0.013	0.214	233.7	0.061	0.951	
parasitec1:sexM	-0.004	0.104	510.2	-0.036	0.971	
parasitec2:sexM	0.039	0.112	494.2	0.351	0.726	
parasitec1:ageP2	-0.103	0.107	475.1	-0.961	0.337	
parasitec2:ageP2	0.128	0.113	501.5	1.132	0.258	
sexM:ageP2	-0.423	0.162	510.5	-2.608	0.009	**
<b>model 5.2</b>						
Intercept	-0.486	0.088	487	-5.520	<0.001	***
Contrast 1	-0.123	0.068	513.1	-1.796	0.073	
Contrast 2	-0.094	0.071	505.8	-1.330	0.184	
sex M	1.064	0.100	485.3	10.686	<0.001	***
Age P2	0.487	0.113	512.2	4.306	<0.001	***
year 2014	-0.197	0.079	347.7	-2.504	0.013	*
year 2015	0.007	0.212	236	0.032	0.974	
parasitec1:ageP2	-0.098	0.106	482.4	-0.926	0.355	
parasitec2:ageP2	0.127	0.113	502	1.129	0.259	
sexM:ageP2	-0.432	0.160	512.6	-2.696	0.007	**

**Table A7.** Results of linear mixed models examining the relation between infection status, sex and age on **chroma** of adult blue tits. The table presents results from initial models with various interaction terms tested (see Table 1), and shows: estimates, standard errors, degrees of freedom, t-values and p-values, with significant values ( $P < 0.05$ ) marked with the asterisks. Contrast 1 and Contrast 2 means respectively: differences between parasitized and non-parasitized birds and differences between *Haemoproteus* and *Plasmodium*. Age is divided into two categories: 2 – birds in their first year and P2 – older birds. The intercept include following factor levels: females (sex), 2 (age), 2013 (year).

<b>Chroma</b>	<b>Estimate</b>	<b>SE</b>	<b>df</b>	<b>t</b>	<b>p</b>	
<b>model 6.1</b>						
Intercept	-0.932	0.080	504.8	-11.592	<0.001	***
Contrast 1	-0.039	0.077	512.0	-0.505	0.614	
Contrast 2	0.000	0.078	504.3	-0.006	0.995	
sex M	0.943	0.094	489.7	10.051	<0.001	***
Age P2	-0.014	0.103	512.8	-0.138	0.890	
year 2014	0.763	0.072	429.2	10.665	<0.001	***
year 2015	1.022	0.194	358.7	5.263	<0.001	***
parasitec1:sexM	0.024	0.094	511.9	0.256	0.798	
parasitec2:sexM	-0.132	0.102	503.3	-1.295	0.196	
parasitec1:ageP2	0.050	0.097	499.0	0.521	0.603	
parasitec2:ageP2	0.088	0.103	510.4	0.861	0.390	
sexM:ageP2	0.046	0.147	511.8	0.316	0.752	
<b>model 6.2</b>						
Intercept	-0.941	0.075	502.9	-12.562	<0.001	***
Contrast 1	-0.040	0.077	512.8	-0.516	0.606	
Contrast 2	0.002	0.078	504.7	0.021	0.983	
sex M	0.961	0.075	424.8	12.734	<0.001	***
Age P2	0.007	0.077	514.3	0.095	0.924	
year 2014	0.763	0.071	428.4	10.694	<0.001	***
year 2015	1.026	0.193	359.2	5.304	<0.001	***
parasitec1:sexM	0.024	0.094	512.9	0.253	0.801	
parasitec2:sexM	-0.137	0.100	503.6	-1.360	0.174	
parasitec1:ageP2	0.053	0.096	500.9	0.556	0.579	
parasitec2:ageP2	0.084	0.102	512.5	0.828	0.408	
<b>model 6.3</b>						
Intercept	-0.946	0.075	503.9	-12.694	<0.001	***
Contrast 1	-0.027	0.062	515.6	-0.438	0.662	
Contrast 2	-0.058	0.064	511.3	-0.900	0.369	
sex M	0.970	0.071	439.5	13.592	<0.001	***
Age P2	0.022	0.076	516.8	0.284	0.777	
year 2014	0.764	0.071	429.6	10.696	<0.001	***
year 2015	1.045	0.193	365.7	5.419	<0.001	***
parasitec1:ageP2	0.039	0.096	504.7	0.408	0.684	
parasitec2:ageP2	0.087	0.101	514.4	0.860	0.390	



## Appendix 2 – Breast colouration

**Table A8.** The table presents all initial models tested for breast colouration. Full results are presented in the following tables: 9, 10, 11 respectively for brightness, UV chroma, hue and tables 12, 13, 14 for UV hue, visible hue and chroma.

Breast	Tested models
<b>UV chroma</b>	
model 1.1	UV chroma ~ (parasite+sex+age)^2+as.factor(year)+(1   ring)
model 1.2	UV chroma ~ (parasite+sex+age)^2-parasite:age+as.factor(year)+(1   ring)
<b>Hue</b>	
model 2.1	Hue ~ (parasite+sex+age)^2+as.factor(year)+(1   ring)
model 2.2	Hue ~ (parasite+sex+age)^2-parasite:age+as.factor(year)+(1   ring)
model 2.3	Hue ~ (parasite+sex+age)^2-parasite:age-parasite:sex+as.factor(year)+(1   ring)
<b>Brightness:</b>	
model 3.1	Brightness ~ (parasite+sex+age)^2 + as.factor(year) + (1   ring)
model 3.2	Brightness ~ (parasite+sex+age)^2 - parasite:age + as.factor(year) + (1   ring)
model 3.3	Brightness ~ (parasite+sex+age)^2 - parasite:age - parasite:sex + as.factor(year) + (1   ring)
<b>UV hue:</b>	
model 4.1	UV hue ~ (parasite+sex+age)^2 + as.factor(year) + (1   ring)
model 4.2	UV hue ~ (parasite+sex+age)^2 - sex:age +as.factor(year) +(1   ring)
model 4.3	UV hue ~ (parasite+sex+age)^2 - sex:age - parasite:sex + as.factor(year) + (1   ring)
<b>Visible hue:</b>	
model 5.1	Visible hue ~ (parasite+sex+age)^2 + as.factor(year) + (1   ring)
<b>Chroma:</b>	
model 6.1	Chroma ~ (parasite+sex+age)^2 + as.factor(year) + (1   ring)
model 6.2	Chroma ~ (parasite+sex+age)^2 - parasite:age + as.factor(year) + (1   ring)
model 6.3	Chroma ~ (parasite+sex+age)^2 - parasite:age - parasite:sex + as.factor(year) + (1   ring)

**Table A9.** Results of linear mixed models examining the relation between infection status, sex and age on **breast UV chroma** of adult blue tits. The table presents results from initial models with various interaction terms tested (see Table 8), and shows: estimates, standard errors, degrees of freedom, t-values and p-values, with significant values ( $P < 0.05$ ) marked with the asterisks. Contrast 1 and Contrast 2 means respectively: differences between parasitized and non-parasitized birds and differences between *Haemoproteus* and *Plasmodium*. Age is divided into two categories: 2 – birds in their first year and P2 – older birds. The intercept include following factor levels: females (sex), 2 (age), 2013 (year).

	Estimate	SE	df	t	p	
<b>UV chroma</b>						
<b>model 1.1</b>						
Intercept	-0.394	0.095	473.9	-4.126	<0.000	***
Contrast 1	0.165	0.092	479	1.798	0.073	
Contrast 2	0.129	0.094	473.8	1.373	0.170	
sex M	0.684	0.121	463.9	5.670	<0.000	***
Age P2	0.442	0.122	478.9	3.625	<0.000	***
year 2014	-0.177	0.087	424	-2.037	0.042	*
year 2015	0.468	0.232	419	2.020	0.044	*
parasitec1:sexM	0.047	0.116	477	0.409	0.683	
parasitec2:sexM	-0.109	0.130	470.2	-0.841	0.401	
parasitec1:ageP2	0.070	0.118	473.4	0.589	0.556	
parasitec2:ageP2	-0.164	0.127	478.6	-1.295	0.196	
sexM:ageP2	-0.500	0.179	479.1	-2.790	0.005	**
<b>model 1.2</b>						
Intercept	-0.399	0.095	478	-4.213	<0.000	***
Contrast 1	0.190	0.078	480.6	2.424	0.016	*
Contrast 2	0.064	0.079	474.2	0.811	0.418	
sex M	0.689	0.119	467.1	5.775	<0.000	***
Age P2	0.449	0.120	481.2	3.759	<0.000	***
year 2014	-0.171	0.087	431.1	-1.967	0.050	*
year 2015	0.466	0.230	430.4	2.023	0.044	*
parasitec1:sexM	0.032	0.115	479.3	0.277	0.782	
parasitec2:sexM	-0.110	0.128	468.5	-0.858	0.391	
sexM:ageP2	-0.469	0.177	480.7	-2.647	0.008	**

**Table A10.** Results of linear mixed models examining the relation between infection status, sex and age on **breast hue** of adult blue tits. The table presents results from initial models with various interaction terms tested (see Table 8), and shows: estimates, standard errors, degrees of freedom, t-values and p-values, with significant values ( $P < 0.05$ ) marked with the asterisks. Contrast 1 and Contrast 2 means respectively: differences between parasitized and non-parasitized birds and differences between *Haemoproteus* and *Plasmodium*. Age is divided into two categories: 2 – birds in their first year and P2 – older birds. The intercept include following factor levels: females (sex), 2 (age), 2013 (year).

	Estimate	SE	df	t	p
<b>Hue</b>					
<b>model 2.1</b>					
Intercept	-0.087	0.100	457.8	-0.874	0.382
Contrast 1	0.025	0.097	480	0.255	0.799
Contrast 2	-0.098	0.100	480	-0.986	0.324
sex M	0.179	0.129	468	1.387	0.166
Age P2	0.226	0.128	468	1.767	0.078
year 2014	-0.159	0.089	358.6	-1.784	0.075
year 2015	0.040	0.234	232.9	0.170	0.866
parasitec1:sexM	-0.062	0.122	478.8	-0.508	0.612
parasitec2:sexM	0.269	0.137	477	1.961	0.051
parasitec1:ageP2	-0.020	0.123	437.6	-0.166	0.868
parasitec2:ageP2	-0.060	0.132	433.8	-0.451	0.653
sexM:ageP2	0.040	0.189	472.8	0.211	0.833
<b>model 2.2</b>					
Intercept	-0.084	0.099	464.1	-0.850	0.396
Contrast 1	0.015	0.083	481.9	0.184	0.854
Contrast 2	-0.122	0.084	481.6	-1.459	0.145
sex M	0.187	0.127	470.4	1.470	0.142
Age P2	0.219	0.125	472.8	1.750	0.081
year 2014	-0.158	0.089	362.9	-1.779	0.076
year 2015	0.027	0.232	232.9	0.119	0.906
parasitec1:sexM	-0.071	0.121	480.7	-0.586	0.558
parasitec2:sexM	0.261	0.135	480.9	1.930	0.054
sexM:ageP2	0.042	0.186	477.2	0.227	0.820
<b>model 2.3</b>					
Intercept	-0.088	0.098	459.7	-0.905	0.366
Contrast 1	-0.010	0.061	479.8	-0.167	0.867
Contrast 2	-0.025	0.066	484	-0.375	0.708
sex M	0.181	0.120	477.5	1.517	0.130
Age P2	0.221	0.125	473.6	1.767	0.078
year 2014	-0.149	0.088	360.8	-1.691	0.092
year 2015	0.003	0.230	231.3	0.012	0.991
sexM:ageP2	-0.005	0.184	478.5	-0.029	0.977

**Table A11.** Results of linear mixed models examining the relation between infection status, sex and age on **breast brightness** of adult blue tits. The table presents results from initial models with various interaction terms tested (see Table 8), and shows: estimates, standard errors, degrees of freedom, t-values and p-values, with significant values ( $P < 0.05$ ) marked with the asterisks. Contrast 1 and Contrast 2 means respectively: differences between parasitized and non-parasitized birds and differences between *Haemoproteus* and *Plasmodium*. Age is divided into two categories: 2 – birds in their first year and P2 – older birds. The intercept include following factor levels: females (sex), 2 (age), 2013 (year).

<b>Brightness</b>	<b>Estimate</b>	<b>SE</b>	<b>df</b>	<b>t</b>	<b>p</b>
<b>model 3.1</b>					
Intercept	0.041	0.100	461.8	0.405	0.686
Contrast 1	-0.095	0.097	479.6	-0.973	0.331
Contrast 2	-0.031	0.100	478.5	-0.311	0.756
sex M	0.254	0.129	462.7	1.977	0.049
Age P2	-0.002	0.128	472.3	1.977	0.986
year 2014	-0.019	0.090	367.9	-0.206	0.837
year 2015	-0.405	0.239	270.4	-1.697	0.091
parasitec1:sexM	-0.217	0.123	480	-1.768	0.078
parasitec2:sexM	0.168	0.138	479.9	1.218	0.224
parasitec1:ageP2	0.054	0.124	449.4	0.431	0.667
parasitec2:ageP2	-0.081	0.134	453.5	-0.604	0.546
sexM:ageP2	-0.362	0.190	478.3	-1.911	0.057
<b>model 3.2</b>					
Intercept	0.037	0.099	467.7	0.373	0.709
Contrast 1	-0.075	0.083	481.4	-0.904	0.366
Contrast 2	-0.062	0.084	479.3	-0.739	0.460
sex M	0.255	0.127	466	2.007	0.045
Age P2	0.005	0.126	476	0.037	0.971
year 2014	-0.016	0.090	372.6	-0.177	0.860
year 2015	-0.407	0.237	269	-1.721	0.086
parasitec1:sexM	-0.224	0.237	482	-1.843	0.066
parasitec2:sexM	0.170	0.136	481.4	1.256	0.210
sexM:ageP2	-0.344	0.187	481	-1.838	0.067
<b>model 3.3</b>					
Intercept	0.054	0.099	463.7	0.543	0.587
Contrast 1	-0.173	0.062	483	-2.802	0.005 **
Contrast 2	-0.004	0.066	480.5	-0.058	0.954
sex M	0.190	0.120	475.4	1.588	0.113
Age P2	0.004	0.126	477.4	0.032	0.974
year 2014	-0.015	0.090	369.2	-0.171	0.864
year 2015	-0.406	0.236	268.9	-1.719	0.087
sexM:ageP2	-0.357	0.185	483.1	-1.933	0.054

**Table A12.** Results of linear mixed models examining the relation between infection status, sex and age on **breast UV hue** of adult blue tits. The table presents results from initial models with various interaction terms tested (see Table 8), and shows: estimates, standard errors, degrees of freedom, t-values and p-values, with significant values ( $P < 0.05$ ) marked with the asterisks. Contrast 1 and Contrast 2 means respectively: differences between parasitized and non-parasitized birds and differences between *Haemoproteus* and *Plasmodium*. Age is divided into two categories: 2 – birds in their first year and P2 – older birds. The intercept include following factor levels: females (sex), 2 (age), 2013 (year).

<i>UV hue</i>	Estimate	SE	df	t	p	
<b>model 4.1</b>						
Intercept	-0.440	0.091	453	-4.845	<0.001	***
Contrast 1	0.144	0.089	480	1.619	0.106	
Contrast 2	0.052	0.091	479.4	0.571	0.568	
sex M	0.741	0.118	470.8	6.277	<0.001	***
Age P2	0.258	0.117	463	2.214	0.027	*
year 2014	-0.118	0.081	345.2	-1.462	0.145	
year 2015	0.318	0.210	204.2	1.512	0.132	
parasitec1:sexM	-0.057	0.112	475.6	-0.509	0.611	
parasitec2:sexM	0.062	0.125	469.5	0.496	0.620	
parasitec1:ageP2	0.128	0.112	425.1	1.146	0.253	
parasitec2:ageP2	-0.153	0.121	413.5	-1.269	0.205	
sexM:ageP2	-0.012	0.172	465.4	-0.070	0.944	
<b>model 4.2</b>						
Intercept	-0.438	0.084	447.9	-5.182	<0.001	***
Contrast 1	0.144	0.089	481	1.624	0.105	
Contrast 2	0.052	0.091	480.3	0.569	0.570	
sex M	0.737	0.094	421.1	7.808	<0.001	***
Age P2	0.253	0.090	452.6	2.808	0.005	**
year 2014	-0.118	0.080	344.8	-1.475	0.141	
year 2015	0.317	0.210	203.4	1.511	0.132	
parasitec1:sexM	-0.056	0.112	475.9	-0.506	0.613	
parasitec2:sexM	0.063	0.123	472.6	0.514	0.608	
parasitec1:ageP2	0.127	0.111	431.7	1.147	0.252	
parasitec2:ageP2	-0.152	0.120	417.4	-1.269	0.205	
<b>model 4.3</b>						
Intercept	-0.432	0.084	447.8	-5.159	<0.001	***
Contrast 1	0.118	0.075	482.4	1.581	0.115	
Contrast 2	0.076	0.080	479.6	0.947	0.344	
sex M	0.718	0.087	419.4	8.254	<0.001	***
Age P2	0.248	0.089	462.5	2.800	0.005	**
year 2014	-0.118	0.080	342.9	-1.479	0.140	
year 2015	0.313	0.208	205.7	1.510	0.133	
parasitec1:ageP2	0.131	0.110	436.6	1.194	0.233	
parasitec2:ageP2	-0.155	0.118	421	-1.313	0.190	

**Table A13.** Results of linear mixed models examining the relation between infection status, sex and age on **breast visible hue** of adult blue tits. The table presents results from initial models with various interaction terms tested (see Table 8), and shows: estimates, standard errors, degrees of freedom, t-values and p-values, with significant values ( $P < 0.05$ ) marked with the asterisks. Contrast 1 and Contrast 2 means respectively: differences between parasitized and non-parasitized birds and differences between *Haemoproteus* and *Plasmodium*. Age is divided into two categories: 2 – birds in their first year and P2 – older birds. The intercept include following factor levels: females (sex), 2 (age), 2013 (year).

<i>Visible hue</i>	Estimate	SE	df	t	p
<b>model 5.1</b>					
Intercept	-0.375	0.097	470.5	-3.863	<0.001 ***
Contrast 1	0.133	0.093	478.8	1.428	0.154
Contrast 2	0.219	0.096	472.8	2.284	0.023 *
sex M	0.487	0.123	458.6	3.957	<0.001 ***
Age P2	-0.126	0.124	477.9	-1.017	0.309
year 2014	0.237	0.088	400.8	2.687	0.008 **
year 2015	0.237	0.235	380.2	1.217	0.225
parasitec1:sexM	0.015	0.118	476.8	0.125	0.900
parasitec2:sexM	-0.321	0.132	469.7	-2.432	0.015 *
parasitec1:ageP2	0.152	0.120	468.6	1.261	0.208
parasitec2:ageP2	-0.096	0.129	476.3	-0.746	0.456
sexM:ageP2	0.000	0.182	479.3	0.003	0.998

**Table A14.** Results of linear mixed models examining the relation between infection status, sex and age on **breast chroma** of adult blue tits. The table presents results from initial models with various interaction terms tested (see Table 8), and shows: estimates, standard errors, degrees of freedom, t-values and p-values, with significant values ( $P < 0.05$ ) marked with the asterisks. Contrast 1 and Contrast 2 means respectively: differences between parasitized and non-parasitized birds and differences between *Haemoproteus* and *Plasmodium*. Age is divided into two categories: 2 – birds in their first year and P2 – older birds. The intercept include following factor levels: females (sex), 2 (age), 2013 (year).

<b>Chroma</b>	<b>Estimate</b>	<b>SE</b>	<b>df</b>	<b>t</b>	<b>p</b>
<b>model 6.1</b>					
Intercept	0.126	0.100	0.189023	1.263	0.207
Contrast 1	-0.082	0.097	479.8	-0.846	0.398
Contrast 2	-0.069	0.100	479.1	-0.692	0.490
sex M	-0.191	0.128	467.6	-1.485	0.138
Age P2	-0.340	0.128	474	-2.656	0.008 **
year 2014	0.066	0.090	391.4	0.730	0.466
year 2015	-0.364	0.238	301.2	-1.531	0.127
parasitec1:sexM	-0.040	0.123	480	-0.323	0.747
parasitec2:sexM	0.236	0.137	480	1.723	0.086
parasitec1:ageP2	0.003	0.124	456.1	0.026	0.979
parasitec2:ageP2	0.070	0.133	458.7	0.523	0.601
sexM:ageP2	0.606	0.189	478.4	3.204	0.001 **
<b>model 6.2</b>					
Intercept	0.125	0.099	471.6	1.260	0.208
Contrast 1	-0.079	0.083	481.5	-0.958	0.339
Contrast 2	-0.041	0.084	479.9	-0.487	0.626
sex M	-0.197	0.127	470	-1.558	0.120
Age P2	-0.337	0.125	477.7	-2.685	0.008 **
year 2014	0.064	0.090	397.2	0.715	0.475
year 2015	-0.356	0.236	307.5	-1.507	0.133
parasitec1:sexM	0.031	0.121	482	-0.257	0.797
parasitec2:sexM	0.242	0.135	481.4	1.790	0.074
sexM:ageP2	0.599	0.187	481.4	3.211	0.001 **

### Appendix 3 – Repeatability of the spectrophotometric measurements

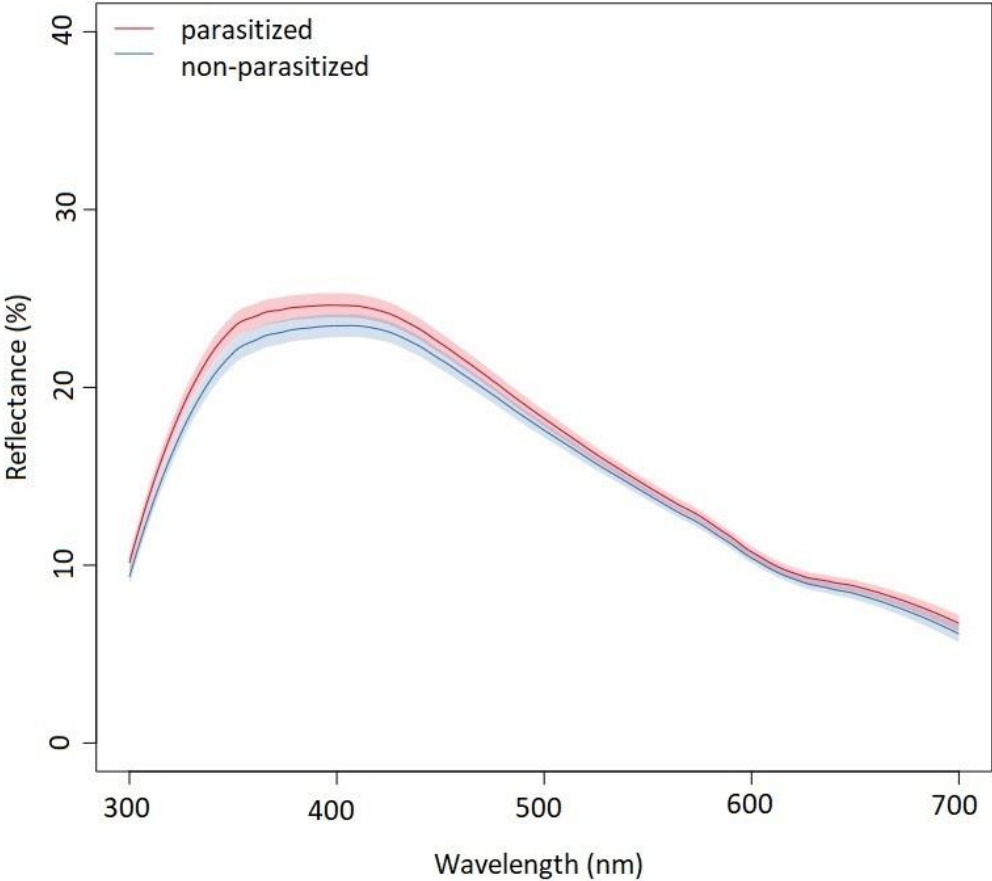
**Table A15.** Repeatability of spectrophotometric measurements within a feather sample for a) crown and b) breast feathers (calculated using *lmerTests* and *nlme* packages). Estimates of repeatability was calculated from the model with ID of an individual as a random term and colour variable as a response. Likelihood ratio statistics and *p*-values from the comparisons of models including and excluding the ID random factor are provided.

	Repeatability	L. Ratio	p-value
<b>a) Crown</b>			
Brightness	0.53	1077.71	<.0001
UV chroma	0.79	1878.88	<.0001
Hue	0.76	2083.72	<.0001
Visible hue	0.86	3386.72	<.0001
UV hue	0.77	2174.81	<.0001
Chroma	0.79	2456.85	<.0001
<b>b) Breast</b>			
Brightness	0.28	407.66	<.0001
UV chroma	0.55	1208.55	<.0001
Hue	0.61	1582.85	<.0001
Visible hue	0.61	1512.34	<.0001
UV hue	0.70	1891.59	<.0001
Chroma	0.45	895.61	<.0001



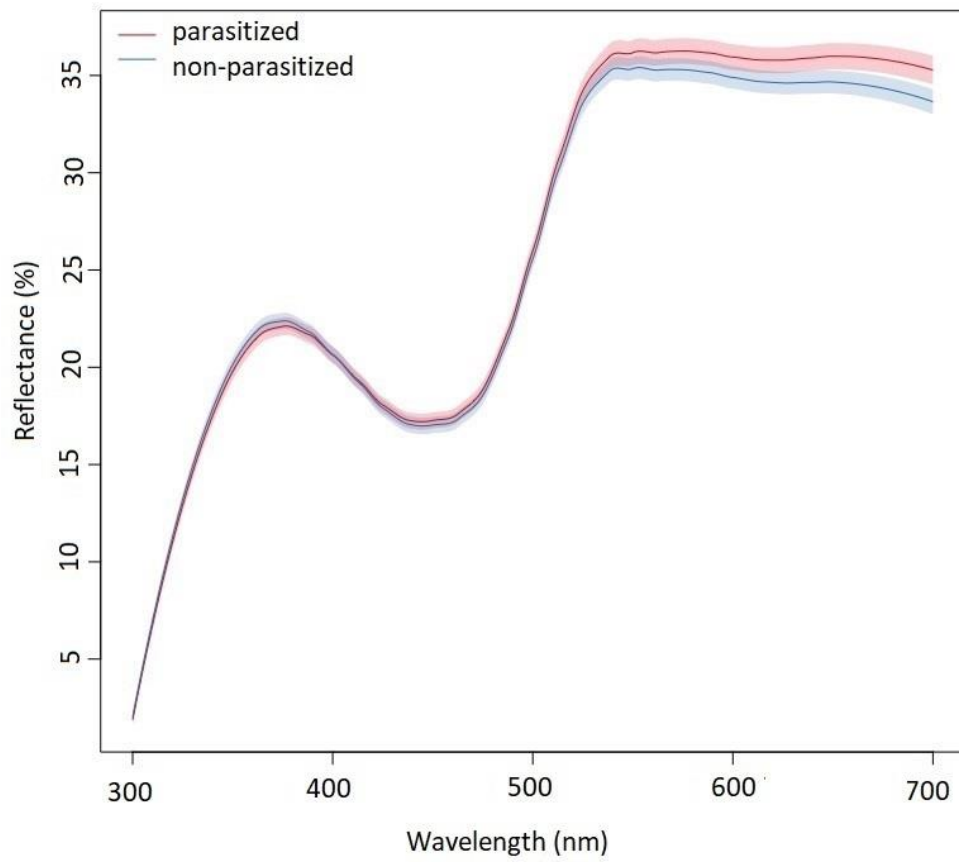
**Appendix 4 –Figures of average reflectances of infected vs uninfected birds**

Fig. 1



**Figure A1.** Average reflectances with confidence intervals (shaded areas) of crown feathers of parasitized and non-parasitized individuals.

Fig. 2



**Figure A2.** Average reflectances with confidence intervals (shaded areas) of breast feathers of parasitized and non-parasitized individuals.