Figure S1

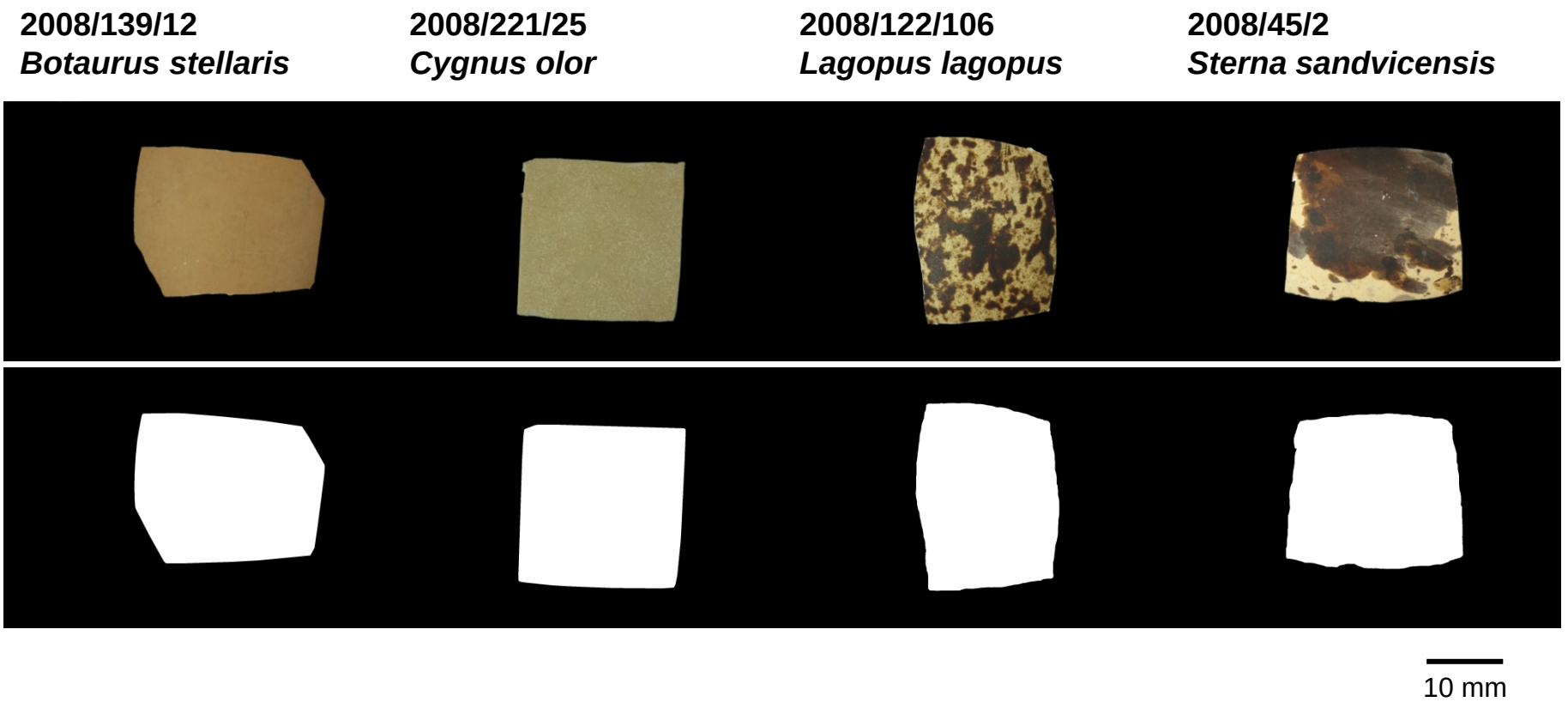
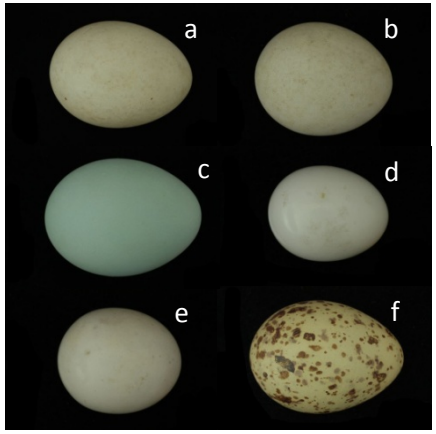
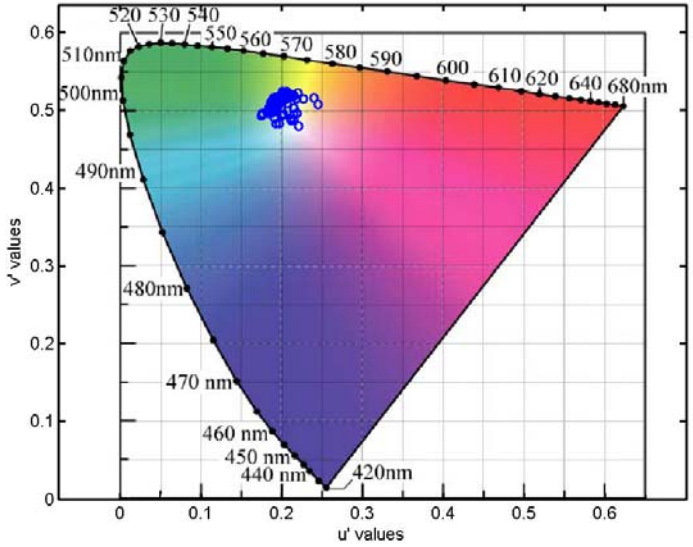
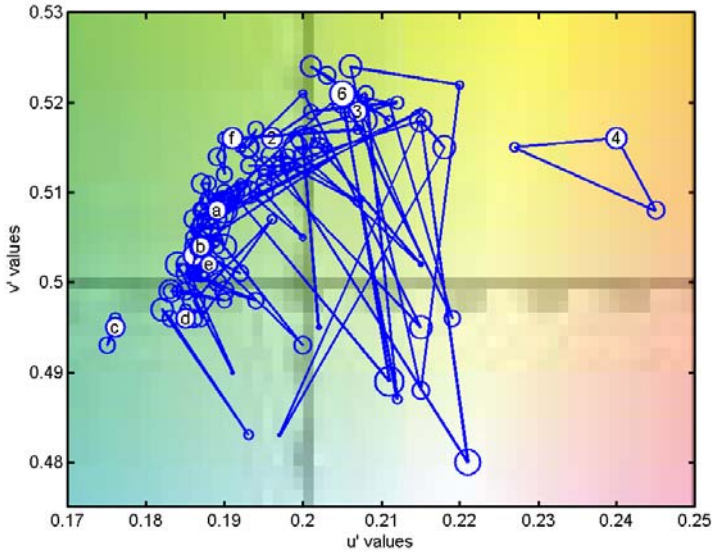

2008/139/12
Botaurus stellaris
2008/221/25
Cygnus olor
2008/122/106
Lagopus lagopus
2008/45/2
Sterna sandvicensis
10 mm

Figure 1


a
b
c
d
e
f


520 530 540
550 560 570 580 590 600 610 620 640 680nm
510nm
500nm
490nm
480nm
470 nm
460 nm
450 nm
440 nm
420nm
v' values
u' values


1
2
3
4
5
6


v' values
u' values

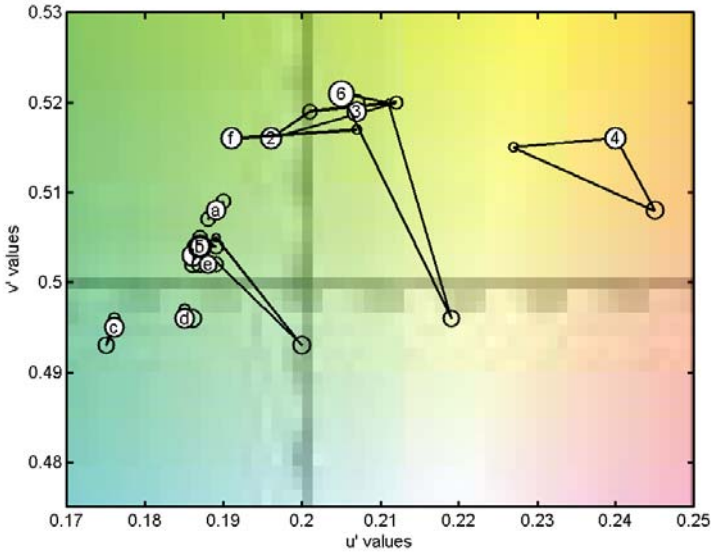

v' values
u' values

Figure 2

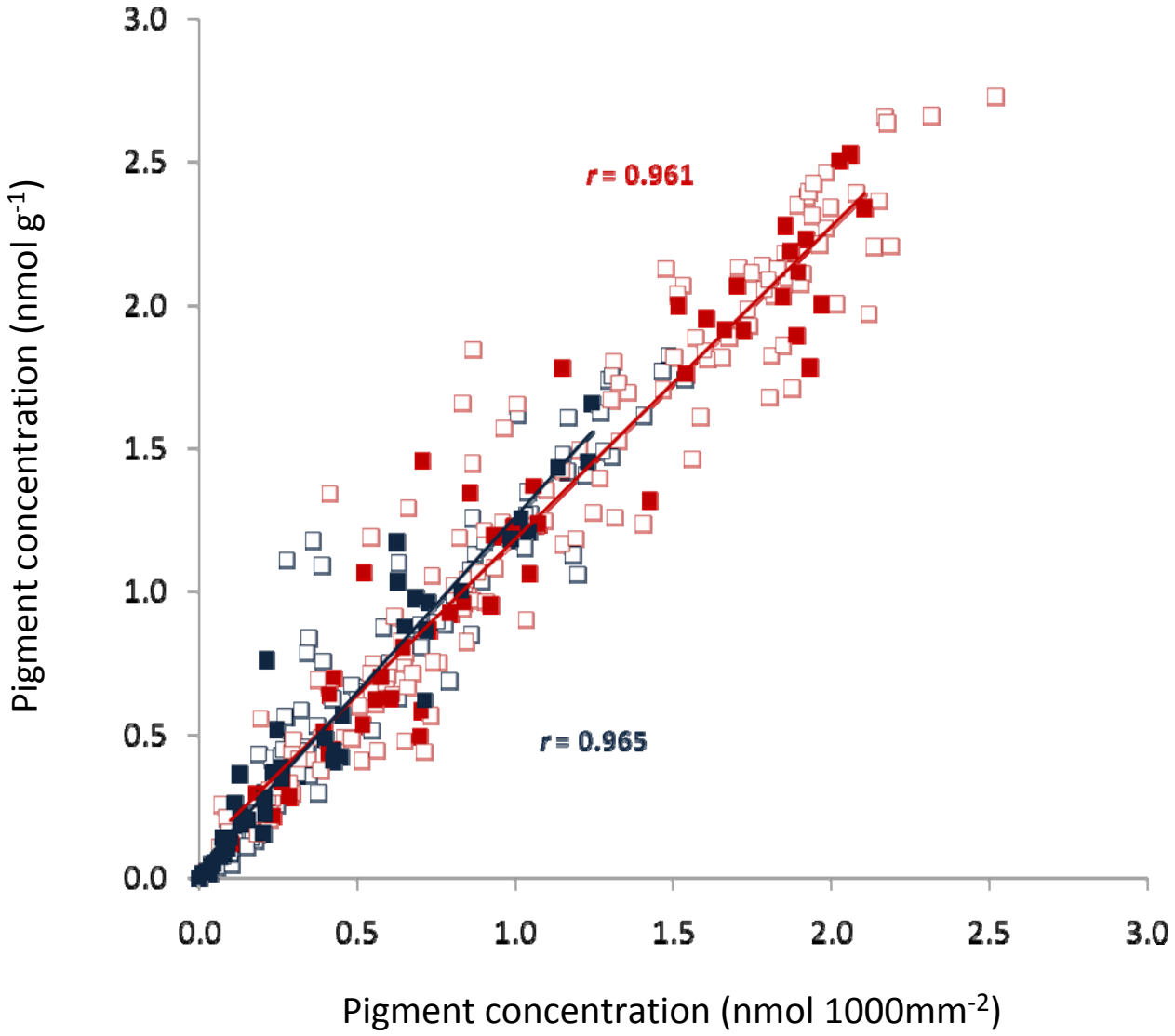

3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
r = 0.961
r = 0.965
Pigment concentration (nmol g-1)
Pigment concentration (nmol 1000mm-2)

Figure 3

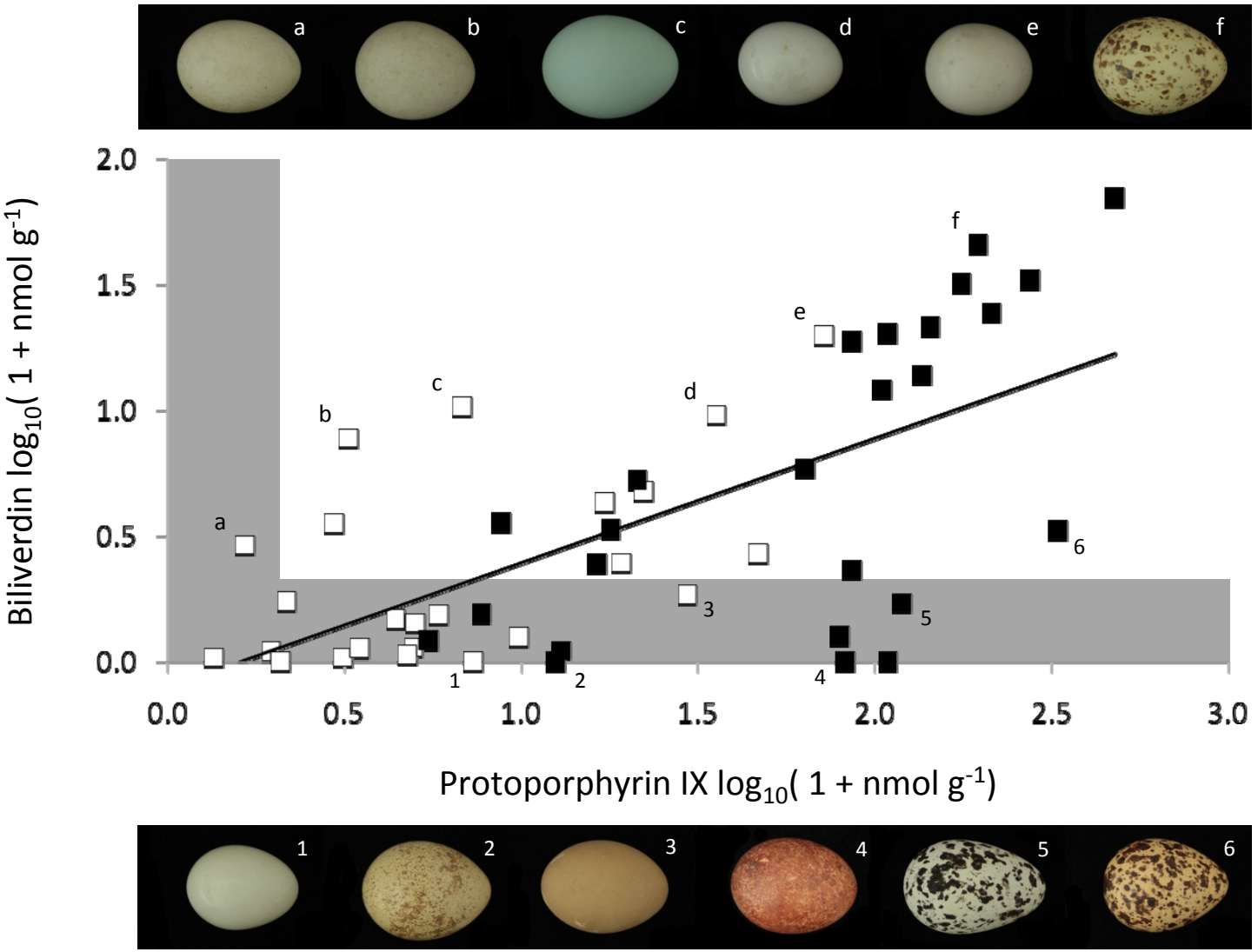

a
b
c
d
e
f
2.0
1.5
1.0
0.5
0.0
Biliverdin log10(1 + nmol g-1)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Protoporphyrin IX log10(1 + nmol g-1)
1
2
3
4
5
6

Figure 4

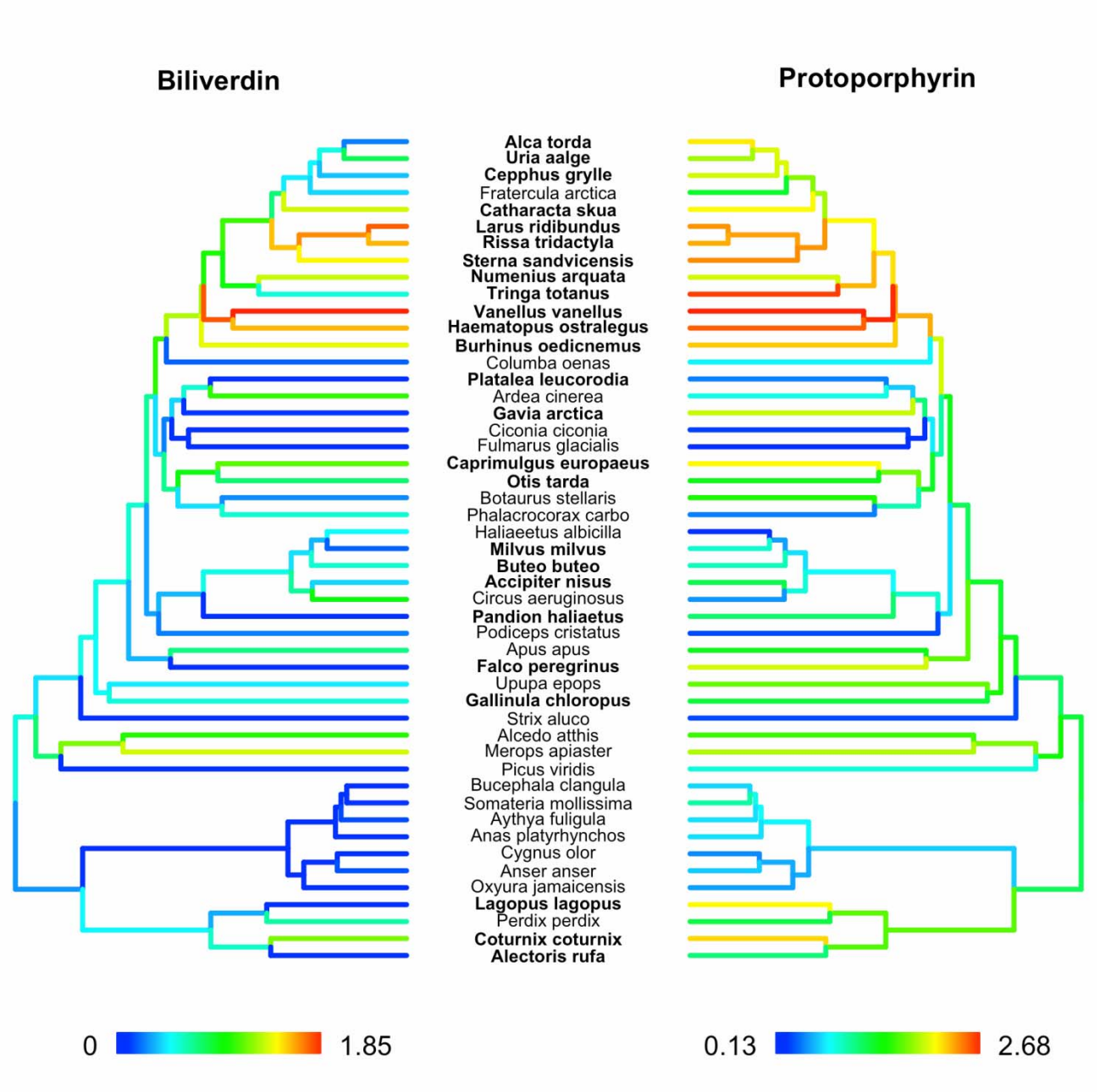

Biliverdin
Protoporphyrin
Alca torda
Uria aalge
Cepphus grylle
Fratercula arctica
Catharacta skua
Larus ridibundus
Rissa tridactyla
Sterna sandvicensis
Numenius arquata
Tringa totanus
Vanellus vanellus
Haematopus ostralegus
Burhinus oedicnemus
Columba oenas
Platalea leucorodia
Ardea cinerea
Gavia arctica
Ciconia ciconia
Fulmarus glacialis
Caprimulgus europaeus
Otis tarda
Botaurus stellaris
Phalacrocorax carbo
Haliaeetus albicilla
Milvus milvus
Buteo buteo
Accipiter nisus
Circus aeruginosus
Pandion haliaetus
Podiceps cristatus
Apus apus
Falco peregrinus
Upupa epops
Gallinula chloropus
Strix aluco
Alcedo atthis
Merops apiaster
Picus viridis
Bucephala clangula
Somateria mollissima
Aythya fuligula
Anas platyrhynchos
Cygnus olor
Anser anser
Oxyura jamaicensis
Lagopus lagopus
Perdix perdix
Coturnix coturnix
Alectoris rufa
0
1.85
0.13
2.68

Figure legends

Figure S1. Eggshell fragments (> 1cm ^{2}) were cut from the equatorial region of the whole shell. Digital photographs were taken of each sample and a binary mask was constructed to locate the eggshell sample in the photograph for all subsequent colorimetric analyses.

Figure 1. The CIELUV chromaticity space occupied by the average of the three principal colours for each of the 49 species' eggs (n = 3 eggs per species) is provided in the top central panel. In the bottom two panels, the three principal colours for a single different egg from each species, are joined by straight (nearest distance) lines, with the size of the points denoting the proportion of pixel coverage each colour contributes. In the bottom right panel, only the twelve eggs pictured are presented. The species are: (a) *Haliaeetus albicilla*, (b) *Circus aeruginosus*, (c) *Ardea cinerea*, (d) *Alcedo atthis*, (e) *Merops apiaster*, (f) *Larus ridibundus*; (1) *Picus viridis*, (2) *Alectoris rufa*, (3) *Botaurus stellaris*, (4) *Falco peregrinus*, (5) *Alca torda*, (6) *Tringa totanus*. Note that the immaculate eggs (e.g., a, c, d) share very similar colours compared with the maculated eggs (e.g., f, 5, 6). Lightness (or saturation) is not represented in this figure.

Figure 2. Bivariate scatterplot of the positive association between pigment concentrations standardized by fragment sample surface area (mm^{-2}) and fragment sample weight (g^{-1}) for protoporphyrin IX (red loci) and biliverdin (blue loci). Hollow loci indicate values for individual fragments (3 per species). Lines of best fit were estimated by ordinary least squares regression and are fitted through the 49 species means (solid loci).

Figure 3. Bivariate scatterplot of the interspecific relationship between the average concentration ($\log_{10}(1 + \text{nmol } g^{-1})$) of the eggshell pigments protoporphyrin IX and biliverdin. Maculated (patterned) species (solid loci) and immaculate species (hollow loci) are distinguished. The shaded (grey) region of the graph indicates values less than one nmol g^{-1}. The line of best fit is estimated by ordinary least squares regression (Pearson's correlation $r = 0.803$, $n = 49$, $P < 0.001$). Species with high residuals across the relationship (chosen non-randomly) are depicted for both protoporphyrin IX (1-6) and biliverdin (a-f). In all cases the photographs (taken by GM) are of an actual egg used in subsequent analyses prior to the removal of a shell fragment. The species are: (1) *Picus viridis*, (2) *Alectoris rufa*, (3) *Botaurus stellaris*, (4) *Falco peregrinus*, (5) *Alca torda*, (6) *Tringa totanus*; (a) *Haliaeetus albicilla*, (b) *Circus aeruginosus*, (c) *Ardea cinerea*, (d) *Alcedo atthis*, (e) *Merops apiaster*, (f) *Larus ridibundus*.

Figure 4. Maximum likelihood consensus phylogenetic tree for 49 species used in the comparative analysis of the association between species biology and eggshell pigment concentration. The coloured branches depict the concentration (log10) of the two pigments protoporphyrin IX and biliverdin. Species names with maculated (patterned) shells are labelled in **bold**. The phylogenetic correlation between the two pigments is positive and highly significant (see Results).

Family	Genus_species	NHM Accession numbers	Biliverdin (nmol.g-1)	Protoporphyrin (nmol.g-1)	Maculation (0,1,2)	Eggshell_thickness (mm)	Incubation_length (days)	Fledging_period (days)	Clutch_size (eggs.brood -1)	Cavity_type	Nest_type	Parental_provisioning	Development	High_Calcium_Diet (0, 1)
Phasianidae	Alectoris_rufa	2008/27/2; 2008/68/3; 2008/72/2	0.00	11.56	2	0.28	24.0	10.0	12.0	none	ground	uniparental	not-altricial	0
Phasianidae	Perdix_perdix	2001/102/1; 2007/31/21; 2008/98/10	3.31	16.22	0	0.24	24.0	15.0	16.0	none	ground	uniparental	not-altricial	0
Phasianidae	Coturnix_coturnix	2007/109/3A; 2006/45/26A; 2008/199/28A	12.82	135.46	1	0.15	18.5	19.0	7.0	none	ground	uniparental	not-altricial	0
Phasianidae	Lagopus_lagopus	2008/122/106; 2008/32/73; 2008/140/19	0.00	108.38	2	0.21	24.0	12.5	12.0	none	ground	uniparental	not-altricial	0
Anatidae	Oxyura_jamaicensis	2006/45/3; 2008/72/344; 2008/60/1	0.13	2.50	0	0.44	24.0	52.5	7.0	none	ground	uniparental	not-altricial	1
Anatidae	Cygnus_olor	2008/221/25; 2008/138/100; 2008/72/339	0.04	2.15	0	0.78	36.0	135.0	6.0	none	ground	biparental	not-altricial	0
Anatidae	Anser_anser	2008/72/338; 2008/50/129; 2007/109/38	0.47	3.44	0	0.67	27.5	55.0	5.0	none	ground	biparental	not-altricial	0
Anatidae	Anas_platyrhynchos	2008/13/6; 2008/50/129; 2008/30/3	0.14	3.98	0	0.31	27.5	55.0	11.0	none	ground	uniparental	not-altricial	0
Anatidae	Aythya_fuligula	2008/35/6; 2008/50/120; 2008/13/21	0.42	4.03	0	0.32	35.0	47.5	9.5	none	ground	uniparental	not-altricial	0
Anatidae	Somateria_mollissima	2008/122/105; 2008/50/128; 2006/45/4	0.26	8.86	0	0.37	26.5	70.0	4.0	none	ground	uniparental	not-altricial	1
Anatidae	Bucephala_clangula	2008/72/263; 2007/109/184; 2008/37/3	0.06	3.79	0	0.39	33.0	61.5	10.0	tree_hole	tree_cliff	uniparental	not-altricial	1
Picidae	Picus_viridis	2008/72/74; 2008/13/20; 2008/50/9	0.00	6.33	0	0.14	16.0	25.0	6.0	tree_hole	tree_cliff	biparental	altricial	0
Upupidae	Upupa_epops	2008/85/1; 2004/91/2a; 2008/95/11	1.69	45.80	0	0.11	18.0	27.5	6.5	tree_hole	tree_cliff	biparental	altricial	1
Alcedinidae	Alcedo_atthis	2008/142/2; 2008/122/81; 2008/119/11	8.62	34.69	0	0.09	20.0	20.0	6.5	burrow_cavity	tree_cliff	biparental	altricial	1
Meropidae	Merops_apiaster	2008/138/40B; 2008/122/25; 2008/111/36	18.97	70.94	0	0.11	21.0	22.5	5.5	burrow_cavity	tree_cliff	biparental	altricial	1
Apodidae	Apus_apus	2008/36/4; 2008/122/71; 2008/142/1	3.77	21.28	0	0.10	19.5	23.0	2.5	burrow_cavity	tree_cliff	biparental	altricial	1
Strigidae	Strix_aluco	2008/15/2; 2003/11/19; 2005/61/40	0.00	1.10	0	0.27	29.0	34.5	4.0	tree_hole	tree_cliff	biparental	altricial	1
Caprimulgidae	Caprimulgus_europaeus	2003/11/14; 2008/72/51; 2005/35/6	11.09	104.10	1	0.13	17.0	16.5	2.0	none	ground	biparental	altricial	1
Columbidae	Columba_oenas	2007/109/101; 2008/221/16; 2008/72/164	0.54	4.87	0	0.19	16.5	25.0	2.0	tree_hole	tree_cliff	biparental	altricial	0
Otididae	Otis_tarda	2008/50/131; 2008/139/1; 2008/105/1	4.27	20.42	1	0.56	26.5	32.5	2.0	none	ground	uniparental	not-altricial	0
Rallidae	Gallinula_chloropus	2008/74/4; 2008/30/4; 2007/113/3	2.36	17.02	1	0.25	20.5	45.0	7.0	none	ground	biparental	not-altricial	0
Scolopacidae	Numenius_arquata	2008/169/17; 2008/42/6; 2008/134/19	17.87	85.54	1	0.28	27.5	35.0	4.0	none	ground	biparental	not-altricial	1
Scolopacidae	Tringa_totanus	2007/109/93; 2008/119/4A; 2008/98/26	2.33	329.90	1	0.15	23.0	30.0	4.0	none	ground	biparental	not-altricial	1
Burhinidae	Burhinus_oedicnemus	2008/169/39; 2008/169/30; 2008/55/6	20.45	143.23	1	0.28	26.0	39.0	2.0	none	ground	biparental	not-altricial	1
Charadriidae	Haematopus_ostralegus	2008/32/69; 2008/72/294; 2005/61/41	32.08	274.29	2	0.27	27.0	30.0	3.0	none	ground	biparental	not-altricial	1
Charadriidae	Vanellus_vanellus	2008/32/90; 2008/98/43; 2008/30/5	69.28	478.06	1	0.19	26.0	37.5	4.0	none	ground	biparental	not-altricial	1
Laridae	Catharacta_skua	2008/55/60; 2008/15/7; 2008/17/6	19.21	107.81	1	0.33	29.0	45.5	2.0	none	ground	biparental	altricial	0
Laridae	Larus_ridibundus	2009/3/182; 2008/72/348; 2008/50/104	44.75	195.94	1	0.21	22.0	35.0	3.0	none	ground	biparental	not-altricial	0
Laridae	Rissa_tridactyla	2008/50/102; 2008/111/25; 2008/106/1	31.02	175.56	1	0.24	22.5	43.5	2.0	none	tree_cliff	biparental	not-altricial	1
Laridae	Sterna_sandvicensis	2008/15/4; 2008/45/2; 2008/32/71	23.48	213.77	1	0.23	22.5	29.0	2.0	none	ground	biparental	not-altricial	1
Laridae	Uria_aalge	2008/199/100A; 2008/209/4A; 2008/98/29	4.86	62.88	2	0.56	33.0	22.5	1.0	none	tree_cliff	biparental	altricial	1
Laridae	Alca_torda	2007/109/90; 2008/101/2; 2008/98/30	0.71	119.04	2	0.46	34.0	19.0	1.0	burrow_cavity	tree_cliff	biparental	altricial	1
Laridae	Cepphus_grylle	2008/32/84; 2008/25/6; 2008/98/15	1.32	85.30	1	0.32	28.0	41.0	1.0	burrow_cavity	tree_cliff	biparental	altricial	1
Laridae	Fratercula_arctica	2008/111/24; 2008/35/1; 2003/25/1	1.47	18.19	0	0.31	41.0	47.0	1.0	burrow_cavity	tree_cliff	biparental	altricial	1
Accipitridae	Pandion_haliaetus	2008/122/8; 2008/32/94; 2008/50/17	0.10	12.04	1	0.44	35.5	53.0	3.0	none	tree_cliff	biparental	altricial	1
Accipitridae	Milvus_milvus	2008/72/243; 2008/111/39; 2007/109/249	0.55	6.77	1	0.36	29.0	49.0	3.0	none	tree_cliff	biparental	altricial	1
Accipitridae	Haliaeetus_albicilla	2008/97/2; 2007/109/241; 2007/109/10	1.91	0.66	0	0.57	40.0	72.5	2.5	none	tree_cliff	biparental	altricial	1
Accipitridae	Circus_aeruginosus	2008/122/37; 2007/109/11a; 2008/95/42	6.76	2.27	0	0.32	32.0	37.5	3.5	none	ground	biparental	altricial	1
Accipitridae	Accipiter_nisus	2008/72/22; 2008/47/31; 2008/169/11	1.45	15.46	1	0.25	33.0	27.0	5.0	none	tree_cliff	biparental	altricial	1
Accipitridae	Buteo_buteo	2008/47/11; 2008/139/3a; 2008/169/22a	2.59	7.81	1	0.35	39.0	52.5	3.0	none	tree_cliff	biparental	altricial	1
Falconidae	Falco_peregrinus	2008/165/4; 2008/72/275; 2008/97/5	0.00	81.84	2	0.32	29.0	38.5	3.5	none	tree_cliff	biparental	altricial	1
Podicipedidae	Podiceps_cristatus	2008/169/26; 2008/13/53; 2008/98/8	0.74	1.18	0	0.30	27.0	75.0	4.0	none	ground	biparental	not-altricial	1
Phalacrocoracidae	Phalacrocorax_carbo	2008/105/4; 2003/11/3; 2008/72/241	2.56	1.96	0	0.43	29.0	50.0	3.0	none	tree_cliff	biparental	altricial	1
Ardeidae	Ardea_cinerea	2003/25/25; 2008/13/56; 2008/72/260	9.41	5.84	0	0.30	26.5	48.5	4.0	none	tree_cliff	biparental	altricial	0
Ardeidae	Botaurus_stellaris	2008/122/89; 2007/109/180; 2008/139/12	0.85	28.59	0	0.22	26.0	52.5	5.0	none	ground	uniparental	altricial	1
Threskiornithidae	Platalea_leucorodia	2008/50/115; 2008/140/31; 2008/111/17	0.22	1.93	1	0.41	24.5	47.5	4.0	none	tree_cliff	biparental	altricial	1
Ciconiidae	Ciconia_ciconia	2008/111/32; 2008/32/59; 2007/109/50	0.10	0.97	0	0.53	32.0	61.0	4.5	none	tree_cliff	biparental	altricial	0
Gaviidae	Gavia_arctica	2007/109/273; 2008/97/7; 2008/72/342	0.26	78.87	1	0.42	30.0	62.5	2.0	none	ground	biparental	not-altricial	1
Procellariidae	Fulmarus_glacialis	2008/50/132; 2008/98/20; 2008/72/336	0.04	0.36	0	0.39	50.0	48.5	1.0	none	tree_cliff	biparental	altricial	1