Supplementary data for Nokelainen et al. 2020 Journal of Animal Ecology

Title: Camouflage accuracy in Sahara-Sahel desert rodents

Authors: Ossi Nokelainen[1*], José Carlos Brito[2], Nicholas E. Scott-Samuel[3], Janne K. Valkonen[1] & Zbyszek Boratyński[2]

[1]Department of Biological and Environmental Science, University of Jyväskylä, P.O. Box 35, 40014 University of Jyväskylä, Finland

[2]CIBIO-InBIO Associate Laboratory, Research Center in Biodiversity and Genetic Resources, University of Porto, Vairão, 4485-661, Portugal

[3]School of Psychological Science, University of Bristol, Bristol, UK

[*] Authors for correspondence (ossi.nokelainen@jyu.fi, boratyns@gmail.com)

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Table S1: Background match estimation using Euclidian distances

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To illustrate the spread of the colour values in animals and backgrounds, using another way than nonparametric colour map approach reported in the main text, we converted normalised camera responses (i.e. raw RGB-values) to two-dimensional XY-colour space. The conversion was done following Kelber et al. 2003. After conversion of RGB values to XY-space distance determination was calculated using $D = \sqrt{((x_{animal} - x_{background})^2 + (y_{animal} - y_{background})^2)}$; as in Nokelainen et al. 2018).

To compare background matching at different scales using XY-coordinates, animal-to-background distances were tested against different spatial scales. (McLachlan and Ladle 2011, Todd et al. 2012, Nokelainen et al. 2017). Average distances were plotted in relation to the original habitat from where the animal was found (i.e. focal), appearance of predominant background types (i.e. the predominant habitat types where animals were found were subjectively classified as: clay (n = 44), sand (n = 78), gravel (n = 18) or rocks (n = 8)), and to an average of colour variation across all background types (i.e. global).

Animal-to-background distances using Euclidian distances were generally very low (range = 0.01 – 0.19, mean = 0.03, s.d. = 0.03) indicating very accurate background match (ESM Figure 1). Overall, match to predominant background types and global average were better than match to focal habitats. This was especially so in *Gerbillus gerbillus* (but also in *Meriones libycus*). Interestingly, there were species-background interaction ($F_{2,30} = 4.23$, $P < 0.001$, see further details from ESM Table S3). The results are in line with the 'similarity-to-background analysis', an extension of the multispectral imaging tool box in image J (Troscianko and Stevens 2015): Quantitative Colour and Pattern Analysis framework (Van Den Berg et al. 2019).

Table S2: Overall correlation analysis of animal colour and pattern compared to background habitat. Subscript refers to region of interest: FUR = dorsal fur coloration, BG = background against which animal was found from. Sample size in each comparison is 163 including all individuals from all species sampled.

Colour	$Lightness_{FUR}$	LW_{FUR}	MW_{FUR}	SW_{FUR}
$Lightness_{BG}$	0.256**	.	.	.
LW_{BG}	0.299**	0.333**	.	.
MW_{BG}	0.250**	0.257**	0.244**	.
SW_{BG}	0.131	0.114	0.133	0.136

Pattern	$MarkingSize_{FUR}$	$Dominance_{FUR}$	$Diversity_{FUR}$	$Contrast_{FUR}$
$MarkingSize_{BG}$	0.090	.	.	.
$Dominance_{BG}$	0.143	0.344**	.	.
$Diversity_{BG}$	0.068	0.066	-0.026	.
$Contrast_{BG}$	0.091	0.205**	0.089	0.255**

Pearson correlation is significance levels are flagged at the 0.05 (*) and at the 0.01 (**).

Table S3: Linear mixed effects analyses (LMER) testing whether desert rodents are found from predominant subjective background types where they minimise the animal-to-background distance in XY colour space (i.e. maximise the match). Specifically, LMER tests animal-to-background colour distances in relation to rodent microhabitat from it was found from (focal), mesohabitat matching to average habitat appearance of different backgrounds (local), macrohabitat matching to overall background appearance (global) as well as matching of different species and the respective interactions. Intercept includes individual ID as random variable.

Subject	Estimate	s.e.	DF	t-value	P
(Intercept)	2.518e-02	4.179e-03	3.270e+02	6.025	<0.001***
Gravel	3.595e-03	3.172e-03	7.781e+02	1.133	0.257
Rocks	4.120e-03	3.194e-03	7.772e+02	1.290	0.197
Sand	3.905e-03	3.172e-03	7.781e+02	1.231	0.218
Global	1.513e-03	3.194e-03	7.772e+02	0.474	0.635
Focal	4.004e-03	3.172e-03	7.781e+02	1.262	0.207
Gerbillus gerbillus	-1.635e-04	6.053e-03	2.834e+02	-0.027	0.978
Gerbillus tarabuli	-4.960e-03	5.858e-03	2.859e+02	-0.847	0.397
Jaculus hirtipes	3.271e-02	5.058e-03	3.914e+02	6.468	<0.001***
Meriones libycus	1.216e-02	1.424e-02	2.556e+02	0.854	0.393
Pachyuromys duprasi	8.562e-03	9.326e-03	2.634e+02	0.918	0.359
Psammomys obesus	-5.987e-03	9.326e-03	2.634e+02	-0.642	0.521
G. gerbillus * Gravel	-3.347e-03	4.501e-03	7.777e+02	-0.744	0.457
G. gerbillus * Rocks	-5.087e-03	4.516e-03	7.772e+02	-1.126	0.260
G. gerbillus * Sand	-7.284e-03	4.501e-03	7.777e+02	-1.618	0.106
G. gerbillus * Global	-2.892e-03	4.516e-03	7.772e+02	-0.640	0.522
G. gerbillus * Focal	1.790e-02	4.501e-03	7.777e+02	3.977	<0.001***

G. tarabuli * Gravel	-2.259e-03	4.362e-03	7.777e+02	-0.518	0.604
G. tarabuli * Rocks	-2.644e-03	4.378e-03	7.772e+02	-0.604	0.546
G. tarabuli * Sand	-4.537e-03	4.362e-03	7.777e+02	-1.040	0.298
G. tarabuli * Global	-1.606e-03	4.378e-03	7.772e+02	-0.367	0.713
G. tarabuli * Focal	-6.723e-04	4.362e-03	7.777e+02	-0.154	0.877
J. hirtipes * Gravel	1.377e-03	3.966e-03	7.777e+02	0.347	0.728
J. hirtipes * Rocks	4.839e-03	3.972e-03	7.772e+02	1.218	0.223
J. hirtipes * Sand	6.495e-03	3.966e-03	7.777e+02	1.638	0.101
J. hirtipes * Global	3.782e-03	3.972e-03	7.772e+02	0.952	0.341
J. hirtipes * Focal	-5.171e-03	3.966e-03	7.777e+02	-1.304	0.192
M. libycus * Gravel	1.618e-03	1.042e-02	7.773e+02	0.155	0.876
M. libycus * Rocks	5.293e-03	1.043e-02	7.772e+02	0.507	0.612
M. libycus * Sand	6.543e-03	1.042e-02	7.773e+02	0.628	0.530
M. libycus * Global	4.055e-03	1.043e-02	7.772e+02	0.389	0.697
M. libycus * Focal	2.743e-02	1.042e-02	7.773e+02	2.631	0.008**
P. duprasi * Gravel	2.593e-03	6.858e-03	7.774e+02	0.378	0.705
P. duprasi * Rocks	6.127e-03	6.868e-03	7.772e+02	0.892	0.372
P. duprasi * Sand	6.806e-03	6.858e-03	7.774e+02	0.992	0.321
P. duprasi * Global	4.602e-03	6.868e-03	7.772e+02	0.670	0.503
P. duprasi * Focal	-7.082e-04	6.858e-03	7.774e+02	-0.103	0.917
P. obesus * Gravel	3.562e-03	6.858e-03	7.774e+02	0.519	0.603
P. obesus * Rocks	6.853e-03	6.868e-03	7.772e+02	0.998	0.318
P. obesus * Sand	6.961e-03	6.858e-03	7.774e+02	1.015	0.310
P. obesus * Global	5.032e-03	6.868e-03	7.772e+02	0.733	0.464
P. obesus * Focal	9.506e-04	6.858e-03	7.774e+02	1.386	0.166

°Intercept includes factor level: background [clay] & species [Gerbillus amoneus].

Figure S1: Animal-to-background colour distances. First panel (A) shows the colour variation between animal (red circles) and background (grey circles) plotted in XY-colour space. In second panel (B) average distances are plotted in relation to the original habitat from where the animal was found (i.e. focal), appearance of predominant types of backgrounds (i.e. clay, gravel, rocks, sand) and general background appearance (i.e. global).

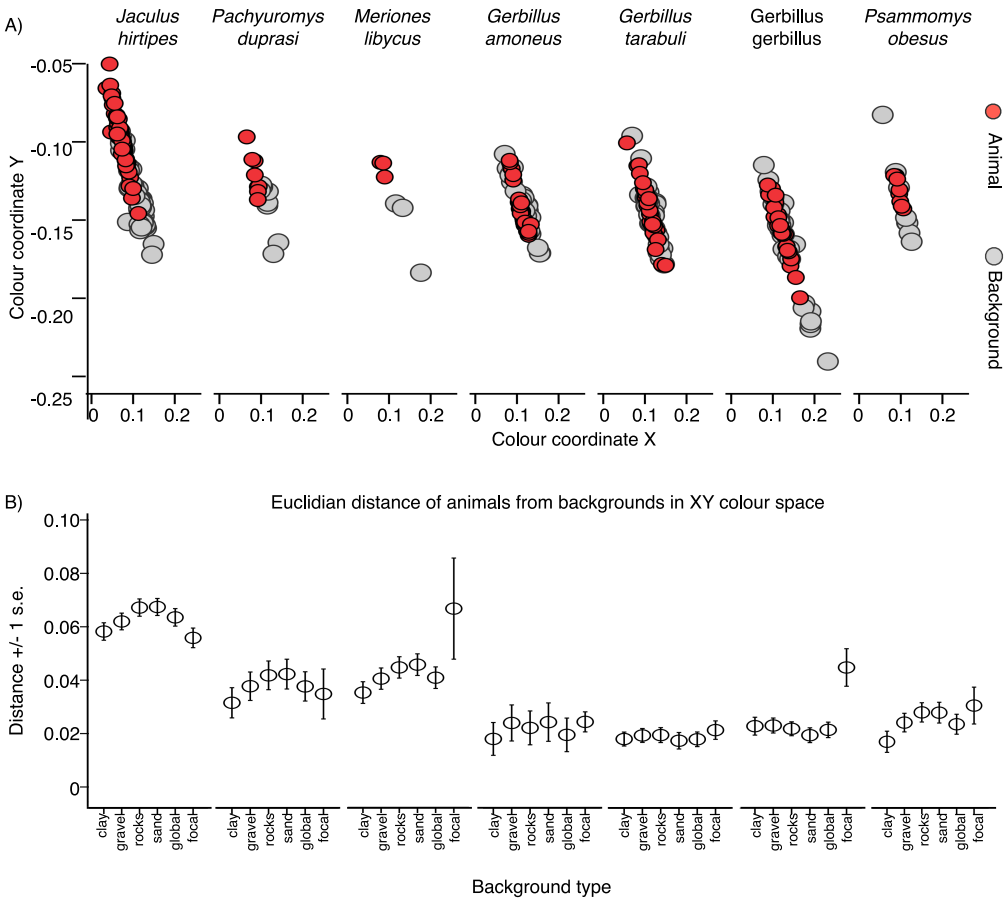
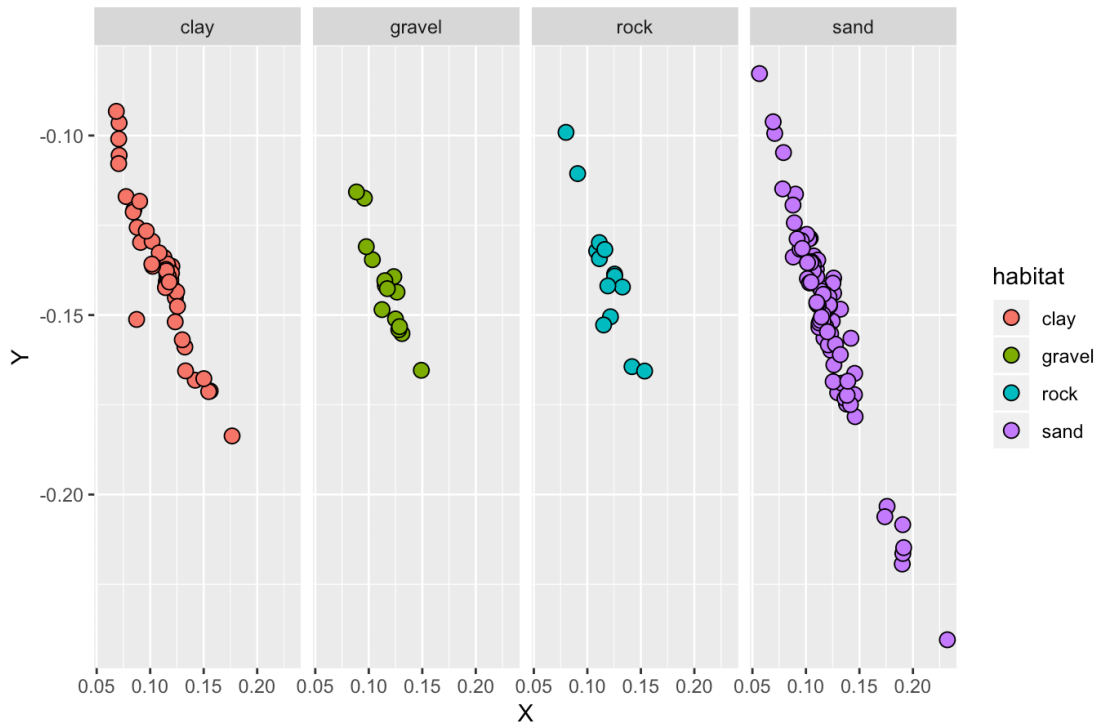


Figure S2: Predominant habitat classes plotted in plotted in XY-colour space. On x-axis the X colour coordinates, on Y-axis the Y colour coordinates. In panels, predominant types of backgrounds (i.e. clay, gravel, rocks, sand).



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