

Appendix from S. R. Kuchta and E. I. Svensson, “Predator-Mediated Natural Selection on the Wings of the Damselfly *Calopteryx splendens*: Differences in Selection among Trait Types”

(Am. Nat., vol. 184, no. 1, p. 91)

Supplementary Materials

Description of Landmarks

Type I landmarks (Zelditch et al. 2012) were placed at the nodus, and at the junction of the R4+5, MA, and acrolus veins (hereafter, the "RMA junction"; Askew 2004). A type II landmark was placed at the apex of the wing. Accuracy in locating the landmark at the apex was improved by placing a line along the anterior edge of the wing such that it was tangent to the wing at points proximal and distal to the nodus, and then extending a line perpendicular to that line such that it was tangent to the apex of the wing (fig. A1).

Semilandmarks were placed with reference to two standardized grids superimposed over the wing. To place the grids, a line was extended along the main axis of the wing from the landmark at the apex of the wing to the RMA junction. The main axes of the grids were placed over this line (hence, in fig. A1 this line is only visible as a white segment between the proximal and distal grids). The proximal grid extended from the RMA junction to the nodus and directed the placement of five semilandmarks. The distal grid extended from the junction of the costal and R1 wing veins (anterior-proximal to the apex of the wing; Askew 2004) to the point identifying the posterior-most extension of the wing. Accuracy in locating the posterior edge of the wing was increased by inserting a line that ran parallel to the main axis line and moving that line posteriorly until it was tangent to the posterior edge of the wing (in fig. A1, this is the short white line along the posterior edge of the wing). The second grid facilitated the placement of eight semilandmarks.

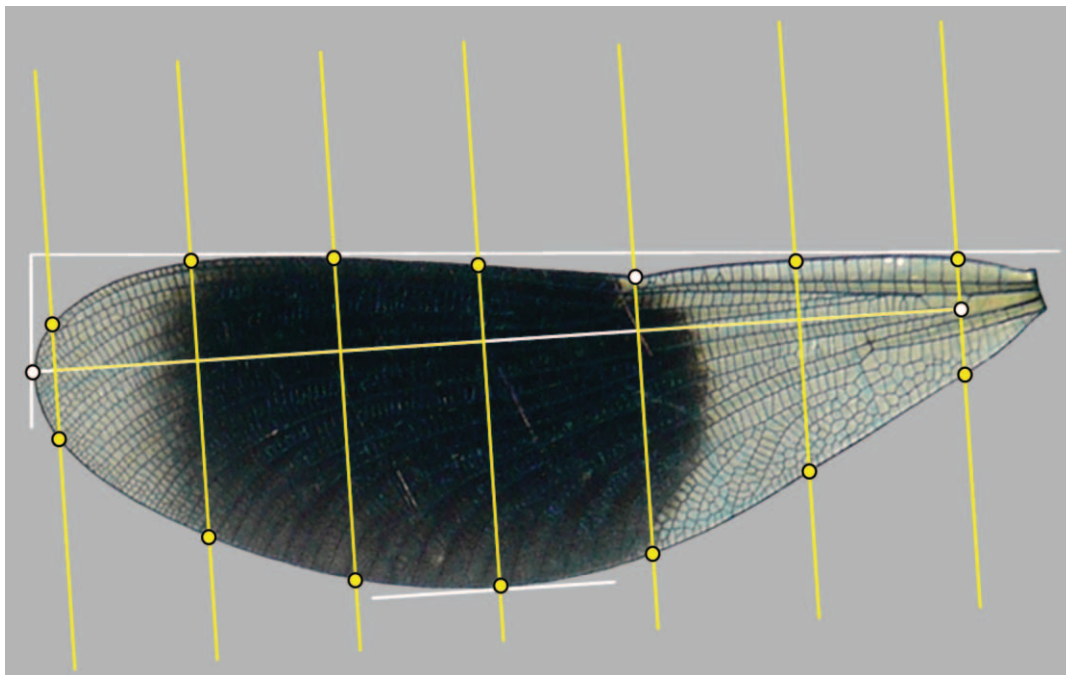


Figure A1: See text for description. White circles designate landmarks, and yellow circles designate semilandmarks.

Scale for Measuring Patch Opacity

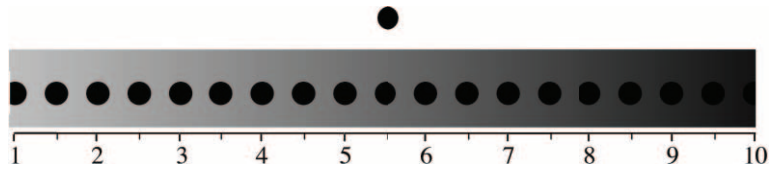


Figure A2: Scale bar used to give opacity scores to wings. To use, hold the wing 1 cm above the dot on the top of the figure under consistent lighting conditions and look down through the wing patch onto the dot. Find the spot on the scale that matches what is seen in terms of contrast.

Discriminant Function Analysis Separating Forewings and Hindwings

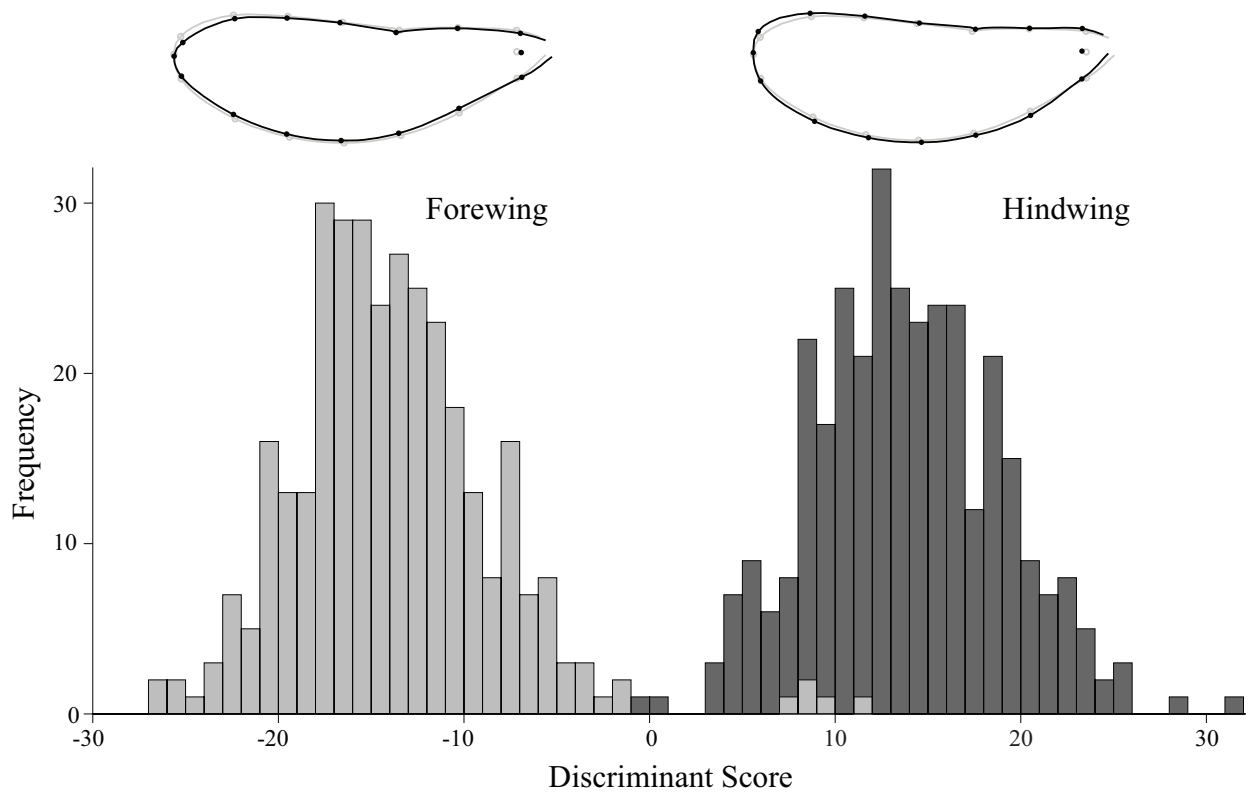


Figure A3: Results of a discriminant function analysis separating forewings and hindwings. The histogram illustrates the results of a leave-one-out cross-validation analysis. One hindwing was misclassified as a forewing, and five forewings were misclassified as hindwings. The other 659 wings were correctly classified (99.1% success). Statistical analyses were conducted in R (R Development Core Team 2013). Warped outline drawings were produced in MorphoJ (Klingenberg 2010), following a generalized Procrustes analysis in tpsRelw (Rohlf 2007). In the warped outline drawing, light colors illustrate the average shape; dark colors illustrate population mean shapes magnified by a factor of three.

Scree Plot

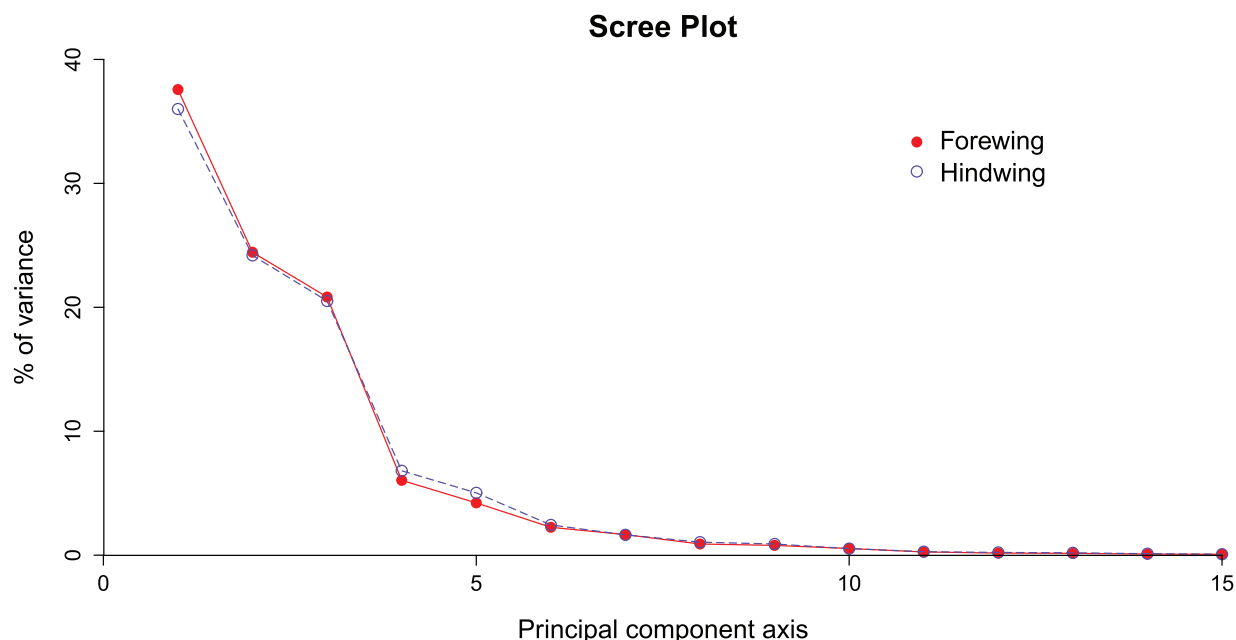


Figure A4: Scree plot showing the percentage of variance explained by each principal components axis. Front wings and hind wings were analyzed separately. Only the first three axes were used in the selection analyses. All axes were used in the two-block partial least-squares (PLS) analysis.

Table A1. Descriptive statistics for forewings and hindwings, including the phenotypic variance-covariance and correlation matrices, the trait means, and trait standard errors

	PC1	PC2	PC3	Wing size	Patch size	Patch opacity	Mean	Standard error
Forewings:								
PC1	<i>.0001</i>	.0062	.0041	.1966	.0333	-.0259	-.0003	.0005
PC2	.0000	<i>.0001</i>	-.0213	-.0260	.0585	-.0536	-.0003	.0004
PC3	.0000	.0000	<i>.0001</i>	.0958	.0608	.0203	-.0001	.0004
Wing size	.0027	-.0003	.0010	<i>1.5828</i>	.4644	.1174	40.8212	.0584
Patch size	.0005	.0008	.0007	.8670	<i>2.2020</i>	.2414	20.5048	.0689
Patch opacity	-.0005	-.0008	.0003	.2541	.6165	<i>2.9609</i>	7.0787	.0799
Hindwings:								
PC1	<i>.0001</i>	-.0146	.0070	-.3416	.0489	-.1131	-.0002	.0005
PC2	.0000	<i>.0001</i>	.0059	-.0475	.0186	-.0024	-.0001	.0004
PC3	.0000	.0000	<i>.0001</i>	-.1006	-.0481	.0123	.0003	.0004
Wing size	-.0046	-.0005	-.0010	<i>1.4624</i>	.4202	.1507	38.9400	.0565
Patch size	.0008	.0003	-.0006	.7572	<i>2.2200</i>	.2034	19.2343	.0696
Patch opacity	-.0021	.0000	.0002	.3137	.5216	<i>2.9611</i>	7.0993	.0804

Note: Diagonal = variances (italicized); below diagonal = covariances; above diagonal = correlations.