Oikos

OIK-04126

Jacobson, B., Dubois, F. and Peres-Neto, P. R. 2017. Phenotype-dependent selection underlies patterns of sorting across habitats: the case of stream-fishes. – Oikos doi: 10.1111/oik.04126.

Appendix 1

As with other species, the original habitat type for *S. atromaculatus*, pool, remained the species' preferred habitat (Table A1), however contrary to other findings, neither the number of individuals utilizing alternative sections nor the number of sections utilized increased as density increased (Pearson product-moment correlations: individuals: $r = 0.548$, $p = 0.160$, sections: $r = 0.718$, $p = 0.045$), as per linear regression, the number of sections actually decreasing with increased density (slope = –0.1). Also as per other species, habitat use was not related to size, ANOVAs of the relationship between habitat use and fork length, body and caudal widths non-significant with the exception of trial D2 where individuals in the preferred pool were larger for each measurement. Habitat use across all trials was conferred through morphology with the degree of morphological differentiation between habitats decreasing, although remaining significant, as density increased (Table A1). Here, given habitat use findings, our interpretation of this pattern of sorting differs from that which we proposed for the three species presented in our manuscript. There, since the number of individuals found in alternative habitats, and the number of alternative habitat sections utilized, both increased within increasing density, in combination with the finding that those individuals within alternative habitats housed morphology more similar to that of individuals in preferred habitats at higher than lower densities, the decreasing differentiation was interpreted to be due to the competitive exclusion *via* scramble competition of individuals from preferred to alternative habitats. In other words, alternative sections contained individuals at higher densities that would have otherwise utilized preferred sections. With respect to *S. atromaculatus*, since neither the number of individuals in alternative sections nor the number of those sections utilized increased at increased densities, we propose the decreased differentiation is due to a greater amount of variation present within the shoal of individuals within preferred habitat at increased densities. In other words, at higher densities individuals that would have been present in alternative habitats, had they made their habitat use decisions based on environmental properties rather than shoal size, were instead

present within preferred habitats. Note that this behaviour may account for the more mixed pattern of functional relationships between the morphology of individuals and the environmental requirements of the habitats that they were found within, as visualized in deformation grids (Fig. A1).

Table A1. Habitat selection and morphological discrimination outcomes of the density trials of *S. atromaculatus*. Original habitat is pool and morphology is the degree of discrimination (1-Wilks' lambda) based on DFAs. All morphology is significant at $p \leq 0.05$.

Density	Replicate	Habitat Use				Morphology
		Original	Run	Runc	Riffle	
.5D	1	12	0	1	1	----
	2	12	0	1	1	----
D	1	27	0	0	0	----
	2	18	0	0	12	0.929
2D	1	59	0	0	1	----
	2	57	0	0	2	0.711
3D	1	84	0	1	3	0.439
	2	79	0	0	3	0.435

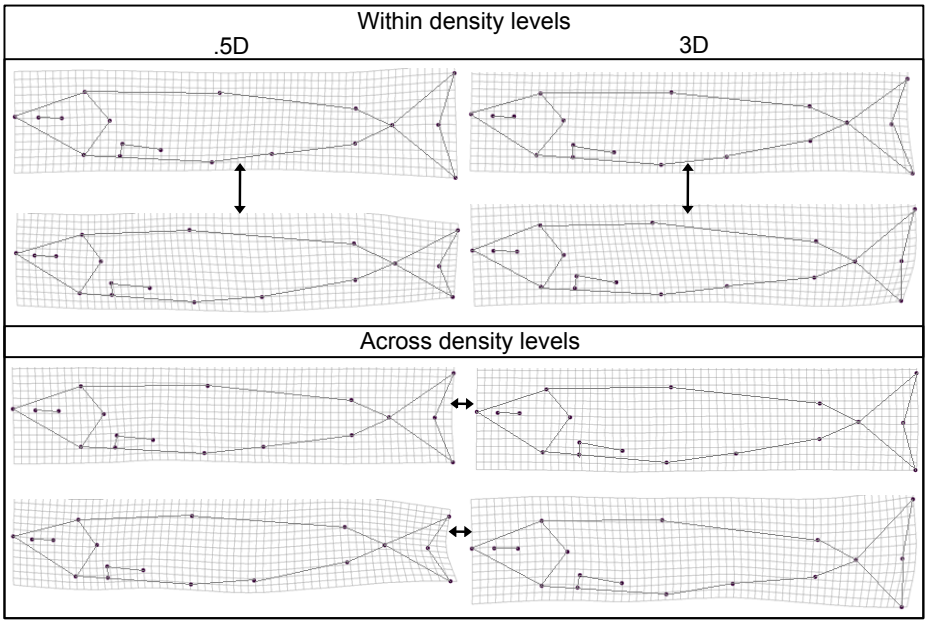

Figure A1. Deformation grids showing relative morphological variation within and across density levels between individuals selecting original versus combined

alternative habitat sections. For each section, top grid is original and bottom alternative habitat, visualization is 3× relative differences.