

ELECTRONIC APPENDIX

This is the Electronic Appendix to the article

Androgens, interspecific competition and species replacement in hybridizing warblers

by

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Proc. R. Soc. B **271** (Supp. 6), 498–500 (doi:10.1098/ rsbl.2004.0230)

Electronic appendices are refereed with the text; however, no attempt is made to impose a uniform editorial style on the electronic appendices.

Electronic Appendix A

Male warblers were captured at the following localities in Washington state: (1) hermits near Pe Ell, 46°33' N 123°24' W (6 to 15 May), (2) hybrids near Trout Lake, 46°03' N 121°30' W (9 to 23 May), and (3) Townsend's near Republic, 48°38' N 118°52' W (18 May to 4 June). See the Supplementary Figure below for map of localities. Songs for playback were recorded locally. Male warblers used for mounts were collected at the same study site, and presented 2-3 m above the ground near the center of the territory. Fieldwork was not conducted under weather conditions more severe than light rain.

Male warblers of each phenotype arrive on the breeding grounds about two weeks before females (Pearson & Rohwer 1998). As the presence of a sexually-receptive female on a territory can alter androgen levels (Moore 1982), we captured males only before they were socially-mated or before females arrived. Males predictably switch song types when they have paired with a female, like many other Parulid warblers (Pearson & Rohwer 1998). Thus, we used both song type and absence/presence of a female on a territory as indicators of the breeding stage of the male.

Within each population, the birds that were successfully netted responded more aggressively toward the mount than the birds that were not netted (unpublished data). Furthermore, in 2002, we captured just 9.1% of the 66 hermit warblers we located on territories, and in 2001-2002, we captured approximately 25% of the 97 hybrid and 68 Townsend's warblers we located on territories. Because of our bias toward sampling the most aggressive birds, mean population androgen levels for hermits and Townsend's may be lower than those found in this study. Our bias towards the most aggressive males was stronger in hermits than Townsend's, which should decrease the likelihood of erroneously concluding that Townsend's have higher

androgen levels than hermits, unless 1) the most aggressive 10% of hermit warblers had lower androgen levels than the rest of the hermits in our population, and 2) if the most aggressive 25% of Townsend's had higher androgen levels than the most aggressive 10% of Townsend's in our population. Both of these explanations seem improbable.

Figure 3. Townsend's warblers have replaced hermit warblers over much of their former range. (a) Current breeding ranges of Townsend's (blue shading) and hermit (gray shading) warblers adapted from Rohwer et al. (2001). Pie charts illustrate the proportion of Townsend's (black) and hermit (white) mtDNA haplotypes found in samples of males at localities in the current breeding ranges of both species. Townsend's (b) and hermit (c) were sampled in separate, phenotypically pure populations in Washington state (figure inset of a). Hybrid warblers (d) were sampled at the mid-point of the Washington Cascades hybrid zone. We thank Tom Eckert for warbler photographs.