

Key Research in Understanding Western Warbler Hybridization

Hybridization between Townsend's Warbler and Hermit Warbler is the subject of many important scientific studies since the 1990s. The following is an annotated, chronological list of selected publications that explore the geography, biology, and ecology of these two warblers' hybrid zones.

1992. Eldredge Bermingham, Sievert Rohwer, Scott Freeman, and Chris Wood. Vicariance biogeography in the Pleistocene and speciation in North American wood warblers: A test of Mengel's model. *Proceedings of the National Academy of Sciences* 89:6624–6628.

- Mitochondrial DNA-based phylogeny places Townsend's Warbler and Hermit Warbler as sister species that diverged during the late Pleistocene.

1992. Wendy M. Jackson, Christopher S. Wood, and Sievert Rohwer. Age-specific plumage characters and annual molt schedules of Hermit Warblers and Townsend's Warblers. *Condor* 94:490–501.

- Establishing criteria for aging individuals of the two species is a necessary prerequisite to studying ages and plumages of their hybrids.

1998. Sievert Rohwer and Christopher Wood. Three hybrid zones between Hermit and Townsend's Warblers in Washington and Oregon. *Auk* 115:284–310.

- This seminal study maps the areas of contact, describes their ecological features, and analyzes morphological transitions from Townsend's through hybrids to Hermit across the contact zones.

1998. Scott F. Pearson and Sievert Rohwer. Influence of breeding phenology and clutch size on hybridization between Hermit and Townsend's Warblers. *Auk* 115:739–745.

- Townsend's clutches average larger than those of Hermit Warblers and hybrids, suggesting a selective advantage for Townsend's.

2000. Scott F. Pearson and David A. Manuwal. Influence of niche overlap and territoriality on hybridization between Hermit Warblers and Townsend's Warblers. *Auk* 117:175–183.

- The two species and their hybrids overlap in habitat characteristics, and all compete for territories.

2000. Catherine E. Smith and Sievert Rohwer. A phenotypic test of Haldane's Rule in an avian hybrid zone. *Auk* 117:578–585.

- Frequency distributions of hybrid males and females show no evidence of a shortage of female hybrids and, thus, no evidence of female hybrids' non-viability.

2000. Scott F. Pearson. Behavioral asymmetries in a moving hybrid zone. *Behavioral Ecology* 11:84–92.

- Townsend's males are more successful than Hermit males in maintaining territories and attracting mates.

2000. Scott F. Pearson and Sievert Rohwer. Asymmetries in male aggression across an avian hybrid zone. *Behavioral Ecology* 11:93–101.

- Male warblers in hybrid neighborhoods on the Townsend's side of the zone are more aggressive than males in hybrid neighborhoods on the Hermit side.

2001. Sievert Rohwer, Eldredge Bermingham, and Christopher Wood. Plumage and mitochondrial DNA haplotype variation across a moving hybrid zone. *Evolution* 55:405–422.

- Mitochondrial DNA variation suggests massive movement of the hybrid zone southward during the 5,000 years since their most recent interglacial contact.

2004. Sievert Rohwer. Using age ratios to infer survival and despotic breeding dispersal in hybridizing warblers. *Ecology* 85:423–431.

- Territorial behavior forces yearling males into high-elevation habitats for their first breeding season, making local-recapture methods unreliable as indicators of male survival rates.

2007. Sievert Rohwer and Paul R. Martin. Time since contact and gene flow may explain variation in hybrid frequencies among three *Dendroica townsendi* × *D. occidentalis* (Parulidae) hybrid zones. *Auk* 124:1347–1358.

- See News and Notes, p. 35, for a summary.

Hybrids display a surprising range of combinations in plumage features. Photographs of twelve such variations at a single locality, the Gifford Pinchot National Forest in Washington, are shown in Thomas Eckert's "HETO Warbler Showcase: Hermit/Townsend's Warbler Hybrids" (*Birding*, August 2001, pp. 342–350).