



Characterizing fall migration of boreal songbirds

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Introduction

In North America:

- Many western songbirds are genetically distinct from continental populations and follow different, historical migration routes (Clegg et al. 2003).
- Physiological or environmental conditions at either site, or enroute, can impact productivity or survival at the other, often in part, by influencing the timing of migration.
- Patterns of northern migration can reflect the strength of migratory connectivity and a species' potential resilience to rapidly changing breeding, stopover and wintering habitats.
- Is there consistency in patterns of migration in northwestern landscapes, where stopover habitat appears dispersed without large concentration points? Are they related to local conditions or large scale Pacific weather events like the Pacific Decadal Oscillation?

Challenges

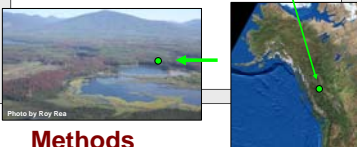
- In Canada, migration stations were established to assess populations trends of northern populations and species inadequately covered by the Breeding Bird Survey (most of Canada). Yet, how do we distinguish between 'migrant' and 'locally' breeding individuals surveyed at the banding stations?
- Stable hydrogen isotope ratios in growing season precipitation encompasses a broad geographic region in northwestern North America making it difficult to pinpoint migrant origins.
- If 'many' songbird migrant species moult their feathers at or near their breeding grounds, how close is near?

Study Site

- The Mugaha Marsh Migration Station (N55° 23', W123° 12') sits at the south end of the large Williston Reservoir in the Rocky Mountain Trench, British Columbia, Canada.



- At the southern edge of the Northwestern Interior Forest Bird Conservation Region (BCR 4), Mugaha Marsh is one of the last boreal forest 'stops' as birds funnel south through the managed, forested landscape.



Methods

- Daily standard fall banding, weather permitting, at 12 mist nets for 6 hr from sunrise to ~21 Jul to ~21 Sep 1997-2007 (26 Jul - 26 Sep in 1997) following the Mackenzie Nature Observatory's protocol for migration monitoring at Mugaha Marsh (2006, unpublished ms).
- Daily counts of birds were adjusted for daily survey (netting) effort and counts were transformed as outlined in Dunn and Hussell, version 4, unpublished ms).
- The mean monthly values of the Pacific Decadal Oscillation Index (PDO) were downloaded 16 Jan 2008 from <<http://jisao.washington.edu/pdo/>>.
- The reservoir water levels were downloaded 19 Nov 2007 for Lost Cabin from <<http://www.wsc.ed.gov.ca/hydat/>>.
- The bird maps were downloaded 9 Feb 2008 <<http://www.on.ec.gc.ca/wildlife/wildspace>>

Results

From 1997-2007, the Mackenzie Nature Observatory (denoted by ●) banded 31,714 individuals of 97 species in 46,715 net hours from the third week of July through the third week of September at Mugaha Marsh. A large component of these boreal birds are wood warblers (14,251 individuals of 16 species). These small Neotropical migrants are active insectivores feeding on many forest pest species synonymous with the boreal ecosystem. Here, we investigate migration patterns of 5 wood warblers with almost no between year recaptures (unpublished data) suggesting the newly banded birds are migrants rather than local breeders: Blackpoll (0 recaptures/333 banded), Tennessee (0/226), Magnolia (3/753), MacGillivray's (0/305), and Wilson's Warblers (0/1170).

Boreal forest birds

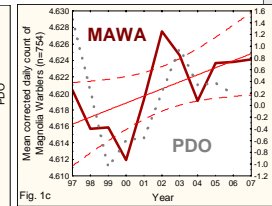
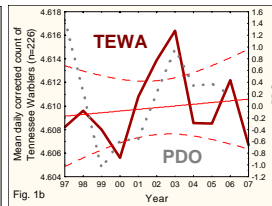
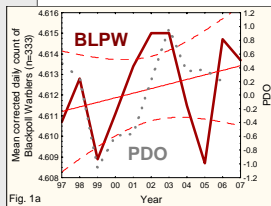
Blackpoll Warbler



Tennessee Warbler



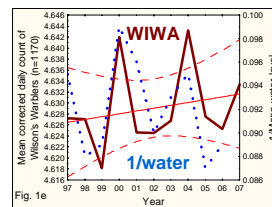
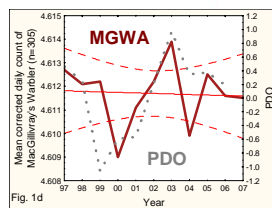
Magnolia Warbler



MacGillivray's Warbler



Wilson's Warbler



Figures 1a-e. Annual comparison of mean daily corrected counts (dark red) with corresponding trend and 95% confidence limits (light red) of fall migrating Blackpoll Warblers (BLPW), Tennessee Warblers (TEWA), Magnolia Warblers (MAWA), MacGillivray's Warblers (MGWA) and Wilson's Warblers (WIWA) at Mugaha Marsh (denoted by ●). British Columbia with mean monthly values of the Pacific Decadal Oscillation Index (PDO) for Fig. 1a-d, and the inverse reservoir water level (m) for Fig. 1e. High PDO is associated with warmer, earlier springs, wetter winters and lower snowpacks in the Pacific Northwest (Mantua et al. 1997).

Trends of four of five species are correlated with trends in the PDO (Mantua et al. 1987), and Wilson's Warblers negatively with water levels in the reservoir. Although the general trends amongst species are similar, there may be different operating as suggested by some consistent annual patterns of migration at Mugaha Marsh:

- Most birds are moulting when banded (95% of Blackpoll, 87% of Tennessee, 94% of Magnolia, 89% of MacGillivray's, but not all (only 48% of Wilson's Warblers);
- Most birds are young (76% of Blackpoll, 88% of Magnolia, 89% of MacGillivray's, and 81% of Wilson's Warblers), but only 58% of Tennessee Warblers;
- Some species have consistent young : adult ratios annually (81-92% for Magnolias, 93-100% for MacGillivray's, and 70-85% for Wilson's Warblers), but others never have (Blackpoll and Tennessee Warblers, 45-89% and 14-90% respectively);
- For some species we cannot detect age- or moult-related differences in median banding dates (Blackpoll, Magnolia and MacGillivray's Warblers), while others we can (adult Tennessee Warblers precede young by ~2 weeks with non-moulting adults first, then moulting adults, then all of the young; young Wilson's Warblers precede adults by ~10 days with moulting birds arriving first).

*Bird cartoons by Phyllis Clancy.

Conclusions

Migration is a product of current conditions and historical legacies. Despite the remarkable opportunity for variability, songbird migration, like other animal migrations, is demonstrating repeatable structure.

- Numbers of NW Blackpoll, Tennessee, Magnolia, and MacGillivray's Warblers correlated positively with the PDO during fall migration, similar to other studies linking large-scale Pacific climate with terrestrial productivity (Mantua et al. 1997, Nott et al. 2002).
- Blackpoll and Magnolia Warblers are increasing, probably linked to budworm and beetle outbreaks.
- Wilson Warbler's were negatively related to reservoir water levels. This relates to PDO, but suggests a different mechanism (related to willow? flooding?)
- Warblers are moulting during migration. But, how far are they from their breeding site? Fall Blackpoll and Wilson's warblers from Mugaha Marsh, BC have Yukon δD signatures and probably Alaska's, which cannot be distinguished from northern BC (Dunn et al. 2006). A Wilson's Warbler of Alaska's Aleutians was recaptured here.
- As forest pest specialists, Blackpoll and Tennessee Warblers are known for their disruptive population dynamics. The inconsistent HY:AHY reflects the same.
- Wilson's Warblers at Mugaha Marsh have the same timing as Alaska Aleutians (Benson et al., unpublished ms)- the young migrate 10 d earlier than adults. In BC, the non-moulting birds arrive later, the same time as the single Alaska recapture, in contrast to southern timing where northern birds arrive first (Kelly et al. 2002).

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For more information

Please contact Wendy, wendy.easton@ec.gc.ca, regarding the analysis, and Vi, vlambie@telus.net, regarding the Mackenzie Migration Station. The station is a member of the Canadian Migration Monitoring Network-Réseau canadien de surveillance des migrations (see www.bsc-ec.org).

