

Alaska Department of Fish and Game



Division of Wildlife Conservation

# INVESTIGATING MIGRATION PATTERNS OF THE RUSTY BLACKBIRD USING LIGHT-LEVEL GEOLOCATORS AND STABLE ISOTOPES

David F. Tessler, James A. Johnson, Steven M. Matsuoka, Russell Greenberg, Carol R. Foss, Keith A. Hobson, Patricia J. Wohner, Luke DiCicco.



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U.S. Fish and Wildlife Service

Audubon Society of New Hampshire

Smithsonian Institution: National Zoo

Environment Canada, Canadian Wildlife Service















#### Backround

Rusty Blackbird

Migratory Connectivity

2009-2010 Research – description and results

Current Research Efforts



#### Background: Rusty Blackbird

The Rusty Blackbird has suffered one of the steepest declines of any bird in North America...

90–98% global decline since 1966

5%-12% per year range-wide

Breed exclusively in Boreal Forest Wetlands

**IRBWG - 2005**: international team working to address hypotheses for the decline and identify and implement priority research and conservation needs throughout the range and lifecycle.



#### Background: conservation & migratory connectivity

Establishing population connectivity between breeding, stopover, and wintering sites of migratory birds is critically important for effective conservation:

- informs analyses of population demography and trends;
- the effects of seasonal interactions;
- the identification of threats or causes of loss tied to specific geographic locations and periods in the annual cycle

"While the concept of protecting populations throughout their annual cycle seems obvious, our ability to make connections among populations within a species has been restricted overwhelmingly to large [long-lived] species that are amenable to band recoveries and satellite [and radio] telemetry (Hobson 2003)."



#### Background Hobson et al. 2010

Isotopic analyses of RUBL feathers (grown on breeding grounds) collected on wintering grounds in M.A.V. and Carolinas, suggested a migratory divide and possibly discreet eastern and western populations



Rusty Blackbird sampling regions (Base map courtesy L. Powell)





Mk10B-S Light Level Geolocator, British Antarctic Survey

Attached via synscarum harness using teflon ribbon

The geolocator and the harness weighed 2.0 g, or 3.4% of a Rusty Blackbird's body mass (~57.8g)











Once fitted the ribbon had to be stitched in place with Kevlar thread...















#### 17 birds outfitted with Geolocators in Anchorage in 2009 (12 females and 5 males - from 13 pairs)



All behaved normally 6 weeks after deployment; 80% nest success compared to multi-year, multi-site Alaska average of 64%



#### 2009-2010 Results

ONLY 3 Geolocator birds were recovered in 2010 (2 females : 1 male): 18% Geo return rate vs. 35-60% return rate for banded birds 2008-2009.

None of the remaining 14 birds were observed again from 2010 – 2014.

At deployment, all birds were healthy; behaved normally, and most successfully fledged chicks.

Upon Capture: the harnesses were found to be loose fitting and had worn the surrounding feathers on the synsacrum and inner thighs of each of the three birds.



We analyzed ambient light level data to determine daily locations; using day length and timing of sunrise to estimate latitude and longitude

We used a low light transition threshold to account for lower ambient light levels in forested or wooded habitats

We only used data  $\pm 15$  days of the equinoxes because latitude estimates during equal day and night lengths are highly inaccurate

We estimated kernel probability densities of home ranges during autumn stopover and winter periods.

We conservatively defined each bird's core stopover and wintering areas using the 50% density contour



#### Average distance between filtered geolocator locations and known nest sites 145 km









Data SIO, NOAA, U.S. Navy, NGA, GEBCO © 2012 MapLink/Tele Atlas US Dept of State Geographer © 2012 Google

lat 45 916617° lon -97 447089- elev 1456 ft



0

#### 2009-2010 Results

All 3 birds wintered in very different locations

None wintered in the Mississippi Alluvial Valley (MAV) – the expected "hotspot"

All used "prairie potholes region" (Saskatchewan, Manitoba, the Dakotas) for extended stopovers (2-4 weeks) in fall and shorter periods in spring. 2 birds stopped in Northern Alberta in spring.

Despite these novel and unexpected results, and the continuing need to understand migratory connectivity in the context of this species' decline, the abrasion coupled with the low return rate for instrumented birds prompted us to curtail geolocator studies until a smaller device and better harness was developed.

Geos alone can't do "CONNECTIVITY"





# >> FAST FORWARD >>

#### To 2014 Research Effort....



#### 2014 Research Effort — Enabled by several new developments

New Geolocator from Migrate Technology: P65 ~ 0.75g + New thin, round elastic harness material reduce abrasion and weight

Subgram Geolocator that potentially addresses our previous concerns

Newly discovered PREALTERNATE MOLT for RUBL (Mettke-Hofmann et al. 2010)

Confirmed: Strong coupling of tissue  $\delta^2 H$  and global hydrologic  $\delta^2 H$  patterns can be used in conservation and research for the purpose of assigning birds to their origin (Hobson et al. 2012).

Advances in the spatial and temporal resolution of baseline isoscapes ( $\delta^{18}O$ ,  $\delta^{2}H$ , and *d*-excess) in N. Am. Due in part to the development of the U.S. Network for Isotopes in Precipitation - USNIP (Welker 2012)





#### Hobson et al. 2012

Figure 1. Location of feather sample collection sites and the underlying gradient in amountweighted average  $\delta 2H$ in precipitation. Shown are locations for 544 calibration samples collected for this study, and the location of 269 samples from previously published sources used as model validation samples. Underlying isoscape based on Bowen et al. 2005.



#### Welker 2012



Figure 1. Spatio-temporal characteristics of isotopic values of precipitation across continental USA. (a)Weighted annual average  $\delta^{18}$ O values of precipitation, (b) weighted annual average  $\delta^{18}$ O values during Neutral during El Niño Southern Oscillation (ENSO) phase, (c)  $\delta^{18}$ O values during El Niño ENSO climate phase, and (d) differences in the  $\delta^{18}$ O values of precipitation between El Niño and Neutral climate phases. Welker 2012.



#### Welker 2012



Figure 2. Spatio-temporal characteristics of isotopic values of precipitation across continental USA. (a)Weighted annual average  $\delta^2$ H values of precipitation, (b) weighted annual average  $\delta^2$ H values during Neutral during El Niño Southern Oscillation (ENSO) phase, (c)  $\delta^2$ H values during El Niño ENSO climate phase, and (d) differences in the  $\delta^2$ H values of precipitation between El Niño and Neutral climate phases.



#### Welker 2012



Figure 3. Spatio-temporal characteristics of isotopic values of precipitation across continental USA. (a)Weighted annual average *d*-excess values of precipitation, (b) weighted annual average *d*-excess values during Neutral during El Niño Southern Oscillation (ENSO) phase, (c) *d*-excess values during El Niño ENSO climate phase, and (d) differences in the *d*-excess values of precipitation between El Niño andNeutral climate phases.



Unique for the research starting in 2014:

We will COMBINE Geolocator and Stable Isotope approaches;

We will look at western AND eastern breeding grounds simultaneously – with sites in Alaska and New Hampshire



🔍 🛛 Anchorage, AK



Collect cheek feathers grown on wintering grounds for isotopic analysis – compare to weighted continental isoscapes for the year and months in question

New 0.75g Geolocator: Migrate Tech P65

New thinner, lighter, and elastic harness material

- Much simpler deployment
- Easily adjustable
- Precise fit
- Faster handling times



Check out Luke's bug net design!



AK <u>n=10</u> 2014 - Collected feathers for isotopic analysis at deployment -NH n=10

2014 - Deployed new lightweight Geolocators

2015 - Recapture instrumented birds, retrieve Geolocators

2015 – Redeploy and/or deploy additional Geos depending on return rate

→ 2015 - Collect 2<sup>nd</sup> feather sample for isotopes at retrieval ←

COMBINING GEOS AND STABLE ISOTOPES AND COLLECTING FEATHERS AT BOTH DEPLOYMENT AND RETRIEVAL GETS US TO <u>CONNECTIVITY</u> – 2 for 1 wintering locations: Geolocator data will help calibrate isotopic signatures of feathers collected during the recapture year; then we will compare isotopic signatures from feathers collected at deployment to those from retrieval year to determine if individual birds wintered in the same locations each year.

# Thanks for your attention!



