

Best tools for studies of small landbird movements in the golden age of bio-logging

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Description: The field of movement ecology is rapidly expanding as tracking technology is becoming simultaneously more sophisticated and light-weight. For small migratory landbirds, this has fueled an exponential increase in our understanding of migratory connectivity, migration timing, and year-round conservation needs for species at risk. In 2012, I co-organized a popular symposium on the new insights into landbird migration provided by miniature light-level geolocators (NAOC V, Vancouver, BC). This led to publication of a special issue of the *Auk* (January 2013) highlighting new work and prefaced by a perspectives piece building on the symposium theme.

Since that symposium there has continued to be widespread enthusiasm for the application of tracking tags to small birds. However, now there are more types of tracking technology available than ever before. Should researchers use light-level geolocators or archival GPS tags? What questions can we answer with digitally coded radio tags in the Motus Wildlife Tracking System? How small are the newest PTTs? What about the upcoming ICARUS tags (using low-orbiting satellites)? Can we use accelerometers to study migration of small landbirds? What are the challenges that researchers have faced applying these miniature tracking tags to various species, including species at risk? Given the overwhelming range of technological options for studying the movement ecology of small landbirds, there is a need for a synthesis of what tracking tools are best applied to which questions, and to which species. We also need clear direction in terms of understanding the impact of tags on the fitness of small birds. Each type of tag has limitations and logistical considerations that must be taken into account in order to effectively answer questions by using these tools. Given the substantial cost of miniature tracking technology (generally a single tag is more than \$200 USD), it is critical that researchers define the specific questions they are interested in, understand the limitations of the tags, and work with the most appropriate study species.

In this symposium, I will start by reviewing the main questions that are being asked about movement ecology of small landbirds and summarize some of the major themes and advances in the last 10 years. The talks in this symposium will be from a broad range of researchers at the forefront of the application of these technologies, who will share their expertise in the use of various tags, analysis techniques, as well as discuss any impacts on study species. My goal is to bring together the experiences of many researchers using these techniques to share solutions to common problems, as well as highlight new research directions that take advantage of these tracking technologies.

Why this symposium is timely: It has been 10 years since the first deployment of miniature geocator tracking devices on Wood Thrushes and Purple Martins. While there are dozens of studies using these tags (both published and still in progress), there is room for synthesis and sharing of experiences in order to push the frontiers of movement ecology research forward. New projects can be informed by a sound understanding of the logistical and analytical limitations of each type of tracking tag (e.g. geocator vs. archival GPS unit vs. digitally-coded radio-tag, etc.) as well as the potential effects on a given study species. The inaugural American Ornithological Society and Canadian Society of Ornithologists' meeting is an excellent place to summarize some of these challenges to inform research in the future, especially as the meeting attracts top landbird biologists and conservation practitioners who are interested in these tools.

Note on diversity: I am committed to promoting diversity in science and ornithology. I will have 50-50 male-female split in speakers, and I have extended invitations to both students, early-career and senior researchers alike, with the goal of having representation from all career stages. I have also specifically contacted non-US researchers to participate in this symposium to increase the diversity of perspectives on this topic and highlight important work being conducted outside the US.

* Denotes female presenter, + Denotes student presenter.

Proposed talks (not necessarily in order):

Opening keynote talk (30 minutes)

1. *McKinnon, E. University of Windsor, Canada.

Introduction to the symposium: Ten years tracking landbirds with miniature geolocators- What have we learned and where do we go from here?

Morning session talks (15 minutes)

2. *+Roberto-Charron, A. University of Manitoba, Canada.

Comparing Bayesian estimates of geocator-derived locations for a swallow, a warbler, a sparrow, and a thrush: Which R package to use?

3. Studds, C. University of Maryland, USA.

Experimental manipulation of winter conditions and tracking subsequent spring migration of Ovenbirds

4. *Crewe, T. Bird Studies Canada, Canada.

Modeling migratory movements of small songbirds using detections from an automated radio-telemetry array: opportunities and technological challenges.

5. Perlut, N. University of New England, USA.

Non-stop transoceanic flights by Bobolinks during fall migration

Afternoon session talks (15 minutes)

6. *+Gomez, C. Universidad de los Andes, Colombia.

Fuel loads acquired at a stopover site carry-over to influence the pace of intercontinental migration in a boreal songbird.

7. Fraser, K. University of Manitoba, Canada.

Tracking martins in the dark: light pollution, nocturnal migration, and nocturnal foraging

8. *+Hayes, S. York University, Canada.

Forest fragmentation effects on survivorship, dispersal and autumn migration on-set in juvenile Wood Thrush (*Hylocichla mustelina*): An automated-telemetry study

9. Hecksher, C. or student, Delaware State University, USA.

Geolocators versus GPS loggers: lessons learned from tracking thrushes through remote regions of Amazonia

10. *+Stanley, C. University of Maryland, USA.

Using archival GPS tags to determine ecological drivers of migratory and non-migratory movements of Wood Thrush

11. +Raybuck, D. University of Tennessee, USA, or +McNeil, D. Cornell University, USA.

Geolocator-tagging 9-10 g birds: Investigating potential breeding season and annual fitness effects on Cerulean and Golden-winged Warblers

12. Cooper, N. Smithsonian Migratory Bird Center, USA.

Automated radio-telemetry and geolocator tracking provide complementary data on migration of an Endangered species, the Kirtland's Warbler.

13. Wells, J. Boreal Songbird Initiative, USA.

Tracking as a tool for conservation of boreal landbirds

Final remarks (McKinnon) and open discussion with all symposium participants (15 minutes). We will continue the conversation at the nearest source of beverages.

Additional presenters: Currently I have more presenters interested than available spaces (given a full-day symposium, with a 30 minute keynote, and an open discussion for the last session). However, there are several presenters for whom attending the conference depends on funding and other commitments. We hope to be able to accommodate everyone who can attend. The line-up above is considered an example, and the final presenters may include some talks from above and or from the following list, and or other presenters not listed here.

14. Sparks, R. Bird Conservancy of the Rockies, USA.

The Northern Black Swift movement ecology: using Nanotags to understand breeding and wintering foraging range

15. +Schoombe, S. University of Cape Town, South Africa.

Lightening the load on light-level geolocator analysis: automated filtering as a means of analysing geolocator data.

16. Jahn, A. Smithsonian Conservation Biology Institute, USA, or *+Macpherson, M. Tulane University, USA.

Tracking 6 related species of flycatchers to gain insights into the evolution of migration strategies.

17. *Phillips, L. National Park Service, USA.

Geolocator tracking of Arctic-breeding birds from Denali National Park.

18. *Bowlín, M. University of Michigan Dearborn, USA.

Title TBD.