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Report to the Nuttall Ornithological Club

Bird Blow Flies and Rusty Blackbirds

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Introduction

Populations of Rusty Blackbirds (*Euphagus carolinus*) have declined dramatically across North America during the past 40 years (Greenberg and Droege 1999, Niven et al. 2004, Sauer et al. 2004), and data suggest a recent range retraction northward and to higher elevations (Francis 2007, Powell 2008, Campbell). While the pattern of range retraction suggests a climate relationship, no obvious mechanism has been identified to date.

Researchers studying a Rusty Blackbird (*Euphagus carolinus*) breeding population in northern New Hampshire discovered larvae of the bird blow fly *Protocalliphora shannoni* parasitizing Rusty Blackbird nestlings in 2015. While bird blow flies had been documented previously from the nests of Brewer's, Red-winged, and Yellow-headed Blackbirds (*Euphagus cyanocephalus*, *Agelaius phoeniceus*, and *Xanthocephalus xanthocephalus*, respectively) and Common Grackle (*Quiscalis quiscula*) (Bennett and Whitworth 1991), they had never been documented from Rusty Blackbird nests (T. Whitworth, pers. comm.). Bird blow fly larvae are blood-sucking parasites of nestling birds that may cause anemia or mortality at high levels of infestation (Hurtrez-Bousses et al 1997, Willson and Hocker 2009). Analysis of 39 Rusty Blackbird nests from our study area in 2015 by blow fly specialist Dr. Terry Whitworth documented parasitism in 69%, with puparium numbers ranging from one to 77 in parasitized nests.

Little is known about the ecology and phenology of *P. shannoni*. Existing data indicates that in eastern North America, this species most frequently infests open cup nests at least 3 m from the ground in forests dominated by deciduous trees, and American Robins (*Turdus migratorius*) are frequent hosts (Bennett and Whitworth 1992). Since Rusty Blackbirds typically nest within 3 m of the ground in forests dominated by spruce and fir, *P. shannoni* may be expanding into previously unoccupied habitat at the southeastern edge of the Rusty Blackbird's breeding range.

Project Description

The original objectives for this project included the following:

1. Compare 2015 and 2016 *P. shannoni* incidence and abundance in northern New England Rusty Blackbird nests.

2. Determine distribution and abundance of *P. shannoni* in northern New England American Robin nests in the vicinity of Rusty Blackbird territories during the 2016 breeding season.
3. Explore potential factors influencing nest selection by *P. shannoni*.
4. Determine ambient temperature pattern preceding spring emergence of female *P. shannoni* and identify food sources utilized prior to egg-laying.
5. Investigate potential attractants for adult *P. shannoni* to explore feasibility of baiting traps for adults.

Subsequent to submission of this grant application, we received unexpected funding for equipment to enable videography at Rusty Blackbird nests and used nests in insect rearing cages to investigate behavior and phenology of *Protocalliphora* at Rusty Blackbird nests. Taking advantage of this opportunity required some shifting of priorities for the bird blow fly technician.

Methods

We inspected spring wildflowers in Rusty Blackbird territories for fly activity and documented locations of American Robin pairs during early May. We deployed video cameras, DVRs, and associated power supplies at two Rusty Blackbird nests with high 2015 puparium counts during late incubation in hopes of documenting female bird blow flies arriving to deposit eggs. We placed retrieved nests from the three territories with high 2015 puparium counts in insect rearing cages with small containers of diluted honey, diluted molasses, and water. Rearing cages were equipped with video cameras to document emergence of adult bird blow flies and use of the provided liquids. We sent used nests to Dr. Terry Whitworth, who dissected them to identify and count bird blow fly puparia. After receiving results from Dr. Whitworth, we created scatterplots to examine relationships between bird blow fly puparium numbers with nest latitude, elevation, distance to road, distance to water, and Rusty Blackbird fledging date.

Results and Discussion

- We occasionally observed activity of unknown fly species on spring wildflowers, especially on Common Strawberry (*Fragaria virginiana*).
- While we located a number of American Robin pairs in the vicinity of Rusty Blackbird nests in early May, we discovered that locating their nests in continuous forest habitat was substantially more challenging and time-consuming than anticipated. In addition, the few suspected nest sites we did find were at inaccessible heights in trees, so we ultimately abandoned this task.
- The video cameras documented one fly entering a Rusty Blackbird nest on May 23, crawling under the eggs, and emerging some six minutes later. Unfortunately, camera resolution was inadequate to identify the genus of fly, but it is highly likely that it was a bird blow fly. We installed the cameras relatively late in incubation, in part because we were concerned about nest abandonment and in part because we expected that the flies would lay eggs during the Rusty Blackbird nestling stage. Additional flies likely accessed nests before the cameras were installed or during several periods of technical problems when the cameras were not operational.
- The first adult bird blow flies emerged from each of the three nests in rearing cages on June 27. We are still reviewing video to document emergence patterns, but footage reviewed thus far shows that emergences occurred between 0500 and 1600 hours. Many flies crawled back into nesting material after initial emergences, sometimes going in and out several times, which complicates our efforts to count emerging individuals. Some

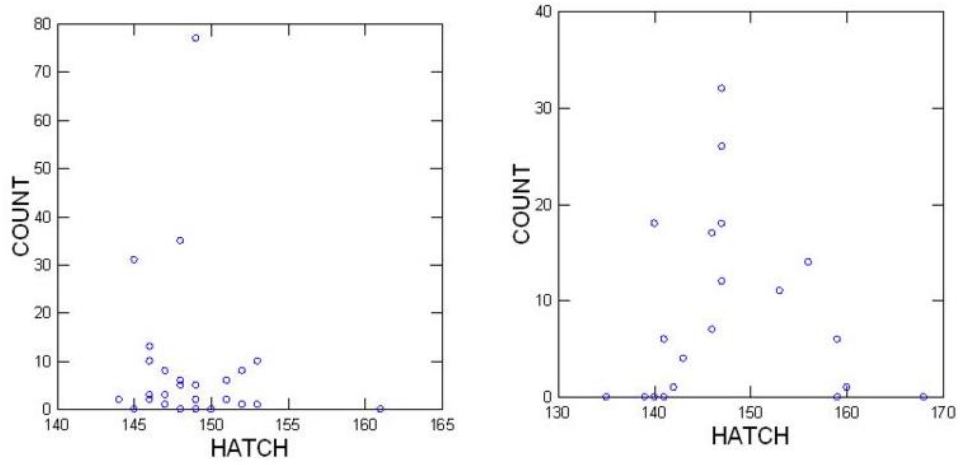
individuals could be seen crawling about near the surface of the nesting material for several hours before emerging. Based on direct observation, emergence appeared to have ended by July 14.

- Of the 25 Rusty Blackbird nests sent to Dr. Terry Whitworth for analysis, 17 contained *Protocalliphora* puparia. In addition to the *P. shannoni* documented in 2015, the 2016 nests also contained *P. metallica*. The overall infestation rate (68%) was the same in both years. Puparium numbers ranged from one to 32 per nest; six nests contained puparia of *P. shannoni* only, five contained *P. metallica* only, and six contained both species.

Future Plans

- Now that we know incubating Rusty Blackbirds tolerate the video cameras, we plan to deploy a higher resolution model at three nests during the egg-laying period in 2017 in hopes of documenting female bird blow fly activity. We also plan to embed miniature temperature loggers within the nesting material to document conditions during fly development.
- We expect to deploy radio transmitters on a sample of nestlings in 2017 to collect post-fledging survival data for a project of the International Rusty Blackbird Working Group. We plan to take blood samples at the time of banding to determine the extent and severity of anemia in nestlings.
- We will continue to collect used nests and send to Dr. Whitworth for analysis. At the August 15-16, 2016 meeting of the International Rusty Blackbird Working Group, other researchers agreed to send used nests in 2017 to determine the extent of bird blow fly parasitism elsewhere in the Rusty Blackbird breeding range.
- By correlating nestling blood counts with fledgling survival data and nest puparium counts we will gain a clearer picture of bird blow fly effects on Rusty Blackbird survival.

Appendix A. Scatterplots of puparium counts against environmental variables



2015 2016

Figure A-1. These plots show no significant relationship between puparium count and Julian day of Rusty Blackbird hatch for either 2015 or 2016.

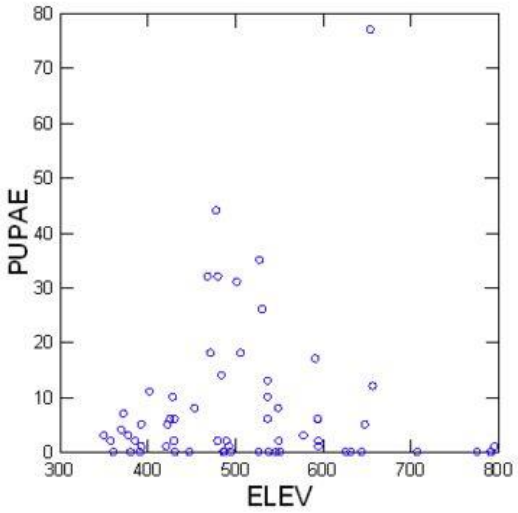


Figure A-2. This plot shows no significant relationship between puparium count and nest site elevation.

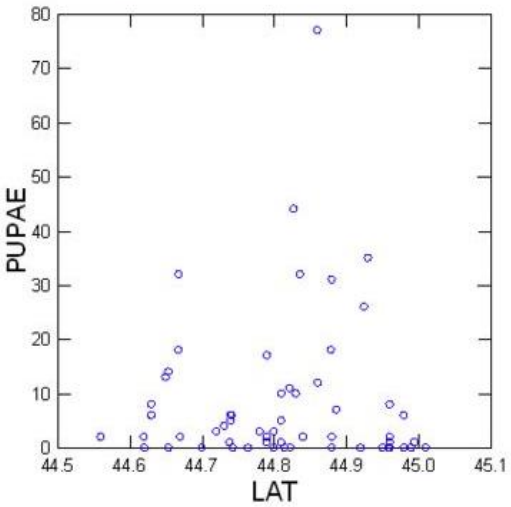


Figure A-3. This plot shows no significant relationship between puparium count and nest site latitude.

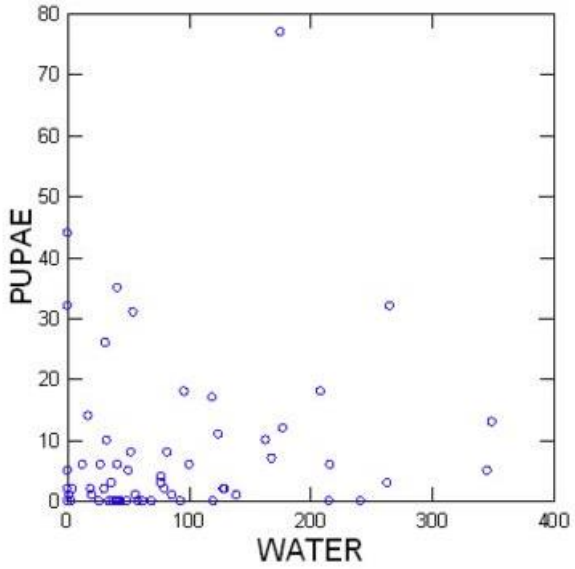


Figure A-4. This plot shows no significant relationship between puparium count and distance to nearest water.

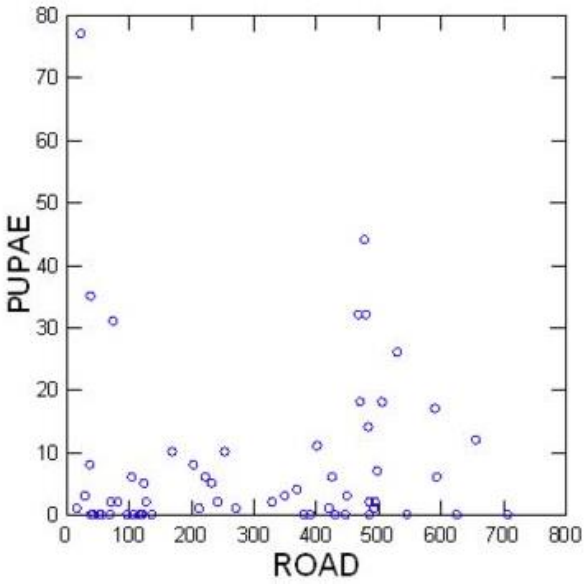
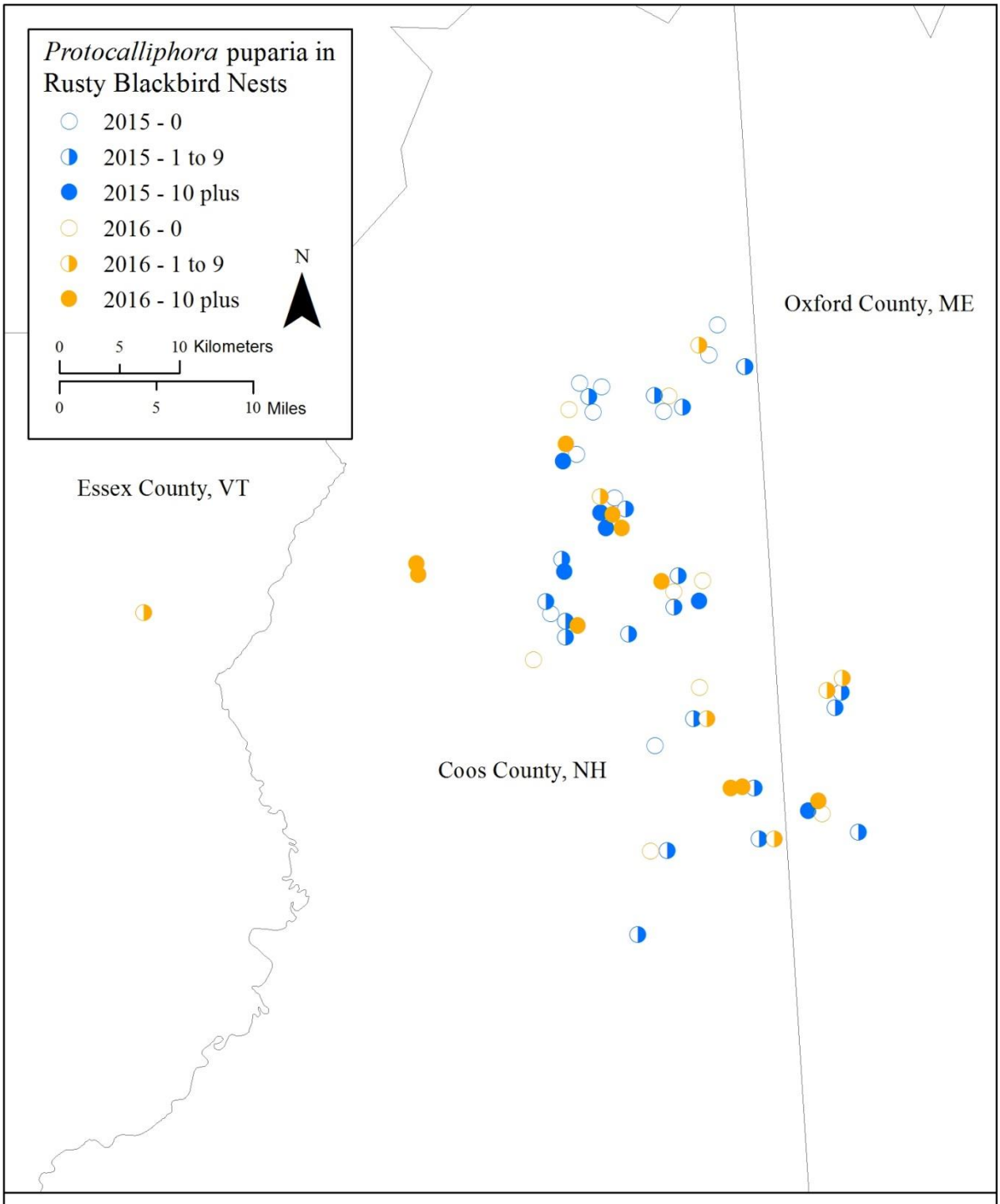
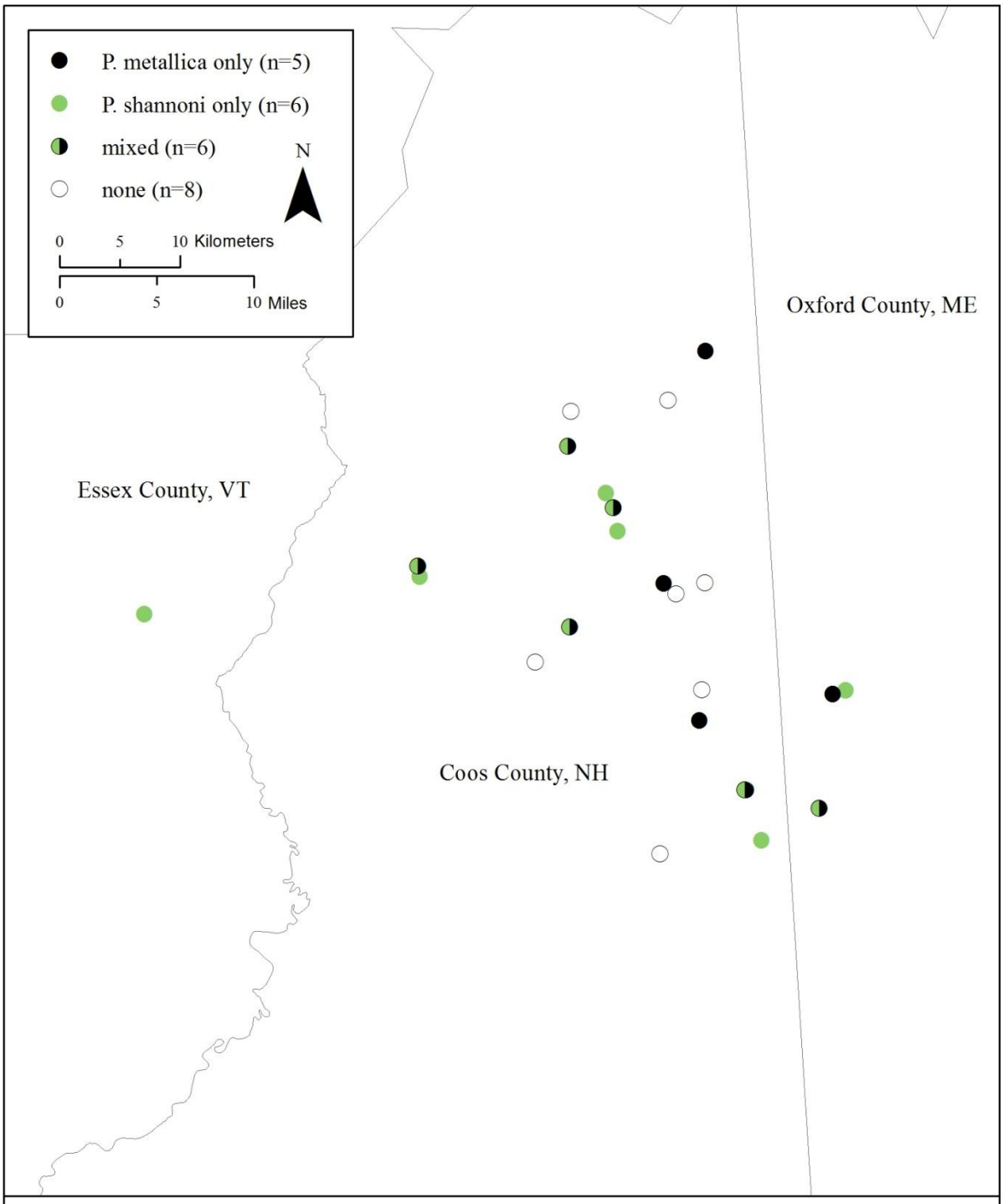


Figure A-5. This plot shows no significant relationship between puparium count and distance to nearest road.

Appendix B. *Protocalliphora* distribution and abundance in northern New England Rusty Blackbird nests, 2015 and 2016.



Distribution and Abundance of *Protocalliphora* in Northern New England Rusty Blackbird Nests, 2015 and 2016



Distribution of *Protocalliphora shannoni* and *P. metallica* in Northern New England Rusty Blackbird Nests, 2016