

Fat Reserves Study

Migratory and Non-Migratory Passerine Birds During Fall Migration

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Eastern Towhee ~ *Pipilo erythrophthalmus*



Captured Birds in Bags waiting to be analyzed.



Observing Fat Deposits in Abdomen.



Mist Nets at Ohio Dominican University



Magnolia Warbler ~ *Setophaga magnolia*

ABSTRACT

Migratory passerines require fat to complete fall migration. It was hypothesized that over the course of fall migration migrating passerines would have an increased fat reserve score so that those captured in late fall migration would have a higher fat score than those captured in early fall migration. 81 passerines, 27 different species, were captured in Columbus and West Mansfield, Ohio. Each bird's fat reserves was recorded based on a score of 0-5 (see methods). The study found that fat reserves of 8 non-migratory passerine species did not change over the course of fall migration. However, the 19 migrating species showed a positive linear regression line, thus an increase of fat reserves over the course of fall migration supporting the hypothesis. It can be concluded that migrant birds display greater fat reserves later in fall migration. The majority of the birds, 76.5%, captured and analyzed had a fat score lower than 3. Further research must be done to understand the variables associated with passerine fat reserves such as deposition rates, weather effects, predator presence, foraging capacity, and stop-over site utilization.

Fat Reserves for Migration

Some avian species migrate for purposes of breeding and favorable climates. Migratory passerines require fat as their main energy source to complete fall migration efficiently. Lipids are stored in reserves that are deposited after birds experience hyperphagia which causes them to consume above their basal metabolic rate in order to create larger stores of fat. These stored lipids are similar to mammalian white fat. Fat reserves can be found in the lower abdomen, furculum, sides of the body and beneath the wings of a bird. Passerines not in migratory state typically store anywhere from 0% to 3% of body mass as fat, while those in migration will store anywhere from 22% to 70% body mass as fat.

METHODS

Capture and Recording

81 Migrating and resident passerines were mist-netted in wooded areas in West Mansfield and Columbus, Ohio. The birds were captured during fall migration from September to October 2012 on September 7th, 17th, 21st, 28th, and 29th, and on October 3rd, 12th, and 20th, at varying times. There were 27 different species captures (see table 1). Within a half hour of capture, the following data were taken on each bird: species, tarsus recorded in millimeters (using a caliper), wing chord recorded in millimeters, body mass recorded in grams (using a digital scale), and fat reserves (observational, 0-5 score). The fat reserves were evaluated observationally by holding each bird in the bander's grip and blowing on the lower abdomen and furcular depression to separate the bird's feathers. Each bird was ranked according to a 0-5 scale (Merilla and Svensson, 1995): 0= no visible fat reserves, 1= 33% or less of the furcular covered and 50% or less of the lower abdomen covered, 2= 33-66% of the furcular covered and 50-100% of the lower abdomen covered, 3= furcular is filled and flush with the pectoral muscle, 4= the furcular or abdomen full and bulging, 5= both furcular and abdomen bulging. Once data were recorded and pictures taken, each captured bird was released.

Analysis

For analysis, birds were categorized into migratory and non-migratory species based on data gathered from Birds of North America Online.

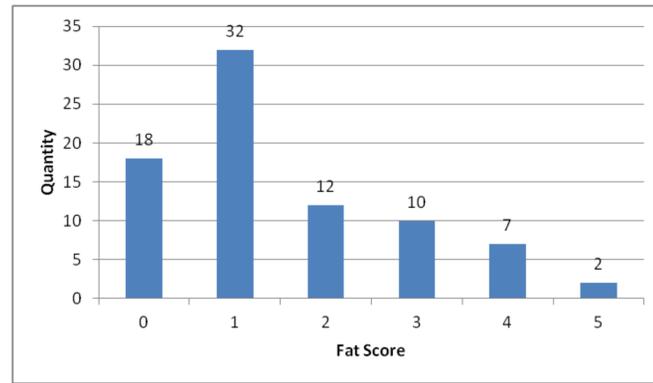


Figure 1: Total Fat Scores

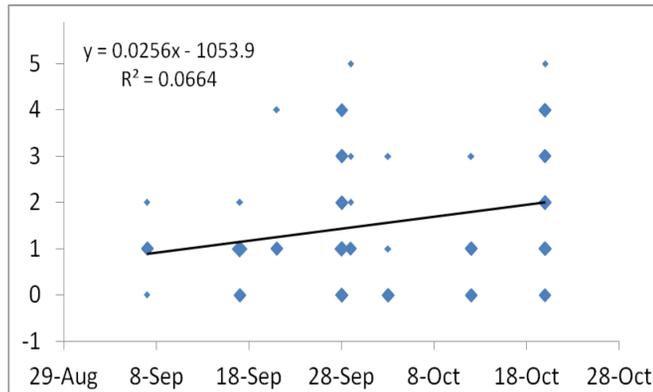


Figure 3: Fat Score v. Time/Date of Capture

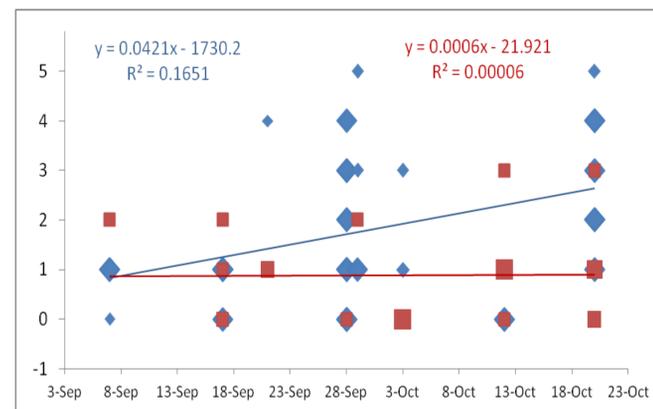


Figure 4: Fat Score v. Time/Date of Capture
Migrants (blue) and Non-Migrants (red)

Species: 81 Birds 27 Species

- Cardinalidae**
 - Northern Cardinal ~ *Cardinalis cardinalis*
- Emberizidae**
 - Swamp Sparrow ~ *Melospiza georgiana*
 - Lincoln's Sparrow ~ *Melospiza lincolni*
 - Song Sparrow ~ *Melospiza melodia*
 - Eastern Towhee ~ *Pipilo erythrophthalmus*
 - American Goldfinch ~ *Spinus tristis*
 - Chipping Sparrow ~ *Spizella passerina*
 - Field Sparrow ~ *Spizella pusilla*
 - White-throated Sparrow ~ *Zonotrichia albicollis*
 - White-crowned Sparrow ~ *Zonotrichia leucophrys*
- Mimidae**
 - Gray Catbird ~ *Dumetella carolinensis*
- Paridae**
 - Carolina Chickadee ~ *Poecile carolinensis*
- Parulidae**
 - Common Yellowthroat ~ *Geothlypis trichas*
 - Tennessee Warbler ~ *Oreothlypis peregrina*
 - Nashville Warbler ~ *Oreothlypis ruficapilla*
 - Ovenbird ~ *Seiurus aurocapilla*
 - Magnolia Warbler ~ *Setophaga magnolia*
 - Blackpoll Warbler ~ *Setophaga striata*
- Regulidae**
 - Ruby-crowned Kinglet ~ *Regulus calendula*
 - Golden-crowned Kinglet ~ *Regulus satrapa*
- Sittidae**
 - White-breasted Nuthatch ~ *Sitta carolinensis*
- Tryglodytidae**
 - Carolina Wren ~ *Thryothorus ludovicianus*
 - House Wren ~ *Troglodytes aedon*
- Turdidae**
 - Swainson's Thrush ~ *Catharus ustulatus*
- Tyrannidae**
 - Eastern Phoebe ~ *Sayornis phoebe*
- Vireonidae**
 - Red-eyed Vireo ~ *Vireo olivaceus*
 - Blue-headed Vireo ~ *Vireo solitarius*

**Resident Species

Conclusion

Fat reserves are essential for migratory birds during migration. During migration birds experience a trade-off between migration time and the opportunity to build these fat reserves by foraging. Birds that migrate later in the year have more time to build their fat stores, but experience increased possibility of dangerous weather and low temperatures during their migratory journey. In this study we found that delayed migration may be beneficial for some migratory species, as fat reserves were higher later in the season, providing increased fuel for flight and thermoregulation. The high percentage of birds with lower fat reserves may have been due to capture time and foraging ability.

This study was carried out under
Federal Bird Banding Permit #23781 and
State Wild Animal Permit #15-47.



Ovenbird ~ *Seiurus aurocapilla*



White-crowned Sparrow ~ *Zonotrichia leucophrys*



Northern Cardinal ~ *Cardinalis cardinalis*



Blue-eyed Vireo ~ *Vireo solitarius*



Golden-crowned Kinglet ~ *Regulus satrapa*