



Arrival timing and hematological parameters in Gray Catbirds



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Introduction

Songbirds arriving early at northerly breeding grounds often encounter poor environmental circumstances, including cold temperatures and limited food availability [1]. Consequently, these early arrivals must be in superior condition. A number of studies have demonstrated the advantages of arriving in superior energetic condition [e.g. 2,3], however other physiological measures of condition such as hematocrit and leukocyte counts have received less attention. Here we present preliminary results from a study of hematological parameters (hematocrit, total leukocyte (WBC) count, differential WBC, Heterophil/Lymphocyte (H/L) ratio) and condition (mass, fat score) in Gray Catbirds (*Dumetella carolinensis*) arriving at breeding grounds in Northeastern Pennsylvania. While several studies have examined seasonal effects in differential WBC counts [e.g. 4-6] to our knowledge none have explicitly focused on arrival.

Methods

- We captured catbirds in mist-nets from mid-April through mid-July, 2006 in Lackawanna County, PA.

- Mass was determined to the nearest 0.1g, fat load was estimated using the MAPS 6 point scale and feather mite infestation was scored on a scale of 0-5.

- To determine hematocrit and differential WBC counts we collected blood via brachial vein puncture.

- One drop of blood was used to make a blood smear which we stained using a Hema3 stain kit (Fisher Diagnostics) and examined at 1000x using oil immersion.

- We determined hematocrit from the rest of the blood sample after centrifuging 9 minutes at 14,000 RPMs.

- We limited our analyses to first captures of catbirds for which we had evidence that they remained to breed at our site.

Results

Arrival - Total WBC count increased with date of arrival while hematocrit decreased (Figure 1). This does not appear a consequence of age or sex differences in arrival (Table 1). Eosinophil and lymphocyte counts increased with date, while heterophils and monocytes did not (Figure 2). The heterophil to lymphocyte ratio, an indicator of stress, declined with arrival date ($R^2 = 0.1$, $N = 70$, $P = 0.008$).

Condition - Mass was unrelated to total WBC count and H/L ratio, but was negatively related to hematocrit (Figure 3). Fat score and mite score also were unrelated to total WBC count and H/L ratio with date accounted for (Table 2).

Figure 1: Total WBC or Hematocrit vs. Date

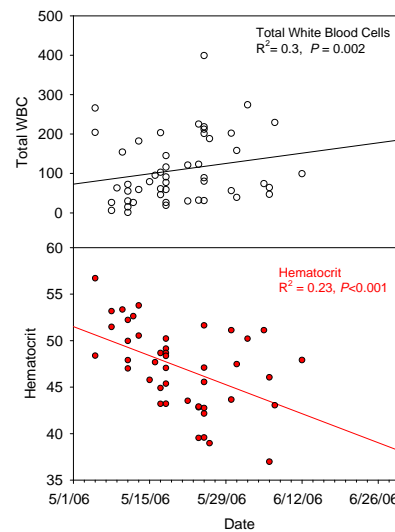


Figure 2: Differential WBC vs. Date

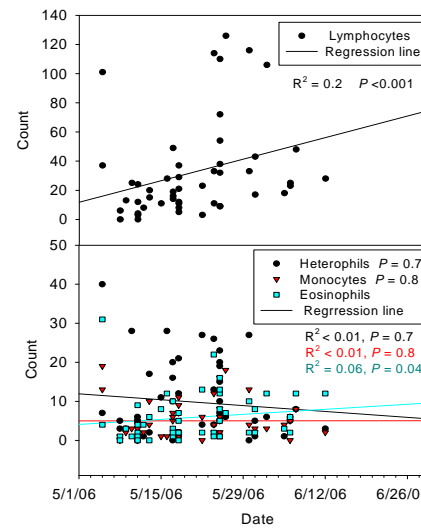


Figure 3: Blood parameters vs. Mass

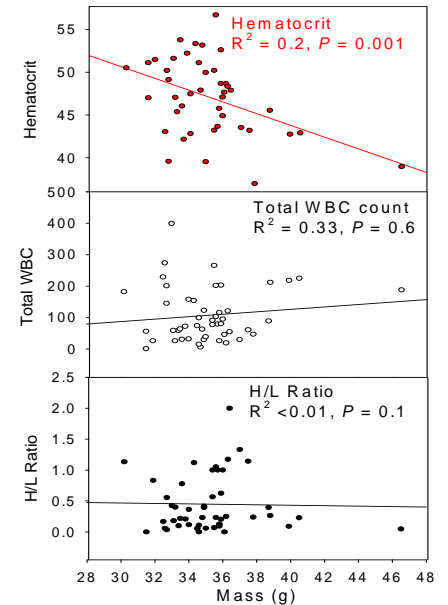


Table 1. ANOVA with hematocrit and total WBC count as dependent variables and sex, age and date as independent variables.

	df	Sex	Age	Date
Hematocrit	2, 57	F = 2.4 P = 0.09	F = 2.5 P = 0.09	F = 16.2 P < 0.001
Total WBC	2, 57	F = 0.7 P = 0.9	F = 0.3 P = 0.7	F = 10.8 P = 0.002

Table 2. ANOVA with hematocrit and total white blood cell count as dependent variables and fat and mite score, and date as independent variables.

	df	Fat score	Mite score	Date
Hematocrit	3, 54	F = 1.8 P = 0.2	F = 1.5 P = 0.2	F = 10.8 P = 0.002
Total WBC	5, 48	F = 2.1 P = 0.1	F = 0.7 P = 0.7	F = 8.6 P = 0.005

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Discussion

The later catbirds arrived on our study site, the lower their hematocrit and the higher their total WBC count. Lymphocytes and eosinophils increased with date while the H/L ratio decreased. Total WBC count and hematocrit were not related to fat or mite score and only hematocrit was related to mass.

Higher lymphocytes and eosinophils with increasing arrival date suggests that later arriving birds are in poorer health or having to devote resources to fighting infection. Lymphocytes are important in recognizing and destroying many types of pathogens while eosinophils function against parasites [6]. Higher H/L ratio and hematocrit of early arriving catbirds are indications of increased stress, but a better ability to deal with the stress as higher hematocrit is associated with higher energetic body condition in other species [7]. These results support the hypothesis of condition-dependent arrival.

Literature Cited

1. Smith, R. J. & Moore, F. R. (2005). *Behav. Ecol. Sociobiol.* 57: 231-239.
2. Sandberg, R. & Moore, F. R. (1996). *Oikos* 77: 577-581.
3. Smith, R. J. & Moore, F. R. (2003). *Oecologia*, 134: 325-331.
4. Driver, E.A. (1981). *J. Wildlife Diseases* 17: 413-421.
5. Pavlak et al. (2005). *Eur. J. Wildl. Res.* 51: 271-276.
6. Maxwell, M. H. (1993). *World's Poultry Sci. Journal* 49: 34-43.
7. Owen, J. C. (2004). Ph.D dissertation. Univ. of Southern Mississippi.

