

# Morphometrics of Worm-eating Warblers in South-Central Indiana: Hatching Year and After Hatching Year Comparison

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## ABSTRACT

We banded 257 Worm-eating Warblers (*Helmitheros vermivorum*) in south-central Indiana. There was no difference in measurements of size (wing, tail, mass) between hatching year (HY) and after hatching year (AHY) individuals. The distribution of culmen measurements showed that HY birds were significantly smaller than AHY birds. There was no statistical relationship between mass and capture date for AHY birds; average mass of HY birds decreased with capture date.

## INTRODUCTION

During the summer of 2015 (21 May - 14 Aug), we banded 257 Worm-eating Warblers (*Helmitheros vermivorum*) in two south-central Indiana counties. Prior to our study, the largest single dataset containing Worm-eating Warbler morphometric measurements consisted of 60 individuals (Hanners and Patton 1998). Here we report primary biological data (as suggested by Bowers and Dunning 1986) to supplement the existing knowledge base for this species.



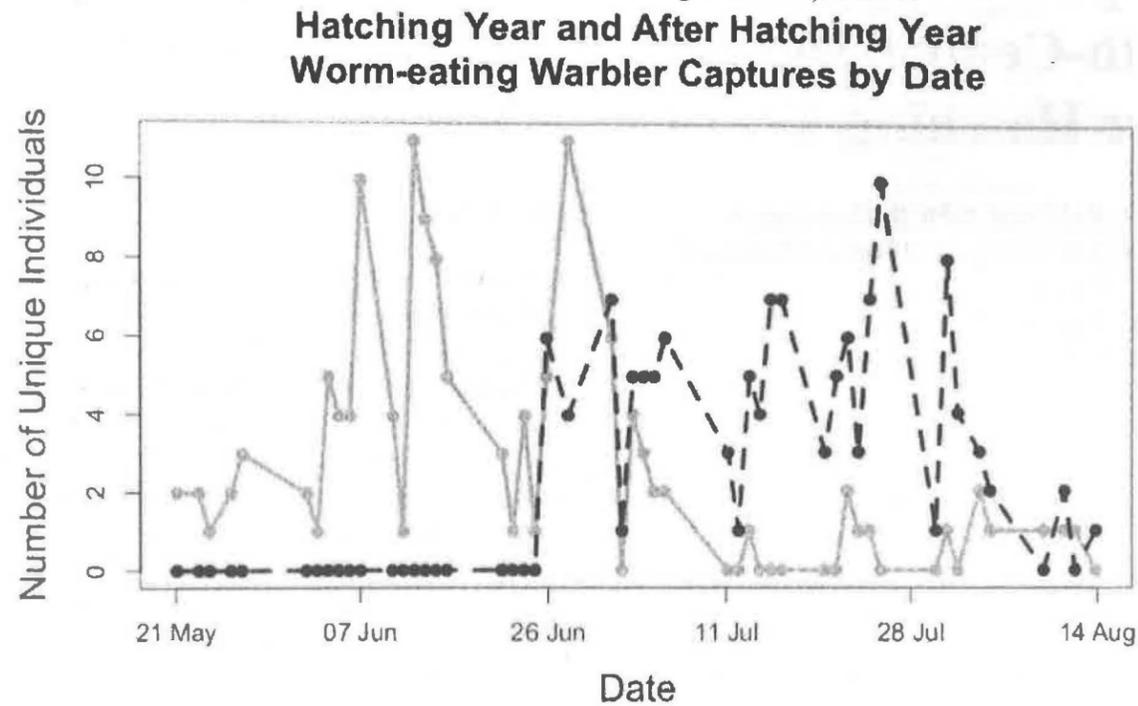
## METHODS

We used constant-effort mist-netting to capture birds in the Yellowwood and Morgan-Monroe state forests (Brown and Morgan counties, IN), following the Monitoring Avian Productivity and Survivorship (MAPS) protocol (DeSante et al. 2000). We measured mass with a 100-g capacity Pesola® scale to the nearest 0.5 g. We used a 30-cm standard wing rule (Avinet®) to measure unflattened wing chord, tail length, and exposed culmen to the nearest 0.5 mm (following Pyle 1997). We determined sex by the presence of a cloacal protuberance (CP) in males or brood patch (BP) in females. We differentiated hatching year (HY) and after hatching year (AHY) birds by plumage and molt characteristics (Pyle 1997). All AHY individuals undergoing pre-basic molt (including rectrices and remiges) were excluded from analyses. Birds were captured and handled in accordance with Federal Banding Permit #21781 and Purdue Animal Care and Use Committee guidelines (protocol # 110000078C002).

## RESULTS and DISCUSSION

In Indiana, active Worm-eating Warbler nests are most often observed during the month of June (Brock 2006, Brock personal communication) and nests have been observed as early as 12 May and as late as 11 Jul (Brock 2006). Average incubation and nesting periods are approximately 13 days and 10 days, respectively (Vitz et al. 2013). In our study we did not encounter fledglings until 26 Jun (Fig. 1), thus based on the known Worm-eating Warbler breeding phenology, HY individuals in this study were most likely between one to three months of age.

Fig. 1. After Hatching Year (gray) and Hatching Year (black-dashed) Worm-eating Warbler captures by sampling date. Birds were banded during the summer of 2015 in Brown and Morgan counties, Indiana.



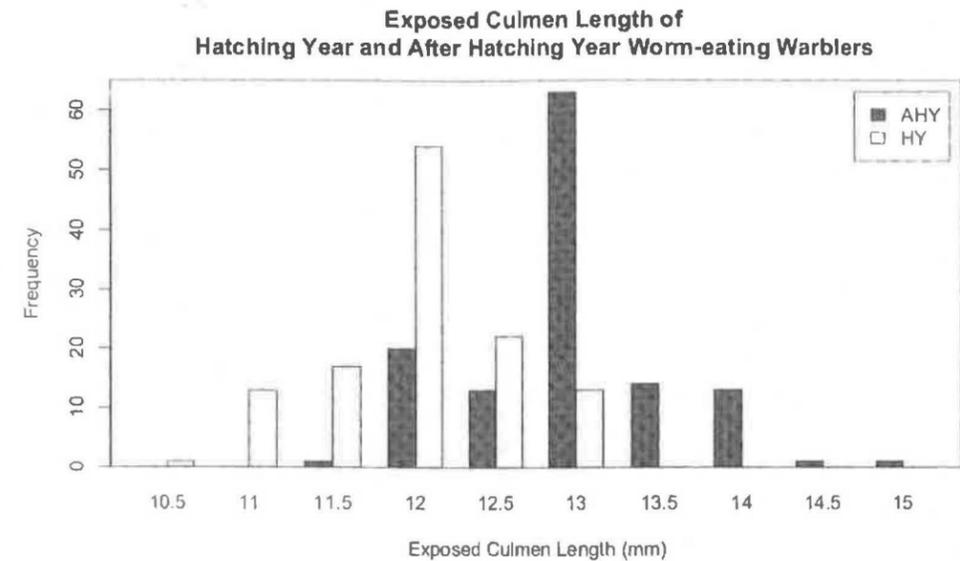
Because our banding season overlapped with the postfledging period, we were able to reliably age birds as HY and AHY ( $n = 120$  and  $n = 126$ , respectively). To our knowledge, ours is the first Worm-eating Warbler morphometric comparison by age class (Table 1). We used Welch's *t*-test to determine whether morphometric measurements differed between AHY and HY individuals (Welch 1947). Wing length, tail length, and mass were not

significantly different between AHY and HY birds ( $p > 0.5$ ). However, mean culmen length was lower in HY birds ( $t = 12.65$ ,  $df = 243.5$ ,  $p < 0.0001$ ). Thus, we suggest that in addition to plumage and molt characteristics, culmen length ( $< 11.5$  mm indicating HY;  $> 13$  mm indicating AHY) could potentially serve as an additional age-determining factor during the first two months post-fledging (Fig. 2).

Table 1. Measurements (Mean  $\pm$  SD, range) of Worm-eating Warblers banded during the summer of 2015 in Brown and Morgan counties, IN. Table rows contain measurement summaries of: all banded individuals (ALL), hatching year individuals (HY), after hatching year individuals (AHY), AHY males (AHY-M), and AHY females (AHY-F). Statistically significant difference between HY and AHY groups exist for culmen only. (AHY-U) not included.

WEWA	NA	Mass	Wing	Tail	Culmen
ALL	246	13.2 $\pm$ 0.8, 11.5 - 15.5	67.6 $\pm$ 2.3, 62.0 - 76.0	49.1 $\pm$ 1.9, 42.0 - 54.0	12.5 $\pm$ 0.8, 10.5 - 15.0
HY	120	13.2 $\pm$ 0.9, 11.5 - 15.5	67.6 $\pm$ 2.2, 62.0 - 73.0	49.0 $\pm$ 2.1, 42.0 - 54.0	12.0 $\pm$ 0.6, 10.5 - 13.0*
AHY	126	13.2 $\pm$ 0.8, 12.0 - 15.5	67.7 $\pm$ 2.5, 62.0 - 76.0	49.2 $\pm$ 1.7, 46.0 - 53.0	13.0 $\pm$ 0.6, 11.5 - 15.0*
AHY-M	30	13.3 $\pm$ 0.7, 12.0 - 14.5	69.3 $\pm$ 1.7, 65.0 - 73.0	49.9 $\pm$ 1.7, 46.0 - 53.0	13.2 $\pm$ 0.6, 12.0 - 14.5
AHY-F	64	13.2 $\pm$ 0.8, 12.0 - 15.5	66.4 $\pm$ 2.5, 62.0 - 76.0	48.6 $\pm$ 1.6, 46.0 - 52.0	13.0 $\pm$ 0.6, 12.0 - 14.0

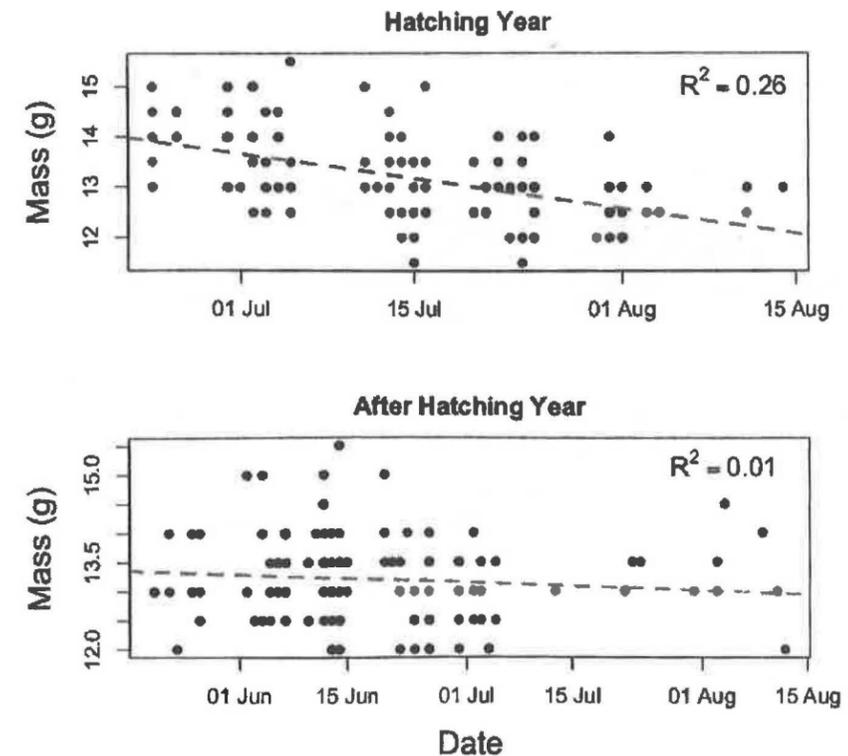
Fig. 2. Frequency of culmen lengths of Hatching Year (light gray) and After Hatching Year (dark gray) Worm-eating Warblers banded during the summer of 2015 in Brown and Morgan counties, Indiana.



We used linear models to test whether Worm-eating Warbler mass was correlated with capture date (Fig. 3). There was no significant correlation between the average mass of AHY birds and capture date ( $F_{1,124} = 1.42$ ,  $p = 0.236$ ). However, the

average mass of HY birds decreased as the season progressed ( $F_{1,118} = 42.73$ ,  $p < 0.0001$ ). We attribute this negative trend to fledgling foraging naiveté post-independence of parental care (Sullivan 1989, Anders et al. 1997).

Fig. 3. Effect of capture date on mass of Hatching Year (top) and After Hatching Year (bottom) Worm-eating Warblers banded during the summer of 2015 in Brown and Morgan counties, Indiana.



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by George West