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Avian Morphometric Data from a Long-term Bird Banding Effort in North Texas

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ABSTRACT

Morphometric data can be useful in determining age and sex of bird species that exhibit regional variation. We analyzed morphometric data from 12,834 individuals of 58 species banded at a long-term bird banding station in North Texas from 1978-2014. Mean wing length, tail length, and body mass are reported for resident and migrant birds banded in this flyway. For 20 species, males had longer mean wing length; in 14 species males had longer mean tail length, and for 3 species males had greater mean body mass than females. For 12 species, adult birds had longer wing length, tail length, or body mass than younger birds.

INTRODUCTION

Long-term banding efforts provide valuable data on survival and population analysis to biologists and conservationists (Osenkowski et al. 2012, Ruiz-Gutierrez et al. 2012). Morphometric data from long-term banding studies have been used to study hybridization and geographic variation (Baker and Johnson 1998, Arendt et al. 2004), age and sex-related differences (Clark 1979, Wiklund 1996, Jones et al. 2002, Kissner et al. 2003, Mulvihill et al. 2004), age and sex determination (Mawhinney and Diamond 1999, Reynolds et al. 2008, Penak et al. 2013, Henry

et al. 2015), molt (Marin 2003), and migratory patterns (Confer et al. 2014) in birds.

Our objective was to report morphometric data including wing length, tail length, and body mass for birds captured at a long-term banding station along the Central Flyway in north Texas. Morphometric data were examined within the context of age and sex for species including residents, short-distance Nearctic-Nearctic migrants, and long-distance Nearctic-Neotropical migrants. These data will improve our understanding of morphometric variation in this region of the Central Flyway.

METHODS

From 1978 through 2014, passerine and near-passerine birds were banded in diverse habitats totaling 117 ha at the Heard Natural Science Museum and Wildlife Sanctuary (hereafter, Heard Museum) in McKinney, TX (33° 09' 33.07"N, 96° 36' 49.57" W; elevation 192 m). Heard Museum habitats included mid-successional prairie grassland, green ash (*Fraxinus pennsylvanica*), black willow (*Salix nigra*) forest, intermittently flooded mid-successional forest with sugarberry (*Celtis laevigata*), Osage orange (*Maclura pomifera*), cedar elm (*Ulmus crassifolia*), and honey locust (*Gleditsia triacanthos*). Birds were also

banded in park-like habitat consisting of scattered pecan (*Carya illinoensis*) and southern live oaks (*Quercus virginiana*) interspersed with Bermuda grass (*Cynodon dactylon*).

Banding occurred primarily during spring (21 Mar - 1 Jun) and fall (15 Aug - 31 Oct) migration, although less intensive banding efforts occurred during other months. Birds were captured in 10 - 25 12-m nets; the number of nets varied depending on the number of banding personnel present and time of year. Netting and handling protocols followed Ralph et al. (1993) and Gustafson et al. (1997). All birds were banded with uniquely numbered USGS bands and assigned to Bird Banding Laboratory age and sex classes based on criteria in Pyle (1997). Migrant and resident status were determined based on annual capture dates. Morphometric data included unflattened wing length and tail length (to the nearest 1 mm), and body mass (to the nearest 1 g) (Pyle 1997). Due to difficulty in separating Alder Flycatcher and Willow Flycatcher, we refer to these individuals as "Traill's Flycatcher". Scientific names for species studied appear in Table 1.

Table 1. Wing length, tail length, and body mass measurements by age-sex classes for 58 species banded at the Heard Museum, McKinney, TX, from 1978 through 2014. Values given are mean \pm standard deviation, sample size and range; or, for sample sizes of just 1 or 2 individuals, measurement and sample size.

Age-Sex	Wing (mm): mean \pm SD, n, range	Tail (mm): mean \pm SD, n, range	Mass (g): mean \pm SD, n, range
Red-bellied Woodpecker (<i>Melanerpes carolinus</i>)			
ATY-M	128.8 \pm 4.7, 4, 133-144	80.0 \pm 2.2, 4, 78-83	79.0 \pm 4.2, 2, 76-82
ASY-F	127.0 \pm 2.0, 3, 125-134	83.0 \pm 6.1, 3, 79-90	70.7 \pm 3.5, 3, 67-74
ASY-M	130.5 \pm 3.4, 4, 126-134	80.0 \pm 8.1, 4, 71-89	74.0 \pm 6.9, 3, 66-78
AHY-F	125, 1	71, 1	72, 1
AHY-M	132, 1	75, 1	78, 1
SY-F	122.8 \pm 4.1, 6, 119-130	74.3 \pm 8.0, 6, 60-85	68.8 \pm 3.0, 4, 66-73
SY-M	128, 1	80, 1	73, 1
HY-F	123.0 \pm 4.4, 3, 120-128	73.3 \pm 6.5, 3, 67-80	66.5 \pm 3.5, 2, 64-69
HY-M	130, 1	79, 1	72, 1
HY-U	122.5 \pm 2.1, 2, 121-124	71.5 \pm 7.8, 2, 66-77	60, 2
Downy Woodpecker (<i>Picoides pubescens</i>)			
ATY-F	91.0 \pm 1.7, 3, 89-92	52.7 \pm 0.6, 3, 52-53	24.0 \pm 2.0, 3, 22-26
ATY-M	87.0 \pm 2.2, 4, 84-89	53.0 \pm 2.2, 4, 50-55	23.3 \pm 1.0, 4, 22-24
TY-F	89.4 \pm 2.1, 4, 88-92	53.0 \pm 2.5, 4, 50-55	24.5 \pm 1.3, 4, 23-26
ASY-F	88.8 \pm 2.5, 8, 86-92	51.5 \pm 2.9, 8, 49-57	23.4 \pm 2.6, 8, 21-29
ASY-M	91.2 \pm 2.8, 18, 85-96	54.0 \pm 4.0, 18, 44-62	24.5 \pm 1.9, 17, 22-29
ASY-U	85, 1	47, 1	24, 1
AHY-F	89.2 \pm 2.3, 9, 85-92	53.0 \pm 5.7, 9, 46-60	25.4 \pm 2.5, 8, 22-30
AHY-M	90.4 \pm 2.8, 15, 85-95	53.3 \pm 2.5, 15, 48-59	24.3 \pm 1.7, 15, 20-26
SY-F	90.6 \pm 1.2, 12, 88-92	55.3 \pm 2.0, 12, 52-59	25 \pm 1.4, 12, 22-27
SY-M	89.5 \pm 3.0, 14, 82-93	53.0 \pm 3.2, 14, 48-59	24.7 \pm 0.9, 13, 24-26
SY-U	95, 1	58, 1	26, 1
HY-F	89.0 \pm 2.8, 20, 84-92	54.2 \pm 3.5, 20, 49-60	23.8 \pm 1.5, 18, 21-26
HY-M	87.5 \pm 2.9, 11, 84-93	52.2 \pm 3.6, 11, 48-60	22.9 \pm 1.2, 10, 21-24
HY-U	86.2 \pm 2.8, 5, 83-90	52.6 \pm 1.1, 5, 51-54	23.2 \pm 1.1, 5, 22-24
U-U	87, 1	50, 1	24, 1

Age-Sex	Wing (mm): mean \pm SD, n, range	Tail (mm): mean \pm SD, n, range	Mass (g): mean \pm SD, n, range
Yellow-bellied Flycatcher (<i>Empidonax flaviventris</i>)			
ASY-U	69.3 \pm 1.2, 3, 68-70	57.0 \pm 3.0, 3, 54-60	12.3 \pm 0.6, 3, 12-13
AHY-F	63.5 \pm 0.7, 2, 63-64	52.0 \pm 1.4, 2, 51-53	11.0 \pm 1.4, 2, 10-12
AHY-M	69.4 \pm 1.1, 5, 69-71	54.3 \pm 1.9, 5, 52-57	11.8 \pm 0.5, 5, 11-12
AHY-U	66.5 \pm 0.7, 2, 66-67	54, 2	14.0 \pm 2.8, 2, 12-16
SY-F	64, 1	51, 1	11, 1
SY-M	74, 1	57, 1	11, 1
SY-U	66.5 \pm 5.0, 2, 63-70	53.0 \pm 1.4, 2, 52-54	10, 1
HY-F	63, 1	50, 1	14, 1
HY-M	71, 1	54, 1	14, 1
HY-U	65.6 \pm 3.4, 5, 60-68	52.4 \pm 3.1, 5, 49-56	12.0 \pm 1.4, 5, 10-14
"Traill's" Flycatcher (<i>Empidonax alnorum/traillii</i>)			
ASY-U	71.0 \pm 4.6, 25, 60-78	57.8 \pm 2.6, 25, 51-62	12.8 \pm 1.9, 25, 10-18
AHY-F	70, 1	55, 1	13, 1
AHY-M	71.3 \pm 4.9, 3, 68-77	56.0 \pm 1.0, 3, 55-57	12.3 \pm 0.6, 3, 12-13
AHY-U	70.3 \pm 4.2, 423, 43-79	57.2 \pm 3.1, 422, 42-67	12.9 \pm 2.0, 414, 8-20
SY-U	70.7 \pm 4.0, 55, 58-78	57.2 \pm 2.8, 55, 52-63	12.1 \pm 1.3, 51, 9-16
HY-U	67.7 \pm 3.1, 140, 57-75	55.4 \pm 2.7, 140, 48-61	14.1 \pm 2.1, 138, 10-19
U-U	73.5 \pm 2.9, 4, 70-77	58.5 \pm 3.0, 4, 55-61	-
Least Flycatcher (<i>Empidonax minimus</i>)			
ASY-F	59, 1	52, 1	8, 1
ASY-M	63.0 \pm 3.5, 3, 59-65	55.3 \pm 0.6, 3, 55-56	9.7 \pm 0.6, 3, 9-10
ASY-U	62.8 \pm 2.8, 24, 58-68	55.0 \pm 0.6, 3, 55-56	10.0 \pm 1.5, 24, 8-13
AHY-F	60.3 \pm 2.5, 83, 50-67	52.8 \pm 2.2, 83, 49-60	9.7 \pm 1.3, 83, 8-14
AHY-M	64.6 \pm 2.1, 111, 60-71	55.0 \pm 2.1, 111, 50-60	10.0 \pm 1.3, 111, 8-14
AHY-U	62.2 \pm 3.0, 139, 54-74	54.3 \pm 2.4, 139, 46-60	10.0 \pm 1.1, 134, 8-13
SY-F	59.3 \pm 1.4, 8, 58-62	51.4 \pm 2.9, 8, 47-55	8.8 \pm 0.7, 8, 8-10
SY-M	64.2 \pm 1.9, 13, 52-69	54.5 \pm 1.8, 13, 52-58	9.9 \pm 0.8, 13, 8-11
SY-U	61.5 \pm 2.7, 33, 54-66	53.5 \pm 3.4, 33, 44-59	9.8 \pm 0.9, 32, 8-12
HY-F	60.5 \pm 2.1, 18, 57-64	52.5 \pm 2.0, 18, 48-56	10.3 \pm 0.9, 18, 9-12
HY-M	63.6 \pm 2.8, 10, 58-67	54.6 \pm 2.8, 10, 49-59	10.8 \pm 2.6, 10, 7-16
HY-U	61.4 \pm 2.7, 93, 53-72	53.3 \pm 2.1, 93, 49-60	10.4 \pm 1.4, 92, 7-16
U-F	57, 2	49.5 \pm 0.7, 2, 49-50	10, 2
U-M	66, 1	56, 1	11, 1
U-U	60.1 \pm 1.6, 9, 57-62	53.1 \pm 2.0, 9, 50-55	11.0 \pm 1.7, 3, 9-12
Eastern Phoebe (<i>Sayornis phoebe</i>)			
ASY-F	82.8 \pm 3.3, 3, 79-85	70.3 \pm 0.6, 3, 70-71	18.7 \pm 1.5, 3, 17-20
ASY-U	83.2 \pm 4.1, 9, 79-90	68.4 \pm 4.0, 9, 63-75	18.4 \pm 1.0, 9, 17-20
AHY-F	80.2 \pm 5.5, 6, 70-85	66.8 \pm 3.1, 6, 62-72	18.2 \pm 3.1, 6, 13-21
AHY-M	85, 1	71, 1	19, 1
AHY-U	82.6 \pm 4.1, 46, 65-90	70.5 \pm 4.1, 46, 62-83	18.7 \pm 1.8, 41, 15-22
SY-F	80.7 \pm 2.1, 3, 79-83	69.7 \pm 2.1, 3, 68-72	14.0 \pm 3.5, 3, 10-16
SY-U	82.0 \pm 3.6, 4, 77-85	69.5 \pm 0.6, 4, 69-70	18.8 \pm 1.9, 4, 16-20
HY-U	82.2 \pm 3.8, 36, 75-91	68.3 \pm 5.1, 36, 54-77	18.5 \pm 1.8, 31, 15-23
U-U	83.4 \pm 2.7, 5, 82-88	68.2 \pm 5.2, 5, 60-73	15, 2

Age-Sex	Wing (mm): mean \pm SD, n, range	Tail (mm): mean \pm SD, n, range	Mass (g): mean \pm SD, n, range
White-eyed Vireo (<i>Vireo griseus</i>)			
ASY-F	61, 1	48, 1	12, 1
ASY-M	60.7 \pm 0.6, 3, 60-61	49.0 \pm 1.7, 3, 47-50	
ASY-U	59.7 \pm 2.8, 23, 53-68	48.0 \pm 3.1, 23, 42-57	10.6 \pm 1.1, 22, 9-12
AHY-F	56.2 \pm 3.3, 5, 51-59	47.6 \pm 1.3, 5, 46-49	11 \pm 1.7, 5, 10-14
AHY-M	58, 2	48.0 \pm 1.4, 2, 47-49	11.5 \pm 0.7, 2, 11-12
AHY-U	59.3 \pm 1.8, 47, 55-63	47.8 \pm 2.4, 47, 40-53	11.4 \pm 1.4, 46, 10-15
SY-F	58.5 \pm 1.8, 15, 55-61	48.0 \pm 1.9, 15, 45-51	11.3 \pm 1.2, 15, 9-14
SY-M	58.9 \pm 1.2, 7, 57-60	48.4 \pm 1.5, 7, 47-50	11.0 \pm 2.0, 7, 22-12
SY-U	58.6 \pm 2.8, 22, 53-64	47.5 \pm 2.9, 22, 40-52	11 \pm 1.1, 22, 9-13
HY-U	58.7 \pm 2.5, 73, 51-63	48.4 \pm 2.1, 73, 44-53	12.3 \pm 1.6, 72, 10-18
U-U	60.1 \pm 2.0, 8, 58-63	48.5 \pm 1.8, 8, 46-51	12.8 \pm 2.2, 8, 10-16
Bell's Vireo (<i>Vireo bellii</i>)			
ASY-U	55, 1	48, 1	10, 1
AHY-U	55.1 \pm 1.8, 16, 51-58	45.4 \pm 1.8, 16, 42-49	9.8 \pm 0.9, 16, 8-12
SY-U	54.2 \pm 1.0, 3, 53-55	44.3 \pm 0.6, 3, 44-45	9.5 \pm 0.7, 2, 9-10
HY-U	54.4 \pm 1.8, 11, 50-57	45.2 \pm 1.5, 11, 43-48	10.4 \pm 1.0, 10, 9-12
U-U	55, 2	44.5 \pm 0.7, 2, 44-45	
Blue-headed Vireo (<i>Vireo solitarius</i>)			
ASY-U	74 \pm 1.4, 2, 73-75	52.5 \pm 0.7, 2, 52-53	15.5 \pm 0.7, 2, 15-16
AHY-F	64, 1	74, 1	24, 1
AHY-U	73.5 \pm 1.8, 18, 71-78	53.9 \pm 5.3, 18, 50-74	16.8 \pm 1.9, 14, 14-19
SY-U	72.0 \pm 1.7, 7, 70-75	51.4 \pm 1.6, 7, 49-54	14.9 \pm 1.0, 7, 14-16
HY-U	73.7 \pm 1.3, 16, 71-75	55.2 \pm 7.4, 16, 49-75	17.9 \pm 1.7, 15, 15-22
U-U	73.9 \pm 1.9, 16, 71-78	52.3 \pm 1.9, 16, 49-56	16.4 \pm 1.6, 7, 14-18
Warbling Vireo (<i>Vireo gilvus</i>)			
ASY-U	68, 1	48, 1	14, 1
AHY-U	71.4 \pm 1.8, 8, 69-74	52.8 \pm 2.5, 8, 51-58	14.1 \pm 2.0, 8, 10-16
HY-U	67.8 \pm 5.6, 13, 52-75	50.9 \pm 4.0, 13, 43-57	16.2 \pm 3.1, 11, 10-19
Red-eyed Vireo (<i>Vireo olivaceus</i>)			
ASY-F	76.0 \pm 1.0, 3, 75-77	47.0 \pm 6.1, 3, 40-51	18, 3
ASY-M	80.8 \pm 2.5, 2, 79-83	53.5 \pm 2.1, 2, 52-55	16.5 \pm 0.7, 2, 16-17
ASY-U	80, 1	55, 1	18, 1
AHY-F	78, 1	51, 1	18, 1
AHY-M	78.5 \pm 2.3, 3, 76-81	52.3 \pm 1.5, 3, 51-54	16.0 \pm 2.0, 3, 14-18
AHY-U	78.5 \pm 1.3, 4, 77-80	53.0 \pm 2.9, 4, 50-56	16.8 \pm 2.9, 4, 15-21
SY-U	73.5 \pm 3.5, 2, 71-76	52.0 \pm 4.2, 2, 49-55	15.5 \pm 0.7, 2, 15-16
HY-U	76.3 \pm 1.7, 4, 74-78	49.0 \pm 2.9, 4, 46-53	19.5 \pm 0.6, 4, 19-20
Blue Jay (<i>Cyanocitta cristata</i>)			
ASY-F	131, 1	129, 1	97, 1
ASY-U	131, 1	128, 1	84, 1
AHY-U	132.8 \pm 3.8, 15, 125-140	127.5 \pm 5.9, 15, 119-137	93.3 \pm 5.6, 15, 83-105
SY-F	124.7 \pm 4.5, 3, 120-129	120.7 \pm 2.1, 3, 119-122	93.0 \pm 5.7, 2, 89-97
SY-U	127.4 \pm 4.3, 7, 121-135	124.7 \pm 4.0, 7, 117-129	83.4 \pm 6.5, 7, 74-90
HY-U	129.9 \pm 4.1, 31, 121-139	124.1 \pm 6.1, 31, 111-136	88.0 \pm 5.8, 26, 76-100

Age-Sex	Wing (mm): mean \pm SD, n, range	Tail (mm): mean \pm SD, n, range	Mass (g): mean \pm SD, n, range
Carolina Chickadee (<i>Parus carolinensis</i>)			
ASY-F	60.8 \pm 3.1, 6, 58-65	53.8 \pm 2.3, 6, 52-58	9.6 \pm 0.6, 5, 9-10
ASY-M	62.3 \pm 2.9, 5, 58-65	56.4 \pm 3.2, 5, 51-59	10.0 \pm 0.7, 5, 9-11
ASY-U	60.7 \pm 1.6, 6, 59-63	54.2 \pm 1.2, 6, 53-56	10.0 \pm 1.1, 6, 8-11
AHY-F	61.5 \pm 1.8, 27, 58-65	53.4 \pm 3.1, 27, 48-62	9.8 \pm 1.0, 27, 8-12
AHY-M	61.4 \pm 2.1, 10, 58-64	53.6 \pm 2.4, 10, 51-58	9.4 \pm 0.7, 10, 8-10
AHY-U	61.7 \pm 2.9, 150, 50-75	54.6 \pm 3.0, 150, 45-66	10 \pm 0.8, 144, 8-12
SY-F	60.5 \pm 1.7, 4, 59-63	54.5 \pm 2.1, 4, 52-57	10.0 \pm 0.8, 4, 9-11
SY-M	60.0 \pm 3.0, 3, 57-63	55.2 \pm 2.8, 3, 52-58	10, 3
SY-U	60.0 \pm 2.6, 16, 53-64	53.1 \pm 2.1, 16, 50-57	10.0 \pm 1.0, 16, 8-12
HY-U	60.7 \pm 2.9, 167, 49-68	53.4 \pm 3.1, 163, 44-65	10.0 \pm 1.0, 159, 8-15
U-U	60.8 \pm 2.4, 18, 55-65	52.8 \pm 3.2, 18, 45-59	9.9 \pm 1.2, 10, 8-12
Tufted Titmouse (<i>Parus bicolor</i>)			
ASY-F	79.0 \pm 1.4, 2, 78-80	70, 2	22, 1
ASY-M	78, 1	69, 1	22, 1
ASY-U	80.0 \pm 1, 3, 79-81	71.0 \pm 3.0, 3, 68-74	22, 2
AHY-F	79, 1	68, 1	22, 1
AHY-M	79.7 \pm 4.7, 3, 76-85	68.3 \pm 3.5, 3, 65-72	20.7 \pm 2.1, 3, 19-23
AHY-U	78.5 \pm 3.6, 36, 70-89	70.1 \pm 3.5, 36, 64-80	21.1 \pm 1.5, 31, 18-24
SY-F	74.9 \pm 2.4, 9, 71-78	66.3 \pm 3.0, 62-70	21.6 \pm 1.7, 9, 19-25
SY-M	78.7 \pm 0.6, 3, 78-79	72.3 \pm 2.1, 3, 70-74	22.3 \pm 1.5, 3, 21-24
SY-U	76.8 \pm 2.9, 12, 72-82	73.0 \pm 3.8, 12, 69-82	21.3 \pm 1.5, 12, 19-24
HY-F	76, 1	64, 1	21, 1
HY-U	77.4 \pm 2.8, 49, 72-83	67.4 \pm 3.6, 49, 60-74	20.1 \pm 1.5, 46, 16-23
U-U	81, 1	73, 1	20, 1
Brown Creeper (<i>Certhia americana</i>)			
AHY-U	63.4 \pm 2.1, 16, 59-66	59.3 \pm 3.9, 16, 52-65	7.6 \pm 0.8, 16, 5-8
HY-M	60, 1	61, 1	7, 1
HY-U	62.3 \pm 3.7, 16, 50-67	62.2 \pm 3.7, 16, 55-69	7.3 \pm 0.9, 16, 6-8
U-U	62.5 \pm 2.0, 15, 59-65	60.4 \pm 2.8, 15, 53-65	7.7 \pm 0.8, 12, 6-9
House Wren (<i>Troglodytes aedon</i>)			
ASY-U	50.4 \pm 2.0, 5, 48-53	44.4 \pm 2.7, 5, 41-48	10, 5
AHY-M	52.7 \pm 2.1, 3, 51-55	44.7 \pm 3.5, 3, 41-48	10.3 \pm 0.6, 3, 10-11
AHY-U	50.8 \pm 1.8, 186, 47-56	42.7 \pm 2.8, 184, 33-53	10.4 \pm 1.1, 176, 8-14
SY-U	50.9 \pm 2.6, 9, 48-56	42.3 \pm 2.6, 9, 39-47	10.4 \pm 0.7, 9, 10-12
HY-U	50.4 \pm 2.1, 96, 44-57	42.1 \pm 2.7, 96, 30-50	10.8 \pm 0.9, 94, 9-13
U-U	50.2 \pm 1.2, 13, 49-52	42.4 \pm 2.2, 13, 40-47	11.2 \pm 1.0, 11, 10-13
Winter Wren (<i>Troglodytes troglodytes</i>)			
AHY-U	46.7 \pm 1.9, 13, 43-50	30.5 \pm 4.3, 13, 24-43	8.0 \pm 1.4, 12, 6-10
SY-U	46, 1	38, 1	8, 1
HY-U	46.9 \pm 1.8, 14, 45-50	30.4 \pm 1.4, 14, 28-34	8.1 \pm 1.2, 12, 6-10
U-U	46.8 \pm 1.5, 10, 45-49	30.3 \pm 2.3, 10, 26-35	8.3 \pm 0.7, 10, 8-10

Age-Sex	Wing (mm): mean ± SD, n, range	Tail (mm): mean ± SD, n, range	Mass (g): mean ± SD, n, range
	Carolina Wren (<i>Thryothorus ludovicianus</i>)		
ASY-F	57.3 ± 2.0, 6, 55-60	48.3 ± 1.6, 6, 46-50	17.5 ± 1.8, 6, 16-20
ASY-M	58.8 ± 2.4, 4, 57-62	49.5 ± 6.6, 4, 43-58	18.3 ± 2.1, 3, 16-20
ASY-U	57.0 ± 4.2, 2, 54-60	53.0 ± 5.7, 2, 49-57	16.5 ± 0.7, 2, 16-17
AHY-F	57.6 ± 2.6, 12, 53-62	49.1 ± 2.7, 12, 45-55	18.6 ± 1.6, 11, 16-22
AHY-M	61.5 ± 0.7, 2, 61-62	51.5 ± 2.1, 2, 50-53	15, 1
AHY-U	58.0 ± 2.8, 46, 50-64	48.6 ± 3.1, 46, 39-57	18.4 ± 2.1, 43, 10-22
SY-F	57.8 ± 2.2, 4, 56-61	47.3 ± 2.1, 4, 45-50	17.5 ± 1.0, 4, 16-18
SY-U	59.5 ± 3.6, 12, 54-66	49.4 ± 3.0, 12, 45-56	17.6 ± 4.0, 11, 10-22
HY-U	57.4 ± 2.6, 90, 49-62	48.5 ± 3.0, 90, 37-59	17.4 ± 1.7, 83, 12-22
U-U	57.5 ± 5.1, 9, 46-63	48.4 ± 4.6, 9, 44-56	18.6 ± 2.4, 5, 16-22
	Blue-gray Gnatcatcher (<i>Polioptila caerulea</i>)		
ASY-M	49, 1	49, 1	6, 1
AHY-F	50, 1	47, 1	6, 1
AHY-M	52.2 ± 1.3, 5, 51-54	48.6 ± 0.9, 5, 48-50	5.8 ± 0.4, 5, 5-6
AHY-U	52.2 ± 2.5, 5, 49-54	50.4 ± 2.1, 5, 49-54	6.0 ± 1.4, 4, 5-8
SY-F	49.5 ± 0.7, 2, 49-50	49.5 ± 0.7, 2, 49-50	6.0 ± 1.4, 2, 5-7
SY-U	49.5 ± 2.1, 2, 48-51	50.5 ± 0.7, 2, 50-51	6, 2
HY-U	50.2 ± 2.7, 13, 42-53	51.5 ± 2.7, 13, 46-57	6.5 ± 0.7, 13, 6-8
	Golden-crowned Kinglet (<i>Regulus strapa</i>)		
ASY-F	54, 1	42, 1	6, 1
ASY-M	56, 1	45, 1	6, 1
AHY-F	54.5 ± 2.7, 20, 48-57	43.0 ± 2.8, 20, 40-50	5.8 ± 0.6, 19, 4-7
AHY-M	56.4 ± 2.1, 33, 51-60	43.8 ± 2.8, 33, 40-57	5.6 ± 0.7, 30, 4-7
SY-F	55, 1	43, 1	6, 1
HY-F	54.5 ± 0.6, 4, 54-55	41.3 ± 1.5, 4, 40-43	5.8 ± 0.5, 4, 5-6
HY-M	57.3 ± 0.4, 2, 57-58	43.5 ± 2.1, 2, 42-45	4, 2
HY-U	55, 1	43, 1	6, 1
U-F	55.3 ± 1.5, 3, 54-57	40.0 ± 2.7, 3, 37-42	5.5 ± 0.7, 2, 5-6
	Ruby-crowned Kinglet (<i>Regulus calendula</i>)		
ASY-F	55.7 ± 1.2, 3, 55-57	42.7 ± 3.5, 3, 39-46	5.7 ± 0.6, 3, 5-6
ASY-M	58.5 ± 2.1, 33, 53-63	43.6 ± 1.9, 33, 40-47	6.1 ± 0.5, 31, 5-7
ASY-U	-	-	6, 1
AHY-F	55.2 ± 2.3, 150, 42-59	41.8 ± 2.0, 150, 38-56	6.0 ± 0.7, 143, 4-8
AHY-M	58.3 ± 1.7, 171, 52-64	43.6 ± 2.0, 171, 38-49	6.1 ± 0.8, 159, 5-10
AHY-U	57.0 ± 2.8, 2, 55-59	41.0 ± 1.4, 2, 40-42	7.0 ± 1.4, 2, 6-8
SY-F	55.4 ± 1.4, 7, 54-59	42.7 ± 2.3, 7, 39-46	5.6 ± 0.5, 7, 5-6
SY-M	57.4 ± 1.3, 28, 55-60	43.1 ± 2.5, 28, 37-49	6.0 ± 0.5, 28, 5-7
SY-U	55, 1	42, 1	6, 1
HY-F	55.5 ± 1.5, 55, 50-58	41.3 ± 1.7, 55, 35-45	6.0 ± 0.7, 54, 5-8
HY-M	57.4 ± 3.0, 37, 48-61	43.0 ± 2.8, 37, 37-49	6.1 ± 0.8, 37, 5-8
HY-U	54.9 ± 2.9, 5, 52-60	41.6 ± 2.7, 5, 39-46	6.4 ± 0.9, 5, 6-8
U-F	55.8 ± 1.9, 32, 50-59	41.4 ± 1.8, 32, 46-45	6.0 ± 0.6, 32, 4-7
U-M	58.7 ± 1.8, 35, 54-63	43.4 ± 2.5, 35, 37-49	6.1 ± 0.7, 31, 5-8
U-U	57, 1	44, 1	-

Age-Sex	Wing (mm): mean ± SD, n, range	Tail (mm): mean ± SD, n, range	Mass (g): mean ± SD, n, range
	Eastern Bluebird (<i>Sialia sialis</i>)		
ASY-F	95.9 ± 1.8, 5, 94-98	60.4 ± 1.7, 5, 59-63	29.6 ± 3.5, 5, 24-33
ASY-M	96.9 ± 1.2, 4, 96-99	62.3 ± 3.9, 4, 58-66	27.8 ± 1.0, 4, 27-29
AHY-F	94.5 ± 6.4, 2, 90-99	58.5 ± 2.1, 2, 57-60	29.0 ± 1.4, 2, 28-30
AHY-M	96.4 ± 2.1, 8, 94-100	62.3 ± 3.0, 8, 59-68	30.9 ± 2.5, 8, 28-34
SY-F	94.7 ± 4.5, 3, 90-99	61.0 ± 1.0, 3, 60-62	29.3 ± 1.5, 3, 28-31
HY-M	93, 1	62, 1	32, 1
HY-U	97, 1	62, 1	27, 1
	Swainson's Thrush (<i>Catharus ustulatus</i>)		
ASY-F	-	60, 2	29.5 ± 3.5, 2, 27-32
ASY-M	101.6 ± 2.1, 12, 98-104	69.9 ± 7.7, 12, 54-76	30.5 ± 2.6, 12, 26-34
ASY-U	97.3 ± 3.1, 211, 91-108	68.3 ± 3.4, 211, 52-77	30.0 ± 3.4, 210, 22-41
AHY-F	100, 1	73, 1	34, 1
AHY-M	101.4 ± 2.6, 20, 93-105	70.8 ± 2.9, 20, 64-75	30.7 ± 3.4, 20, 26-38
AHY-U	96.7 ± 2.8, 89, 90-106	66.9 ± 3.9, 89, 55-76	29.6 ± 2.9, 74, 25-38
SY-M	101.3 ± 1.3, 8, 100-103	68.4 ± 4.6, 8, 58-72	30.5 ± 2.6, 8, 26-34
SY-U	96.4 ± 3.0, 48, 91-104	67.2 ± 3.5, 48, 60-75	28.8 ± 3.1, 45, 24-38
HY-U	101, 1	68, 1	30, 1
U-U	96, 1	62, 1	24, 1
	Hermit Thrush (<i>Catharus guttatus</i>)		
ASY-M	88, 1	62, 1	28, 1
ASY-U	90.5 ± 2.8, 64, 86-94	66.4 ± 3.7, 64, 61-73	28.6 ± 2.8, 17, 24-33
AHY-F	90.7 ± 0.6, 3, 90-91	63.7 ± 1.5, 3, 62-65	28, 2
AHY-U	91.2 ± 3.3, 64, 84-100	68.0 ± 4.4, 64, 60-85	28.9 ± 2.4, 60, 22-36
SY-U	91.7 ± 4.0, 7, 86-98	67.4 ± 1.9, 7, 65-70	29.9 ± 2.9, 7, 26-33
HY-U	91.2 ± 3.1, 48, 85-98	67.5 ± 3.6, 48, 60-78	28.8 ± 2.4, 44, 24-34
	American Robin (<i>Turdus migratorius</i>)		
ASY-F	128.5, 1	99, 1	84, 1
ASY-M	132, 1	97, 1	81, 1
ASY-U	125 ± 4.6, 4, 120-131	92.0 ± 1.4, 4, 90-93	75.8 ± 7.1, 4, 67-82
AHY-F	124.3 ± 2.9, 3, 121-126	99.3 ± 1.2, 3, 98-100	77.3 ± 2.1, 3, 75-79
AHY-M	126.3 ± 9.6, 3, 116-135	99.3 ± 13.3, 3, 84-108	74.7 ± 0.6, 3, 74-75
AHY-U	127.5 ± 4.0, 16, 122-137	95.0 ± 4.3, 16, 87-100	77.9 ± 5.4, 14, 67-86
SY-M	126.5 ± 2.1, 2, 125-128	105.0 ± 17, 2, 93-117	77.0 ± 4.2, 2, 74-80
SY-U	125.7 ± 7.8, 3, 117-132	92.3 ± 4.9, 3, 89-98	72.7 ± 4.0, 3, 69-77
U-F	125, 1	91, 1	-
U-U	122, 1	100, 1	74, 1
	Gray Catbird (<i>Dumatella carolinensis</i>)		
ASY-U	89.1 ± 2.4, 36, 84-93	92.4 ± 3.6, 36, 84-100	37.3 ± 3.7, 35, 31-45
AHY-F	88, 2	89.0 ± 5.7, 2, 85-93	44, 1
AHY-M	86.7 ± 2.1, 3, 85-89	88.3 ± 4.9, 3, 85-94	35.0 ± 2.8, 2, 33-37
AHY-U	89.3 ± 3.1, 94, 81-96	92.2 ± 4.1, 93, 84-106	36.8 ± 3.9, 90, 28-52
SY-U	87.8 ± 3.9, 17, 78-96	91.7 ± 4.1, 17, 84-100	35.5 ± 2.9, 15, 31-42
HY-U	87.4 ± 2.5, 19, 83-93	89.8 ± 3.3, 19, 85-99	36.6 ± 3.5, 19, 31-46
U-U	93, 1	91, 1	40, 1

Age-Sex	Wing (mm): mean \pm SD, n, range	Tail (mm): mean \pm SD, n, range	Mass (g): mean \pm SD, n, range
Brown Thrasher (<i>Toxostoma rufum</i>)			
ASY-U	104.5 \pm 3.0, 12, 101-110	125.5 \pm 2.4, 12, 122-130	75.8 \pm 5.9, 10, 70-87
AHY-M	-	119, 1	78, 1
AHY-U	103.5 \pm 3.0, 77, 97-111	124.9 \pm 5.5, 77, 113-141	69.1 \pm 5.3, 70, 58-82
SY-M	102.5 \pm 0.7, 2, 102-103	126.0 \pm 2.8, 2, 124-128	67.0 \pm 7.1, 2, 62-72
SY-U	106.2 \pm 4.4, 3, 102-111	122.3 \pm 2.5, 3, 120-125	74.0 \pm 6.3, 3, 67-79
HY-U	100.8 \pm 2.8, 19, 96-107	122.4 \pm 5.3, 19, 112-131	66.4 \pm 4.0, 16, 59-74
U-U	104, 1	122, 1	64, 1
Northern Mockingbird (<i>Mimus polyglottos</i>)			
ASY-F	100, 1	116, 1	50.0 \pm 5.7, 2, 46-54
ASY-M	106, 1	119, 1	44, 1
ASY-U	110.0 \pm 1.4, 2, 109-111	117.0 \pm 7.1, 2, 112-122	45.0 \pm 9.9, 2, 38-52
AHY-F	111.5 \pm 6.4, 2, 107-116	116.5 \pm 0.7, 2, 116-117	45, 1
AHY-U	107.9 \pm 4.4, 45, 100-120	114.1 \pm 6.3, 45, 102-130	49.6 \pm 3.4, 44, 44-57
SY-U	104.7 \pm 3.1, 3, 102-108	107.0 \pm 2.7, 3, 105-110	48.7 \pm 3.1, 3, 46-52
HY-U	107.1 \pm 4.0, 53, 98-116	111.8 \pm 5.9, 53, 95-130	49.1 \pm 4.6, 50, 31-58
U-U	100, 1	117, 1	-
House Finch (<i>Haemorhous mexicanus</i>)			
AHY-F	75.8 \pm 2.0, 17, 73-81	58.8 \pm 1.7, 17, 56-62	20.5 \pm 1.0, 17, 19-23
AHY-M	77.5 \pm 1.8, 6, 75-80	62.7 \pm 2.4, 6, 61-67	20.7 \pm 1.2, 6, 19-22
AHY-U	74, 1	69, 1	22, 1
SY-M	77.0 \pm 2.8, 2, 75-79	60, 1	18.5 \pm 5.0, 2, 15-22
HY-M	77.8 \pm 2.5, 4, 75-81	61.0 \pm 3.8, 4, 58-66	21.5 \pm 1.0, 4, 20-22
HY-U	75.2 \pm 1.5, 5, 73-77	58.5 \pm 1.8, 5, 56-60	19.8 \pm 0.8, 5, 19-21
U-M	79.2 \pm 3.2, 3, 76-81	61.3 \pm 3.1, 3, 58-64	22, 3
U-U	75, 1	58, 1	-
American Goldfinch (<i>Spinus tristis</i>)			
ASY-F	68.5 \pm 1.3, 11, 67-71	47.0 \pm 2.4, 11, 43-51	13.0 \pm 0.9, 11, 12-14
ASY-M	71.6 \pm 1.5, 14, 69-74	48.1 \pm 2.1, 14, 45-52	13.7 \pm 0.7, 14, 12-15
AHY-F	69.6 \pm 2.5, 41, 66-76	46.6 \pm 2.3, 41, 42-52	12.6 \pm 1.0, 39, 10-14
AHY-M	71.8 \pm 2.4, 37, 66-77	48.2 \pm 2.6, 37, 41-54	13.2 \pm 1.3, 33, 10-15
SY-F	68.8 \pm 1.5, 16, 66-71	46.3 \pm 2.4, 16, 43-50	12.9 \pm 0.9, 15, 11-14
SY-M	70.1 \pm 1.7, 15, 67-73	47.3 \pm 1.8, 15, 45-51	13.3 \pm 1.0, 15, 11-14
SY-U	68, 1	49, 1	12, 1
HY-F	69.2 \pm 2.2, 91, 60-75	46.3 \pm 2.3, 91, 41-52	12.3 \pm 1.1, 79, 9-15
HY-M	70.6 \pm 2.7, 88, 59-77	47.3 \pm 2.2, 88, 42-52	12.8 \pm 1.1, 81, 11-16
HY-U	69.0 \pm 0.8, 4, 68-70	48.5 \pm 2.9, 4, 45-52	12, 2
U-U	69.2 \pm 0.8, 3, 68-70	46.7 \pm 3.2, 3, 42-49	14, 1
Ovenbird (<i>Seiurus aurocapillus</i>)			
ASY-M	80, 1	53, 1	20, 1
ASY-U	73.9 \pm 2.5, 20, 69-77	53.4 \pm 3.5, 20, 49-64	18.3 \pm 2.0, 19, 16-23
AHY-F	68, 1	49, 1	19, 1
AHY-M	78.2 \pm 1.0, 3, 77-79	56.3 \pm 0.6, 3, 56-57	-
AHY-U	72.8 \pm 3.8, 78, 51-80	52.3 \pm 2.6, 78, 43-57	18.3 \pm 2.6, 68, 12-25
SY-U	73.1 \pm 2.8, 16, 65-76	51.9 \pm 2.6, 16, 46-55	17.8 \pm 1.2, 15, 16-20
HY-U	72.1 \pm 0.8, 8, 71-73	51.4 \pm 2.5, 8, 49-56	21.0 \pm 2.2, 6, 18-24
U-U	70, 1	52, 1	20, 1

Age-Sex	Wing (mm): mean \pm SD, n, range	Tail (mm): mean \pm SD, n, range	Mass (g): mean \pm SD, n, range
Northern Waterthrush (<i>Parkesia noveboracensis</i>)			
ASY-F	69, 1	48, 1	17, 1
ASY-M	78.5 \pm 5.0, 2, 75-82	56.0 \pm 5.7, 2, 52-60	16, 1
ASY-U	74.5 \pm 2.1, 39, 70-78	52.2 \pm 2.3, 39, 48-58	15.7 \pm 1.6, 39, 13-20
AHY-F	78, 1	54, 1	16, 1
AHY-U	73.4 \pm 2.7, 84, 66-81	50.7 \pm 2.6, 41-56	15.3 \pm 2.1, 77, 10-22
SY-U	73.8 \pm 3.1, 21, 69-80	50.3 \pm 2.0, 21, 48-55	15.1 \pm 2.1, 21, 10-22
HY-U	73.4 \pm 2.7, 5, 71-78	49.4 \pm 3.2, 5, 47-55	17.8 \pm 2.6, 4, 14-20
Black-and-white Warbler (<i>Mniotilta varia</i>)			
ASY-F	67.5 \pm 2.3, 6, 66-72	51.0 \pm 3.0, 6, 49-57	10.5 \pm 1.2, 6, 10-13
ASY-M	66.0 \pm 4.4, 6, 57-68	49.0 \pm 1.1, 6, 48-50	10.8 \pm 1.3, 6, 10-13
AHY-F	66.6 \pm 1.4, 12, 64-69	48.7 \pm 2.4, 12, 45-52	10.7 \pm 1.4, 11, 9-14
AHY-M	69.5 \pm 2.0, 11, 65-73	50.7 \pm 2.9, 11, 47-58	10.9 \pm 1.5, 10, 9-14
SY-F	66.0 \pm 1.4, 2, 65-67	47.0 \pm 2.8, 2, 45-49	12.0 \pm 2.8, 2, 10-14
SY-M	68.1 \pm 1.7, 7, 66-70	48.6 \pm 2.6, 7, 46-53	10.7 \pm 1.0, 7, 10-12
SY-U	49, 1	49, 1	10, 1
HY-F	66.8 \pm 2.2, 11, 63-70	48.8 \pm 1.7, 11, 46-52	10.3 \pm 1.1, 11, 9-12
HY-M	67.5 \pm 3.0, 4, 65-71	49.8 \pm 5.5, 4, 42-55	10.8 \pm 1.0, 4, 10-12
U-F	65.5 \pm 0.7, 2, 65-66	49, 2	10, 1
Prothonotary Warbler (<i>Protonotaria citrea</i>)			
ASY-F	67.4 \pm 2.1, 18, 64-73	43.9 \pm 1.6, 18, 42-48	14.5 \pm 1.5, 16, 12-16
ASY-M	70.5 \pm 3.0, 21, 60-74	45.7 \pm 2.2, 21, 40-49	13.4 \pm 0.9, 21, 11-15
AHY-F	66.2 \pm 1.5, 6, 64-68	43.3 \pm 1.6, 6, 41-45	14.5 \pm 1.5, 6, 12-16
AHY-M	71.2 \pm 2.6, 7, 67-75	47.4 \pm 2.2, 7, 46-52	13.6 \pm 1.0, 7, 12-15
SY-F	66.3 \pm 2.9, 3, 63-68	43.0 \pm 1.7, 3, 41-44	14.5 \pm 2.1, 2, 13-16
SY-M	69.0 \pm 2.2, 14, 65-72	45.3 \pm 1.6, 14, 41-48	13.3 \pm 0.8, 13, 12-14
HY-F	67.4 \pm 1.5, 7, 65-70	43.3 \pm 2.0, 7, 40-45	13.9 \pm 1.5, 7, 11-15
HY-M	68.8 \pm 2.3, 6, 65-72	42.8 \pm 4.3, 6, 37-47	14.5 \pm 1.1, 6, 13-16
HY-U	68.3 \pm 1.5, 4, 67-70	44.3 \pm 2.1, 4, 42-46	14.0 \pm 1.6, 4, 12-16
Tennessee Warbler (<i>Oreothlypis peregrina</i>)			
ASY-M	58, 1	41, 1	8, 1
AHY-F	59.5 \pm 1.3, 5, 58-62	39.8 \pm 1.1, 5, 38-41	8.3 \pm 2.5, 3, 6-11
AHY-M	63.3 \pm 1.8, 8, 61-67	41.3 \pm 1.8, 8, 39-44	8, 3
AHY-U	61.3 \pm 1.2, 3, 60-62	41.2 \pm 1.4, 3, 40-42	10, 2
SY-M	62, 1	41, 1	8, 1
U-F	61.0 \pm 2.8, 2, 59-63	38.5 \pm 5.0, 2, 35-42	-
Orange-crowned Warbler (<i>Oreothlypis celata</i>)			
ASY-F	57.9 \pm 2.2, 8, 55-60	46.8 \pm 1.8, 8, 45-50	8.4 \pm 0.9, 8, 7-10
ASY-M	60.6 \pm 2.7, 18, 54-65	48.9 \pm 2.8, 18, 44-54	8.7 \pm 0.8, 18, 8-11
ASY-U	60, 1	46, 1	8, 1
AHY-F	59.1 \pm 2.6, 46, 52-64	47.2 \pm 2.8, 46, 41-58	9.1 \pm 1.0, 43, 7-12
AHY-M	60.6 \pm 2.6, 31, 54-65	48.7 \pm 3.4, 31, 40-57	9.1 \pm 1.1, 27, 6-11
AHY-U	60.6 \pm 3.7, 22, 51-67	47.9 \pm 2.6, 22, 43-52	8.9 \pm 1.1, 22, 8-11
SY-F	58.0 \pm 2.1, 18, 55-64	47.6 \pm 2.9, 18, 45-57	8.5 \pm 1.0, 18, 8-12
SY-M	60.1 \pm 2.2, 14, 57-65	48.6 \pm 3.3, 14, 45-57	8.9 \pm 0.9, 14, 8-10
SY-U	59.3 \pm 4.5, 6, 55-67	49.2 \pm 4.3, 5, 44-54	8.5 \pm 0.6, 6, 8-9
HY-F	59.4 \pm 2.2, 30, 55-64	48.3 \pm 3.5, 28, 43-58	8.6 \pm 0.7, 29, 8-10
HY-M	61.8 \pm 2.0, 15, 59-66	50.0 \pm 2.6, 15, 47-57	9.4 \pm 1.0, 14, 8-11
HY-U	60.9 \pm 2.3, 20, 56-65	48.2 \pm 2.1, 20, 44-52	9.2 \pm 1.4, 18, 7-12
U-F	58.0 \pm 2.8, 2, 56-60	46.5 \pm 3.5, 2, 44-49	8.0 \pm 1.4, 2, 7-9
U-U	62.7 \pm 1.2, 3, 62-64	50, 3	9.3 \pm 1.2, 3, 8-10

Age-Sex	Wing (mm): mean ± SD, n, range	Tail (mm): mean ± SD, n, range	Mass (g): mean ± SD, n, range
	Nashville Warbler (<i>orreothlpis ruficapilla</i>)		
ASY-M	58.5 ± 1.6, 27, 55-61	41.9 ± 1.6, 27, 39-45	7.9 ± 0.7, 26, 6-10
ASY-U	58, 1	43, 1	8, 1
AHY-F	56.3 ± 2.0, 69, 50-60	42.0 ± 2.5, 69, 38-54	8.0 ± 1.0, 67, 6-11
AHY-M	58.1 ± 2.3, 146, 47-63	42.3 ± 2.1, 146, 37-48	8.2 ± 1.0, 133, 6-11
AHY-U	56.4 ± 1.4, 20, 54-59	41.2 ± 1.2, 20, 40-44	7.6 ± 0.9, 20, 6-9
SY-F	56.1 ± 1.3, 22, 54-59	40.9 ± 1.7, 22, 37-44	7.6 ± 0.7, 22, 6-8
SY-M	56.8 ± 2.0, 43, 53-61	40.9 ± 2.1, 43, 34-46	7.5 ± 0.9, 42, 6-10
SY-U	57.7 ± 2.1, 7, 55-60	42.4 ± 1.9, 7, 41-45	8, 6
HY-F	56.7 ± 2.1, 88, 53-64	42.1 ± 2.0, 88, 38-49	8.2 ± 0.9, 87, 6-11
HY-M	59.0 ± 2.4, 81, 48-58	43.0 ± 1.7, 81, 38-48	8.5 ± 1.1, 80, 6-12
HY-U	56.9 ± 1.8, 31, 54-61	42.5 ± 3.1, 31, 37-54	8.2 ± 1.0, 30, 6-10
U-F	55.9 ± 1.2, 9, 54-58	40.8 ± 1.6, 9, 39-43	8.1 ± 0.8, 9, 7-10
U-M	59.3 ± 2.0, 38, 54-63	42.9 ± 1.9, 38, 39-46	8.3 ± 1.0, 38, 6-10
U-U	57, 1	43, 1	-
	Mourning Warbler (<i>Geothlypis philadelphia</i>)		
ASY-F	59.5 ± 3.0, 11, 56-67	48.2 ± 3.5, 11, 45-57	11.1 ± 0.7, 11, 10-12
ASY-M	61.6 ± 1.6, 26, 59-65	50.0 ± 1.7, 26, 47-54	11.5 ± 0.9, 26, 10-13
ASY-U	69, 1	49, 1	16, 1
AHY-F	59.1 ± 2.0, 56, 54-64	48.3 ± 3.2, 56, 44-60	11.4 ± 1.6, 55, 9-19
AHY-M	61.7 ± 2.1, 79, 58-69	49.5 ± 2.5, 79, 42-58	11.9 ± 1.6, 75, 10-17
AHY-U	61.8 ± 6.3, 4, 57-71	47.0 ± 3.2, 4, 44-51	12.3 ± 0.5, 4, 12-13
SY-F	57.3 ± 1.4, 5, 56-59	46.8 ± 1.5, 5, 45-49	10.6 ± 0.9, 5, 10-12
SY-M	60.3 ± 2.8, 25, 52-69	50.1 ± 3.1, 24, 46-59	11.2 ± 0.8, 25, 10-12
HY-F	59.3 ± 2.9, 24, 56-67	48.2 ± 2.4, 24, 40-51	12.3 ± 1.3, 23, 9-14
HY-M	61.2 ± 2.9, 15, 56-69	49.5 ± 3.1, 15, 47-59	13.3 ± 1.3, 15, 10-15
HY-U	59.2 ± 2.5, 15, 55-62	47.6 ± 2.5, 15, 43-50	12.7 ± 0.7, 15, 12-14
U-M	59.0 ± 1.4, 2, 58-60	50, 2	12, 1
U-U	58.3 ± 2.1, 3, 56-60	47.7 ± 0.6, 3, 47-48	11.3 ± 2.3, 3, 10-14
	Common Yellowthroat (<i>Geothlypis trichas</i>)		
ASY-F	52.2 ± 1.5, 34, 50-56	48.5 ± 2.3, 34, 43-55	9.3 ± 0.8, 34, 8-11
ASY-M	55.5 ± 2.1, 94, 50-61	50.6 ± 2.6, 94, 45-57	9.8 ± 0.9, 94, 7-12
AHY-F	52.9 ± 2.1, 266, 46-63	47.7 ± 3.0, 265, 40-57	9.1 ± 1.2, 260, 6-16
AHY-M	55.8 ± 2.2, 305, 50-67	50.3 ± 3.0, 304, 42-63	9.8 ± 1.2, 295, 8-15
AHY-U	52.3 ± 3.9, 4, 50-58	47.8 ± 1.7, 4, 46-50	8.5 ± 0.6, 4, 8-9
SY-F	51.9 ± 1.6, 39, 49-55	47.5 ± 2.8, 39, 42-53	9.1 ± 0.9, 38, 8-10
SY-M	55.2 ± 2.2, 144, 50-61	49.1 ± 3.2, 144, 41-61	9.8 ± 1.3, 142, 8-14
SY-U	56.9 ± 9.6, 4, 50-71	52.5 ± 6.3, 4, 46-61	9.5 ± 1.3, 4, 8-11
HY-F	53.5 ± 3.5, 18, 48-61	47.1 ± 4.2, 18, 40-55	9.9 ± 1.5, 18, 8-12
HY-M	54.8 ± 2.2, 37, 50-59	50.6 ± 2.9, 37, 46-59	10.6 ± 1.0, 37, 9-13
HY-U	53.4 ± 2.8, 21, 48-60	48.4 ± 4.1, 21, 40-59	9.6 ± 1.5, 21, 7-12
U-U	53.4 ± 1.8, 14, 51-57	49.5 ± 3.1, 14, 46-58	9.3 ± 1.1, 14, 8-11
	American Redstart (<i>Setophaga ruticilla</i>)		
ASY-F	63, 1	57, 1	8, 1
ASY-M	63.8 ± 1.3, 5, 62-65	56.8 ± 1.9, 5, 55-60	7.8 ± 0.5, 5, 7-8
AHY-F	60.1 ± 1.5, 14, 57-63	55.4 ± 1.7, 14, 52-59	8.1 ± 1.4, 14, 7-11
AHY-M	60.0 ± 5.8, 3, 53-63	53.7 ± 9.3, 3, 43-60	7.7 ± 0.6, 3, 7-8
SY-M	61.5 ± 0.7, 2, 61-62	56, 2	8, 2
HY-F	59.0 ± 0.8, 4, 58-60	53.0 ± 1.4, 4, 51-54	8.3 ± 0.5, 4, 8-9
HY-M	61, 2	54.5 ± 2.1, 2, 53-56	9.5 ± 0.7, 2, 9-10
HY-U	57, 1	53, 1	11, 1

Age-Sex	Wing (mm): mean ± SD, n, range	Tail (mm): mean ± SD, n, range	Mass (g): mean ± SD, n, range
	Magnolia Warbler (<i>Setophaga magnolia</i>)		
ASY-F	57.0 ± 1.4, 2, 56-58	45.0 ± 1.4, 2, 44-46	7.5 ± 0.7, 2, 7-8
ASY-M	59.6 ± 2.2, 11, 56-63	48.8 ± 2.6, 11, 45-53	8.2 ± 1.2, 11, 6-10
AHY-F	57.8 ± 1.0, 4, 57-59	47.9 ± 0.6, 4, 47-49	7.5 ± 0.6, 4, 7-8
AHY-M	58.4 ± 1.7, 11, 56-61	47.4 ± 1.1, 11, 46-49	9.1 ± 1.9, 10, 7-12
AHY-U	56.3 ± 0.4, 2, 56-57	47.0 ± 1.4, 2, 46-48	10.5 ± 3.5, 2, 8-13
SY-F	55.9 ± 1.0, 4, 55-57	48.5 ± 5.7, 4, 45-57	7.8 ± 0.5, 4, 7-8
SY-M	57.1 ± 4.6, 7, 47-61	49.2 ± 2.2, 7, 46-53	7.7 ± 0.5, 7, 7-8
HY-F	56, 1	41, 1	8, 1
HY-U	61, 1	50, 1	10, 1
	Yellow Warbler (<i>Setophaga petechia</i>)		
ASY-F	59.3 ± 3.1, 4, 55-62	43.5 ± 1.7, 4, 42-45	8.8 ± 0.5, 4, 8-9
ASY-M	62.4 ± 2.3, 21, 58-66	45.0 ± 2.6, 21, 41-50	9.3 ± 1.0, 21, 8-12
AHY-F	59.9 ± 1.4, 18, 58-63	43.2 ± 1.3, 18, 40-45	9.0 ± 1.1, 18, 8-12
AHY-M	61.8 ± 3.1, 36, 53-69	44.7 ± 2.5, 36, 41-54	9.8 ± 1.6, 35, 7-15
AHY-U	59.0 ± 1.3, 6, 57-60	43.0 ± 1.9, 6, 41-45	9.0 ± 1.3, 6, 7-10
SY-F	60.0 ± 1.3, 7, 58-62	43.3 ± 1.3, 7, 42-45	9.9 ± 0.9, 7, 9-11
SY-M	60.9 ± 3.6, 11, 53-67	43.7 ± 3.5, 11, 38-52	9.2 ± 0.9, 11, 8-10
SY-U	58.0 ± 2.8, 2, 56-60	42.0 ± 1.4, 2, 41-43	8, 2
HY-F	59.5 ± 2.4, 4, 57-62	43.5 ± 1.9, 4, 42-46	9.5 ± 1.9, 4, 8-12
HY-M	64, 1	46, 1	10, 1
	Yellow-rumped (Myrtle) Warbler (<i>Setophaga coronata coronata</i>)		
ASY-F	71.5 ± 2.2, 47, 67-76	56.3 ± 3.0, 47, 51-66	11.8 ± 0.9, 44, 10-14
ASY-M	73.3 ± 2.5, 51, 67-78	57.0 ± 2.5, 51, 51-62	12.7 ± 0.9, 50, 12-15
ASY-U	71.8 ± 3.2, 2, 70-74	54.5 ± 3.5, 2, 52-57	12, 2
AHY-F	71.7 ± 2.9, 61, 63-80	56.8 ± 3.4, 61, 51-67	12.2 ± 1.0, 61, 10-15
AHY-M	73.8 ± 2.3, 58, 69-80	57.8 ± 2.2, 58, 53-63	12.6 ± 1.4, 54, 10-18
AHY-U	72.7 ± 3.0, 73, 65-80	56.1 ± 2.8, 73, 50-64	11.9 ± 1.1, 72, 9-14
SY-F	70.1 ± 2.2, 74, 65-77	55.5 ± 2.9, 74, 46-65	11.8 ± 1.0, 70, 10-14
SY-M	72.3 ± 2.6, 67, 65-80	56.8 ± 3.0, 67, 48-64	12.6 ± 1.0, 67, 10-15
SY-U	70.4 ± 2.3, 14, 66-75	55.6 ± 2.8, 14, 52-61	12.0 ± 1.0, 14, 10-14
HY-F	70.6 ± 2.2, 32, 67-75	55.3 ± 2.8, 32, 50-61	12.0 ± 0.9, 31, 10-15
HY-M	72.3 ± 2.6, 35, 66-76	57.0 ± 3.1, 35, 50-63	12.2 ± 0.9, 34, 10-14
HY-U	71.5 ± 2.5, 43, 66-77	55.7 ± 2.6, 43, 50-64	11.7 ± 1.1, 42, 9-14
U-U	72.7 ± 2.5, 23, 69-78	56.8 ± 3.4, 23, 52-66	12.1 ± 0.9, 21, 10-14
	Wilson's Warbler (<i>Cardellina pusilla</i>)		
ASY-F	51.5 ± 2.1, 2, 50-53	46.5 ± 3.5, 2, 44-49	7.0 ± 1.4, 2, 6-8
ASY-M	55.4 ± 2.6, 36, 52-68	49.7 ± 2.4, 36, 45-56	7.1 ± 0.8, 36, 6-8
AHY-F	53.9 ± 2.0, 18, 51-58	48.4 ± 2.6, 18, 44-52	7.9 ± 1.4, 18, 6-10
AHY-M	55.3 ± 2.3, 186, 49-62	48.4 ± 2.6, 186, 40-59	7.5 ± 1.2, 181, 6-12
AHY-U	53.1 ± 0.9, 8, 52-54	49.3 ± 4.5, 8, 45-60	7.0 ± 0.8, 7, 6-8
SY-F	53.0 ± 1.8, 6, 50-55	47.8 ± 1.8, 6, 45-50	7.4 ± 1.1, 5, 6-9
SY-M	53.3 ± 1.9, 22, 50-58	48.1 ± 2.3, 22, 45-53	7.0 ± 0.8, 22, 6-8
SY-U	52.0 ± 1.4, 2, 51-53	47.5 ± 2.1, 2, 46-49	6.5 ± 0.7, 2, 6-7
HY-F	53.1 ± 1.7, 21, 50-57	48.3 ± 2.5, 21, 45-57	8.1 ± 1.0, 21, 6-10
HY-M	54.1 ± 1.7, 44, 50-57	47.3 ± 1.7, 44, 43-50	8.1 ± 0.8, 44, 6-9
HY-U	53.7 ± 2.5, 7, 52-59	48.5 ± 3.4, 7, 46-56	7.9 ± 0.4, 7, 7-8
U-M	53.7 ± 0.6, 3, 53-54	46.7 ± 1.5, 3, 45-48	9.5 ± 0.7, 2, 9-10
U-U	58.5 ± 6.4, 2, 54-63	48.0 ± 2.8, 2, 46-50	8, 2

Age-Sex	Wing (mm): mean ± SD, n, range	Tail (mm): mean ± SD, n, range	Mass (g): mean ± SD, n, range
	Yellow-breasted Chat (<i>Icteria virens</i>)		
ASY-U	72.5 ± 3.5, 2, 70-75	69.5 ± 2.1, 2, 68-71	21.5 ± 2.1, 2, 20-30
AHY-F	74.0 ± 2.8, 15, 70-79	71.4 ± 4.3, 15, 65-80	27.5 ± 2.3, 15, 25-33
AHY-M	75.3 ± 2.9, 19, 71-85	72.3 ± 2.7, 19, 68-77	27.8 ± 2.7, 19, 24-34
AHY-U	75.9 ± 2.6, 12, 71-79	74.2 ± 5.6, 12, 68-85	28.1 ± 2.2, 12, 24-30
SY-F	79, 1	78, 1	24, 1
SY-M	72.0 ± 2.8, 2, 70-74	67.5 ± 3.5, 2, 65-70	23.0 ± 4.2, 2, 20-26
SY-U	73, 2	68.0 ± 2.8, 2, 66-70	22.5 ± 2.1, 2, 21-24
HY-F	74.8 ± 0.5, 4, 74-75	70.8 ± 3.6, 4, 65-76	26.5 ± 4.7, 4, 20-30
HY-M	75.6 ± 1.6, 12, 73-78	72.0 ± 3.9, 12, 65-80	27.9 ± 2.2, 11, 24-31
HY-U	75.8 ± 2.8, 21, 71-80	74.0 ± 4.4, 21, 67-83	28.0 ± 2.3, 20, 23-32
U-U	74.5 ± 0.7, 2, 74-75	73.8 ± 2.5, 2, 72-76	29.0 ± 1.4, 2, 28-30
	Chipping Sparrow (<i>Spizella passerina</i>)		
ASY-U	68, 1	59, 1	12, 1
AHY-U	65.4 ± 7.4, 4, 55-71	59 ± 2.7, 4, 55-61	11.8 ± 0.5, 4, 11-12
SY-U	66.4 ± 2.8, 7, 63-70	55.7 ± 2.8, 7, 53-61	12.0 ± 1.3, 7, 10-14
HY-U	65.9 ± 3.7, 16, 57-72	57.4 ± 3.9, 16, 51-68	11.7 ± 1.2, 14, 9-13
U-U	67.3 ± 2.0, 5, 66-71	58.0 ± 3.5, 5, 54-63	10.6 ± 0.9, 5, 10-12
	Field Sparrow (<i>Spizella pusilla</i>)		
ASY-U	61.1 ± 2.7, 9, 58-66	62.8 ± 3.6, 9, 57-69	12.5 ± 0.8, 8, 12-14
AHY-U	62.8 ± 2.8, 83, 54-70	63.5 ± 3.3, 83, 56-71	12.9 ± 1.3, 78, 11-20
SY-U	62.8 ± 2.1, 13, 60-66	62.8 ± 3.6, 13, 57-69	13.5 ± 1.1, 13, 12-15
HY-U	62.9 ± 2.6, 124, 57-68	63.9 ± 2.9, 124, 57-72	12.4 ± 1.0, 110, 10-15
U-U	64.8 ± 3.4, 31, 56-71	64.8 ± 3.5, 30, 55-71	12.8 ± 1.3, 19, 10-15
	Le Conte's Sparrow (<i>Ammodramus leconteii</i>)		
AHY-U	51.5 ± 2.4, 10, 49-57	48.8 ± 2.2, 10, 46-52	13.3 ± 1.5, 9, 12-16
HY-U	50.8 ± 1.4, 13, 48-53	49.4 ± 2.1, 13, 45-53	12.9 ± 1.0, 13, 11-14
U-U	51, 1	50, 1	13, 1
	Fox Sparrow (<i>Passerella iliaca</i>)		
ASY-U	83.6 ± 2.0, 7, 81-87	70.4 ± 2.6, 7, 66-73	34.1 ± 3.3, 7, 28-38
AHY-U	85.5 ± 3.1, 90, 76-97	72.0 ± 3.3, 90, 65-79	33.1 ± 2.3, 88, 26-40
SY-U	84.0 ± 3, 10, 79-87	71.0 ± 3.4, 10, 65-77	35.0 ± 3.5, 10, 27-39
HY-U	85.6 ± 3.0, 76, 80-94	71.8 ± 3.5, 75, 64-81	32.3 ± 2.9, 56, 24-39
U-M	85.0 ± 4.2, 2, 82-88	71.5 ± 3.5, 2, 69-74	-
U-U	86.2 ± 2.8, 28, 82-92	73.3 ± 4.0, 28, 66-86	32.0 ± 3.6, 7, 28-37
	Song Sparrow (<i>Melospiza melodia</i>)		
ASY-U	65.1 ± 5.1, 6, 59-72	67.2 ± 3.4, 6, 62-71	20.8 ± 1.0, 6, 20-22
AHY-U	65.5 ± 2.9, 117, 60-72	67.5 ± 4.3, 116, 50-76	20.2 ± 1.9, 98, 17-28
SY-U	63.9 ± 2.5, 19, 60-69	66.6 ± 2.8, 19, 63-74	19.2 ± 2.4, 18, 14-22
HY-U	64.8 ± 2.4, 104, 59-20	66.7 ± 3.1, 103, 59-74	19.2 ± 1.7, 86, 16-26
U-U	65.7 ± 2.7, 14, 61-70	67.8 ± 3.1, 14, 64-75	19.5 ± 1.0, 10, 18-21

Age-Sex	Wing (mm): mean ± SD, n, range	Tail (mm): mean ± SD, n, range	Mass (g): mean ± SD, n, range
	Lincoln's Sparrow (<i>Melospiza lincolnii</i>)		
ASY-U	60.7 ± 2.8, 46, 51-67	56.4 ± 2.8, 46, 51-62	16.3 ± 0.9, 44, 14-18
AHY-M	58, 2	53.0 ± 1.4, 2, 52-54	14.5 ± 0.7, 2, 14-15
AHY-U	60.3 ± 2.5, 480, 51-73	55.5 ± 2.7, 480, 47-63	15.6 ± 1.4, 434, 10-20
SY-M	63, 1	60, 1	15, 1
SY-U	59.4 ± 2.8, 115, 48-66	54.8 ± 3.1, 115, 41-62	15.5 ± 1.4, 109, 12-18
HY-F	62, 1	58, 1	12, 1
HY-U	60.2 ± 2.7, 178, 47-69	55.8 ± 2.8, 178, 47-64	15.8 ± 1.8, 141, 12-21
U-U	61.0 ± 3.4, 38, 53-76	56.8 ± 2.4, 38, 52-62	16.1 ± 1.8, 22, 11-18
	Swamp Sparrow (<i>Melospiza georgiana</i>)		
ASY-F	-	54, 1	14, 1
ASY-U	60.4 ± 3.6, 15, 55-68	56.6 ± 3.2, 15, 50-60	16.0 ± 1.1, 15, 14-18
AHY-F	55, 1	50, 1	14, 1
AHY-U	59.3 ± 2.1, 48, 54-65	57.1 ± 2.8, 48, 50-62	15.6 ± 1.7, 44, 10-18
SY-M	55, 1	53, 1	16, 1
SY-U	58.3 ± 2.2, 21, 56-64	55.8 ± 3.5, 21, 48-64	15.4 ± 0.8, 21, 14-16
HY-U	58.8 ± 2.4, 78, 51-64	57.3 ± 2.9, 78, 51-66	15.3 ± 1.3, 64, 12-19
U-U	59.4 ± 2.0, 20, 56-63	56.8 ± 3.6, 20, 44-61	15.1 ± 1.0, 10, 14-16
	White-throated Sparrow (<i>Zonotrichia albicollis</i>)		
ASY-M	74.3 ± 0.4, 2, 74-75	76.5 ± 2.1, 2, 75-78	-
ASY-U	72.0 ± 3.2, 25, 67-77	71.9 ± 3.6, 25, 65-78	25.3 ± 2.0, 24, 22-29
AHY-F	66.4 ± 0.8, 4, 66-67	68.0 ± 1.8, 4, 66-70	25.0 ± 1.4, 2, 24-26
AHY-M	75.2 ± 2.2, 44, 69-80	74.6 ± 2.1, 44, 70-80	25.4 ± 1.9, 26, 21-30
AHY-U	71.9 ± 3.0, 213, 64-83	71.8 ± 3.1, 210, 64-81	24.7 ± 2.2, 175, 20-33
SY-M	75.8 ± 3.3, 4, 72-79	74.1 ± 2.1, 4, 72-77	25.8 ± 2.1, 4, 23-28
SY-U	71.2 ± 3.1, 81, 65-79	71.8 ± 3.4, 81, 65-80	25.1 ± 1.9, 79, 21-30
HY-F	66.4 ± 0.7, 11, 65-67	67.4 ± 2.2, 11, 64-70	20.7 ± 1.2, 3, 20-22
HY-M	74.5 ± 1.6, 26, 72-77	73.3 ± 3.1, 26, 68-79	24.3 ± 1.7, 21, 22-28
HY-U	70.7 ± 2.3, 201, 66-76	70.6 ± 3.3, 199, 60-80	23.5 ± 1.8, 165, 20-28
U-F	66, 2	67.5 ± 0.7, 2, 67-68	23.5 ± 2.1, 2, 22-25
U-M	76, 1	78, 1	28, 1
U-U	71.4 ± 2.7, 25, 65-76	72.5 ± 2.9, 25, 67-78	24.1 ± 2.3, 22, 22-29
	Harris's Sparrow (<i>Zonotrichia querula</i>)		
ASY-U	81.8 ± 3.3, 6, 78-87	80.3 ± 2.6, 6, 78-84	36.2 ± 5.9, 6, 30-45
AHY-F	84, 1	79, 1	32, 1
AHY-U	83.7 ± 0.6, 3, 83-84	79.0 ± 1.0, 3, 78-80	32.0 ± 3.5, 3, 30-36
SY-U	77.3 ± 0.6, 3, 77-78	75.7 ± 1.2, 3, 75-77	33.3 ± 2.3, 3, 32-36
HY-U	81.3 ± 7.0, 4, 72-88	80.8 ± 9.2, 4, 70-91	28.0 ± 2.7, 3, 25-30
U-M	90, 1	84, 1	40, 1
U-U	80.7 ± 1.8, 9, 77-82	77.2 ± 1.7, 9, 75-80	-
	White-crowned Sparrow (<i>Zonotrichia leucophrys</i>)		
ASY-U	76.3 ± 3.2, 9, 71-80	71.0 ± 2.3, 9, 68-75	28.5 ± 2.6, 8, 23-32
AHY-U	75.8 ± 2.9, 18, 71-81	71.4 ± 3.1, 18, 67-77	25.7 ± 1.9, 16, 23-30
SY-U	74.9 ± 2.4, 18, 70-79	70.7 ± 3.4, 18, 65-78	26.2 ± 2.7, 18, 22-30
HY-F	72, 1	69, 1	24, 1
HY-M	82, 1	74, 1	26, 1
HY-U	75.6 ± 3.1, 44, 66-83	71.4 ± 2.7, 44, 66-78	25.4 ± 2.5, 39, 19-31

Age-Sex	Wing (mm): mean \pm SD, n, range	Tail (mm): mean \pm SD, n, range	Mass (g): mean \pm SD, n, range
Dark-eyed Junco (<i>Junco hyemalis</i>)			
ASY-M	77, 1	60, 1	18, 1
ASY-U	76, 1	68, 1	17, 1
AHY-F	73.0 \pm 2.6, 23, 71-83	66.6 \pm 4.2, 22, 60-76	16.8 \pm 1.3, 16, 14-19
AHY-M	76.9 \pm 3.4, 17, 70-81	67.9 \pm 3.8, 17, 63-77	18.0 \pm 1.4, 14, 16-20
AHY-U	74.3 \pm 2.3, 47, 70-79	65.5 \pm 2.2, 47, 59-71	17.6 \pm 1.6, 32, 14-22
SY-F	72.9 \pm 2.5, 7, 70-77	64.1 \pm 3.3, 7, 59-69	18.0 \pm 1.5, 7, 15-20
SY-U	73.6 \pm 1.3, 12, 72-75	64.5 \pm 2.6, 12, 60-68	17.8 \pm 1.4, 12, 16-21
HY-F	72.1 \pm 2.4, 12, 69-78	64.0 \pm 2.3, 12, 61-68	16.9 \pm 1.2, 10, 15-19
HY-M	78.6 \pm 2.2, 5, 76-82	66.5 \pm 1.9, 5, 64-69	17.8 \pm 0.5, 4, 17-18
HY-U	74.4 \pm 2.1, 61, 71-79	64.3 \pm 2.9, 61, 52-70	17.2 \pm 1.3, 54, 13-21
U-U	75.7 \pm 1.2, 3, 75-77	64.2 \pm 3.9, 3, 61-69	16.3 \pm 0.6, 3, 16-17
Northern Cardinal (<i>Cardinalis cardinalis</i>)			
ASY-F	88, 1	95, 1	41, 1
ASY-M	90.3 \pm 2.3, 3, 89-93	99.3 \pm 2.1, 3, 97-101	40.7 \pm 4.2, 3, 36-44
AHY-F	90.0 \pm 2.4, 250, 83-99	97.4 \pm 5.0, 250, 81-111	40.6 \pm 2.6, 183, 34-49
AHY-M	93.2 \pm 2.8, 183, 82-104	102.0 \pm 5.0, 183, 87-113	42.2 \pm 2.4, 132, 36-48
SY-F	90.8 \pm 2.6, 24, 86-98	97.3 \pm 4.5, 24, 86-103	41.3 \pm 4.0, 13, 34-52
SY-M	93.7 \pm 2.2, 22, 89-98	100.0 \pm 3.9, 22, 94-108	40.4 \pm 2.8, 10, 36-44
SY-U	91, 1	97, 1	44, 1
HY-F	88.7 \pm 3.3, 104, 80-97	97.6 \pm 5.3, 103, 85-112	40.5 \pm 2.4, 43, 35-46
HY-M	90.1 \pm 3.9, 127, 72-98	99.7 \pm 5.1, 127, 81-116	42.1 \pm 2.8, 57, 36-48
HY-U	87.0 \pm 3.3, 65, 74-93	96.4 \pm 6.2, 65, 81-109	40.0 \pm 2.5, 55, 33-45
U-F	90.2 \pm 2.0, 58, 84-95	99.2 \pm 3.4, 58, 92-108	42.0 \pm 1.9, 49, 38-46
U-M	93.3 \pm 3.4, 62, 81-102	102.4 \pm 4.9, 62, 85-112	43.7 \pm 2.8, 40, 38-55
U-U	86, 1	97, 1	38, 1
Indigo Bunting (<i>Passerina cyanea</i>)			
ASY-F	63.1 \pm 1.5, 28, 61-66	49.4 \pm 2.3, 28, 47-59	13.3 \pm 1.1, 27, 12-16
ASY-M	66.5 \pm 3.1, 25, 56-71	51.5 \pm 2.1, 25, 47-56	14.1 \pm 1.2, 20, 12-18
AHY-F	63.7 \pm 2.5, 30, 58-71	49.9 \pm 2.8, 30, 46-58	13.5 \pm 1.7, 24, 10-17
AHY-M	67.9 \pm 1.8, 14, 64-70	51.4 \pm 2.1, 14, 46-55	14.5 \pm 1.9, 8, 12-18
SY-F	63.2 \pm 2.0, 19, 61-69	48.8 \pm 3.0, 19, 42-57	12.5 \pm 1.0, 19, 11-14
SY-M	66.5 \pm 2.7, 48, 61-77	51.4 \pm 2.3, 48, 46-57	13.5 \pm 1.0, 47, 11-16
HY-F	63.1 \pm 2.2, 8, 60-66	50.4 \pm 3.5, 8, 46-57	14.6 \pm 0.9, 8, 13-16
HY-M	66.4 \pm 3.2, 7, 60-69	52.4 \pm 2.9, 7, 48-57	14.4 \pm 1.1, 7, 13-16
HY-U	63.8 \pm 2.3, 43, 60-68	50.4 \pm 2.7, 43, 44-60	14.2 \pm 1.9, 37, 9-17
U-M	69, 1	54, 1	16, 1
U-U	64.5 \pm 2.0, 4, 62-66	51.0 \pm 0.8, 4, 50-52	14, 1

Age-Sex	Wing (mm): mean \pm SD, n, range	Tail (mm): mean \pm SD, n, range	Mass (g): mean \pm SD, n, range
Painted Bunting (<i>Passerina ciris</i>)			
ASY-F	67.9 \pm 2.1, 55, 62-72	53.0 \pm 2.4, 55, 46-58	14.7 \pm 1.1, 55, 12-17
ASY-M	71.1 \pm 1.3, 14, 70-74	55.3 \pm 1.0, 14, 54-58	16.0 \pm 0.8, 13, 15-18
ASY-U	71, 1	54, 1	15, 1
AHY-F	67.3 \pm 2.3, 19, 63-71	53.2 \pm 2.9, 19, 49-62	14.3 \pm 1.3, 15, 12-16
AHY-M	72.0 \pm 1.8, 4, 70-74	57.5 \pm 2.9, 4, 54-61	15.5 \pm 0.7, 2, 15-16
AHY-U	67.5 \pm 3.5, 2, 65-70	53.0 \pm 2.8, 2, 51-55	14, 2
SY-F	67.9 \pm 2.2, 30, 65-72	53.3 \pm 2.0, 30, 49-57	14.9 \pm 1.2, 30, 13-17
SY-M	69.8 \pm 2.1, 21, 63-73	54.4 \pm 2.6, 21, 47-59	15.7 \pm 1.2, 20, 13-18
SY-U	67.8 \pm 3.4, 12, 62-72	52.9 \pm 3.1, 12, 49-57	14.6 \pm 1.2, 12, 13-16
HY-F	66.3 \pm 1.6, 4, 65-68	50.5 \pm 2.7, 4, 47-53	17.3 \pm 1.5, 4, 15-18
HY-U	67.1 \pm 1.9, 10, 65-70	53.7 \pm 5.1, 9, 47-66	15.7 \pm 2.2, 10, 11-18

For statistical analysis, 15 species met the assumptions of normality for comparing mean wing length, tail length, and body mass; therefore, we used t-tests with an alpha level = 0.05. Six species had small sample sizes and we used nonparametric Mann Whitney U-tests to compare morphometric means. Four species met the assumptions of normality and we used analysis of variance to compare differences in mean wing length, tail length, and body mass among age classes. We used nonparametric Kruskal Wallis analysis for eight species with small sample sizes to compare morphometric variables among age classes. Species with less than 20 individuals were examined for differences in measurements among sex or age classes.

RESULTS

We analyzed morphometric data for 12,834 individual birds of 59 species (12 resident, 20 Nearctic-Nearctic, and 27 Nearctic-Neotropical) netted at the Heard Museum. Table 1 presents summary statistics for each species by age-sex classes for wing length, tail length, and body mass. For 20 species, wing length was statistically longer in males than females including: Red-bellied Woodpecker ($t = -3.89$, $df = 22$, $P < 0.01$), Least Flycatcher ($t = -14.86$, $df = 248$, $P < 0.01$), Tufted Titmouse ($t = -2.4$, $df = 18$, $P = 0.03$), Golden-crowned Kinglet ($U = 239$, $df = 63$, $P < 0.01$)

Ruby-crowned Kinglet ($t = -16.24$, $df = 549$, $P < 0.01$), House Finch ($U = 65.5$, $df = 31$, $P = 0.02$), Black-and-white Warbler ($U = 251$, $df = 59$, $P < 0.01$), Prothonotary Warbler ($t = -5.23$, $df = 80$, $P < 0.01$), Nashville Warbler ($t = -9.94$, $df = 534$, $P < 0.01$), Mourning Warbler ($t = -7.33$, $df = 241$, $P < 0.01$), Common Yellowthroat ($t = -18.71$, $df = 935$, $P < 0.01$), Magnolia Warbler ($U = 64.5$, $df = 38$, $P < 0.01$), Yellow Warbler ($t = -3.74$, $df = 100$, $P < 0.01$), Yellow-rumped (Myrtle) Warbler ($t = -8.25$, $df = 423$, $P < 0.01$), Wilson's Warbler ($t = -4.61$, $df = 336$, $P < 0.01$), White-throated Sparrow ($t = -17.11$, $df = 92$, $P < 0.01$), Dark-eyed Junco ($U = 141$, $df = 63$, $P < 0.01$), Northern Cardinal ($t = -11.36$, $df = 832$, $P < 0.01$), Indigo Bunting ($t = -9.39$, $df = 178$, $P < 0.01$), Painted Bunting ($t = -7.06$, $df = 145$, $P < 0.01$).

Tail length was significantly longer in males than females for 14 species (Table 1) including:

Least Flycatcher ($t = -8.74$, $df = 248$, $P < 0.01$),
Tufted Titmouse ($t = -2.36$, $df = 18$, $P = 0.03$),
Ruby-crowned Kinglet ($t = -16.24$, $df = 549$, $P < 0.01$),
House Finch ($U = 47.5$, $df = 29$, $P < 0.01$),
Prothonotary Warbler ($t = -3.74$, $df = 80$, $P < 0.01$),
Orange-crowned Warbler ($U = 274.4$, $df = 178$, $P < 0.01$),
Mourning Warbler ($t = -4.22$, $df = 240$, $P < 0.01$),
Common Yellowthroat ($t = -11.71$, $df = 933$, $P < 0.01$),
Yellow Warbler ($t = -2.69$, $df = 100$, $P < 0.01$),
White-throated Sparrow ($t = -10.17$, $df = 92$, $P < 0.01$),
Dark-eyed Junco ($U = 317$, $df = 62$, $P = 0.03$),
Northern Cardinal ($t = -10.27$, $df = 831$, $P < 0.01$),
Indigo Bunting ($t = -5.32$, $df = 178$, $P < 0.01$),
Painted Bunting ($t = -4.44$, $df = 145$, $P < 0.01$).

Males of three species had greater body mass than females including:

Red-bellied Woodpecker ($t = -3.21$, $df = 16$, $P < 0.01$),
Northern Cardinal ($t = -6.51$, $df = 529$, $P < 0.01$),
White-throated Sparrow ($t = -3.03$, $df = 59$, $P < 0.01$).

HY Traill's Flycatcher had shorter wing ($X^2_3 = 61.05$, $P < 0.01$) and tail length ($X^2_3 = 41.99$, $P < 0.01$) than adult birds. ASY Least Flycatcher had greater wing length than SY birds ($X^2_3 = 21.13$, $P < 0.01$). SY Blue Jay had shorter wing length ($X^2_3 = 13.6$, $P < 0.01$) and less body mass ($X^2_3 = 10.49$, $P = 0.02$) than ASY birds. ASY Tufted Titmouse had longer wing length ($F_{3,116} = 3.51$, $P = 0.02$) and tail length ($F_{3,116} = 5.84$, $P < 0.01$)

than HY birds. ASY Ruby-crowned Kinglet had longer wing length than sub-adult birds ($F_{3,489} = 6.67$, $P < 0.01$). HY Brown Thrasher had shorter wings ($F_{3,110} = 4.34$, $P < 0.01$) than adult birds and ASY birds had greater body mass ($F_{3,98} = 5.4$, $P < 0.01$). ASY Northern Waterthrush had greater wing length than SY birds ($X^2_3 = 13.59$, $P < 0.01$). ASY American Redstart had longer wing length ($X^2_3 = 14.4$, $P = 0.02$) and tail length ($X^2_3 = 9.43$, $P = 0.02$) than other age classes. ASY Wilson's Warbler had greater wing length ($X^2_3 = 37.71$, $P < 0.01$) than SY birds. ASY White-throated Sparrow had longer wings ($X^2_3 = 26.92$, $P < 0.01$), tails ($X^2_3 = 22.92$, $P < 0.01$) and greater body mass ($X^2_3 = 55.63$, $P < 0.01$) than SY birds. ASY White-crowned Sparrow had greater body mass than juvenile birds ($X^2_3 = 9.83$, $P = 0.02$). Adult Northern Cardinal had longer wing length than HY birds ($F_{3,776} = 36.62$, $P < 0.01$).

DISCUSSION

Red-bellied Woodpecker – Male Red-bellied Woodpeckers averaged 5 mm greater wing length than females and both sexes had similar wing length ranges (Wallace 1974, Pyle 1997). Male Red-bellied Woodpeckers weighed 6.2 g more than females and body mass for both sexes fell within published ranges for this species (Winkler et al. 1995).

Least Flycatcher – Male Least Flycatchers averaged 4.3 mm greater wing length than females, although both sexes had wider ranges for wing length than reported by Pyle (1997). Female (60.2 mm) and male (64.5 mm) wing lengths were nearly identical to measurements from females and males in Michigan (60.8 and 64.1 mm, respectively; Walkinshaw 1966). Male Least Flycatchers averaged 2.4 mm longer tails than females; female tail length fell within the range reported by Pyle (1997), but males had a broader range of tail length.

Tufted Titmouse – Male Tufted Titmouse averaged 3.1 mm greater wing length than females. The range of wing lengths for male Tufted Titmouse was equal to values reported by Pyle (1997), but female wing length range was shorter by 3–4 mm. Male Tufted Titmouse averaged 3.2 mm longer tails than females, although both male and female titmice had shorter and narrower tail length ranges than reported by Pyle (1997).

Golden-crowned Kinglet – Male Golden-crowned Kinglets averaged 1.9 mm longer wings than females,

although both male and female wing length ranges were less than those reported by Pyle (1997), but within ranges reported by Jewett et al. (1953) in Washington and Prescott (1980) in New Jersey.

Ruby-crowned Kinglet – Female Ruby-crowned Kinglets averaged 2.8 mm shorter wing length than males. Male (58.2 mm) and female (55.4 mm) mean wing lengths were identical to males (58.2 mm) and within 1 mm among females (55.5 mm) in Ontario (Wallace 1991 in Swanson et al. 2008). Female Ruby-crowned Kinglets averaged 1.9 mm shorter tails than males. Females exhibited a broader range of tail lengths compared to Pyle (1997), whereas male tail length range was shorter than in Pyle (1997).

House Finch – Female House Finches averaged 2 mm shorter wings than males, with comparable wing length ranges. Compared to data from Pyle (1997), House Finches in our study also had similar wing length ranges. Male House Finches averaged 2.9 mm longer tails than females, but both sexes had narrower tail length ranges than reported by Pyle (1997).

Black-and-white Warbler – Male Black-and-white Warblers averaged 1.4 mm greater wing length than females, although females had a broader wing length range than males. Compared to data from Pyle (1997), females in our study had longer wing length, but males had a narrower range of wing length than other estimates (Pyle 1997).

Prothonotary Warbler – Male Prothonotary Warblers averaged 2.9 mm greater wing length than females, with similar ranges reported by Pyle (1997). Males in our study (70 mm) had shorter wings than males (71.3 mm) in a similar study in Oklahoma (Wood 2007), whereas females had similar mean wing length. Male Prothonotary Warblers averaged 1.9 mm longer tails than females. Females in our study had similar tail length (43.6 mm) to females in Oklahoma (43.2 mm) and males had similar tail length (45.5 mm) compared to males in Oklahoma (45.7 mm) (Wood 2007).

Orange-crowned Warbler – Male Orange-crowned Warblers had 1.5 mm longer tails than females, but both sexes had narrower ranges for tail length compared to Pyle (1997).

Nashville Warbler – Female Nashville Warblers averaged 1.9 mm shorter wings than males and both sexes had similar wing length ranges compared to data from Pyle (1997). In Ontario, female Nashville Warblers averaged 0.8 mm shorter wings than females in our study, but males in Ontario averaged 0.5 mm longer wings than males in our study (Francis and Cooke 1986).

Mourning Warbler – Male Mourning Warblers averaged 2.3 mm longer wings than females and wing length range for both sexes fell within those reported by Pyle (1997). Female Mourning Warblers averaged 1.5 mm shorter tails than males, but both sexes exhibited narrower ranges for tail length than reported by Pyle (1997).

Common Yellowthroat – Male Common Yellowthroats averaged 2.7 mm longer wings than females and wing length ranges for both sexes were shorter, but within the range of wing lengths reported by Pyle (1997); however, the effects of weathering on feathers by age and time of year may vary (Francis and Wood 1989, Flinks and Salewski 2012). Male Common Yellowthroats averaged 2.4 mm longer tails than females. Tail length range for female yellowthroats in our study was within the range reported by Pyle (1997); however, male yellowthroats in our study had a wider range for tail length than Pyle (1997).

Magnolia Warbler – Male Magnolia Warblers averaged 1.8 mm longer wings than females. Compared to Pyle (1997), females and males in our study had a narrower range of wing lengths.

Yellow Warbler – Female Yellow Warblers averaged 2.1 mm shorter wings than males and females had similar wing length range compared to Pyle (1997); males exhibited a broader wing length range than Pyle (1997). Female Yellow Warblers averaged 1.3 mm shorter tail length than males. Mean female tail length in our study (43.3 mm) was identical to those reported from Minnesota (Raveling and Warner 1978). For Yellow Warblers, males in Minnesota had longer tails (45.1 mm) than males (44.6 mm) in our study (Raveling and Warner 1978).

Yellow-rumped Warbler – For Yellow-rumped Warblers, males averaged 2 mm longer wings than

females and both sexes had broader wing length ranges than reported by Pyle (1997).

Wilson's Warbler – Male Wilson's Warblers averaged 1.7 mm longer wings than females and both sexes wing length ranges fell within those reported by Oberholser (1974) and Pyle (1997).

White-throated Sparrow – Male White-throated Sparrows averaged 8.7 mm longer wings than females and had similar wing length ranges to those reported by Pyle (1997). Male White-throated Sparrows averaged 6.7 mm longer tails than females and had similar tail length ranges to Pyle (1997). For body mass, male White-throated Sparrows averaged 2.4 g more than females. Dunning (1993) reports a mean body mass of 25.9 g (range 19-35.4 g) for both sexes compared to 24.4 g (range 20-33 g) in our study.

Dark-eyed Junco – Male Dark-eyed Juncos averaged 4.6 mm longer wings than females and both sexes had broader ranges for wing length than reported by Pyle (1997). Male Dark-eyed Juncos averaged 1.9 mm longer tails than females and both sexes tail length ranges fell within those reported by Pyle (1997).

Northern Cardinal – For Northern Cardinals, females averaged 2.4 mm shorter wings than males. Female and male cardinals exhibited a narrower range for wing length than reported by Pyle (1997). Male Northern Cardinals averaged 3.5 mm longer tails than females and both sexes exhibited a wider range of tail lengths than reported by Pyle (1997) for the subspecies found in North Texas (*C. c. cardinalis*). For body mass, Male Northern Cardinals averaged 1.5 g more than females. Male (42.3 g) and female (40.8 g) cardinals in our study weighed less than males (45.1 g) and females (43.0 g) in Tennessee (Laskey 1944).

Indigo Bunting – Male Indigo Buntings averaged 3.4 mm longer wings than females. Mean male wing length in our study (66.7 mm) was identical to males in Pennsylvania; similarly, females in Texas (63.3 mm) were nearly identical to females (63.2 mm) in Pennsylvania with similar wing length ranges (Mulvihill et al. 2004). Male Indigo Buntings averaged 2 mm longer tails than females. Males had a similar tail length range to Pyle (1997), whereas females had a greater range than reported by Pyle (1997).

Painted Bunting – Male Painted Buntings averaged 2.7 mm longer wings than females and had similar wing length ranges to Pyle (1997). Male Painted Buntings averaged 2.0 mm longer tails than females. Both female and male tail length ranges were within the ranges reported by Pyle (1997).

When significant differences were detected, males averaged longer wing length, tail length, and body mass than females. For several species, males and females had greater variation in morphometric measurements than in Pyle (1997), although other species fell within the ranges reported by Pyle (1997) and others studies. Although differences by age-sex combinations are under reported in the published literature, our results indicate that adult birds tended to have longer wing length, tail length and greater body mass than HY or immature birds.

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